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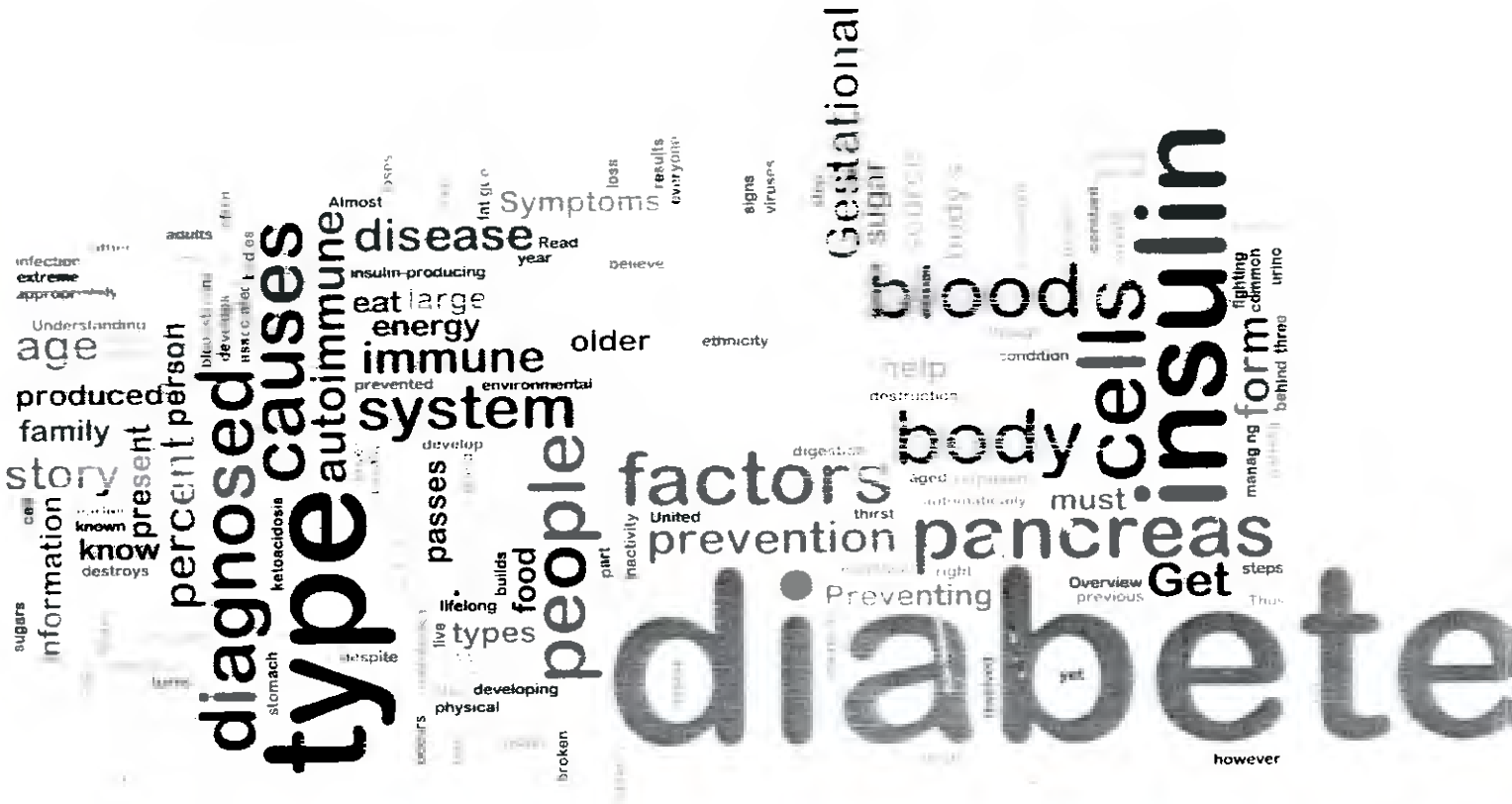

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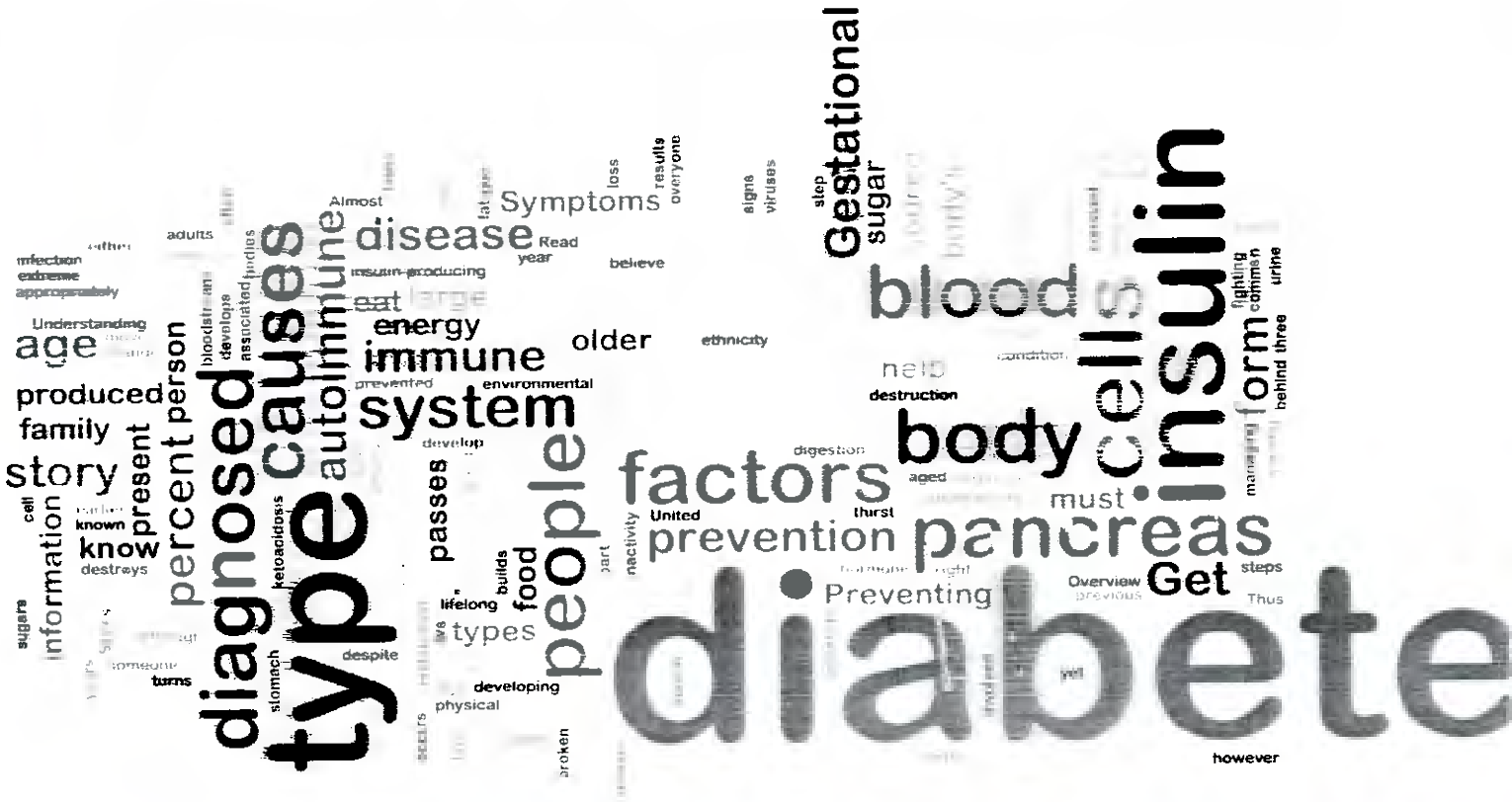

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Role of Ultrasonography and Computed Tomography in Diagnosis of Pancreatitis

Dr. Ajit Kumar[1], Dr. S. Vivekanand[2]

ABSTRACT

BACKGROUND AND OBJECTIVES [illegible] to diagnose pancreatitis by ultrasound and computed tomography and to define limitations and advantages of one modality over other.

MATERIALS AND METHODS : We studied findings of acute and chronic pancreatitis by ultrasound and CT between [illegible] years of age from October 2012 to September 2014. Patients were confirmed to have pancreatitis based on imaging findings on either modality and a combination of clinical features suggestive of pancreatitis and biochemical values to support a diagnosis of the same. In acute pancreatitis, CT severity index also taken into consideration. The index focuses on the presence and degree of pancreatic inflammation and necrosis on a 10 point severity scale, points are awarded for the presence or absence of fluid collections. Patients in whom the diagnosis of pancreatitis was made purely on clinical grounds without any imaging (ultrasound or CT) and patients in whom no imaging was done prior to surgery where a diagnosis of pancreatitis was made was excluded from the study.

RESULTS : Epigastric pain is the most common symptom in acute pancreatitis. Mostly the patients are alcoholic. It affects males more than females. In our study 81% of patients are males.

CONCLUSION : Ultrasound is the initial investigation for pancreatitis but CT is investigation of choice. Ultrasound sometimes is not accurate because of bowel gas and other techniqual problems. Alteration in the size and echogenicity were the most common ultrasonography findings. Bulky hypoechoic pancreas was considered diagnostic of acute pancreatitis on ultrasonography. Duct dilatation and calcification were seen in chronic pancreatitis on ultrasonography.

INTRODUCTION

The pancreas is a difficult organ to evaluate by both clinical and routine radiological methods. An inflammatory pathology involving the pancreas will form part of the differential diagnosis of other conditions presenting with abdominal pain. The combination of appropriate clinical findings and laboratory tests permit an accurate diagnosis of acute pancreatitis in most patients. Chronic pancreatitis, on the other hand, forms a much more difficult entity to evaluate clinically or biochemically.

The clinical and biochemical parameters form a key factor in the diagnosis of Acute Pancreatitis. But the history and clinical presentation may be misleading and the biochemical parameters (particularly serum amylase values) can be normal, particularly when the test is performed a few days after the initial attack. To exclude other abdominal catastrophes and support the clinical suspicion of acute pancreatitis, conventional radiographs have been used. Radiographic studies are of limited value in patients suspected of having acute pancreatitis, both to support and exclude its diagnosis. Supine, lateral decubitus and erect films of the abdomen, help exclude other diagnosis such as a perforated viscus. Nonspecific finding are found in radiographs in patients with acute pancreatitis, including adynamic ileus or a sentinel loop. In addition, pancreatic calcifications may be found in patients with chronic pancreatitis, and peripancreatic gas is seen uncommonly in patients with pancreatic abscess8. These tests are rather insensitive and nonspecific.

Cross-sectional imaging with ultrasound and CT has afforded rapid, accurate and noninvasive evaluation of the pancreas. Ultrasound provided the first reliable, reproducible, cross-sectional view of pancreatic anatomy. However, it has limitations in obese patients and in those with large amounts of bowel gas.

CT offers a diagnostic method that does not have these limitations. But CT is expensive, exposes patients to ionizing radiation, and has difficulty in defining tissue planes in lean patients. Modern ultrasound machines allow quick and comprehensive evaluation of the abdomen and the pancreas with its ductal system. Because the examination is inexpensive, noninvasive, and well accepted by the patient, it is currently one of the first imaging techniques performed for the evaluation of suspected chronic pancreatitis.

MATERIALS AND METHODS

This study included 55 cases of pancreatitis who were diagnosed on imaging studies (Ultrasound or CT) or on a constellation of signs, symptoms and laboratory data indicative of pancreatitis during the period from October 2012 to September 2014. The study was conducted in Katihar Medical College and Hospital, Katihar, Bihar.

The inclusion criteria:

One or more imaging modality (Ultrasound and/or CT) were employed for the diagnosis. Patients were confirmed to have pancreatitis based on imaging findings on either modality and a combination of clinical features suggestive of pancreatitis and biochemical values to support a diagnosis of the same.

Exclusion criteria:

Patients in whom the diagnosis of pancreatitis was made purely on clinical grounds without any imaging (ultrasound or CT) being done and patients in whom no imaging was done prior to surgery where a diagnosis of pancreatitis was made.

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patients. The sonographic study was done Siemens Sonatom ARS[illegible] ...MHz convex and a curvilinear 3 ... 5 MHz probe. The sonographic study was not repeated. The CT study was done within 3 to 4 days of admission using a Toshiba AestionT 10mm sections throughout the abdomen and 5 mm section through out the pancreas. The CT study was not repeated. Oral and ... contrast was given in all patients.

A total of 55 cases were studied of which 45 had acute pancreatitis and 10 had chronic pancreatitis. In the 45 cases with acute pancreatitis, ultrasound alone was done in 20 cases, CT alone in 4 cases and both modalities were employed in the remaining 21 patients. All the 10 cases with chronic pancreatitis had an ultrasound study but only one required a CT scan.

RESULT AND DISCUSSION

The study was done on 55 patients who were diagnosed to have pancreatitis which included 45 patients with acute and 10 patients with chronic pancreatitis.

AGE AND SEX DISTRIBUTION

The majority of patients with acute pancreatitis were in the 21 to 40 years age group who represented 55.5% of the total patients with acute pancreatitis. The average age of patients in acute pancreatitis was 41 years with a range from 16 to 67 years.

In patients with chronic pancreatitis, the majority of patients were aged below 30 years (50%) and the average age of patients with chronic pancreatitis was lower (29 years) as compared to acute pancreatitis.

The majority of patients with pancreatitis were males (45 out of 55 patients) representing 81.8% of the total. It was also noted that females with acute pancreatitis tended to be older (47.8 years) as compared to males (35.9years).

PRESENTATION

All patients presented with abdominal pain and vomiting. Most of the patients had a history of alcohol consumption (23 out of 45 patients with acute pancreatitis) and 7 patients gave a history of an alcoholic binge prior to onset of symptoms. Trauma was seen as an etiological factor in two cases, both following a road traffic accident. In two cases, one of whom was positive for rheumatoid factor, was an autoimmune etiology proposed. One patient was an epileptic on carbamazepine and this was suggested as a cause of pancreatitis. In 13 patients, no cause could be found and these were labeled as being idiopathic in nature. Other causes included hyperlipidemia and cholelithiasis.

The serum and / or ascitic fluid amylase [illegible] none of the cases of chronic pancreatitis.

ULTRASOUND FINDINGS IN ACUTE PANCREATITIS

This was done in 41 out of 45 patients (90 ...%). The pancreas ... and the findings noted

1 **Visualization** : The pancreas was visualized in 29 patients (70.7%) and obscured in the remaining 12. This was a better yield ... pancreas as compared to a study reported by Calleja and JS Barkin which stated that in acute pancreatitis, overlying bowel gas disturbances may obscure the pancreas in 40% of patients.

2 **Size** : An enlarged pancreas is due to the interstitial edema within the pancreas- edematous pancreatitis. A bulky pancreas was seen in 16 patients (55.2%)which was more than that reported by RB Jeffrey Jr. where only a third of patients with acute edematous pancreatitis had an enlarged gland. In one case, a patient with acute on chronic pancreatitis, the pancreas was contracted. The pancreas was normal size in 12 patients (41%).

3 **Echotexture** : Due to the edema, a bulky, hypoechoic pancreas is characteristic of edematous pancreatitis. However, this may not be the case always and one series has shown this finding only in a third of patients with edematous pancreatitis. In the present study, hypoechoic pancreas was seen in 13 patients (44.8%) but as many as 11 patients (37.9%) had a normal echogenicity of the pancreas. In the remainder, the pancreas had a heterogenousechotexture representing 17.3% of the cases. Of the 5 patients with a heterogenousechotexture pancreas, 2 were cases of acute on chronic pancreatitis.

4 **Duct dilatation** : The presence of duct dilatation in acute pancreatitis is very variable and could be compressed due to edema or the hypoechoic pancreas may render the duct more easily visible. In this study, it was seen in only 3 patients (10.4%) of whom 2 were cases of acute on chronic pancreatitis. Thus, duct dilation was seen in only 1 patient (3.4%).

5 **Calcification** : This is mainly a feature of chronic pancreatitis and in this study both the patients with calcification (representing 6.9% of patients with a visualized pancreas) had acute on chronic pancreatitis.

6 **Focal lesions** : In the 4 patients (13.8%) with focal lesions within the pancreas, [illegible] ...scans.

... effusions in 8 patients (... other findings which could ... etiology were fatty liver as a manifestation of hyperlipidemia seen in 18 patients, 43.9%) and ... in 8 patients (19.5%).

CT FINDINGS IN ACUTE PANCREATITIS

... 4 patients (9.1%) a CT alone was done.

1 **Visualization** : CT visualization of the pancreas was possible in all cases (25 patients) due to noninterference by the overlying bowel gas.

2 **Size** : In 23 patients (92%), the pancreas was bulky. The one case in which the pancreas was contracted, was a patient with acute on chronic pancreatitis. One case had a normal sized pancreas. As mentioned in literature, a normal pancreas is seen on CT in very mild forms of pancreatitis. Due to lack of surgical correlation, the incidence of normal CT scans in mild acute pancreatitis is not known.

3 ***Duct dilatation*** : This was seen in 3 patients (12%) of whom 2 were cases of acute on chronic pancreatitis.

4 ***Focal lesions*** : Focal lesions were seen in 5 patients (20%) which is comparable to that reported by EJ Balthazer where 18% of patients were seen to have focal lesions.

a) Fluid collections and exudates: Fluid collections were seen in 7 patients (28%), and exudates in 18 patients (72%) with acute pancreatitis.

b) Stomach wall and Gerota' s fascia thickening: Stomach wall thickening was seen in 20 patients (80%) and Gerota's fascia thickening, usually on the left (14 patients), seen in16 patients (64%).

c) Ascites and Plueral effusions: Free intraperitonealfuild representing pancreatic ascites was seen in 4 patients (16%) which was more than that reported by EJ Balthazar (7%).

Pleural effusions were seen in 10 patients (40%) which was also more than that reported by EJ Balthazar. It was seen more often on the left side (60%).

Other findings included fatty liver (11 patients, 44%), cholecystitis (8 patients, 32%) and portal vein thrombosis (1 patient, 4%).

Comparison Between Ultrasonography and CT in Acute Pancreatitis

The overall visualization of the pancreas was far better by CT than by ultrasound. In a study done between 1979-1980 on 102

patients good to excellent visualization [illegible] as present in 64% [illegible] in comparison to 30% [illegible] sonographic study. With improvements in technology, visualization of the pancreas is better on both modalities. This study showed that the pancreas was visualized in as many as 70.7% of patients on ultrasonography and in 100% of patients on CT in acute pancreatitis.

Alterations in size were better appreciated on CT. On CT, 23 patients with acute pancreatitis (92%) were seen to have a bulky pancreas. Of the remainder, one had a contracted pancreas due to underlying chronic pancreatitis; and in one case, the pancreas was normal. This patient had clinical features and laboratory findings suggestive of acute pancreatitis and was managed conservatively. He was asymptomatic at the time of discharge. Incidentally, the ultrasound study of this patient was also normal.

Duct dilation and calcification were picked up in three patients on both modalities. Ultrasound proved more useful in detecting free fluid as seen in 17 patients, in contrast to CT which picked up the same finding in 4 patients. However, due to the facility to inject intravenous contrast, the complication of portal vein thrombosis was picked up on the CT scan of one patient. Probably a colour Doppler sonographic study could have detected the same.

The sensitivity of ultrasongraphy in detecting acute pancreatitis was 59% in those patients in whom the pancreas was visualized. However if all the sonographic studies were considered, sonography diagnosed acute pancreatitis in only 17 of 41 cases representing 41.5% of cases. CT had a sensitivity of 96% mainly due to better visualization (100%) and better assessment of size. As all the patients had pancreatitis, the specificity could be estimated. However, the positive predictive value of both ultrasound and CT was 100%. This means that all patients with a bulky, hypoechoic pancreas on ultrasound have acute pancreatitis. It must be pointed out that 5 patients were taken up for surgery and of these 2 had a normal pancreas on ultrasound. In the other 3, the pancreas was obscured. Hence, as mentioned in the study by SJ Hessel et al, a negative ultrasound study does not exclude significant and, at times, life-threatening pancreatic disease.

ULTRASOUND FINDINGS IN CHRONIC PANCREATITIS

This was done in all the 10 patients

1 ***Size alterations*** The size of the pancreas in chronic pancreatitis is considered to correlate with the activity or chronicity of the disease process. This study showed an atrophic pancreas in 6 patients (60%) and a normal sized pancreas in the remaining 4 patients

Calcifications [illegible] clumps of high level echoes within the parenchyma or [illegible] excretory system. Calcifications was seen in 9 patients (40%) and is the most common finding along with a dilated system in chronic pancreatitis.

3 ***Duct dilatation*** This is the most [illegible] sign in chronic pancreatitis. The incidence of abnormal main pancreatic duct varies from 20% to 52.3% of cases. This study showed this finding to be most common along with calcifications/calculi and was seen in 9 patients (90%). However, ERCP is considered to be more sensitive than ultrasound for detecting ductal changes.

4 ***Echogenecity*** : The infiltration by retroperitoneal fat may alter the echogenicity of the pancreas making it hyperechoic. Acute inflammation may cause areas of decreased echogenicity. Echotexture abnormalities were seen in 7 patients (70%) with 4 patients (40%) being heterogenous in echotexture. Studies have shown echotexture alterations in 55-57% of cases.

5 ***Ascites*** This was seen in one patient.

6 ***Pseudocysts*** This was seen in one patient

CT FINDINGS IN CHRONIC PANCREATITIS

CT was done only in one case which showed an atrophic pancreas, calcifications and a dilated main pancreatic duct which were the most common findings noted by PH Luetmer, David H. Stephens in 54%, 50% and 68% of cases receptivity.

COMPARISION

All the patients who were diagnosed as having chronic pancreatitis on ultrasound were treated as such and findings were confirmed by CT in one case. The sensitivity was 100%, higher than the sensitivity reported by L. Bolondi et al which was 70%. The number of patients in the current study was small due to low incidence (0.2-3%) in the general population.

However, in all the patients, the ultrasound visualization was adequate and the observation of a dilated pancreatic duct and an atrophic pancreas was diagnostic of chronic pancreatitis. Hence, as suggested by L. Bolondi et al, ultrasound, should be first diagnostic step when pancreatic disease is suspected. Ultrasound may lead to a definite diagnosis and visualize complications of chronic pancreatitis. In fact, the most accurate assessment of chronic pancreatitis is achieved by a combination of clinical evaluation (symptoms and pancreatic function tests) and radiologic definition of duct and parenchyma

CONCLUSION

Maximal [illegible] 16—6[illegible] years of age

Pain abdomen [illegible] and periumblical region radiating to the back nausea and vomiting were the most frequent presenting complaints.

Ultrasonography visualized pancreas on [illegible] pancreas in 100% patients

Alteration in the size and echogenicity were the most common ultrasonography findings.

Bulky hypoechoic pancreas was considered diagnostic of acute pancreatitis on ultrasonography.

Duct dilatation and calcification were seen in chronic pancreatitis on ultrasonography.

Ultrasonography has a PPV of 100% and Sensitivity of 59% in patients in whom pancreas were visualized.

CT visualized pancreas in all patients.

Estimation of size and detection of calcification were diagnostic of pancreatitis.

Extra pancreatic spread of inflammation was better noted on CT

CT has a PPV of 100% and Sensitivity of 96%.

Thus it is seen that both Ultrasonography and CT have roles to play in the diagnosis of pancreatitis and both are complementary to each other.

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Real Time Ultrasonography Evaluation of Focal Liver Lesions

Dr. Ajit Kumar[1], Dr. S. Vivekanand[2]

ABSTRACT

Objective : To evaluate the role of real time ultrasonography in characterization of focal liver lesions.

Methodology : Real time ultrasonography was performed in 40 patients with suspected of having focal liver lesions attending the Department of Radiology, Katihar Medical College & Hospital, Katihar, Bihar, over a period of one year.

Results : Of the 40 patients, 26 were male (65%) and 14 were female (35%). Focal liver lesions were common in the age group between 50 – 60 years with 10 patients (25%). Out of 40 patients Hemangioma was the most common lesion with an incidence of 25%, followed by metastases (20%), liver abscess (17.5%), hepatic cysts (15%), primary malignant liver tumor (12.5%), Hydatid lesion (7.5%) and cholangiocarcinoma (2.5%). Abdominal pain and fever were the most common clinical features, followed by loss of weight and appetite. Right lobe of liver was predominantly involved with (75%), followed by both lobes (17.5%) and left lobe (12.5%). Solitary lesions were common (75%) than multiple lesions (25%).

Conclusion *: Real time Sonography is a comprehensive, multiplanar, non invasive, safe diagnostic modality for characterization of focal liver lesions.*

INTRODUCTION

Focal liver lesions are common on pathologic or imaging evaluation of the liver and include a variety of malignant and benign neoplasms, as well as congenital and acquired masses of inflammatory and traumatic nature.

Evaluation of focal liver lesions is a complex issue which is often the major focus of a cross sectional imaging study. Next only to lymph nodes, liver is the most common site for metastases. At death, 40 to 50% of all primary carcinomas will have metastases within the liver.

Sonography is widely accessible, relatively inexpensive, portable, noninvasive, nonionizing, allows imaging in multiple planes and can be repeated frequently. It assists in real time evaluation of organ under examination, especially the liver which is situated just below the ribcage without intervening gas, has a high sensitivity and reasonable specficity. Sonography has excellent spatial and contrast resolution, hence gray-scale morphology of a mass allows for differentiation of cystic and solid masses and in many instances, characteristic recognized appearances may suggest the correct diagnosis without further evaluation.1Characterization of a liver mass on conventional sonography is based on the appearance of the mass on gray scale imaging.

Sonography is widely available and inexpensive. Based on the patients complaints like vague upper abdominal pain, jaundice, fever or unexpected abnormal liver function tests many clinicians request sonography as the initial imaging modality for clinically suspected liver pathology.

The presence of diffuse liver disease such as cirrhosis or steatosis may largely vary the gray-scale sonographic appearance of the hepatic tumors because the echogenecity of the background liver may be altered and make the characterization of the tumors difficult.

MATERIAL AND METHODS

Source of Data

This cross sectional study compromised a total of 40 patients, who are referred for sonography at radiology department, clinically suspected of having focal hepatic lesions and incidentally found focal hepatic lesions on patients sonography done for other reasons from both inpatient & outpatient departments in Katihar Medical College & Hospital, Katihar, Bihar.

This study was conducted from February 2013 to January 2014.

Selection criteria

All the patients who are clinically suspected of focal hepatic lesions and incidentally detected focal hepatic lesions who were referred for sonography were included in the study.

Inclusion criteria

Patients in the age group above 18 years & focal liver lesion of diameter > 10.0 mm.

Exclusion criteria

Patients with diffuse liver disease like steatosis, cirrhosis, hepatitis, storage diseases, diffuse malignancies and also the post-operative and post-traumatic patients.

Statistical analysis

Data analysis was done using Rates, Ratios and Percentages of differential diagnosis made by the real time Sonography will be computed and compiled.

Data collection procedure

Equipment : In the present study, gray scale real time ultrasound examination was carried out using 3.5 to 10 MHz, curvilinear and linear array transducers.

Ultrasound machines used are:

- Siemens Somatom ARSP 3rd generation six slice machine

Patient preparation and scanning technique:

Once the patient agrees to participate in the study, informed consent was taken prior to ultrasound examination, followed by detailed history and brief clinical examination.

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Patients were kept nil by mouth for few hours prior to ultrasound examination.

In some cases clinical condition of patient demanded an ultrasound examination without prior preparation.

Patients were examined in the supine position to begin with and then in decubitus (right or left) and sitting position if needed.

Liver was scanned in various planes like sagittal, parasagittal, transverse, oblique, subcostal, intercostal and coronal planes. Comprehensive scanning of other upper abdominal organs was done.

Various ultrasonographic features of focal liver lesions were observed, which include:

1 Number of lesions – single or multiple

2 Location within liver – Lobar distribution (right lobe, left lobe, both lobes).

3 Echogenicity –(by comparing with that of normal liver parenchyma), hyperechoic, hypoechoic, anechoic or mixed echogenic.

4 Size, shape and margins: Exact size of lesion was measured with a note on shape of lesion like round, oval or irregular. Margins of lesion were studied whether well defined, poorly defined, regular or irregular.

5 Acoustic characteristics of lesions.

Apart from the above observations related to lesion several other important observations were made which include overall assessment of liver size, portal and hepatic veins involvement, biliary tract and gall bladder, lymphadenopathy and ascites.

RESULTS

In the present study, 40 patients suspected of having focal liver lesions were studied for a period of one year and were subjected to detailed ultrasonographic examination in the department of Radio-diagnosis, Katihar Medical College & Hospital, Katihar, Bihar. Some of these patients underwent CT examination and USG guided aspiration later.

Table 1 : Age distribution of focal liver lesion

Age group (years)	No. of cases	Percentage
18-20	1	2.5
21-30	2	5
31-40	5	12.5
41-50	9	22.5
51-60	10	25
61-70	9	22.5
>70	4	10
Total	**105**	**100**

Table 2 : Sex distribution of focal liver lesion

Sex	No. of cases	Percentage
Male	26	65
Female	14	35
Total	**40**	**100**

CLINICAL FEATURES: Out of the 40 patients, 24 (60%) patients had abdominal pain, 18 (45%) patients had fever, 16 (40%) had loss of weight and appetite, 14 (35%) patients complained of mass per abdomen,9 (23%) had jaundice and 7(18%) patients complained of abdominal distension and urticaria.

ULTRASOUND DIAGNOSIS: Out of 40 patients, 10 (25%) had haemangiomas, 8 (20%) had metastases, 7 (17.5%) had abscess,6 (15%) had cystic lesion, 5 (12.5%) had primary malignant liver tumor, 3 (7.5%) had Hydatid cyst and 1(2.5%) had cholangiocarcinoma.

LOCATION : In 28 (70%) patients the lesions were in right lobe, in 7(17.5%) involved both lobes and in 5 (12.5%) in the left lobe.

NUMBER OF LESIONS: In 30 (75%) patients had solitary lesions and 10 (25%) had multiple lesions.

HEMANGIOMA: Out of 40 (100%), there were 10 cases of hemangioma in the age range of 29-70 years with a mean age of 49.6 years. There were 5 (50%) males and 5 (50%) females. The right lobe was involved in 7(70%) patients, left lobe in 2(20%) and 1 (10%) patient with both lobes.

METASTASES : Out of the 40 patients (100%), 8 (20%) cases were diagnosed as hepatic metastses in the age group of 51 – 68 years, with a mean age of 58.2 years. Out of 8 patients 6 (75 %) were male and 2(25%) were female. Both the lobes were involved in 6(75%) patients and right lobe in 2(25%) patients.

HEPATIC ABSCESS: Out of the 40 patients (100%), 7(17.5%) cases were diagnosed as hepatic abscess, in the age group of 19 – 63 years with a mean age of 47 years. Six (85.7%) patients were male and one (14.3%) female patient. In all seven (100%) patients right lobe was involved.

HEPATIC CYSTS: Out of the 40 patients (100%), 6 (15%) patients had hepatic cysts. Hepatic cysts were found in both sexes equally.

Table 3 : Age distribution of Individual Focal Liver Lesions

Age group (years)	Liver abscess	PMLT	Metastatses	Hemangioma	Cystic lesion	Hydatid lesion	Cholangioca	Total
18-20	1							1
21-30				1		1		2
31-40	1			1	2	1		5
41-50	2	1		4	2			9
51-60	1		5	2	1	1		10
60-70	2	2	3	2				9
>70		2			1		1	4
Total	**7**	**5**	**8**	**10**	**6**	**3**	**1**	**40**

Table 4 : Sex distribution of Individual Focal Liver Lesions

Age group (years)	Liver abscess	PMLT	Metastatses	Hemangioma	Cystic lesion	Hydatid lesion	Cholangioca	Total
Male	6	4	6	5	3	2		26
Female	1	1	2	5	3	1	1	14
Total	**7**	**5**	**8**	**10**	**6**	**3**	**1**	**40**

3 each. The age distribution was between 36 -75 years of age with mean age of 48.3 years. Right lobe was involved in 5 (83.3%) patients and left lobe in 1(16.7%) patient.

PRIMARY MALIGNANT LIVER TUMOR: PMLT was found in 5 patients (12.5%) in the study group with age distribution of 49 – 84 years with a mean age of 66.8 years. Four (80%) were men and one (20%) female patient. Right lobe was affected in 4(80%) and left lobe in 1(20%) patient.

HYDATID CYSTIC LESION: There were 3 (7.5%) cases of echinococcal cyst, in the age group of 28-54 years of age with a mean age of 38.6 years. Two male (66.6%) and one (33.3%) female patient were affected. Right lobe was involved in 2 (66.6%) and left lobe was involved in 1(33.3%) patient.

CHOLANGIOCARCINOMA: There was one (2.5%) case of intrahepatic cholangiocarcinoma in a female patient aged 75 years involving the right lobe with associated dilated intrahepatic biliary radicles.

DISCUSSION

A total of 40 patients, clinically suspected of having focal space occupying lesions in the liver who underwent Sonography were chosen for the study during a period of 1 year.

The mean age of the patients in the sample study was 53.4 years with an age range of 19 to 84 years.

Majority of the patients were males.

The most common complaints were abdominal pain and fever.

The most common lesions were hemangioma followed by hepatic metastases.

In this study, out of 40 cases, hemangioma was present in 10 pateints, metastases in 8 patients, abscess in 7 patients, hepatic cysts in 6 patients, primary malignant liver tumor in 5 patients, hydatid cyst disease in 3 patients and 1 patient with cholangiocarcinoma.

Complimentary studies like laboratory investigations and chest radiographs were undertaken with special emphasis on ultrasonography.

Ultrasonography serves as an important diagnostic tool in imaging and characterization of focal liver lesions.

CONCLUSION

Ultrasonography is a safe and effective method of detecting focal liver lesions. It's easy availability, portability, flexibility, lack of dependence on organ function and lack of ionizing radiation makes it ideal for imaging the liver.

Ultrasonography also serves a vital role in guided FNAC, which avoid unnecessary repeated trauma to the patient and also help to yield productive specimen for hoistopathological evaluation. It also helps the operating surgeon in planning a in the pre-operative approach to the lesions.

With ultrasonography as an initial imaging modality, time and cost to arrive at an diagnosis was significantly reduced.

Its multiplanar imaging ability and portability has a significant advantage in sick patients to detect lesions, to locate lesion and to identify solid from the cystic nature of lesion, thereby aid in characterization of lesions.

Information regarding the secondary features of liver disease such as ascites, primary source of malignancy, secondaries in the abdomen, splenomegaly , pleural effusion can be evaluated.

As ultrasonography is safe, repeatable and low cost as compared to newer modalities CT and MRI , it is still one of the most effective imaging modality for characterization and for overall assessment of abdomen.

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A Prospective Duplex Sonographic Study of Intrarenal Arteries in Acute Ureteric Obstruction

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ABSTRACT

BACKGROUND AND OBJECTIVES: Acute renal colic due to ureteric obstruction is one of the leading causes of morbidity. Ureteric obstruction predisposes to urinary infection, renal damage and failure. Sonography though useful in the diagnosis of hydronephrosis fails to reveal acute obstruction of the kidney in 35% of the cases. Intravenous urography (IVU) or Computed Tomography (CT) urography is the gold standard for demonstrating acute ureteric obstruction. Both these modalities involve radiation, which may not be desirable in patients especially those who present with multiple episodes of renal colic. This prospective study aims at evaluating the utility of intrarenal arterial doppler and assessing its diagnostic accuracy in patients with acute ureteric obstruction as an adjunct to gray scale sonography of the urinary tract, thereby reducing the need to perform investigations like IVU & CT urography which involve patient's exposure to radiation.

Hence this study aims:

1. To compare intrarenal arterial doppler changes in patients with ureteric obstruction and non obstructed ureters.
2. To evaluate the diagnostic accuracy and utility of intrarenal arterial Doppler study in ureteric obstruction.

METHODS: This study was designed to evaluate patients presenting with acute ureteric colic as a result of unilateral ureteric obstruction due to calculus by high-resolution ultrasound. A total of 50 patients (50 unilaterally obstructed kidneys and 50 contralateral normal XIII kidneys) were studied over a period of 1 year. Ultrasound examination was done using with GE LOGIQ 500 PRO ULTRASOUND MACHINE WITH 3.5 MHz curvilinear array transducer. Renal Interlobar arteries were examined by Colour Doppler ultrasound in upper, mid and lower renal pole with a two to five millimetre sample volume to calculate average resistive index. Inter-renal resistive index (IRI) was then determined by calculating the difference in RI between the obstructed and contralateral non obstructed kidney. Age of the study population ranged between 20 to 80yrs.

RESULTS: 50 patients (100 kidneys) satisfying the inclusion criteria were part of this analysis. The mean resistivity Index (RI) in obstructed kidneys was significantly higher than in the contralateral unobstructed kidneys (0.72 vs. 0.63; $p < 0.001$).

Forty six (92%) cases had distal while 4 (8%) cases had proximal obstruction. The difference in RI among the two groups was statistically not significant.

Using the discriminatory value of 0.70 for obstruction, the overall sensitivity was 92%. Sensitivity was 94% at a delta RI of 0.06.

INTERPRETATION AND CONCLUSION: Measurement of inter-renal resistive index difference in patients with ureteric colic improves diagnostic accuracy of ultrasound in diagnosing acute ureteric obstruction.

INTRODUCTION

Ultrasound is a sensitive detector of pelvicalyceal dilatation. This is important because minor dilatation is a well-recognized finding in some patients with severe obstruction, particularly those with acute ureteric obstruction caused by a calculus. Even with very careful technique, ultrasound may miss renal obstruction in a small proportion of patients in whom an obstructed pelvicalyceal system is not dilated. The obstructed pelvicalyceal system fails to dilate presumably because of low diuresis resulting from dehydration, underlying renal parenchymal disease and intermittent obstruction by calculus or decompression of the pelvicalyceal system through a tear of a calyceal fornix. In the diagnosis of renal obstruction, the sensitivity of ultrasound is much better than its specificity. Ultrasound is less specific than excretory urography because it shows less detail of the pelvicalyceal anatomy, visualizes the dilated ureter incompletely, makes a poorer assessment of upper tract drainage and provides none of the functional information furnished by contrast medium excretion during urography.

One problem relates to the fact that ultrasound can image a fluid filled collecting system, which may not necessarily be pathological. These situations include a baggy extra-renal type of pelvis, a compound upper pole calyx and an over-distended urinary bladder. Fluid within the collecting system is often visualized during active diuresis after an overload of oral fluids. A similar situation arises during the osmotic diuresis induced after intravenous injection of hypertonic contrast medium for urography. In addition, ultrasound visualizes a variety of dilated but non-obstructed systems, especially in reflux, or other non-obstructive causes of calyceal dilatation e.g. papillary necrosis, mega calyces, TB, infection and residual dilatation due to previous stone or surgery. Acute complete ureteric obstruction is associated with changes in renal blood flow as well as with an increase in renal pelvic pressure. In the first few hours, renal blood flow increases, most likely because of afferent arteriolar dilatation. After three to five hours, renal blood flow decreases, probably because of afferent arteriolar vasoconstriction produced by prostaglandins and other vasoactive substances. Decreased renal blood flow persists after 24 hrs, at a time when the pressure within the collecting system is returning towards normal. The decrease in renal blood flow during obstruction can be demonstrated with Doppler ultrasound using the resistive index (RI). The time course of the

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RI changes is exactly as might be predicted from knowledge of the pathophysiology – increasing approximately six hours after acute calculus obstruction and remaining at its peak from 6 to 48 hours. Subsequently, the RI remains elevated but less markedly so. Platt *et al* found that obstructed pelvicalyceal systems were associated with RI greater than 0.7, whereas kidneys with dilated non-obstructed systems had RI less than 0.7. A difference greater than 0.06 to 0.10, in RI values between the two kidneys (iRI) is considered to be a significant indicator of unilateral obstruction. Duplex sonography is a modality that is reliable, inexpensive, easily available, non-invasive, has no adverse effect and has good patient acceptability. The present study was conducted to evaluate the utility of intrarenal arterial Doppler study in ureteric obstruction.

MATERIALS AND METHODS

Type of study : Study was a Prospective Case Control Study.

Source of data : 50 patients, in the age group of 20 to 80yrs, presenting with acute ureteric colic as a result of unilateral ureteric calculus obstruction confirmed by gray scale sonography or intravenous urography reporting to the Department of Radiodiagnosis, Katihar Medical College & Hospital, Katihar, Bihar, based on intrarenal arterial Doppler study over a period of one year from August 2014 to July 2015.

The kidney on the side of the obstruction was treated as the case kidney and the contralateral normal (unobstructed) kidney served as the control.

Selection criteria : Inclusion criteria: All patients with acute ureteric colic as a result of unilateral ureteric obstruction due to calculus (confirmed with gray scale USG/IVU), in the age group of 20 to 80yrs. Exclusion criteria :

a) Patients with history of

(i) renal parenchymal disease,

(ii) chronic renal obstruction

(iii) renal trauma

(iv) bilateral renal calculi

b) Patients on dialysis

c) Patients having

(i) a single kidney

(ii) congenital anomaly of the kidneys

d) Pregnant women.

Method of collection of data : Intrarenal Doppler evaluation of the kidney with obstructed ureter and comparison of Doppler indices like peak systolic velocity, end diastolic velocity, resistivity index (RI) with those of the contralateral non-obstructed kidney and iRI. The data was collected as per the detailed proforma prepared for the study and records maintained.

Definition of control: Fifty individuals in the age group of 20 to 80 years with no history of systemic illness and with unilateral obstructed kidney due to calculus. The contralateral, nonobstructed kidney confirmed by ultrasonography with presence of ureteric jet, absence of ureteric calculus and pelvicalyceal dilatation served as the control

Equipment : In this study ultrasound was performed using – Ultrasound machine:GE LOGIQ 500 PRO ULTRASOUND MACHINE, Transducer: 3.5 MHz curvilinear transducer. Imaging mode: Real time 2D Grey scale and colour Doppler. Hard copy: Thermal printer

Examination technique:

ULTRASOUND EVALUATION OF KIDNEYS : Both kidneys were evaluated by GE LOGIQ 500 PRO ultrasound machine unit using a 3.5 MHz curvilinear transducer.

Positioning: Patient was put in supine position with the sonologist sitting on the right side of the patient. Ultrasound transducer positioned gently on the flank in an oblique projection and kidney visualized in longitudinal axis. Right kidney: The right kidney was examined in the supine or in the left lateral position using the liver as an acoustic window. If bowel gas obscured visualization of the lower pole, the right side-up decubitus position was used and scan performed by lateral approach.

Left kidney: With the patient in the left side-up position, his/her left arm extended over the head and using a coronal approach the kidney was visualized through the spleen. The decubitus and oblique positions were varied until the kidney was completely seen. Measurements were made at three sites in the kidney in the upper, mid and lower pole. A 2-5 mm sample volume was used and angle correction was not applied. Waveforms were optimized for measurement using the lowest pulse repetition frequency without aliasing (to maximize waveform size), the highest gain without background noise, and the lowest wall filter. Three to five waveforms were recorded from each kidney and RIs from these waveforms were averaged to arrive at mean RI values for each kidney. This was done on the affected kidney as well as the contralateral normal kidney and iRI was obtained.

Method of Statistical Analysis:

The following methods of statistical analysis have been used in this study.

The results are presented in numbers and percentages for categorical data and average and SD for continuous data in Tables and Figures.

Independent samples t-test were used to compare the mean iRI values in obstructed and non-obstructed kidneys. In all the tests the "p" value of less than 0.05 was accepted as indicating statistical significance. Data analysis was carried out using Statistical Package for Social Science(SPSS) version 17 software package and Microsoft word and excel have been used to generate graphs, tables etc.

RESULTS

Total number of patients : 50 (100 kidneys) Cases : 50 obstructed kidneys Controls : 50 non-obstructed contralateral kidneys Range of age : 21-65 years Sex incidence : Male - 33 Female – 17.

Majority of the men came under the 30 to 39 years age group (30%) and majority of the women came under the 20 to 29 years age group (12%). The mean age (in years) in women, 36.41 ± 12.15 (25 – 65) was higher compared to 36.15 ± 10.39 (21 – 60) in men. This difference was statistically not significant.

The mean peak systolic velocity (PSV) value and the end diastolic velocity (EDV) value were lower in the obstructed kidney as compared to the non-obstructed kidney and was statistically significant($p < 0.05$). The mean intra-renal Resistivity Index (RI) in the 50 kidneys which had a ureteric calculus downstream was 0.72. The mean RI of the contralateral normal kidney in the 50 patients was 0.63. The mean intra-renal RI in obstructed kidneys was significantly higher than in unobstructed kidneys (0.72 Vs 0.63; $p < 0.001$). RI was higher in obstructed kidneys in all the cases. The difference in RI between obstructed and non-obstructed kidney (delta RI) ranged from 0.04 to 0.14 with a mean delta RI of 0.09. Most of the patients (54%) were evaluated between 6-12hrs, 28% within 13-18hrs, 14% within 19-24hrs and 4% within 0-5hrs after the onset of symptoms. Slightly higher RI values were noted in patients evaluated between 6-12hrs and the least was noted in patients evaluated between 0-5hrs ($p < 0.05$).

The site of obstruction was distal in 46 (92%) cases and proximal in 4 (8%) cases. The mean RI of the obstructed kidneys with distal obstruction was higher

(0.72 ± 0.03), than in the kidneys with proximal obstruction (0.71 ± 0.01). However, the difference was statistically not significant.

Pelvicalyceal system (PCS) dilatation was observed in 48 (96%) patients while it was absent in 2 (4%) patients. RI values were similar in both groups. Calculus was noted in the vesicoureteric junction in both the cases. Doppler USG was useful in diagnosing acute renal obstruction even in those cases, where PCS dilatation was absent on USG. (iRI > 0.06 in both the cases)

Taking 0.70 as the threshold for abnormality as reported by Platt *et al* RI was found to have a sensitivity of 92% in patients with acute unilateral ureteric obstruction. If the mean RI value of 0.72 is taken as the threshold (as found in this study), the sensitivity calculated is 50%. By using the inter-renal RI difference with a value 0.06 as abnormal, the sensitivity rises to 94% as only 2 patients out of 50 patients presenting with unilateral ureteric calculus had an RI difference from the contralateral normal kidney of < 0.06.

DISCUSSION

Intravenous urography (IVU) and grey-scale are the two most common imaging examinations used in patients with acute renal colic to determine whether renal obstruction is present. Evaluation with ultrasonography (USG) is particularly useful in conditions when IVU is contraindicated, e.g. pregnancy, a history of reaction to contrast material, renal impairment and repeated episodes of renal colic. However, conventional USG is an inaccurate test for obstruction because dilatation of the collecting system is often seen in unobstructed kidneys and may not occur or may occur late in obstructed kidneys. Traditionally, the evidence of renal obstruction provided by USG has been indirect and dependent on the anatomical criterion of dilatation of the PCS and ureter proximal to the level of obstruction. However, USG fails to reveal hydronephrosis in acute obstruction of the kidney in up to 35% of cases. More direct functional evidence of obstruction has usually required scintigraphy but recently, Doppler US techniques have been used to obtain functional information in suspected renal obstruction. USG imaging may miss the diagnosis of obstruction in a variety of situations. Mild dilatation may be overlooked or considered clinically insignificant. Some patients with obstructive renal failure may show no PCS dilatation. The reasons for this are unclear; in some patients it may relate to dehydration or to decompression of the pelvicalyceal system by rupture of a calyceal fornix.

PCS dilatation may be missed if the PCS system is filled with blood clot, calculus, tumor or pus. Intermittent ureteric obstruction, particularly caused by ureteric calculi, may also lead to a failure to visualize the collecting system with USG. On the contrary, in an attempt not to miss the diagnosis of obstruction in patients with only mild PCS dilatation, the false positive rate of diagnosis may be as high as 26%. Causes of a false-positive diagnosis include: (i) Visualization of a normal PCS system, when there are anatomical variants such as extrarenal pelvis, when the bladder is distended or under conditions of diuresis (ii) Visualization of a dilated but unobstructed system when there is vesico-ureteric reflux (VUR), a distensible system after previous obstruction or infection, dilated calyces (e.g. in papillary necrosis or reflux nephropathy) or during normal pregnancy (iii) Central renal fluid collections other than the PCS, including normal vessels, renal artery aneurysm and peripelvic cysts. Acute unilateral ureteric obstruction results in a complex sequence of changes in renal blood flow and ureteric pressure. In the first two hours, the renal blood flow increases, because of afferent arteriolar vasodilatation and the ureteric pressure increases. From two to six hours after obstruction, the renal blood flow decreases, secondary to vasoconstriction of the efferent arterioles and the ureteric pressure remains elevated. Subsequently, at six to eighteen hours, the renal blood flow remains reduced, because of vasoconstriction of the afferent arterioles and the ureteric pressure decreases. With bilateral ureteric obstruction, the initial pattern of blood flow change is slightly different, but the resultant decrease in renal blood flow by 24hrs is similar to that in unilateral ureteric obstruction.

The role of renal Doppler US in the evaluation of acute renal obstruction has been vigorously debated. Rodgers PM *et al* found an elevated RI in acutely obstructed kidneys, especially when compared with the RI in normal contralateral kidneys and with a control group of healthy subjects. Similar results were obtained by Platt JF *et al* in patients with acute unilateral ureteric obstruction. However, others reported that duplex Doppler sonography is highly insensitive for detecting acute ureteric obstruction. The application of an adequate Doppler sonographic technique is essential for obtaining accurate results. The most common reason for obtaining a normal RI in the presence of significant obstruction is a technical error that is simple to correct. The use of the correct scale (Pulse repetition frequency-PRF) to expand the waveform size to fill as much of the available display as possible, without aliasing, is crucial. With this strategy, errors in measurement of RI are reduced and flow at the end of diastole generally can be differentiated from background machine noise and the wall filter. Failure to make this simple technical correction results in minute waveforms barely deviating from the baseline; when measured, these waveforms invariably result in an RI that is calculated to lie within the normal range, even when a true state of elevated renal arterial resistance is present.

In our study, the RI was 0.70 in 46 cases (out of a total of 50). If 0.72 (the mean RI value obtained in our study) is taken as the threshold, then 25 cases out of 50 were equal to or above this level. Only two cases with unilateral ureteric calculus had RI values•d 0.65 (mean RI of 0.65 and 0.64 respectively). The

increase in RI was also demonstrated in two cases that had equivocal dilatation of the pelvicalyceal system.

This observation is important in showing that duplex Doppler sonography can reveal urinary obstruction earlier than conventional sonography, which can miss cases of urinary obstruction without collecting system dilatation. The same observation has been made by Opdenakker L *et al* and Roy C *et al*. Previous investigators (Ryan P *et al*, Murphy G *et al*, Moody T *et al*, Badr K *et al* and Klahr S *et al*) have shown that a short period (<2 hrs) of likely prostaglandin-mediated vasodilatation occurs immediately after obstruction. After this period, renal blood flow decreases, and renal vascular resistance increases. In our study, two patients presented with renal colic at 3hrs and 4hrs duration respectively. Only the patient with 4hrs duration of renal colic had shown change in the inter-renal resistive index (iRI=0.10) whereas the mean RI was 0.65. Thus, according to our study, the shortest duration of acute renal obstruction that can cause elevation of RI is 4hrs. The mean peak systolic velocity (PSV) value and the end diastolic velocity (EDV) value were lower in the obstructed kidney as compared to the non-obstructed kidney and was statistically significant($p < 0.05$). We divided our patients into four groups (0-5hrs, 6-12hrs, 13-18hrs and 19-24hrs) based on the duration of the renal colic. Slightly higher RI values were noted in patients evaluated between 6-12hrs. We agree with Platt *et al*71 and Shokeir *et al* that kidneys obstructed for more than 12h do not have a higher RI than those with obstruction of shorter duration. We also studied the effect of the level of obstruction on RI values. In our study the level of ureteric obstruction (proximal v/s distal) had no significant impact on the values of RI, in agreement with Platt *et al* and Shokeir AA *et al* Statistical analysis showed that the sensitivity of RI in the diagnosis of complete urinary obstruction was 92% if a threshold value of 0.70 (as suggested by Platt JF *et al*) is taken as the abnormal value. When inter-renal RI difference (iRI) of 0.06 or above is used to analyse the effect of ureteric obstruction, only 3 cases with unilateral ureteric calculus exhibited values less than or equal to 0.05, raising the sensitivity to 94%. These findings suggest that inter-renal resistive index difference (iRI) is a more significant measurement to be made in acute unilateral ureteric obstruction. Several studies have demonstrated that RI is affected by factors other than renal vascular resistance, such as vascular compliance, age of the patient, hypertension, diabetes mellitus and other renal diseases. These factors may explain the absence of significant iRI in four cases with unilateral ureteric calculus. One additional factor that could potentially affect renal arterial resistance is clinical management. Ureteric colic is usually accompanied by considerable pain, the severity of which mandates administration of narcotics and non-steroidal anti-inflammatory drugs (NSAIDs). The use of NSAIDs (Indomethacin, Toradol) has been shown in animal models to reverse both the early vasodilatation and subsequent vasoconstriction of acute ureteric obstruction. Thus, their use may mask the expected changes in the renal arterial RI. The measurement of iRI should always be undertaken in all cases presenting with acute unilateral ureteric colic as it increases the sensitivity of duplex Doppler sonography in diagnosing obstruction (sensitivity of 94% in this study). This indicates the importance of calculating the iRI in all cases presenting with unilateral ureteric colic, even when collecting system dilatation is absent on conventional sonography.

CONCLUSION

As conventional sonography is the first imaging modality used in many centres to evaluate patients presenting with acute ureteric/renal colic, it should be complemented by duplex Doppler sonography in all patients, even when collecting system dilatation is not present. Duplex Doppler sonography concentrating mainly on the measurement of inter-renal resistive index difference is a very useful examination in patients presenting with unilateral ureteric colic, especially where pelvicalyceal dilatation is not present on the symptomatic side and in those cases where IVU is not possible or contraindicated. The duration of symptoms at presentation showed slightly higher RI values at 6-12hrs. The site of obstruction did not significantly affect the RI values in acute renal obstruction. Using the discriminatory threshold value of RI 0.70, the overall sensitivity of Doppler USG in diagnosing acute renal obstruction was 92%. Using a threshold value of delta RI of 0.06, the sensitivity was 94%. Thus, a delta RI of 0.06 is a highly sensitive investigation.

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ORIGINAL & CLINICAL RESEARCH

Role of Colour Flow Duplex Sonography in the Evaluation of Chronic Venous Insufficiency of the Lower Limbs

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ABSTRACT

Background and objectives : Chronic venous insufficiency of the lower limbs is characterized by symptoms and signs produced by venous hypertension due to structural and functional abnormalities of veins as a result of underlying reflux or obstruction that may eventually give rise to lower extremity edema, pigmentation pain, ulceration.

The main objective is to study the spectrum of findings on colour duplex sonography in patients with clinical suspicion of CVI and to identify the patients who can be taken up for varicose surgery by locating and ruling out DVT in them.

Methods : A prospective study was carried out in 50 patients with clinical suspicion of chronic venous insufficiency. All the clinically diagnosed patients with CVI referred to different department of K.M.C.H., Katihar, Bihar, were subjected to colour flow duplex examination using (3-12 MHz) linear array transducer.

Results : Of the total 50 cases, 42 cases showed positive doppler findings, 8 cases were normal.

Males predominated in our study (76%) and positive doppler findings were higher in them (78.57 %). Swelling (32%) and varicosities (24%) were the most predominant symptoms. Prolonged hospitalization was the most common predisposing factor in patients diagnosed to have DVT(27.8%) and occupational-prolonged standing (33.33%) factor were the commonest in patients with other causes of varicosities.

The predominant involvement was unilateral (90.48 %) and left lower limb (61.9 %). GSV varicosity (75%) predominated in our study, with SFJ incompetence noted in 45%.

Among the positive doppler cases (42), 18 cases was diagnosed to have DVT. Thrombus was confined to femoro- popliteal segment in (83.33%) suggesting thrombus is more common in femoro- popliteal segment(proximal) than than in distal segment.

Severe form of CVI with venous ulcer were noted in 8 cases of which 7 case(87.5%) showed underlying DVT. Suggesting that underlying DVT with deep venous reflux is seen in most severe forms of CVI and thus it should be excluded in to provide a safe and effective treatment.

Interpretation and conclusion : It has been conclusively established that colour duplex sonography is safe, non invasive, accurate, easily repeatable, widely available and cost effective in diagnosis of chronic venous insufficiency especially to exclude underlying DVT and thus helping in providing valuable information of therapeutic significance.

INTRODUCTION

The term chronic venous insufficiency refers to the venous valvular incompetence in the superficial, deep and/or perforating veins. Incompetence of the vein valves permits reversal of flow and promotes venous hypertension in the distal segments. This form of venous dysfunction may be the result of recanalisation of thrombosed venous segments, pathological dilation of the vein or due to congenital absence of competent valves.

Chronic venous insufficiency of the lower limbs (CVI) is characterized by symptoms or signs produced by venous hypertension as a result of structural or

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functional abnormalities of veins. Symptoms may include aching, heaviness, tiredness, cramps, itching, sensations of burning, swelling, the restless leg syndrome, dilatation or prominence of superficial veins, and skin changes. Signs may include telangiectasia, reticular or varicose veins, edema, and skin changes such as, pigmentation, lipodermatosclerosis, eczema, and ulceration.

The most frequent causes of CVI are primary abnormalities of the venous wall and the valves and secondary changes due to previous venous thrombosis that can lead to reflux, obstruction, or both. Congenital malformations are rare causes of CVI.

Because the history and clinical examination will not always indicate the nature and extent of the underlying abnormality (anatomic extent, pathology, and cause), a number of diagnostic investigations have been developed that can elucidate whether there is calf muscle pump dysfunction and can determine the anatomic extent and functional severity of obstruction or reflux.

Venous insufficiency is associated with physical findings that are characteristic, yet these findings are non specific with respect to cause. They do not differentiate between obstruction and valvular incompetence , nor do they define the location or extent of valvular dysfunction.

CVI may affect only the superficial veins or it may be a sequelae to deep vein thrombosis. Deep vein thrombosis can cause pain and swelling of the affected limb and it may also cause structural damage to the valves of the deep veins, which results in post phlebitis syndrome. DVT of the lower extremity is one of the most common cause of pulmonary embolism; which in turn is responsible for majority of the deaths. Varicose veins represent a significant clinical problem and are not just a "cosmetic" issue because of their unsightly nature. The problem arises from the fact that varicose veins actually represent underlying chronic venous insufficiency with ensuing venous hypertension. Varicose veins have a wide clinical presentation, which if recognized early can significantly reduce the morbidity of patients.

However since the clinical signs and symptoms of deep venous thrombosis are nonspecific and even though clinical examination can lead to correct diagnosis in case of varicose veins, it is important to promptly perform objective testing to confirm the diagnosis and enable the institution of safe and effective therapy.

Historically investigators relied on the invasive procedures (namely, ascending and descending venography and ambulatory venous pressure measurements) to evaluate CVI. Ambulatory venous pressure measurements were used as a haemodynamic complement to anatomic information obtained from venography.

Phlebography which is considered as the "gold standard" of venous imaging is expensive, invasive, time consuming, painful, exposes to radiation, lacks repeatability, requires expertise to perform and interpret reliably and associated with low but finite risk of contrast reaction and postvenographic phlebitis. This led to the development of several noninvasive techniques such as impedance plethysmography, air displacement plethysmography, thermography phlebography, iodine 125(1-125) fibrinogen scanning and doppler ultrasonography.

Impedance plethysmography is a physiologic test that measures changes in venous capacitance during physiologic maneuvers and detects abnormalities in the venous outflow. The predictive value of this test for detecting occlusive thrombi of proximal veins is approximately 90%.6 However it has low sensitivity for detection of calf thrombi, 7 is highly operator-dependent and gives false negative results in the presence of non-occluding thrombi, prominent collaterals or a duplication anomaly of the deep venous system. False positive results can occur in patients with CCF, venous insufficiency and extrinsic venous compression.

The introduction of doppler ultrasound technique has irrevocably altered the diagnosis and treatment of CVI. The rationale is quite simple: thrombotic obstruction of the underlying vein distorts the venous flow pattern and these perturbations are readily detected by the Doppler instrument.10 This technique is non invasive, repeatable, can be performed rapidly in the clinic, at patient's bedside or even at home and the results are available immediately. It can be used in pregnant women, permits multiple views in various positions of the leg and the study is safe, painless inexpensive. Venous system is evaluated for flow, phasicity, pliability and augmentation. It is useful as a screening modality in high-risk patients to ensure prompt and early treatment.

Duplex ultrasound, complemented with colour flow imaging, has been validated as a sensitive and specific modality for the identification of superficial and deep vein thrombosis. Valvular incompetence can be confirmed with spectral and colour doppler, and unlike photoplethysmography and APG, venous insufficiency can be localized to specific valve sites in the deep and superficial veins. Incompetent perforators can similarly be identified and mapped prior to intervention.

The present study aims to evaluate the role of colour flow duplex ultrasound in clinically suspected patients of CVI of the lower limbs.

MATERIAL AND METHODS

Chronic venous insufficiency of the lower limbs is characterized by symptoms and signs produced by venous hypertension as a result of structural and functional abnormalities of veins that may eventually give rise to lower extremity edema,pigmentation pain and ulceration.

50 patients with symptoms of lower extremity were included in this study. Study was done to identify the cause of

their symptoms and to diagnose and establish venous insufficiency or deep vein thrombosis or both as their symptomatic cause with the help of Doppler ultrasound technique.

Any other cause of their symptoms was also noted in Doppler ultrasound examination.

The present study included 50 patients who were referred to the Department of Radiodiagnosis in a period of 1 year from October 2014 to October 2015 in the Katihar Medical College & Hospital, Katihar, Bihar.

INCLUSION CRITERIA

Clinically suspected cases of chronic venous disease.

Patients who present with swelling and ulcers over the foot.

EXCLUSION CRITERIA

Pregnant ladies.

Seriously ill patients

Specifications of the colour doppler ultrasonography machine

AGE LOGIQ 500 PRO ULTRASOUND MACHINE

METHODS

In all patients, the following protocol was followed :

Detailed clinical history was elicited with reference to onset, duration and progress of the symptoms and special reference to risk factors.

Patients with following symptoms were included in the study :

Pain, swelling, pedal edema, varicosities, erythema, venous ulcer.

Review of all the previous radiological (chest radiograph ,ultrasound of abdomen and pelvis, Doppler ultrasonography of lower extremities in patients with history of DVT and pathological investigations was done.

Standard examination would evaluate common femoral vein, superficial femoralvein, popliteal vein followed by calf veins. The patient was examined in supine position with legs abducted and extremely rotated with slight flexion of knee for evaluation of femoral venous segment. Patient was given prone position for evaluation of popliteal vein. Calf veins were evaluated in supine position and the knee slightly flexed, internally rotated for the anterior tibial veins and externally rotated for the posterior tibial and peroneal veins.

7.5 MHz linear array transducer was used for femoral and popliteal venous segments and calf veins .

Superficial venous system was assessed for SFJ and SPJ incompetence. For detection of incompetent veins, patients were examined in standing position facing the examiner supporting his/her weight on contralateral extremity. Veins were manually compressed (asked to cough, perform valsalva maneuver) and released suddenly and tested for reflux.

In lower extremity venous imaging; in which vessels run parallel to the skin surface without tortousity, all venous segments were encoded in blue and corresponding arteries in red.

Examination included gray- scale, colour Doppler and spectral evaluation of lower extremity veins.

Statistical analysis by proportions.

RESULTS AND DISCUSSION

The peripheral veins may be affected by a variety of disorders which can be assessed by the ultrasound.

DVT and thromboembolic diseases are the most common indications for

investigation of the peripheral veins, but venous insufficiency and vein mapping are also indications for examining the veins. The myriad of signs and symptoms that can be associated with DVT and the fact that many thrombi are asymptomatic, make it difficult to rely on the clinical presentation alone.

The present study was performed to assess the role of colour flow duplex in chronic venous insufficiency. It included the detection of thrombus and extent of its involvement, assessment of valvular incompetence, distinguishing between reflux and obstruction, characterization of the varicosities as primary or secondary to underlying DVT – thus helping to ensure safe and effective treatment.

Among the 50 cases studied for suspected venous pathology colour duplex showed positive findings in 42 cases; 2 cases showed other causes of symptoms; and 6 cases had normal findings. Thus doppler was effective in excluding other causes of pain and swelling, thus preventing unnecessary interventions and medical therapy.

AGE

The range of age of patients with venous abnormalities in our study was 11- 70 years. We studied a total of 50 patients, of which 42 were detected to have venous abnormalities, the study group which showed maximum incidence was the age group 41 – 50 years, 15 cases (30%). Out of the total 50 cases, 31cases (i.e. 62%) were more than 40 years.

In a randomized controlled study *Belcaro G et al (2002) Italy*, found that venous abnormalities increased with increasing age.

SEX:

Males contributed the major group 38 (76 %) in our study with suspected

venous abnormalities and they also had a higher incidence 33 (78.57 %) of positive Doppler study. In our study out of the total 50 cases, 12 (24 %) are females with 9 (75%) showing doppler features of chronic venous insufficiency.

TYPE OF INVOLVEMENT :

In our study venous abnormalities were more common in left extremity. 26 cases i.e. 61.9% of the positive cases showed left side involvement, 12 (28.58%) showed right side involvement and bilateral involvement was found in 4 (9.52%).

SYMPTOMS :

The symptoms that prompted for Doppler examination were swelling in 16 (32%) patients, varicosity in 12 (24%), pain in 8 (16%), ulcer in 7(14%), varicosity and swelling in 3 (6%), varicosity and pain in 2 (4%) and eczema in 2 (4%) patients.

In cases showing venous abnormalities; swelling (32%) and varicosity (24%) were the predominant symptoms. Among the 18 patients showing evidence of DVT the most common symptom was swelling (55.56%), next most common symptom was venous ulcer (38.89%).

DVT AND CHRONIC VENOUS INSUFFICIENCY LOCALISATION AND EXTENT OF THROMBOSIS :

Colour Doppler ultrasound helps in exact localization of the thrombus. In the present study thrombosis was localized to thigh or popliteal region in 15 (83.33%) of the total 18 cases of DVT. This roughly correlates with the study by Hill SL et al (1997)110 who found 49% thrombi in the thigh or popliteal region without calf involvement.

The distribution of thrombi in the present study are as follows- 5.56% in CIV, 22.22% in EIV, 61.11% in CFV, 72.22% in SFV, 44.44% in PV,22.22% in ATV, 0% in PTV and 38.89% in the Superficial veins.

This correlates with the study by Appleman PT et al (1987). The study by Hill SL et al (1997) reported involvement of iliofemoral segment in 16%, CFV in 13%, SFV in 19%, PV in 18%, calf veins in 24% and superficial veins in 11%.

Identifying the thrombus in the proximal veins of lower extremity is important for they pose greater risk in terms of both embolism and local residual changes. Calf vein thrombi often resolve spontaneously and do not result in emboli, so they are considered clinically insignificant. The presence of above knee DVT greatly increases the risk of pulmonary embolism and eventual post phlebitis syndrome.

DISTRIBUTION OF VARICOSITIES

This includes both primary and secondary varicosities involving 40 patients whose Doppler findings were suggestive of varicosities. 25 patients had left sided involvement, 12 right sided involvement; 3 patients had bilateral involvement.

Varicosities along GSV predominated in our study, 30 cases (75%); and along SSV 14 cases (35%) were noted. Saphenofemoral junction incompetence was commonly noted in 18 (45%) of our cases. Out of the 18 cases of SFJ incompetence, 15 cases showed incompetence associated with dilation of superficial venous system.

SPJ incompetence was noted in 9 (22.5%) cases of which 6 cases showed associated dilation/ varicosities of short saphenous vein.

CONCLUSION

Lower limb venous system pathology is a common occurrence and clinically presents either as DVT or a venous insufficiency situation which may be associated with considerable morbidity and mortality.

Colour duplex assessment of peripheral veins gives diagnostically adequate anatomic and hemodynamic information.

Doppler ultrasound provides a noninvasive and reliable method for examining the venous system, particularly with respect to the diagnosis of thrombus in symptomatic patients. Colour Doppler can be used instead of venography or varicography in many cases and may be the only examination required to define the anatomy and function in patients with varicose veins. Varicography show perforator veins which are obviously incompetent and some superficial and deep venous segments but ultrasound has the advantage that the segments of deep and superficial systems can be examined and the direction of blood flow within each segment can be demonstrated. Compared to other modalities like contrast enhanced CT and MRV, Colour Doppler is much cheaper, reasonably accurate and much more widely available.

In the present study of 50 patients with suspected venous pathology, colour duplex sonography could identify the cause of symptoms in 42 patients. It was of immense importance and utility with respect to the following:

1. To differentiate between obstruction and valvular incompetence.
2. Accurate clot localization in cases with diagnosis of DVT.
3. Evaluation of the extent of thrombosis.
4. To define the location and extent of valvular dysfunction.
5. Easily evaluate the competence of SFJ and SPJ valves. To distinguish whether saphenous vein is involved and whether the involvement is confined to the venous tributaries or perforators.
6. Depicting anatomic variations, collaterals.
7. Excluding other causes of pain and swelling of lower limbs.
8. To confirm the diagnosis of valvular incompetence and venous insufficiency due to primary venous pathology or secondary to underlying DVT; and thus to ensure safe and effective therapy.

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Role of Computed Tomography in Evaluation of Cerebrovascular Accidents.

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ABSTRACT

Background: Our study was to evaluate the role of computed tomographic scan in patients with cerebrovascular accidents. **Methods:** patients with CVA were subjected to computed tomography scan of the head using GE Revolution ACTs 16 slice MDCT scanners, Slice Thickness – 2mm, 5mm and 10mm and Matrix size of 512 X 512. **Results:** Data was analyzed by using MS-Office software. **Conclusions:** CT scanning was the "Gold standard" technique for diagnosis of acute stroke as the rational management of stroke depends on "Accurate diagnosis" and it should be ideally done in all cases.

Keywords: Stroke, computed tomographic scan.

1

INTRODUCTION

Cerebrovascular accident or stroke is defined as an acute loss of focal and at times global (applied to patients in deep coma and those with subarachnoid haemorrhage) cerebral function, the symptoms lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin (WHO). [1]

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Stroke is a generic term that describes a clinical event characterized by sudden onset of neurological deficit. Stroke syndromes have significant clinical and pathological heterogeneity that is reflected in their underlying gross pathologic and imaging appearance. Arterial ischemia /infarction are by far the most common cause of stroke, accounting for 80% of all cases. The remaining 20% are mostly hemorrhagic, divided between primary spontaneous intracranial hemorrhage (sICH), nontraumatic subarachnoid hemorrhage (SAH), and venous occlusions.[2]

Cerebrovascular accidents are one of the leading causes of death after heart disease and cancer in the developed countries and one of the leading causes of death in India. The exact prevalence rate of this disease in the Indian population is not known, although it accounts for about one percent of admissions to general hospital. The incidence rate and the death rate from stroke increases dramatically with age. About 15 to 30% of patients die with each episode of cerebral infarction and 16 to 80% with cerebral haemorrhage. Those who survive are usually left with permanent disability. Thus, stroke becomes a great medical and social problem. Accurate and early diagnosis may improve the morbidity and mortality rates in the future as newer and more effective therapies are currently being instituted.[2]

The advent of CT in early 1970s greatly facilitated the diagnosis and management of stroke and added significantly to our understanding of patho-physiological brain alterations in case of humans. With CT it is now possible for the first time to non-invasively and reliably diagnose and distinguish between stroke due to cerebral infarction and stroke due to hemorrhage. In addition, other brain lesions, at times, may clinically present as stroke like syndromes such as primary or metastatic brain tumor or subdural hematoma that can usually be clearly differentiated by CT examination.[3]

Computed Tomographic is one of the most accurate methods available for identifying and localizing an infraction within the brain. Ischemic infarction, haemorrhagic infarction and intracerebral hematoma are usually differentiated. CT also permits identification of the acute and chronic sequence that may develop after a sequence of infarction. These include, in acute phase, brain swelling and conversion of a bland infarct into haemorrhagic infarct and in chronic phase, cystic parenchymal change, cortical atrophy and focal ventricular dilation.[2]

Despite many improvements in MR technology, CT is still the method of choice for most of the patients being evaluated for cerebrovascular accidents because of its fast acquisition. CT is a good diagnostic instrument even in early phase of acute ischemic stroke. In combination with new helical CT technique (CT angiography) all- important decisions regarding early therapeutics can be answered.

Clinical approach to stroke has undergone many changes in the past few years. CT scan has become an essential and integral part of the assessment and has given a more objective basis to the management and use of the IV contrast material. After non-contrast CT and the availability of follow-up studies in many instance significantly aids in the determination of the correct vascular etiology of the stroke, as does correlation of CT changes with patient's age, sex, history and neurological deficit. Aims of our study were to detect the presence or absence of infarct or hemorrhage, to determine the location and arterial territories involved of infarct with respect to onset of clinical symptoms and to detect other causes simulating stroke.

MATERIALS & METHODS

A total of 60 patients (40 males and 20 females) with age group 20 to 85 years with stroke were included in this study. The attendant of entire subject signed an informed consent approved by institutional ethical committee of Katihar Medical College, Katihar, Bihar, India was sought. Data was collected on the basis of inclusion and exclusion criteria, with irrespective of sex in OPD or the ward, of department of Medicine/Radio diagnosis, Katihar Medical College, Katihar, Bihar during period of November 2014 to October 2016.

Patients with clinical history of stroke were subjected to computed tomography scan of the head using GE REVOLUTION ACTs 16 slice MDCT SCANNER. The imaging protocol consisted of acquisition of sequential 5x5 mm axial sections with image reconstruction (coronal and sagittal) and viewing MPR images without intravenous contrast material administration. Images were evaluated with brain window settings.

Definition of study subject: The study subject was considered as a case of cerebrovascular accident if he/she has an acute stroke which is defined as a focal or global deficiency of brain function lasting for more than 24 hours which had occurred within 2 weeks of the patient's presentation and which was considered on admission to have a vascular cause. Clinical details and the computed tomography findings of the case were recorded as per the proforma. No attempt was made to compare computed tomography with other imaging modalities like M.R.I, Angiography or Doppler.

Inclusion Criteria was patients with clinical diagnosis of acute stroke. Patients with neurological deficiency due to obvious cause other than vascular, such as hypoglycemia, diabetic keto acidosis and traumatic cause were excluded in this study.

Equipment used: GE Revolution ACTs 16 slice MDCT scanners, Slice Thickness – 2mm, 5mm and 10mm and Matrix size of 512 X 512.

Computed Tomography Scan Technique:

Patient Position: Patient was supine with the head on the head rest, arms by the sides and the chin was as far down as comfortably possible. Plane of Section at 100 – 250 to Reids line or parallel to orbito-meatal Line. **Reid's base Line**: Passes from infraorbital margin to the upper border of external auditory meatus. This ensures that a minimum number of scans will pass through the lens. **OM Line (Orbito-metal line):** Passes from lateral canthus to the middle of the external auditory meatus. **Scan Parameter:** Lateral head scanogram: scans were taken parallel to the floor of the anterior fossa the lowest section through the external auditory meatus and continuing to the top of the head. To decrease the artifacts from beam hardening from the petrous bone across the posterior fossa, higher mA scans may be helpful. Factors of 140 kV and 100 mA were constant for all cases. **Slice thickness:** 5mm sections of the brain were obtained. Wherever necessary, 3mm sections were taken. **Window settings:** Window width – 100, Window level – 30

Statistical Analysis

Data was analyzed by using of simple statistical method with the help of MS-Office software.

RESULT

Observations

Total of 60 patients with clinically suspected of CVA were submitted for CT scan study of brain. Out of 60 patients, 38 patients had infarction, 15 patients had hemorrhage, 3 patients had Subarachnoid hemorrhage (SAH), 1 patient had tumorous pathology, 2 Patient had cerebral venous thrombosis and 1 Patient had normal study.

Table 1: Distribution of patients with clinically suspected CVA

CT Findings	No. of cases	Calculation for 60 cases
Infarcts	38	63.33%
Haemorrhage	15	25%
SAH	3	5%
Tumor	1	1.6%
CVT	2	3.33%
Normal	1	1.6%

Patient with age group 20-29 years 1 patient had infarcts. Age group 30-39 years 2 patients had

infarcts. Age group 40-49 years 5 patients had infarct. Age group 50-59 years 5 patients had infarct. Age group 60-69 years had 14 patients had infarcts. Age group 70-79 years had 10 patients' infarcts. And age group 80-89 years had 1 patient infarcts. Out of 60 patients, there had total of 38 patient's infarcts. That is 65.7 % male had infarcts and 34.21 % females had infarcts; male and female ratio was 1.05:0.5.

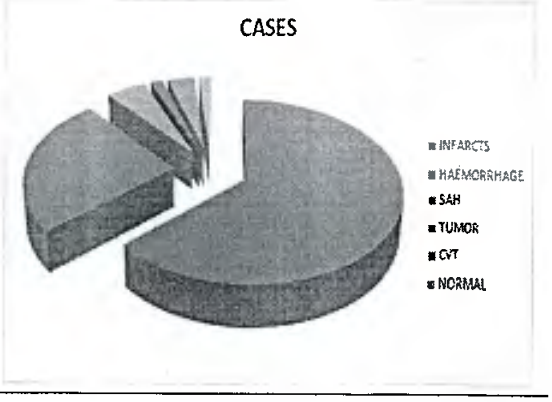

Figure 1: Distribution of patients with clinically suspected CVA

We were studied on hemorrhage. Then we were seen that patients with age group 20-29 years, 1 patient were hemorrhage. Age group 30-39 years also 1 patient was hemorrhage. Age group 40-49 years also 1 patient was seen hemorrhage. Age group 50-59 years was no case of hemorrhage. Age groups 60 -69 years 6 patients were hemorrhage. Age group 70-79 years 4 patients were hemorrhage. And age groups 80-89 years, 2 patients were hemorrhage. That is in out of 60 patients only 15 totals of 15 patients was hemorrhage. 66.66% male was hemorrhage and 33.33% female was hemorrhage, male and female ratio was 2:1. Our study showed that infarction and hemorrhage were mostly seen in the age group of 60-69 yrs.

Risk factors of stroke of this study:

Hypertension: Among the risk factors, past history of hypertension was given importance. 18 patients i.e., 30% had history of pre-existing hypertension, however many patients admitted that they were not tested for hypertension before the onset of stroke. 10 patients i.e., 55.55 % with hypertension showed cerebral haemorrhage. 6 patients i.e., 33.33% with hypertension showed infarct.

Diabetes mellitus: In our study 30% of the patients had a history of Diabetes mellitus. Many patients were not tested previously for evidence of diabetes before the onset of stroke. Out of 60 patients 18 patients had diabetes. 66.66% of the diabetic patients had cerebral infarction i.e., in 12 patients. 33.33% of the diabetic patients had cerebral hemorrhage i.e., 6 patients.

Heart disease: In our study history revealed the existence of heart disease in 20 % of the patients i.e., in 12 cases. Out of 12 cases, 6 had cardiac disease, which was previously detected, 4 had ECG changes after stroke attack and 2 had silent cardiac chest pain.

Involvement of vascular territory cerebral infarction:

Out of 60 cases of CT evaluation of CVA, 38(63.33%) cases of infarcts were diagnosed. 10 patients had infarct in right MCA territory accounting for 26.31%. 8(21.05%) patients had infarct in left MCA territory. 4 patients had infarct in right PCA territory accounting for 10.52%. 02(5.26%) patients had infarct in left PCA territory. 1(2.63%) patient had infarct in right ACA territory. 1(2.63%) patient had infarct in left ACA territory. 3(7.89%) patients had infarct in Rt. MCA and PCA territory. 2(5.26%) patients had infarct in Lt. MCA and PCA territory. 4 (10.52%) patients had infarct in both MCA territories. 1(2.63%) patient had infarct in vertebro-basilar artery territory. 2(5.26%) patients had lacunar infarcts. That is most common affected site was right MCA.

Intracerebral haemorrhage (ICH):

In our study of 60 cases of clinically suspected CVA, 15 cases (25%) were turned out to be intracerebral haemorrhage. 7 (46.66%) patients were putamen/external capsule ICH. 3(20%) were thalamus ICH. 2(13.33%) patients were cerebellum ICH. 1(6.6 %) patient was pons ICH. 2(13.33%) patients were miscellaneous ICH.

Out of 60 patients of CVA, 3(5%) patients were subarachnoid haemorrhage. In out of 60 patients 1(3.33%) patients were cerebral venous thrombosis and these patients were non diabetic and non hypertensive.

Out of 60 cases of clinically suspected CVA subjected to CT study, 1(1.6%) case turned out to be normal. This case was taken as negative case. There was a technical problem to detect infarction but certainly the haemorrhage was ruled out.

Out of 60 patients, 1(1.6%) patients was tumors. Signs and symptomatology of tumor were mimicking the signs and symptoms of stroke, hence clinicians suspected these cases as stroke, which turned out to be of tumorous pathology on computed tomography scanning. These patients presented with loss of sensory and/or motor functions on one side of the body was mimicking stroke.

DISCUSSION

R.H. Rosenwasser et al. (2000) emphasized the need for CT Scanning as a tool in the early diagnosis of cerebrovascular accidents in providing therapy via intra-arterial or intravenous pathway[4]

Our study was to evaluate the role of CT scan in patients presenting with acute cerebrovascular accident in differentiating between haemorrhage, infarct and other causes of stroke.

Before the advent of CT scan and in places where CT scan was not available, physicians were mainly dependent on the history, physical findings and the Allen's method of scoring system to differentiate between haemorrhage and infarct using this scoring system. Allen studied 174 cases of acute stroke and was able to make an accurate diagnosis in 90% of cases.[5]

However, the scoring system had certain limitations as it is dependent on the history given by the relatives of patients and sometimes they are not able to give a clear description of signs and symptoms due to poor literacy level, which correlated with the scoring system. 100% accuracy in distinguishing haemorrhage from ischemic stroke based on clinical findings was not possible.

Ogun S.A, et al. (2000) assessed the frequency of misdiagnosis of stroke using CT of the brain. 156 patients admitted with clinical features suggestive of stroke were reviewed with CT brain. It was found that only 89 of them (57%) had neuroradiological features suggestive of stroke of which 59 (66%) had cerebral infarctions while 30 (34%) had cerebral haemorrhage. In 67 (43%) of the cases there were no features of cerebrovascular accident on CT scan. The misdiagnosis of surgically treated patients was 13.5%. He concluded that patients with clinical diagnosis of CVA should have CT scan evaluation to ensure appropriate treatment.[6]

Other studies have reported the usefulness of CT scan in patients suffering from stroke by ability to differentiate between haemorrhage and infarct and other causes of stroke and thus aiding in the clinical management. Oxford shire Community Stroke project that assessed 325 consecutive patients of acute stroke highlights the role of usefulness of CT scan. [3]

Mukherjee N, et al. (1998) studied on 80 patients suffering from stroke. On the settings of clinical and CT scan findings and with follow up to 6 months. He found that even though some of the clinical and CT scan findings are found to be important in prediction of outcome of stroke patients, clinical assessment appears to be more important.[7]

Previously, CT was considered insensitive in the evaluation of acute ischemic stroke patient; however, more recently detection of early CT findings has proved to be of prognostic value in the evaluation of these patients. The use of CT coupled with early acute phase therapy of stroke such as thrombolytic therapy has shown to improve outcome in the acute stroke patients. Cerebral CT is a mainstay in emergency diagnostic work up of acute stroke patients and conveys important information within a few hours after the ictus. Hans Peter Harring et al., found that in a recent series of patients with MCA territory infarctions the incidence of positive findings was 68% in cerebral CT scans performed within 2 hours of stroke onset increasing to 89% within 3 hours, thus emphasizing the great value of emergency cerebral CT scanning in acute stroke management, which is superior to MRI.[8]

Razzaq AA, et al. (1999) performed a CT study to investigate the role of CT in diagnosis and management of young stroke patients. CT scan findings of 108 stroke patients between 15 and 45 years of age were reviewed retrospectively. About 80% of the patients had infarcts of carotid territory and 20% of the vertebro basilar distribution. More than half of the infarcts were cortical (56%).[9]

In the present study 60 patients of stroke were analyzed and of them 38 patients had infarct i.e., 63.33%, 15 patients had haemorrhage i.e., 25%, 2 patients had CVT i.e., 3.33%, 1 patient had tumor i.e., 1.6%, 3 patients had SAH i.e., 5% and 1 patient had normal scan i.e., 1.6 %. Gaskill et al. (1999) emphasized that although new imaging techniques have emerged in the diagnosis of cerebrovascular accidents, CT remains the primary imaging test for evaluation of acute stroke. It is fast reliable, readily available and an accurate method of screening patients prior to thrombolytic therapy.[10]

In this present study, Out of 60 cases of clinically suspected CVA subjected to CT study, 1 case turned out to be normal accounting for 1.6%. This case is taken as negative cases.

There are technical problems to detect infarction but certainly the haemorrhage is ruled out in all cases.

Future Research

Science is dynamic and there is always a scope of improvement and change in time to come ahead. With progressive aim to move ahead we aspire to achieve highly accurate and reliable results. Thus every study leaves back scopes for other researcher to do something more advanced and varied in order to touch the height of perfection. This study examined only 60 subjects' (40 males and 20 females), future researchers can expand the study by including more number of subjects so as to make generalization of the results and practice, further studies with a larger sample size and in multiple centers are required. Thus it could be applied to real life situation.

Relevance to Clinical Practice

This study is relevant to the role of Computed Tomography in Evaluation of patients with Cerebrovascular Accident. It opens up new possibilities of prevention of CVA and makes maintain the good health of population. Such knowledge in future would not only reduce this disease but also have significant medical benefits on the health care systems.

Limitation

There were several limitations like, the sample size was small, the instrumentations and investigations may be different from a different health setup.

Summary

A total of 60 patients who were clinically suspected of stroke were subjected to computed tomographic study. Among these 60 patients 63.33% of patients had infarcts, 25% patients had intracerebral haemorrhage, 3.33% patients had cerebral venous thrombosis, 5% patients had subarachnoid hemorrhage, 1.6% of patients had tumorous pathology and 1.6% had normal scan. It was observed that both infraction and intracerebral haemorrhage were most common in the age group between 60-69 years. Males were more commonly affected with stroke than females. Risk factors like hypertension and Diabetes mellitus were played major role in the evolution of stroke. Out of 18 patients who had history of pre-existing hypertension, 55.55% of them showed cerebral haemorrhage and 33.33% of patients showed infarction. Out of 18 diabetic patients, 66.6% of patients had cerebral infarction and 33.33% of patients had cerebral haemorrhage. 20% of our patients had pre-existing heart disease. Commonest territory affected was right middle cerebral artery territory in cases of cerebral infarction, which accounts for 26.31%. However, most of the large infarcts were noted involving more than one arterial territory. In cases of intracerebral haemorrhage putamen and external capsule were commonly affected i.e., in 46.66 % of cases. 2 cases (3.33 %) were turned out to be cerebral venous thrombosis. 1 case (1.6%) was turned out to be normal on brain scan through there were technical problems to detect infarction, certainly the haemorrhage was ruled out. I case (1.6%) was shown tumor mimicking stroke symptomatology.

CONCLUSION

CT scanning was the "Gold standard" technique for diagnosis of acute stroke as the rational management of stroke depends on "Accurate diagnosis" and it should be ideally done in all cases. Risk factors such as hypertension, diabetes and previous episodes of stroke play major role in the evolution of cerebrovascular accidents, it was suggested that such patients should be investigated carefully; Sudden onset of neurological deficit or unexplained headache should further be investigated for the possibility of CVA. And if treatment is given early some of the cases of CVA can be saved from life threatening problems

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ORIGINAL RESEACH ARTICLE

Role of Color Doppler in Medical Renal Disease and its Correlation with Histopathological Findings

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Abstract:

Renal parenchyma disease is also called medical renal disease. It can be defined as a disease affecting renal parenchyma that is the glomeruli, tubules, interstitium or blood vessels of the kidney. Grey-scale renal sonography is still routinely performed during the initial evaluation of both native and transplant renal dysfunction.
Objective: Present study was to evaluate the role of color Doppler and its histopathological correlation in medical renal disease. Methodology: B-mode ultrasonography and detailed Doppler study was performed in all 27 patients. And ultrasound guided biopsy was done in 27 kidneys for histopathological examination. Results: Data was analyzed by using MS-Office software. Conclusions: Renal Doppler analysis with RI and PI measurement was to differentiate the major types of medical renal disease.
Key words: Medical Renal Disease, Color Doppler, Histopathological changes.

Introduction:

Renal parenchyma disease is also called medical renal disease. It can be defined as a disease affecting renal parenchyma that is the glomeruli, tubules, interstitium or blood vessels of the kidney. Grey-scale renal sonography is still routinely performed during the initial evaluation of both native and transplant renal dysfunction. The results of the sonography study, however, often do not impact the differential diagnosis or management of renal disease. Only basic anatomy information is obtained with the modality: renal length, cortical thickness, and grade of collecting system dilation are assessed. Although these findings may help in evaluating disease chronicity. Often the findings of sonography are normal despite severe renal dysfunction. Moreover, clinicians and radiologists accept that even the increased renal echogenicity that may be seen in medical renal disease lacks the specificity and sensitivity to be clinically relevant. Acute tubular necrosis, the most common cause of acute renal failure, is an instructive example. Brenner BM and Zollinger HU et al. [1,2] were stated that early in the course of the disease renal vascular resistance is elevated and renal blood flow is reduced. As in other instances of increased resistance, this should result in changes in the Doppler wave form with more marked reduction in diastolic flow than in systolic flow and a resultant elevation in RI.

Various imaging modalities beginning from intravenous urography, B-mode gray scale ultrasonography, Doppler Ultrasound, Computed Tomography to Magnetic Resonance Imaging have been used to differentiate renal parenchymal diseases.

Renal biopsy is the investigation of choice in case of renal parenchymal disease. But biopsy itself carries a 4% risk of morbidity [3]. Hence a non-invasive, easily repeatable technique is needed for the early detection of the disease.

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A series of articles during the past decade indicated the potential of Doppler sonography for improving the sonographic assessment of renal dysfunction. Changes in intrarenal arterial waveforms were shown to be associated with urinary obstruction, several types of intrinsic renal disorders, and renal vascular disease [4, 5]. The Doppler resistive (RI) was advanced as a useful parameter for quantifying the alterations in renal blood flow that may occur with renal disease. Our aim was to determine the role of color Doppler in renal parenchyma disease and find out the Correlation of the color Doppler finding with histopathological findings.

Materials and Methods:

A total of 27 patients with age group 14 to 68 years, i.e. 54 kidneys with medical renal disease (grade 1 & grade 2) undergoing biopsy were included in this study. The entire subject signed an informed consent approved by institutional ethical committee of Sri Ramachandra Medical College and Research Institute, Chennai, India was sought. Data was collected on the basis of inclusion and exclusion criteria, with irrespective of sex in OPD or the ward, of department of Medicine/Radio diagnosis, Sri Ramachandra Medical College and Research Institute, Chennai, India. All these patients were clinical symptomatology and biochemical parameters suggestive of renal parenchymal disease.

Our inclusion criteria were patients with medical renal disease (grade 1 & grade 2) undergoing biopsy. And exclusion criteria were chronic disease, where one or both kidneys are contracted, Patients with extensive exfoliative dermatitis and Patients unable to hold their breath.

There were total of 27 patients (16 males and 11 females, 54 kidneys were studied and 27 kidneys were biopsied.

Instruments:

USG machine used: Aloka SSD 5500, USG Probe: 3.5 MHZ curvilinear, Biopsy gun: Bard Max core disposable biopsy instrument, Specimen container: Bouin's fluid and Light microscope were used.

Technique:

B-mode ultrasonography and detailed Doppler study was performed as an initial examination in all 27 patients (16 males and 11 females) in the age group of 14 to 68 years of medical renal disease.

Ultrasound was performed using 3.5 MHZ probe on Aloka SSD 5500 machine. On B-mode examination, the overall size and structure of the kidney was noted as a first step, followed by longitudinal measurement of the kidney. The cortical echoes of the right kidney were compared with that of the adjacent liver parenchyma and on the left side, the cortical echoes compared with that of the spleen. And the renal parenchyma graded accordingly. The status of the pelvicalyceal system and perinephric areas was also studied.

After B-mode examination of the kidneys, a through Doppler examination was done in all the cases. First, the global perfusion of both the kidneys was seen, and then each artery beginning from the main renal artery till the interpolar division of the main renal artery was carefully studied at each level (i.e., main renal artery at hilum and interlobar arteries at upper, mid and lower pole). The pulsatality index (PI), resistive index (RI), peak systolic velocity (PSV), end diastolic velocity (EDV) and acceleration time were recorded. For our comparison with histopathological results, only pulsatality index and resistive index values were considered.

Biopsy:

Ultrasound guided biopsy was performed in 27 kidneys using true-cut biopsy needle (Bard Max Core, disposable biopsy instrument, 18 G, depth 22cm). The kidneys were identical on gray scale imaging, the lower pole chosen for biopsy and the site of skin entry was marked. The distance of the lower pole from the skin was measured and the nephrologists were told to go ahead with the preparation of the biopsy site. The site was cleaned with antiseptic solution, local anesthesia injected and then, through the needle two biopsy specimens were collected in Bouin's fluid containers and send for histopathological examination. The paraffin embedded section of the biopsy specimen was reviewed by light microscope and immunofluroscence to determine the diagnosis and primary site of pathologic changes. An attempt was made to determine if the dominant process was within the nephron (glomeruli), the tubulointerstitial compartment or if it was vascular.

Statistical Analysis: Data was analyzed by using of simple statistical method with the help of MS-Office software.

Results and observations:

The sonographic and pathologic data were analyzed separately and correlated with clinical history and laboratory studies. Out of the 27 patients 16(59.3%) were male with the mean age range 1B-64 years and 11(40.7%) were female with the age group of 14-6B years. Patient had elevated level of serum creatinine and BUN.

As more than one vessel was studied within a particular kidney. We were able to determine any significant variation in mean RI & PI measurements between different sites in the kidney. In general the amount of variation in different sites within a particular kidney was not great. In addition we compared the values between both the kidneys in a given patient. The mean difference between the resistive index (RI's) with a range of 0.0 to 0.5 and pulsatality index (PIs) with a range of 0.0 to 0.7. In only one patient the RI difference between two kidney was 0.7, whereas PI difference in two patients was 1.2 & 1.3.

Renal biopsy finding were analyzed and an attempt was made to classify the location of the primary abnormality as within the glomeruli, tubulointerstitial or within the vascular compartment. However in some patients more than one significant form of renal disease was present.

Table 1 : Comparison of Histopathological Findings with Doppler Findings:

	Glomerulo nephritis	Tubulointerstitial Nephritis	Mixed
Positive	0	8 (72.8%)	5 (100%)
Negative	11 (100%)	3 (27.2%)	0
Total	11 (100%)	11 (100%)	5(100%)

Out of 27 patients, there were 11 patients who had tubulointerstitial disease of which 8 (72-7%) patients had elevated RI and PI. 5 patients had a mixed type of disease which involve all the compartment like, vascular, glomerular and tubulointerstitial, and all these patients had elevated RI and PI values. The remaining 11 patients had renal disease essentially Out of 27 patients 3 patients had an abnormal Doppler examination and normal BUN and creatinine level. Whereas 11 patients with a normal Doppler examination had an elevated BUN and creatinine level. Only 7(25.9%) patients with Medical Renal Disease exhibited a definite increase in renal echogenicity, compared with 13 (48.1%) patients demonstrating an elevated intrarenal RI.

Discussion:

Pedal edema, puffiness of face and oligourea are common presenting complaints of patient with medical renal disease. Pathological parameter of this condition usually include, increase blood urea, creatinine, proteinurea. However with these symptoms and parameters one cannot absolutely confirm the diagnosis of medical renal disease.

Renal disease may involve the glomeruli, vascular, or intestinal tissues; these are all interrelated. Nephron changes will result from vascular disease, and in turn, vascular disease will cause nephron and interstitial tissue changes. In a similar fashion, interstitial tissue changes inevitably accompany and follow vascular ad nephron disease. The kidney that has been seriously injured for a long period of time will lose the distinguishing features of specific disease regardless of whether the original disease was glomerular, tubular, interstitial or vascular. In end-stage kidney disease recognition of the primary renal disease is often not possible.

Joel F. Platt et al. [6] who stated that there is weak correlation between blood urea, creatinine and renal Doppler findings. Our data indicate duplex Doppler analysis is superior to conventional gray-scale US criteria in identifying abnormal kidneys in patients with Medical Renal Disease.

Percutaneous renal biopsy and adequate analysis of the biopsy specimen is the single most definitive tool in the confirmatory diagnosis of renal parenchyma disease. Analysis of the specimen requires light microscopic, electron microscopy and immunofluorescent study. Welt L et al [7] and Buxo et al [8] proved the reported success rate of renal biopsy ranges between 89.8% and 94.9% in their study.

limited to the glomeruli with no active abnormalities in the tubulointerstitial region and no vasculopathy. In these patients the RI and PI was within normal limits. In fact, many patients having severe or acute glomerular disease, no kidney with disease essentially limited to the glomeruli had an abnormal Doppler waveform.

Though percutaneous renal biopsy is the investigation of choice for the diagnosis of medical renal disease. But it is not free of complications which include infection, hematoma, haematuria, etc. Thus a non invasive easily repeatable technique is required for the early detection of the disease which is done by color and spectral Doppler ultrasound.

All the 27 patients in our study had the base line blood and urine investigations which included blood urea, creatinine and proteins. Gray scale imaging to assess the size and echogenicity of the kidney was done.

Our finding was similar with finding of Hedvig Hricak et al. [9] they were found that there is no correlation between the type of renal disease and the cortical echogenicity.

In present study 7 of 27 patients (25.9%) with renal medical disease had echogenic kidneys. However echogenicity was not discriminated between major forms of renal disease as the renal Doppler imaging.

Following the gray scale sonography, the Doppler examination was performed and resistive index (RI) and pulsatility index (PI) recorded at hilum and polar levels in both kidneys. Our results showed the RI & PI in kidneys with active/acute tubulointerstitial disease was significantly increased with RI in kidneys that were disease essentially limited to the glomeruli. This was true no matter how severe or acute the glomerulor disease without accompanying tubule interstitial disease or vasculitis, all RIs & PIs were normal. And there was no significant difference seen between RI & PI of normal echogenic kidney and abnormal echogenic kidney. This agrees with a finding of Joel F. Platt et al. [10]. Their study showed no significant difference seen in RI of echogenic kidneys and RI of normal echogenic kidneys.

When the findings of Duplex Doppler Sonography were compared with the renal biopsy, 8 of 11 (72.7%) kidneys with active tubular interstitial disease had elevated RI and PI measurements. And 11 kidneys with glomerular disease showed normal RI and PI measurements. In addition 5 patients of mixed pathology (tubulointerstitial, glomerular and vascular) in our series all had elevated RI & PI measurement. We inferred that Doppler values were most accurate in mixed type of kidney parenchymal disease when correlated with gold standard biopsy results.

Future Research:
Science is dynamic and there is always a scope of improvement and change in time to come ahead. With progressive aim to move ahead we aspire to achieve highly accurate and reliable results. Thus every study leaves back scopes for other researcher to do something more advanced and varied in order to touch the height of perfection. This study examined only 27 subjects (16 males and 11 females), future researchers can expand the study by including more number of subjects so as to make generalization of the results and practice, further studies with a larger sample size and in multiple centers are required. Thus it could be applied to real life situation.

Relevance to clinical practice:
This study is relevant to the role of color Doppler and histopathological changes in medical renal disease. It opens up new possibilities of prevention of renal disease and makes maintain the good health of population. Such knowledge in future would not only reduce this disease but also have significant medical benefits on the health care systems.

Limitation:
There were several limitations like, the sample size was small, and it was a hospital-based study, the instrumentations and investigations may be different from a different health setup.

Conclusion:
The production of Doppler waveform changes in strongly influenced by the site of the main disease within the kidneys, active disease within the tubulointerstitial compartment (acute tubular necrosis, interstitial nephritis) or vasculitis / vasculoparthy generally resulted in an elevated RI & PI, whereas disease limited to the glomeruli, no matter how severe, was not significantly elevate the RI & PI.
Hence, we conclude that some forms of medical renal disease can produce changes in the Doppler waveform, detectable by RI and PI measurement. And renal Doppler analysis with RI and PI measurement to be promising in differentiating major types of medical renal disease.

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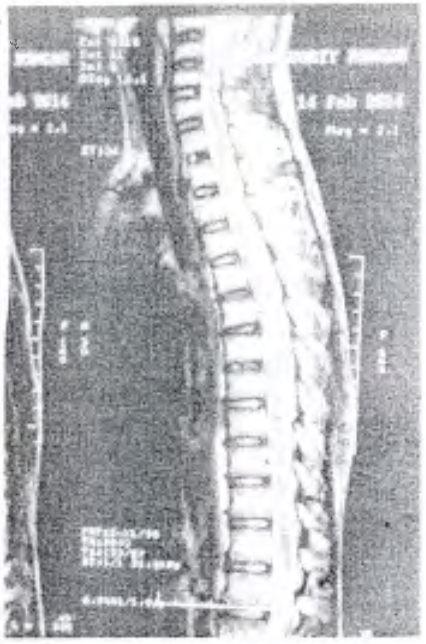

Figure 5 : Spinal dural ectasia.

Hyperlysinemia and Sulphideoxidase deficiency diseases are very rare and also their chracteristic features were not matching with the patient.

Scoring of the patient as per Ghent's revised criteria . Ghent's revised criteria for those without family history of Marfan's Syndrome are as follows:

1. Aortic root diameter (Z-score 2) and ectopia lentis = MFS
2. Aortic root diameter (Z-score 2) and causal *FBN1* mutation = MFS
3. Aortic root diameter (Z-score 2) and systemic score 7 points – MFS
4. Ectopia lentis and causal *FBN1*mutation with known aortic root dilatation = MFS

In my patient aortic root diameter was 28mm (Normal 20-37mm) and systemic score was 3 (Table 1, Figure 3-5). Therefore Marfan's Syndrome as per Ghent's revised criteria [1] was ruled out.

Absence of aortic dilatation and low systemic score of only 3 points in Ghent's revised criteria ruled out the diagnosis of Marfan's syndrome in the present case. Therefore constellation of bilateral dislocation of lens, bilateral rhegmatogenous retinal detachment, high myopia and spinal dural ectasia could well be the manifestations of a new syndrome. This paper opened up the avenue of further research lest similar cases are found in future. Another possibility is that there was incomplete expression of the manifestations of Marfan syndrome leading to atypical presentation.The most striking atypical feature was absence of tall stature.Therefore physicians should remain cautious not to rule out diagnosis of Marfan syndrome on the basis of stature alone.

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ORIGINAL & CLINICAL RESEARCH

Assessment of Renal Parenchymal Diseases in Diabetes Mellitus by Colour Doppler Study of Intra Renal Vessels

Dr. Ahmad Rizwan Karim[1], Dr. Kshitish Kumar[2]

INTRODUCTION

Diabetes mellitus is a syndrome characterised by chronic hyperglycaemia and disturbances of carbohydrate, protein and fat metabolism associated with absolute or relative deficiency in insulin secretion and /or insulin action.

The main identifying feature of diabetes mellitus is chronic and substantial elevation of blood glucose level.

Diabetes mellitus is the most common of the serious metabolic diseases. The disease is characterized by metabolic abnormalities with long term complications involving the eyes, kidneys, nerves and blood vessels. Diabetes affects the kidneys primarily through vascular changes, although recurrent infections may also play a part in impairment of renal function and that cases papillary necrosis may be seen.

Diabetic nephropathy is a relatively common microvascular complication of both insulin-dependent (IDDM) and non-insulin dependent (NIDDM) diabetes mellitus with concomitant retinopathy and elevated blood pressure[30] In 1936, Kimmelstiel and Wilson described the nodular glomerular inter capillary lesions in the diabetic kidney and related them to the clinical syndrome of profuse proteinuria and renal failure accompanied by arterial hypertension. The renal involvement has been better defined in IDDM than in NIDDM, partly because the usual relatively acute onset of diabetes in the former allows for a more precise timing of observed clinical and physiological events.

The appearance of diabetic kidney on grey scale ultrasound as with many other conditions are inconsistent, with variable change in size and reflectivity as the disease progresses. One interesting feature of diabetic nephropathy is that the glomerular filtration rate increase during the initial stages and this is associated with a small but measurable increase in overall renal size[2,5]. The increased in size is most marked in those patients with microalbuminuria compared to patients without microalbuminuria. As chronic changes

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supervene in diabetic kidneys, however, they decrease in size, although their echogenicity/ reflectivity is usually unchanged or only slightly increased.

However we are especially interested in the evaluation of diabetic nephropathy; i) in early stages of the disease without grey scale changes in the kidneys in order to detect patients at risk for irreversible renal changes and ii) in late stages of the disease to tell about the prognosis. The early stages of nephropathy is still reversible by medical treatment (ACE inhibitor and good metabolic control). So early diagnosis is of prime importance for detecting patient at risk for irreversible renal disease.

Till the advent of colour Doppler sonography, the grey scale ultrasonographic study could only detect increased renal size in early stages of diabetic nephropathy[2] and in very late stages when only cortical echogenicity and size did changes along with the change in biochemical parameters.

However, changes in Doppler indices e.g., increased RI (Resistive Index) of intra-renal (interlobular/arcuate) arteries (more than 0.7 is diagnostic of nephropathy) could be detected by Doppler study in an early stages of nephropathy.

Hence, by grey scale USG, determination of renal size and change in renal parenchymal echogenicity proved to be little value. The most relevant information is provided by RI of intrarenal arteries, a parameter that will allow early detection of patients affection by diabetes mellitus who show renal vascular involvement without however any alteration of the traditional USG parameters. However both RI of intrarenal arteries and serum creatinine and creatinine clearance rate in patients of early stages diabetic nephropathy with normal renal function have equal diagnostic capability.

AIMS AND OBJECTIVES

1. Colour Doppler study of intra-renal vessels for assessment of the renal parenchymal change and change in intra-renal vascular structures in early nephropathy due to diabetes mellitus.

2. Colour Doppler study of intrarenal vessels in late stages of diabetic nephropathy with or without change in renal size and parenchymal echogenicity.

3. Correlation of biochemical changes with grey scale ultrasound features and colour Doppler study.

MATERIALS AND METHODS

The present study was performed in the department of Radio-Diagnosis, Katihar Medical College and Hospital, Katihar, Bihar.

Hundred patients were selected from Indoor medical and surgical wards and from diabetic clinic and other out patient department of Katihar Medical College and Hospital, Katihar.

Twelve controls were selected from Medical and Surgical OPD.

All the patients selected in this study had fulfilled the following selection criteria;

Diabetic patients having.

i) Micro Albuminuria.

ii) Macro Albuminuria.

iii) Normal / increase serum creatinine.

Exclusion criteria;

Diabetic patients without the above biochemical criteria were excluded from this study.

All the controls selected in this study had fulfilled the following selection criteria.

1. Normal blood sugar
2. Normoalbuminuria
3. Normal serum creatinine

Patient satisfying above criteria were selected for this study and subjected to following protocol;

a) History

b) Laboratory examination.

c) Ultrasonographic examination of kidneys.

d) 99m Tc DTPA renogram

e) Renal biopsy.

History

History was taken, for the age & sex of the patient, clinical features of diabetes mellitus, Presence or absence of other causes of renal diseases for exclusion.

Investigations

Following investigations were done:

Blood sugar (F) and (P.P.)

Blood urea.

Serum creatinine.

Quantitative assessment of total urinary protein in 24 hours.

Sonographic examination

Preparation: For the sonographic examination of the kidney, fasting was recommended for reducing the difficulties caused by bowel gas.

Equipment

a) Ultrasound Machine of M/S Philips Ltd, model scanner 200 having gray-scale display and real time facilities with 3.5 MHZ convex sector and 5 and 7.5 MHZ linear transducer.

b) M/S Philips make scanner 250 ultrasound machine with 3.5 annular sector probe with 'Fairlogic' automatic multi spot imager camera.

c) Agilent image point- HX colour Doppler machine of M/S Hewlett- Packard (HP) Ltd having colour Doppler, angio, pulse-wave and continuous wave facility with 1.8,2.5,7.5 and 10MHZ curvilinear and linear probes and doing automatic multi-imager model AE; 66 camera, HP Deskjet 640 C printer, one personal computer with samtel Monitor and HP key-board.

Patient positioning

Patient was positioned in the right and left lateral decubitus position, and also in a standard supine position.

Examination technique

First the kidneys are optimally visualized in the B- mode image in the (Rt) and (Lt) lateral decubitus positions. This can also be done in a standard supine position in most patients. After obtaining an optimum B-mode view, activate colour flow and duplex and measure successive RI values in the upper, mid and lower polar region for the interlobar/arcuate arteries. In a healthy subject, the RI values will show only minimal difference within one kidney and between the kidneys. A mean value is calculated from the resistance indices for each kidney. The RI values measured in healthy subjects show a significant dependence on age and the area sampled. The best sampling sites are the segmental and interlobar arteries as these vessels are

easy to find at the junction of the renal pelvis and parenchyma. They usually pass directly toward the transducer and produce a high Doppler frequency shift, resulting in good- quantity color flow and spectral image.

The B-mode imaging technique

The B- mode image was used to evaluate.

a) The anatomical location of kidney,

b) Size of the kidney.

c) Parenchymal echogenicity.

d) Cortico- medullary differentiation.

Pulsed Doppler technique

After evaluation of B- mode image, activate color flow and Duplex. Pulse Doppler sampled volume was placed at the level of arcuate/ inter lobar arteries and the Doppler wave form were assessed for measuring resistance index (RI).

Spectral wave form of normal intra renal arteries.

The Doppler wave form of intra-renal arteries in turn, defined a flow property called low pulsatility that means a broad systolic peaks and forward flow throughout diastole because there vessels feed circulatory systems with low resistance to flow. Low pulsatility wave from are also monophasic, meaning that flow is always forward and the entire wave is either above or below the Doppler spectrum baseline according to direction of flow in relation to transducer.

Examination protocol

After evaluation of patient's history, the B-mode image was at first performed with the (Rt) and (Lt) lateral decubitus and supine position. The kidneys are examinated in longitudinal and axial plain sequentially from upper polar region to lower polar region using 3.5 MHZ curvilinear transducer. Focal length is changed according to the level of imaging plane. The kidney size, parenchymal echo whether diffuse or focal, corticomedullary differentiation are assessed.

The findings of B- mode image in each kidneys are recorded. Other incidental findings if any e.g. hydronephrotic changes, nephrolithiasis, nephrocalcinosis are also noted.

According to patient's body thickness, depth of the imaging plane were adjusted and reduce the gray scale gain if necessary for subsequent color flow imaging. After completion of B- mode view, activate color flow and duplex view. The colour Doppler method was performed with 3.5 MHZ curvilinear transducer and changed the box size as required. Doppler signals of arcuate arteries are at the bases of pyramids and that of inter lobar arteries are between the adjacent pyramids. The pulsed Doppler sampled volume were placed at the level of arcuate/ interlobar arteries in upper, mid and lower polar region and spectral wave forms were recorded. Each spectral tracing should contain at least three wave form. The resistive index of spectral wave form of these three region were recorded and mean of these three value are take as a diagnostic RI value of the kidney.

99m Tc DTPA renogram and ultrasound guided percutaneous renal biopsy were done in 5 cases separately for confirmation of diabetic nephropathy in adjunct to Doppler & Gray Scale Parameters and Laboratory Parameters.

Documentation

Documentation of RI changes and gray scale findings of kidney.

1) Mean RI value calculated from RI of upper, mid and lower region.
2) Kidney size.
3) Parenchymal echogenicity.
4) Cortico-medullary differentiation.

Diagnostic criteria of ultrasonography;

1. Adult RI value >.7
2. Increased parenchymal echogenicity
3. Alternation of cortico-medullary differentiation.
4. Diminished kidney size.

Diagnostic criteria of 99m Tc DTPA renogram

In early diabetic nephropathy

a. Kidney to background ratio-low
b. Renal curve – 1) low amplitude, 2) delayed peaking
c. Renal perfusion – normal
d. Tracer uptake – prolonged & low
e. GFR – low

In late diabetic nephropathy

i. Kidney almost – invisible
ii. Loss of typical characteristics of renal curve
iii. Perfusion is maintained
iv. GFR – very low

Diagnostic criteria of renal biopsy

In early diabetic nephropathy

a) Glomerular basement membrane thickening

In late diabetic nephropathy

a) Nodular glomerulosclerosis
b) Diffuse glomerulosclerosis

RESULTS

In modern practice ultrasound imaging is an important adjunct to clinical examination in the management of patients with diabetes mellitus and provides useful informations to diagnose nephropathy. The use of ultrasound is increasing rapidly worldwide. Because there is no ionizing radiation and the method is non- invasive, ultrasound should be the preferred method of imaging whenever it can give useful clinical information.

Diabetes affects the kidneys primarily through vascular changes. As chronic changes supervene in diabetic kidneys, however they decrease in size, although their reflectivity is usually unchanged or slightly increased. In present study, the sensitivity of US diagnosis for RI of intra-renal arteries was 85% in patient group and 89.7% pathological values were observed in advanced stage of diabetic nephropathy but 32% Gray scale changes and smallest mean kidney size were observed in advanced stage of Nephropathy.

Early nephropathy with microalbuminuria and normal s. creatinine level is still reversible by medical treatment (ACE inhibitor) and good metabolic control.[5]

From Present study, we can decide that the duplex sonography with Doppler waveform analysis in the evaluation of early diabetic nephropathy has a very important role in order to detect patients at risk for irreversible renal disease.

The means for RI in group I, group II and group III were 0.72 + /- .10 (SD), 0.77 +/- 0.08 (SD) and 0.83 +/- 0.10(SD)

respectively. The mean for s. creatinine in groups I, group II and group III were 0.86 + /- 0.23 (SD), 1.09 +/- 0.15 (SD) and 3.23 + /- 2.37 (SD) respectively. The RI was significantly correlated with serum creatinine for the patient groups of diabetic nephropathy P < 0.001). So Duplex Doppler sonography may be helpful in evaluation of renal function status in patient with diabetic nephropathy. The mean age for control and patient group and male and female ratio were not significantly different for comparison of control and patient group in statistical method. In early nephropathy (group I) with micro albuminuria and normal mean s creatinine level [0.86+/- 0.23 (SD)] was studied for Duplex sonography with Doppler wave form analysis. The mean RI for early nephropathy group was 0.72 +/ - 0.10 (SD) which was definitively raised value.

So, Doppler changes can be diagnosed earlier than biochemical parameters.

CONCLUSION

Although renal biopsy is a gold standard in diagnosis of Diabetic nephropathy, Duplex Doppler sonography and gray scale imaging can often become an important complementary role to renal biopsy and scintigraphy. In the right clinical setting a combination of assessment of size, of morphological characteristics and a high resistance Doppler spectrum of blood flow to the kidneys provides useful information about diabetic renal disease.

However we can conclude the following from the present study.

- Biochemeical changes are significantly correlated with Duplex Doppler sonography of intra-renal arteries.
- Biochemical changes are significantly correlated with gray scale diagnosis of renal parenchymal echogenicity and cortico- medullary differentiation at the late stages of nephropathy.
- Intra-renal Duplex Doppler changes are seen in both early and late nephropathy.
- The intra-renal Doppler changes can be diagnosed earlier than the biochemical changes.
- Both Duplex Doppler and gray scale sonography may be helpful in evaluation of renal functional status in patients with diabetic renal disease.
- The Duplex sonography with Doppler wave form analysis in the evaluation of early diabetic nephropathy has a very important role in order to detect patients at risk for irreversible renal disease.

Advantages of US over renal biopsy and seintigraphy includes –it's low cost, easy performance, bed side examination facility with portable machine, real time imaging, non- invasive, without radiation hazards and easy follow up.

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postpartum/puerperal haematoma were more common in primigravida and the location was twice more about labia than the perineal region.

CONCLUSION

The availability of newer modality of treatment such as administration of safer antibiotics, intravenous oxytocin, blood transfusion facility in the time of need, fluid and electrolyte balance, quality of improved anaesthesia for high risk patients and early resort to life saving surgery represent the hallmark of successful management of postpartum haemorrhage.

Further more the development of synthetic prostaglandins have drastically changed the management of postpartum haemorrhage, and these agents are emerging as the first line of approach in the management of severe postpartum haemorrhage caused by relaxed fundus and uterine atony.

High rates of morbidity and mortality related to postpartum haemorrhage reinforces need for understanding vigilance in the fourth stage events if the first three stages are uncomplicated.

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ORIGINAL & CLINICAL RESEARCH

Study on Role of Sonohysterography in Evaluating Aetiology of Infertility Prior to Hysterolaparoscopy

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ABSTRACT

BACKGROUND AND OBJECTIVES : Infertility is defined as the inability of a couple to conceive after 1 year of coital activity without contraception. It affects approximately 10-15% of couples in the reproductive age group. uterine and tubal factor accounts for 10% and 25% to 30% respectively for infertility. Thus the evaluation of utero-tubal factors is an essential step in infertility work. There are various invasive and non-invasive diagnostic procedures to evaluate uterine and / or tubal pathology. The common invasive modalities are Hysterosalpingography, hysteroscopy and laparoscoy. The non – invasive modalities are Ultrasonography, sonohysterography and MRI. The objective of the study was to compare the efficacy of sonohysterography with hysterolaparoscopy. To assess the sensitivity, specificity, positive predictive value and negative predictive value of sonohysterography.

METHODS : This prospective study was done in 60 patients with infertility with unknown uterine and tubal function from April 2015 to March 2016 in Department of Obstetrics and Gynecology and Radio-diagnosis, KMCH, Katihar, Bihar. All the patients with unknown uterine and tubal function attending infertility clinic at ARC, were included in the study and patients who were having active bleeding and were not willing to participate were excluded.

All patients recruited for the study were called post menstrually and the sonohysterography was done to assess the uterine cavity and patency of fallopian tube. Next day, hysterolaparoscopy was done. in all patients who had underwent SHG the previous day and findings of both the procedures were compared.

RESULTS : The maximum and minimum ages of the patients were 46 and 21 years with average of 30.1 years. Maximum patients were between the age group of 25-

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34 years. Maximum no.of patients were having 5-10 years of duration of infertility with average duration of 7.7 years 45(75%) patients were having primary infertility and remaining 15(25%) patients were having secondary infertility.

For evaluation of uterine cavity, when compared with hysteroscopy SHG had a sensitivity of 97.8%, specificity of 88.8%, PPV of 97.8% and NPV of 88.8%. For tubal patency when SHG was compared to laparoscopy with CPT, SHG had a sensitivity of 83.3%, specificity of 82.9%, PPV of 42.9% and NPV of 97.5%. On correlating presence of fluid in POD and tubal patency SHG has sensitivity of 75%, specificity of 94.2%, PPV of 50% and NPV of 98%.

CONCLUSION : Sonohysterography is a non–invasive, simple, easy cost effective procedure for evaluation of uterine cavity and tubal patency which can be used as screening procedure initial work up of infertility women.

INTRODUCTION

Infertility is defined as the inability of a couple to conceive after 1 year of coital activity without contraception.

It affects approximately 10-15% of couples in the reproductive age group.

Historically the concept of inheritability has changed over time and although the problems pertaining to procreation have been mentioned even in the Bible (Ober, 1984) it is only with the advent of modern biomedical research technique that a fuller insight into various cause of infertility has been obtained.

Male and female factor both or either can be the cause of infertility. Male factor mainly comprises of low sperm count, decreased motility or auto immunity. It accounts for 40% of the infertility cases. Female factor includes ovulatory disorders, uterine and tubal diseases, cervical factors and pelvic factors. Out of these uterine and tubal factor accounts for 10% and 25% - 30% respectively for infertility.

Thus the evaluation of utero-tubal factors is an essential step in infertility work.

There are various invasive and non-invasive diagnostic procedures to evaluate uterine and / or tubal pathology. The non - invasive modalities are Ultrasonography, sonohysterography and MRI. The invasive modalities are Hysterosalpingography, hysteroscopy and laparoscopy.

It would be beneficial if a way could be found to assess the uterine and / or tubal pathology using a relatively minimal invasive approach and also which is cost effective.

NON-INVASIVE MODALITIES

1. **Transvaginal ultrasonography :** USG is extensively used in the evaluation and treatment of infertility. It is valuable for visualizing various ovarian, tubal and uterine abnormalities. It is simple and has quite good accuracy for most of the uterine cavity diseases. But in some situations its fails to define the native of abnormality like USG fails to differentiate between endometrial thickening from polyp, submucous from the intramural fibroid etc.

2. **Sonohysterography :** Richman TS in 1984 first studied the sonographic appearance of the uterus after artificial uterine cavity distension i.e. hydrosonography to evaluate the female genital tract and its anatomy in infertility.

For a sonologist "FLUID IS A FRIEND". The basic principle of sonohysterography is to distend the uterine cavity with isotonic saline, which will delineate the contour, identify intrauterine pathology, thickness of endometrium and also show the presence of fluid in the pouch of Douglas. Sonohysterography is more precise in accurately detecting intrauterine abnormalities and measuring endometrial thickness and also the tubal patency. It is simple, safe and easy to perform and unlike HSG has absence of radiation hazard and allergy to iodine contrast.

It is also non invasive and does not require anaesthesia unlike hysteroscopy and laparoscopy.

The present study is done to assess the diagnostic accuracy of sonohysterography compared with hysterolaparoscopy.

INVASIVE MODALITIES

Hysterosalpingography : In the evaluation of uterine and tubal factors causing infertility HSG plays an important role. It became an accepted procedure in 1925 ever since the discovery of an effective medium lipiodol. However it has its limitations and complications. It cannot be done in cases of pelvic infections and active uterine bleeding. It is associated with risks like iodine allergy, pelvic infections and pain. It can cause venous or lymphatic intravasation of medium and also involves the risks of radiation exposure. Transient distortion of uterine cavity by blood, mucus, debris and air bubbles may produce false positive results.

Hysteroscopy : It allows the direct visualization of uterine cavity, thus to rule out intra uterine causes of infertility. However, it only visualizes the inner surface of the uterus. Also this procedure is costly and requires anaesthesia for a satisfactory performance.

Laparoscopy : Laparoscopy is one of the major advances that has been made in the last 30 years. It is indicated in tubal diseases, endometriosis and peritoneal factors like pelvic adhesions as a cause of infertility. However, it cannot visualize inner cavity of uterus. It is an invasive and expensive procedure and also requires anaesthesia.

OBJECTIVES

1. To compare the efficacy of sonohysterography with hysterolaparoscopy.
2. To assess the sensitivity, specificity, positive predictive value and negative predictive value of sonohysterography.

MATERIAL AND METHODS

All women with primary or secondary infertility with unknown uterine and tubal function attending Department of Obstetrics and Gynaecology infertility section from April 2015-March 2016 at Katihar Medical College and Hospital, Katihar, Bihar.

Study Design : Cross sectional study.

Sample Size: 60

Duration : One year

Instruments : Sim's speculum, anterior vaginal wall retractor, vulsellum forceps, intrauterine insemination catheter, ultrasound machine.

Procedure : If the patient fulfilled the inclusion criteria, she was explained about the procedure and informed consent was

taken. Inj Atropine and Inj. Pentazocine intramuscularly was given 15 minutes prior to the procedure. Then a palpatory bimanual examination was performed. Both the ultrasonographic procedures were done by a single obstetrician a routine transvaginal sonography was done and the following was noted.

- Uterine size – measured both longitudinally and axially
- Gross lesion of myometrium and endometrium
- Endometrial thickness to be measured across the lumen of the endometrial cavity just below the fundus
- Tubal pathology

The instruments used for sonohysterography i.e. Sim's speculum, Anterior vaginal wall retractor, vulsellum, intrauterine insemination catheter 20 ml syringe, 30 ml saline were kept ready.

After routine transvaginal sonography, vulva and cervix were cleaned with antiseptic solution. The posterior vaginal wall was retracted and the cervix was visualized, retracting the anterior vaginal wall. The anterior lip of cervix is held with vulsellum. Intrauterine insemination catheter is now inserted into the uterine cavity. Sterile saline is flushed through the catheter to get rid of small amount of air before instillation. The small siliastic ring is placed at the level of cervical canal to help prevent backflow of fluid. The speculum is then removed carefully, a continuous IV drip was attached to the catheter. Scanning was done in the long axis, fluid was instilled while watching the monitor and the transducer is moved from side to side i.e. from cornua to cornua. The amount of fluid instilled is variable and depend on the image that is produced on the ultrasound screen. The transducer was then rotated 90 into a coronal plane and further fluid is instilled by scanning down towards the endocervical canal and up towards the uterine fundus.

It is considered essential to recrete a three dimensional anatomy, taking great care not to miss any portion of the uterine cavity because some polyp or hyperplasia could be focal. The free flow of saline from both the tubes was taken as the criteria for tubal patency and also the collection of fluid in pouch of Douglas was also noted to detect tubal patency. At the end of procedure leakage, pain and time taken during the procedure was also noted.

Inclusion Criteria

All patients with primary and secondary infertility with unknown uterine and tubal function attending infertility section (Obst. & Gynae.) and reffered Radio-diagnosis department of KMCH, Katihar.

Exclusion Criteria

1. All patients not willing to participate in this study.
2. Patients having active bleeding

RESULTS

We have done a one year prospective study on 60 infertility patients for the evaluation of utero tubal factor by sonohysterography and correlating by hysterolaparoscopy with CPT.

Out of 60 infertility patients, SHG could not be done in 4 cases due to technical difficulty which were excluded. Thus out of 56 cases, 8 cases had intrauterine pathology, on SHG, out of which only 7 had abnormality of uterine cavity on hysteroscopy and in 1 case which was diagnosed as normal on SHG had abnormality (synechiae). Thus for the evaluation of uterine cavity sonohysterography had a sensitivity of 97.8%, specificity of 88.8%, PPV of97.8% and NPV of 88.8%.

For evaluation of tubal patency, SHG had sensitivity of 83.3%, specificity of 82.9%, PPV of 42.9% and NPV of 97.5% for evaluation of tubal patency. On correlating fluid in POD and tubal patency SHG had sensitivity of 75%, specificity of 94.2%, positive PPV of 50% and NPV 98%.

In our study out of 60 patients 11(18.3%) patients had mild pain and 1(1.7%) patient had moderate pain but no analgesics were required in any case.

Average time taken in our study for sonohysterography was 19.9 minutes

In the present study minimal leakage of fluid was seen in 22 (36.7%) cases.

CONCLUSION

With the present study, we conclude that—

1. Sonohysterography is a non-invasive, simple, cost effective procedure to diagnose the uterine cavity abnormalities and tubal patency.
2. It can be used as screening procedure in initial work of infertility i.e. if sonohysterography shows a normal uterine cavity and patent fallopian tubes, invasive procedures like HSG or hysterolaparsocopy can be avoided.
3. Hysterolaparoscopy with CPT should be done only in cases where SHG has detected any pathology of uterine cavity or fallopian tube or in cases where it is inconclusive.

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Real Time Ultrasonography Evaluation of Focal Liver Lesions

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ABSTRACT

Objective : To evaluate the role of real time ultrasonography in characterization of focal liver lesions.

Methodology : Real time ultrasonography was performed in 40 patients with suspected of having focal liver lesions attending the Department of Radiology, Katihar Medical College & Hospital, Katihar, Bihar, over a period of one year.

Results : Of the 40 patients, 26 were male (65%) and 14 were female (35%). Focal liver lesions were common in the age group between 50 – 60 years with 10 patients (25%). Out of 40 patients Hemangioma was the most common lesion with an incidence of 25%, followed by metastases (20%), liver abscess (17.5%), hepatic cysts (15%), primary malignant liver tumor (12.5%), Hydatid lesion (7.5%) and cholangiocarcinoma (2.5%). Abdominal pain and fever were the most common clinical features, followed by loss of weight and appetite. Right lobe of liver was predominantly involved with (75%), followed by both lobes (17.5%) and left lobe (12.5%). Solitary lesions were common (75%) than multiple lesions (25%).

Conclusion *: Real time Sonography is a comprehensive, multiplanar, non invasive, safe diagnostic modality for characterization of focal liver lesions.*

INTRODUCTION

Focal liver lesions are common on pathologic or imaging evaluation of the liver and include a variety of malignant and benign neoplasms, as well as congenital and acquired masses of inflammatory and traumatic nature.

Evaluation of focal liver lesions is a complex issue which is often the major focus of a cross sectional imaging study. Next only to lymph nodes, liver is the most common site for metastases. At death, 40 to 50% of all primary carcinomas will have metastases within the liver.

Sonography is widely accessible, relatively inexpensive, portable, noninvasive, nonionizing, allows imaging in multiple planes and can be repeated frequently. It assists in real time evaluation of organ under examination, especially the liver which is situated just below the ribcage without intervening gas, has a high sensitivity and reasonable specficity. Sonography has excellent spatial and contrast resolution, hence gray-scale morphology of a mass allows for differentiation of cystic and solid masses and in many instances, characteristic recognized appearances may suggest the correct diagnosis without further evaluation.1Characterization of a liver mass on conventional sonography is based on the appearance of the mass on gray scale imaging.

Sonography is widely available and inexpensive. Based on the patients complaints like vague upper abdominal pain, jaundice, fever or unexpected abnormal liver function tests many clinicians request sonography as the initial imaging modality for clinically suspected liver pathology.

The presence of diffuse liver disease such as cirrhosis or steatosis may largely vary the gray-scale sonographic appearance of the hepatic tumors because the echogenecity of the background liver may be altered and make the characterization of the tumors difficult.

MATERIAL AND METHODS

Source of Data

This cross sectional study compromised a total of 40 patients, who are referred for sonography at radiology department, clinically suspected of having focal hepatic lesions and incidentally found focal hepatic lesions on patients sonography done for other reasons from both inpatient & outpatient departments in Katihar Medical College & Hospital, Katihar, Bihar.

This study was conducted from February 2013 to January 2014.

Selection criteria

All the patients who are clinically suspected of focal hepatic lesions and incidentally detected focal hepatic lesions who were referred for sonography were included in the study.

Inclusion criteria

Patients in the age group above 18 years & focal liver lesion of diameter > 10.0 mm.

Exclusion criteria

Patients with diffuse liver disease like steatosis, cirrhosis, hepatitis, storage diseases, diffuse malignancies and also the post-operative and post-traumatic patients.

Statistical analysis

Data analysis was done using Rates, Ratios and Percentages of differential diagnosis made by the real time Sonography will be computed and compiled.

Data collection procedure

Equipment : In the present study, gray scale real time ultrasound examination was carried out using 3.5 to 10 MHz, curvilinear and linear array transducers.

Ultrasound machines used are:

- Siemens Somatom ARSP 3rd generation six slice machine

Patient preparation and scanning technique:

Once the patient agrees to participate in the study, informed consent was taken prior to ultrasound examination, followed by detailed history and brief clinical examination.

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Patients were kept nil by mouth for few hours prior to ultrasound examination.

In some cases clinical condition of patient demanded an ultrasound examination without prior preparation.

Patients were examined in the supine position to begin with and then in decubitus (right or left) and sitting position if needed.

Liver was scanned in various planes like sagittal, parasagittal, transverse, oblique, subcostal, intercostal and coronal planes. Comprehensive scanning of other upper abdominal organs was done.

Various ultrasonographic features of focal liver lesions were observed, which include:

1 Number of lesions – single or multiple

2 Location within liver – Lobar distribution (right lobe, left lobe, both lobes).

3 Echogenicity –(by comparing with that of normal liver parenchyma), hyperechoic, hypoechoic, anechoic or mixed echogenic.

4 Size, shape and margins: Exact size of lesion was measured with a note on shape of lesion like round, oval or irregular. Margins of lesion were studied whether well defined, poorly defined, regular or irregular.

5 Acoustic characteristics of lesions.

Apart from the above observations related to lesion several other important observations were made which include overall assessment of liver size, portal and hepatic veins involvement, biliary tract and gall bladder, lymphadenopathy and ascites.

RESULTS

In the present study, 40 patients suspected of having focal liver lesions were studied for a period of one year and were subjected to detailed ultrasonographic examination in the department of Radio-diagnosis, Katihar Medical College & Hospital, Katihar, Bihar. Some of these patients underwent CT examination and USG guided aspiration later.

Table 1 : Age distribution of focal liver lesion

Age group (years)	No. of cases	Percentage
18-20	1	2.5
21-30	2	5
31-40	5	12.5
41-50	9	22.5
51-60	10	25
61-70	9	22.5
>70	4	10
Total	**105**	**100**

Table 2 : Sex distribution of focal liver lesion

Sex	No. of cases	Percentage
Male	26	65
Female	14	35
Total	**40**	**100**

CLINICAL FEATURES: Out of the 40 patients, 24 (60%) patients had abdominal pain, 18 (45%) patients had fever, 16 (40%) had loss of weight and appetite, 14 (35%) patients complained of mass per abdomen,9 (23%) had jaundice and 7(18%) patients complained of abdominal distension and urticaria.

ULTRASOUND DIAGNOSIS: Out of 40 patients, 10 (25%) had haemangiomas, 8 (20%) had metastases, 7 (17.5%) had abscess,6 (15%) had cystic lesion, 5 (12.5%) had primary malignant liver tumor, 3 (7.5%) had Hydatid cyst and 1(2.5%) had cholangiocarcinoma.

LOCATION : In 28 (70%) patients the lesions were in right lobe, in 7(17.5%) involved both lobes and in 5 (12.5%) in the left lobe.

NUMBER OF LESIONS: In 30 (75%) patients had solitary lesions and 10 (25%) had multiple lesions.

HEMANGIOMA: Out of 40 (100%), there were 10 cases of hemangioma in the age range of 29-70 years with a mean age of 49.6 years. There were 5 (50%) males and 5 (50%) females. The right lobe was involved in 7(70%) patients, left lobe in 2(20%) and 1 (10%) patient with both lobes.

METASTASES : Out of the 40 patients (100%), 8 (20%) cases were diagnosed as hepatic metastses in the age group of 51 – 68 years, with a mean age of 58.2 years. Out of 8 patients 6 (75 %) were male and 2(25%) were female. Both the lobes were involved in 6(75%) patients and right lobe in 2(25%) patients.

HEPATIC ABSCESS: Out of the 40 patients (100%), 7(17.5%) cases were diagnosed as hepatic abscess, in the age group of 19 – 63 years with a mean age of 47 years. Six (85.7%) patients were male and one (14.3%) female patient. In all seven (100%) patients right lobe was involved.

HEPATIC CYSTS: Out of the 40 patients (100%), 6 (15%) patients had hepatic cysts. Hepatic cysts were found in both sexes equally.

Table 3 : Age distribution of Individual Focal Liver Lesions

Age group (years)	Liver abscess	PMLT	Metastatses	Hemangioma	Cystic lesion	Hydatid lesion	Cholangioca	Total
18-20	1							1
21-30				1		1		2
31-40	1			1	2	1		5
41-50	2	1		4	2			9
51-60	1		5	2	1	1		10
60-70	2	2	3	2				9
>70		2			1		1	4
Total	**7**	**5**	**8**	**10**	**6**	**3**	**1**	**40**

Table 4 : Sex distribution of Individual Focal Liver Lesions

Age group (years)	Liver abscess	PMLT	Metastatses	Hemangioma	Cystic lesion	Hydatid lesion	Cholangioca	Total
Male	6	4	6	5	3	2		26
Female	1	1	2	5	3	1	1	14
Total	**7**	**5**	**8**	**10**	**6**	**3**	**1**	**40**

3 each. The age distribution was between 36 -75 years of age with mean age of 48.3 years. Right lobe was involved in 5 (83.3%) patients and left lobe in 1(16.7%) patient.

PRIMARY MALIGNANT LIVER TUMOR: PMLT was found in 5 patients (12.5%) in the study group with age distribution of 49 – 84 years with a mean age of 66.8 years. Four (80%) were men and one (20%) female patient. Right lobe was affected in 4(80%) and left lobe in 1(20%) patient.

HYDATID CYSTIC LESION: There were 3 (7.5%) cases of echinococcal cyst, in the age group of 28-54 years of age with a mean age of 38.6 years. Two male (66.6%) and one (33.3%) female patient were affected. Right lobe was involved in 2 (66.6%) and left lobe was involved in 1(33.3%) patient.

CHOLANGIOCARCINOMA: There was one (2.5%) case of intrahepatic cholangiocarcinoma in a female patient aged 75 years involving the right lobe with associated dilated intrahepatic biliary radicles.

DISCUSSION

A total of 40 patients, clinically suspected of having focal space occupying lesions in the liver who underwent Sonography were chosen for the study during a period of 1 year.

The mean age of the patients in the sample study was 53.4 years with an age range of 19 to 84 years.

Majority of the patients were males.

The most common complaints were abdominal pain and fever.

The most common lesions were hemangioma followed by hepatic metastases.

In this study, out of 40 cases, hemangioma was present in 10 pateints, metastases in 8 patients, abscess in 7 patients, hepatic cysts in 6 patients, primary malignant liver tumor in 5 patients, hydatid cyst disease in 3 patients and 1 patient with cholangiocarcinoma.

Complimentary studies like laboratory investigations and chest radiographs were undertaken with special emphasis on ultrasonography.

Ultrasonography serves as an important diagnostic tool in imaging and characterization of focal liver lesions.

CONCLUSION

Ultrasonography is a safe and effective method of detecting focal liver lesions. It's easy availability, portability, flexibility, lack of dependence on organ function and lack of ionizing radiation makes it ideal for imaging the liver.

Ultrasonography also serves a vital role in guided FNAC, which avoid unnecessary repeated trauma to the patient and also help to yield productive specimen for hoistopathological evaluation. It also helps the operating surgeon in planning a in the pre-operative approach to the lesions.

With ultrasonography as an initial imaging modality, time and cost to arrive at an diagnosis was significantly reduced.

Its multiplanar imaging ability and portability has a significant advantage in sick patients to detect lesions, to locate lesion and to identify solid from the cystic nature of lesion, thereby aid in characterization of lesions.

Information regarding the secondary features of liver disease such as ascites, primary source of malignancy, secondaries in the abdomen, splenomegaly , pleural effusion can be evaluated.

As ultrasonography is safe, repeatable and low cost as compared to newer modalities CT and MRI , it is still one of the most effective imaging modality for characterization and for overall assessment of abdomen.

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Role of Ultrasonography and Computed Tomography in Diagnosis of Pancreatitis

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ABSTRACT

BACKGROUND AND OBJECTIVES [illegible] to diagnose pancreatitis by ultrasound and computed tomography and to define limitations and advantages of one modality over other.

MATERIALS AND METHODS : We studied findings of acute and chronic pancreatitis by ultrasound and CT between [illegible] years of age from October 2012 to September 2014. Patients were confirmed to have pancreatitis based on imaging findings on either modality and a combination of clinical features suggestive of pancreatitis and biochemical values to support a diagnosis of the same. In acute pancreatitis, CT severity index also taken into consideration. The index focuses on the presence and degree of pancreatic inflammation and necrosis on a 10 point severity scale, points are awarded for the presence or absence of fluid collections. Patients in whom the diagnosis of pancreatitis was made purely on clinical grounds without any imaging (ultrasound or CT) and patients in whom no imaging was done prior to surgery where a diagnosis of pancreatitis was made was excluded from the study.

RESULTS : Epigastric pain is the most common symptom in acute pancreatitis. Mostly the patients are alcoholic. It affects males more than females. In our study 81% of patients are males.

CONCLUSION : Ultrasound is the initial investigation for pancreatitis but CT is investigation of choice. Ultrasound sometimes is not accurate because of bowel gas and other techniqual problems. Alteration in the size and echogenicity were the most common ultrasonography findings. Bulky hypoechoic pancreas was considered diagnostic of acute pancreatitis on ultrasonography. Duct dilatation and calcification were seen in chronic pancreatitis on ultrasonography.

INTRODUCTION

The pancreas is a difficult organ to evaluate by both clinical and routine radiological methods. An inflammatory pathology involving the pancreas will form part of the differential diagnosis of other conditions presenting with abdominal pain. The combination of appropriate clinical findings and laboratory tests permit an accurate diagnosis of acute pancreatitis in most patients. Chronic pancreatitis, on the other hand, forms a much more difficult entity to evaluate clinically or biochemically.

The clinical and biochemical parameters form a key factor in the diagnosis of Acute Pancreatitis. But the history and clinical presentation may be misleading and the biochemical parameters (particularly serum amylase values) can be normal, particularly when the test is performed a few days after the initial attack. To exclude other abdominal catastrophes and support the clinical suspicion of acute pancreatitis, conventional radiographs have been used. Radiographic studies are of limited value in patients suspected of having acute pancreatitis, both to support and exclude its diagnosis. Supine, lateral decubitus and erect films of the abdomen, help exclude other diagnosis such as a perforated viscus. Nonspecific finding are found in radiographs in patients with acute pancreatitis, including adynamic ileus or a sentinel loop. In addition, pancreatic calcifications may be found in patients with chronic pancreatitis, and peripancreatic gas is seen uncommonly in patients with pancreatic abscess8. These tests are rather insensitive and nonspecific.

Cross-sectional imaging with ultrasound and CT has afforded rapid, accurate and noninvasive evaluation of the pancreas. Ultrasound provided the first reliable, reproducible, cross-sectional view of pancreatic anatomy. However, it has limitations in obese patients and in those with large amounts of bowel gas.

CT offers a diagnostic method that does not have these limitations. But CT is expensive, exposes patients to ionizing radiation, and has difficulty in defining tissue planes in lean patients. Modern ultrasound machines allow quick and comprehensive evaluation of the abdomen and the pancreas with its ductal system. Because the examination is inexpensive, noninvasive, and well accepted by the patient, it is currently one of the first imaging techniques performed for the evaluation of suspected chronic pancreatitis.

MATERIALS AND METHODS

This study included 55 cases of pancreatitis who were diagnosed on imaging studies (Ultrasound or CT) or on a constellation of signs, symptoms and laboratory data indicative of pancreatitis during the period from October 2012 to September 2014. The study was conducted in Katihar Medical College and Hospital, Katihar, Bihar.

The inclusion criteria:

One or more imaging modality (Ultrasound and/or CT) were employed for the diagnosis. Patients were confirmed to have pancreatitis based on imaging findings on either modality and a combination of clinical features suggestive of pancreatitis and biochemical values to support a diagnosis of the same.

Exclusion criteria:

Patients in whom the diagnosis of pancreatitis was made purely on clinical grounds without any imaging (ultrasound or CT) being done and patients in whom no imaging was done prior to surgery where a diagnosis of pancreatitis was made.

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patients. The sonographic study was done Siemens Sonatom ARS[illegible] ...MHz convex and a curvilinear 3 ... 5 MHz probe. The sonographic study was not repeated. The CT study was done within 3 to 4 days of admission using a Toshiba AestionT 10mm sections throughout the abdomen and 5 mm section through out the pancreas. The CT study was not repeated. Oral and ... contrast was given in all patients.

A total of 55 cases were studied of which 45 had acute pancreatitis and 10 had chronic pancreatitis. In the 45 cases with acute pancreatitis, ultrasound alone was done in 20 cases, CT alone in 4 cases and both modalities were employed in the remaining 21 patients. All the 10 cases with chronic pancreatitis had an ultrasound study but only one required a CT scan.

RESULT AND DISCUSSION

The study was done on 55 patients who were diagnosed to have pancreatitis which included 45 patients with acute and 10 patients with chronic pancreatitis.

AGE AND SEX DISTRIBUTION

The majority of patients with acute pancreatitis were in the 21 to 40 years age group who represented 55.5% of the total patients with acute pancreatitis. The average age of patients in acute pancreatitis was 41 years with a range from 16 to 67 years.

In patients with chronic pancreatitis, the majority of patients were aged below 30 years (50%) and the average age of patients with chronic pancreatitis was lower (29 years) as compared to acute pancreatitis.

The majority of patients with pancreatitis were males (45 out of 55 patients) representing 81.8% of the total. It was also noted that females with acute pancreatitis tended to be older (47.8 years) as compared to males (35.9years).

PRESENTATION

All patients presented with abdominal pain and vomiting. Most of the patients had a history of alcohol consumption (23 out of 45 patients with acute pancreatitis) and 7 patients gave a history of an alcoholic binge prior to onset of symptoms. Trauma was seen as an etiological factor in two cases, both following a road traffic accident. In two cases, one of whom was positive for rheumatoid factor, was an autoimmune etiology proposed. One patient was an epileptic on carbamazepine and this was suggested as a cause of pancreatitis. In 13 patients, no cause could be found and these were labeled as being idiopathic in nature. Other causes included hyperlipidemia and cholelithiasis.

The serum and / or ascitic fluid amylase [illegible] none of the cases of chronic pancreatitis.

ULTRASOUND FINDINGS IN ACUTE PANCREATITIS

This was done in 41 out of 45 patients (90 ...%). The pancreas ... and the findings noted

1 **Visualization** : The pancreas was visualized in 29 patients (70.7%) and obscured in the remaining 12. This was a better yield ... pancreas as compared to a study reported by Calleja and JS Barkin which stated that in acute pancreatitis, overlying bowel gas disturbances may obscure the pancreas in 40% of patients.

2 **Size** : An enlarged pancreas is due to the interstitial edema within the pancreas- edematous pancreatitis. A bulky pancreas was seen in 16 patients (55.2%)which was more than that reported by RB Jeffrey Jr. where only a third of patients with acute edematous pancreatitis had an enlarged gland. In one case, a patient with acute on chronic pancreatitis, the pancreas was contracted. The pancreas was normal size in 12 patients (41%).

3 **Echotexture** : Due to the edema, a bulky, hypoechoic pancreas is characteristic of edematous pancreatitis. However, this may not be the case always and one series has shown this finding only in a third of patients with edematous pancreatitis. In the present study, hypoechoic pancreas was seen in 13 patients (44.8%) but as many as 11 patients (37.9%) had a normal echogenicity of the pancreas. In the remainder, the pancreas had a heterogenousechotexture representing 17.3% of the cases. Of the 5 patients with a heterogenousechotexture pancreas, 2 were cases of acute on chronic pancreatitis.

4 **Duct dilatation** : The presence of duct dilatation in acute pancreatitis is very variable and could be compressed due to edema or the hypoechoic pancreas may render the duct more easily visible. In this study, it was seen in only 3 patients (10.4%) of whom 2 were cases of acute on chronic pancreatitis. Thus, duct dilation was seen in only 1 patient (3.4%).

5 **Calcification** : This is mainly a feature of chronic pancreatitis and in this study both the patients with calcification (representing 6.9% of patients with a visualized pancreas) had acute on chronic pancreatitis.

6 **Focal lesions** : In the 4 patients (13.8%) with focal lesions within the pancreas, [illegible] ...scans.

... effusions in 8 patients (... other findings which could ... etiology were fatty liver as a manifestation of hyperlipidemia seen in 18 patients, 43.9%) and ... in 8 patients (19.5%).

CT FINDINGS IN ACUTE PANCREATITIS

... 4 patients (9.1%) a CT alone was done.

1 **Visualization** : CT visualization of the pancreas was possible in all cases (25 patients) due to noninterference by the overlying bowel gas.

2 **Size** : In 23 patients (92%), the pancreas was bulky. The one case in which the pancreas was contracted, was a patient with acute on chronic pancreatitis. One case had a normal sized pancreas. As mentioned in literature, a normal pancreas is seen on CT in very mild forms of pancreatitis. Due to lack of surgical correlation, the incidence of normal CT scans in mild acute pancreatitis is not known.

3 ***Duct dilatation*** : This was seen in 3 patients (12%) of whom 2 were cases of acute on chronic pancreatitis.

4 ***Focal lesions*** : Focal lesions were seen in 5 patients (20%) which is comparable to that reported by EJ Balthazer where 18% of patients were seen to have focal lesions.

a) Fluid collections and exudates: Fluid collections were seen in 7 patients (28%), and exudates in 18 patients (72%) with acute pancreatitis.

b) Stomach wall and Gerota' s fascia thickening: Stomach wall thickening was seen in 20 patients (80%) and Gerota's fascia thickening, usually on the left (14 patients), seen in16 patients (64%).

c) Ascites and Plueral effusions: Free intraperitonealfuild representing pancreatic ascites was seen in 4 patients (16%) which was more than that reported by EJ Balthazar (7%).

Pleural effusions were seen in 10 patients (40%) which was also more than that reported by EJ Balthazar. It was seen more often on the left side (60%).

Other findings included fatty liver (11 patients, 44%), cholecystitis (8 patients, 32%) and portal vein thrombosis (1 patient, 4%).

Comparison Between Ultrasonography and CT in Acute Pancreatitis

The overall visualization of the pancreas was far better by CT than by ultrasound. In a study done between 1979-1980 on 102

patients good to excellent visualization [illegible] as present in 64% [illegible] in comparison to 30% [illegible] sonographic study. With improvements in technology, visualization of the pancreas is better on both modalities. This study showed that the pancreas was visualized in as many as 70.7% of patients on ultrasonography and in 100% of patients on CT in acute pancreatitis.

Alterations in size were better appreciated on CT. On CT, 23 patients with acute pancreatitis (92%) were seen to have a bulky pancreas. Of the remainder, one had a contracted pancreas due to underlying chronic pancreatitis; and in one case, the pancreas was normal. This patient had clinical features and laboratory findings suggestive of acute pancreatitis and was managed conservatively. He was asymptomatic at the time of discharge. Incidentally, the ultrasound study of this patient was also normal.

Duct dilation and calcification were picked up in three patients on both modalities. Ultrasound proved more useful in detecting free fluid as seen in 17 patients, in contrast to CT which picked up the same finding in 4 patients. However, due to the facility to inject intravenous contrast, the complication of portal vein thrombosis was picked up on the CT scan of one patient. Probably a colour Doppler sonographic study could have detected the same.

The sensitivity of ultrasongraphy in detecting acute pancreatitis was 59% in those patients in whom the pancreas was visualized. However if all the sonographic studies were considered, sonography diagnosed acute pancreatitis in only 17 of 41 cases representing 41.5% of cases. CT had a sensitivity of 96% mainly due to better visualization (100%) and better assessment of size. As all the patients had pancreatitis, the specificity could be estimated. However, the positive predictive value of both ultrasound and CT was 100%. This means that all patients with a bulky, hypoechoic pancreas on ultrasound have acute pancreatitis. It must be pointed out that 5 patients were taken up for surgery and of these 2 had a normal pancreas on ultrasound. In the other 3, the pancreas was obscured. Hence, as mentioned in the study by SJ Hessel et al, a negative ultrasound study does not exclude significant and, at times, life-threatening pancreatic disease.

ULTRASOUND FINDINGS IN CHRONIC PANCREATITIS

This was done in all the 10 patients

1 ***Size alterations*** The size of the pancreas in chronic pancreatitis is considered to correlate with the activity or chronicity of the disease process. This study showed an atrophic pancreas in 6 patients (60%) and a normal sized pancreas in the remaining 4 patients

Calcifications [illegible] clumps of high level echoes within the parenchyma or [illegible] excretory system. Calcifications was seen in 9 patients (40%) and is the most common finding along with a dilated system in chronic pancreatitis.

3 ***Duct dilatation*** This is the most [illegible] sign in chronic pancreatitis. The incidence of abnormal main pancreatic duct varies from 20% to 52.3% of cases. This study showed this finding to be most common along with calcifications/calculi and was seen in 9 patients (90%). However, ERCP is considered to be more sensitive than ultrasound for detecting ductal changes.

4 ***Echogenecity*** : The infiltration by retroperitoneal fat may alter the echogenicity of the pancreas making it hyperechoic. Acute inflammation may cause areas of decreased echogenicity. Echotexture abnormalities were seen in 7 patients (70%) with 4 patients (40%) being heterogenous in echotexture. Studies have shown echotexture alterations in 55-57% of cases.

5 ***Ascites*** This was seen in one patient.

6 ***Pseudocysts*** This was seen in one patient

CT FINDINGS IN CHRONIC PANCREATITIS

CT was done only in one case which showed an atrophic pancreas, calcifications and a dilated main pancreatic duct which were the most common findings noted by PH Luetmer, David H. Stephens in 54%, 50% and 68% of cases receptivity.

COMPARISION

All the patients who were diagnosed as having chronic pancreatitis on ultrasound were treated as such and findings were confirmed by CT in one case. The sensitivity was 100%, higher than the sensitivity reported by L. Bolondi et al which was 70%. The number of patients in the current study was small due to low incidence (0.2-3%) in the general population.

However, in all the patients, the ultrasound visualization was adequate and the observation of a dilated pancreatic duct and an atrophic pancreas was diagnostic of chronic pancreatitis. Hence, as suggested by L. Bolondi et al, ultrasound, should be first diagnostic step when pancreatic disease is suspected. Ultrasound may lead to a definite diagnosis and visualize complications of chronic pancreatitis. In fact, the most accurate assessment of chronic pancreatitis is achieved by a combination of clinical evaluation (symptoms and pancreatic function tests) and radiologic definition of duct and parenchyma

CONCLUSION

Maximal [illegible] 16—6[illegible] years of age

Pain abdomen [illegible] and periumblical region radiating to the back nausea and vomiting were the most frequent presenting complaints.

Ultrasonography visualized pancreas on [illegible] pancreas in 100% patients

Alteration in the size and echogenicity were the most common ultrasonography findings.

Bulky hypoechoic pancreas was considered diagnostic of acute pancreatitis on ultrasonography.

Duct dilatation and calcification were seen in chronic pancreatitis on ultrasonography.

Ultrasonography has a PPV of 100% and Sensitivity of 59% in patients in whom pancreas were visualized.

CT visualized pancreas in all patients.

Estimation of size and detection of calcification were diagnostic of pancreatitis.

Extra pancreatic spread of inflammation was better noted on CT

CT has a PPV of 100% and Sensitivity of 96%.

Thus it is seen that both Ultrasonography and CT have roles to play in the diagnosis of pancreatitis and both are complementary to each other.

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STUDY OF CONGENITAL FETAL ANOMALIES WITH THE HELP OF SONOGRAPHIC EVALUATION

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Abstract:

Information regarding specific anatomic anomalies affords the physician the opportunity to offer the patient sophisticated prenatal procedures, such as fetal surgery or selective fetal reduction in multiple gestations. Likewise, prenatal knowledge about genetic, physiologic, and/or anatomic abnormalities enables the physician to tailor or manage the timing and mode of delivery for optimal maternal and fetal outcomes. Prenatal diagnosis also allows the neonatal and paediatric specialists to be adequately prepared for a potentially ill neonate at delivery. Recent progress in the fields of maternal fetal medicine, radiology, and genetics has resulted in great advances in prenatal diagnosis. Ultrasonography is the initial modality for evaluation of pregnant patient because of its widespread availability and reasonable cost, with other modalities used only if Ultrasonography results are non diagnostic. Hence based on above data the present study was planned Study of Congenital Fetal anomalies with the Help of Sonographic Evaluation.

The present study was planned in Department of Radio- Diagnosis, Katihar Medical College and Hospital, Katihar, Bihar, India. All pregnant females of second trimester who are referred from obstetrics and gynaecology department and thus sent to department of Radio diagnosis for antenatal Sonographic examination. A complete antenatal ultrasound examination of pregnant women included in the study will be done using gray scale & colour duplex examination.

Obstetric ultrasonography has become an important part of routine antenatal care. Routine anomaly screening improves perinatal outcome directly through termination of pregnancy for certain anomalies. Congenital fetal anomalies are one of the most threatening complications which are prevalent in the society associated with severe morbidity and mortality in the new born fetus or neonates. Ultrasound is the best possible non-invasive technique available to detect any congenital anomalies in pregnant women which will help to identify the severity of the disease, its outcome leading to pregnancy termination or gives an opportunity for fetal therapy or better neonatal care.

Keywords: Congenital Fetal anomalies, Sonography, etc.

Introduction

A birth defect, also known as a congenital disorder, is a condition present at birth regardless of its cause. Birth defects may result in disabilities that may be physical, intellectual, or developmental. The disabilities can range from mild to severe. Birth defects are divided into two main types: structural disorders in which problems are seen with the shape of a body part and functional disorders in which problems exist with how a body part works.[4] Functional disorders include metabolic and degenerative disorders. Some birth defects include both structural and functional disorders.[1]

Birth defects may result from genetic or chromosomal disorders, exposure to certain medications or chemicals, or certain infections during pregnancy. Risk factors include folate deficiency, drinking alcohol or smoking during pregnancy, poorly controlled diabetes, and a mother over the age of 35 years old. Many are believed to involve multiple factors. Birth defects may be visible at birth or diagnosed by screening tests. A number of defects can be detected before birth by different prenatal tests.[2]

Treatment varies depending on the defect in question. This may include therapy, medication, surgery, or assistive technology. Birth defects affected about 96 million people as of 2015. In the

United States, they occur in about 3% of newborns. They resulted in about 628,000 deaths in 2015, down from 751,000 in 1990. The types with the greatest numbers of deaths are congenital heart disease (303,000), followed by neural tube defects (65,000).[3]

A congenital physical anomaly is an abnormality of the structure of a body part. It may or may not be perceived as a problem condition. Many, if not most, people have one or more minor physical anomalies if examined carefully. Examples of minor anomalies can include curvature of the fifth finger (clinodactyly), a third nipple, tiny indentations of the skin near the ears (preauricular pits), shortness of the fourth metacarpal or metatarsal bones, or dimples over the lower spine (sacral dimples). Some minor anomalies may be clues to more significant internal abnormalities.

Birth defect is a widely used term for a congenital malformation, i.e. a congenital, physical anomaly that is recognizable at birth, and which is significant enough to be considered a problem. According to the Centers for Disease Control and Prevention(CDC), most birth defects are believed to be caused by a complex mix of factors including genetics, environment, and behaviors, though many birth defects have no known cause. An example of a birth defect is cleft palate, which occurs during the fourth through seventh weeks of gestation. Body tissue and special cells from each side of the head grow toward the center of the face. They join together to make the face. A cleft means a split or separation; the "roof" of the mouth is called the palate.[4]

A congenital malformation is a physical anomaly that is deleterious, i.e. a structural defect perceived as a problem. A typical combination of malformations affecting more than one body part is referred to as a malformation syndrome. Some conditions are due to abnormal tissue development: A malformation is associated with a disorder of tissue development. Malformations often occur in the first trimester. A dysplasia is a disorder at the organ level that is due to problems with tissue development.[5]

Conditions also can arise after tissue is formed: A deformation is a condition arising from mechanical stress to normal tissue. Deformations often occur in the second or third trimester, and can be due to oligohydramnios. A disruption involves breakdown of normal tissues.[5] When multiple effects occur in a specified order, they are known as a sequence. When the order is not known, it is a syndrome.

A limb anomaly is called a dysmelia. These include all forms of limbs anomalies, such as amelia, ectrodactyly, phocomelia, polymelia, polydactyly, syndactyly, polysyndactyly, oligodactyly, brachydactyly, achondroplasia, congenital aplasia or hypoplasia, amniotic band syndrome, and cleidocranial dysostosis. Congenital heart defects include patent ductus arteriosus, atrial septal defect, ventricular septal defect, and tetralogy of Fallot.

Congenital anomalies of the nervous system include neural tube defects such as spina bifida, encephalocele, and anencephaly. Other congenital anomalies of the nervous system include the Arnold-Chiari malformation, the Dandy-Walker malformation, hydrocephalus, microencephaly, megalencephaly, lissencephaly, polymicrogyria, holoprosencephaly, and agenesis of the corpus callosum. Congenital anomalies of the gastrointestinal system include numerous forms of stenosis and atresia, and perforation, such as gastroschisis. Congenital anomalies of the kidney and urinary tract include renal parenchyma, kidneys, and urinary collecting system.[6] Defects can be bilateral or unilateral, and different defects often coexist in an individual child.

The mother's consumption of alcohol during pregnancy can cause a continuum of various permanent birth defects: cranofacial abnormalities, brain damage, intellectual disability, heart disease, kidney abnormality, skeletal anomalies, ocular abnormalities. The prevalence of children affected is estimated at least 1% in U.S. as well in Canada. Very few studies have investigated the links between paternal alcohol use and offspring health. However, recent animal research has shown a correlation between paternal alcohol exposure and decreased offspring birth weight. Behavioral and cognitive disorders, including difficulties with learning and memory, hyperactivity, and lowered stress tolerance have been linked to paternal alcohol ingestion. The compromised stress management skills of animals whose male parent was exposed to alcohol are similar to the exaggerated responses to stress that children with fetal alcohol syndrome display because of maternal alcohol use. These birth defects and behavioural disorders were found in cases of both long- and short-term paternal alcohol ingestion. In the same animal study, paternal alcohol exposure

was correlated with a significant difference in organ size and the increased risk of the offspring displaying ventricular septal defects at birth.[7]

Substances whose toxicity can cause congenital disorders are called teratogens, and include certain pharmaceutical and recreational drugs in pregnancy, as well as many environmental toxins in pregnancy. A review published in 2010 identified six main teratogenic mechanisms associated with medication use: folate antagonism, neural crest cell disruption, endocrine disruption, oxidative stress, vascular disruption, and specific receptor- or enzyme-mediated teratogenesis.[8]

An estimated 10% of all birth defects are caused by prenatal exposure to a teratogenic agent. These exposures include medication or drug exposures, maternal infections and diseases, and environmental and occupational exposures. Paternal smoking use has also been linked to an increased risk of birth defects and childhood cancer for the offspring, where the paternal germline undergoes oxidative damage due to cigarette use. Teratogen-caused birth defects are potentially preventable. Nearly 50% of pregnant women have been exposed to at least one medication during gestation. During pregnancy, a woman can also be exposed to teratogens from the contaminated clothing or toxins within the seminal fluid of a partner. An additional study found that of 200 individuals referred for genetic counseling for a teratogenic exposure, 52% were exposed to more than one potential teratogen.[9]

A low socioeconomic status in a deprived neighborhood may include exposure to "environmental stressors and risk factors". Socioeconomic inequalities are commonly measured by the Cartairs-Morris score, Index of Multiple Deprivation, Townsend deprivation index, and the Jarman score. The Jarman score, for example, considers "unemployment, overcrowding, single parents, under-fives, elderly living alone, ethnicity, low social class and residential mobility". In Vos' meta-analysis these indices are used to view the effect of low SES neighbourhoods on maternal health. In the meta-analysis, data from individual studies were collected from 1985 up until 2008. Vos concludes that a correlation exists between prenatal adversities and deprived neighbourhoods. Other studies have shown that low SES is closely associated with the development of the fetus in utero and growth retardation. Studies also suggest that children born in low SES families are "likely to be born prematurely, at low birth weight, or with asphyxia, a birth defect, a disability, fetal alcohol syndrome, or AIDS".[63] Bradley and Corwyn also suggest that congenital disorders arise from the mother's lack of nutrition, a poor lifestyle, maternal substance abuse and "living in a neighborhood that contains hazards affecting fetal development (toxic waste dumps)". In a meta-analysis that viewed how inequalities influenced maternal health, it was suggested that deprived neighborhoods often promoted behaviors such as smoking, drug and alcohol use. After controlling for socioeconomic factors and ethnicity, several individual studies demonstrated an association with outcomes such as perinatal mortality and preterm birth.[10]

Prenatal diagnosis has revolutionized prenatal care from the perspective of both the patient and the physician. For the patient, prenatal diagnosis provides genetic, anatomic, and physiologic information about the fetus or fetuses that can be used to make informed and individualized decisions regarding the pregnancy. For the physician, prenatal diagnosis provides vital information that can be utilized for better antepartum management. Information regarding specific anatomic anomalies affords the physician the opportunity to offer the patient sophisticated prenatal procedures, such as fetal surgery or selective fetal reduction in multiple gestations. Likewise, prenatal knowledge about genetic, physiologic, and/or anatomic abnormalities enables the physician to tailor or manage the timing and mode of delivery for optimal maternal and fetal outcomes. Prenatal diagnosis also allows the neonatal and paediatric specialists to be adequately prepared for a potentially ill neonate at delivery. Recent progress in the fields of maternal fetal medicine, radiology, and genetics has resulted in great advances in prenatal diagnosis. Ultrasonography is the initial modality for evaluation of pregnant patient because of its widespread availability and reasonable cost, with other modalities used only if Ultrasonography results are nondiagnostic. Hence based on above data the present study was planned Study of Congenital Fetal anomalies with the Help of Sonographic Evaluation.

Methodology:

The present study was planned in Department of Radio- Diagnosis, Katihar Medical College and Hospital, Katihar, Bihar, India. All pregnant females of

second trimester who are referred from obstetrics and gynaecology department and thus sent to department of Radio diagnosis for antenatal sonographic examination. A complete antenatal ultrasound examination of pregnant women included in the study will be done using gray scale & colour duplex examination.

A complete second trimester antenatal ultrasound examination of pregnant women was done using gray scale & color duplex examination on PHILIPS HD7 machine with a transducer of frequency 3.5 to 5 MHZ. The information about the gestational age, location of placenta, fetal biometry & fetal anomalies was collected. The scans were performed as a standard level one ultrasonography. In casesof uncertain abnormal findings, the women were reviewed by a level two scan with repeated scans. This data was compared with the findings at delivery / termination of pregnancy & appropriate statistical analysis was performed.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: All pregnant women coming for antenatal sonographic examination during the second trimester at Department of Radio diagnosis.

Exclusion Criteria: Females with Multiple gestations.

Results & Discussion:

The recent development of high-resolution ultrasound equipment has markedly improved the diagnostic accuracy of ultrasound. In particular, the introduction of high-frequency vaginal probes has enabled early diagnosis of certain fetal abnormalities from the 12th to 14th week of pregnancy. Such early testing is of special importance for women with a history of pregnancies associated with birth defects.

The study would determine the sensitivity and specificity of ultrasound modality in evaluating congenital fetal anomalies. Many modalities are available to detect congenital anomalies at an early stage like laboratory & imaging studies, out of which sonography has emerged as the investigation of choice. Ultrasound is non-invasive and safe and hence can be used repeatedly. It is quick, inexpensive, and sensitive causing no discomfort to the patient at any time of gestation. Fetal anomaly scan is usually carried out at second trimester of pregnancy.

Table 1: Age of Pregnant Females

Age	No. of Cases	Number of anomalies detected by ultrasound
Below 20 years	30	0
21 – 25 years	225	8
26 – 30 years	128	5
31 – 40 years	117	1
Total Cases	500	14

Table 2: Type of Anomalies

Organ system	**Number of anomalies detected by ultrasound**
CNS	4
Genitourinary	3
Gastrointestinal	2
Cardiovascular	2
Musculoskeletal	1
Craniofacial	1
Others	1
Total Cases	**14**

Women who delay child bearing are at an increased risk of having an adverse outcome of pregnancy. [11] Increasing maternal age is independently linked with definite adverse pregnancy as well as fetal abnormalities and multiple gestation. [12] Bobrowski R et al have statistically shown that mothers between 25 to 30 years of age stand at a higher risk of producing malformed babies. [13] Sugunabai [14] reported a higher incidence of malformation in babies born to mothers aged over 35 years, whereas Datta et al [15] documented statistically insignificant association of increased maternal age and congenital anomalies.

A study conducted by Trish Chudleigh [16] from Rosie Ultrasound Department, Cambridge University Hospitals NHS Foundation Trust stated that Ultrasound screening for fetal abnormalities has been available to pregnant women in England for over two decades. The Department of Health commissioned the Fetal Anomaly Screening Programme to develop and extend the second trimester anomaly scan to ensure an effective and accessible service for all pregnant women in England.

Muhammad Nafees, Muhammad Hamid Akram, Makki Muhammad Afridi and Aqsa Javed have conducted an ultrasonographic study on 200 patients

out of which 134 had different congenital anomalies. [17] The most common congenital anomalies detected were from central nervous system with relatively more prevalent in cousin marriages.

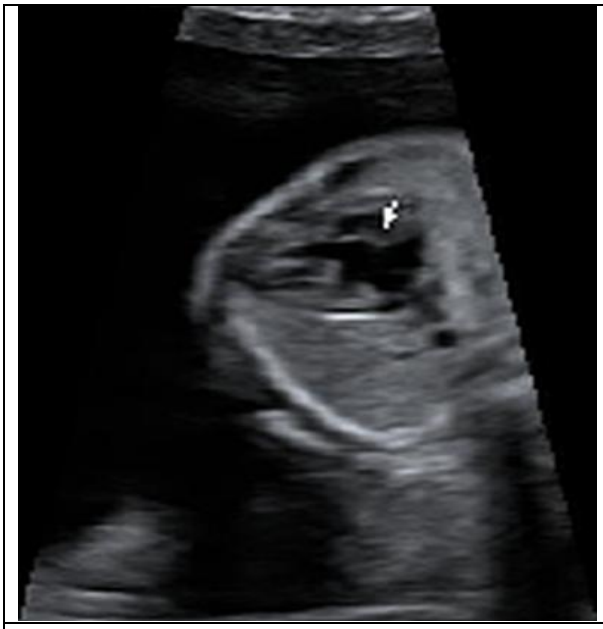

Figure 1: Sonographic imaging demonstrates atrio-ventricular septal defect

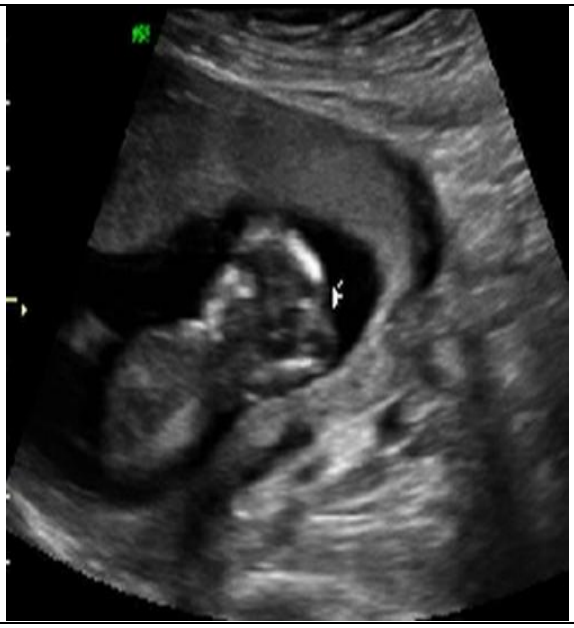

Figure 2: Image demonstrates protrusion over occipital region of fetal head

According to Sarah A. Waller, Theodore J. Dubinsky and Manjiri Dighe [18] Ultrasonography provides patients with an excellent means of screening for anomalies, and the use of soft markers has individualized each patient's decision to pursue diagnostic testing.

A study conducted by Grandjean H et al, on the purpose of the Eurofetus study was to evaluate the accuracy of the antenatal detection of malformations by routine ultrasonography in unselected populations concluded that systemic ultrasonographic screening during pregnancy can now detect a large population of fetal malformations. [19]

A report published in 'The society of Obstetricians and Gynaecologists of Canada' by Yvonne Cargill and Lucie Morin was done to review the benefits and requirements for a complete second trimester ultrasound and the documentation needed. The outcome of the report was that a complete second trimester ultrasound provides information about the number of fetuses, the gestational age, the location of the placenta, and fetal and maternal anatomy. [20]

The benefits of scanning in early pregnancy are therefore divided into several levels: first, earlier diagnosis of normal and abnormal intrauterine pregnancy and the detection of ectopic pregnancy; second, more accurate dating of early pregnancies on the basis of the measurement of the gestational sac and the crown-rump length; third, measuring the nuchal translucency (NT) at 12 to 14 gestational week as a marker for chromosomal abnormalities (mainly Down syndrome) and certain organ anomalies (mainly in the cardiovascular system); fourth and perhaps most importantly, the ability to detect structural anomalies during the first and early second trimester of pregnancy. [21]

Early diagnosis of presence or absence of congenital anomalies is beneficial to mother, both physically and psychologically. A negative sonogram is certainly reassuring particularly for the couples with an increased risk of fetal anomalies. This reassurance was particularly seen in parents with previous congenital anomalies, where normal early scan reduced the anxiety levels to a great extent. On the other hand, anticipation of a positive diagnosis may be valuable in itself. Earlier detection of fetal structural malformations would allow for earlier antenatal referral to a tertiary care facility and coordination of care among appropriate subspecialists. [22] Parents are mentally prepared for these anomalies and a better co-ordination with specific sub-specialties can be assured to the baby.

Conclusion:

Obstetric ultrasonography has become an important part of routine antenatal care. Routine anomaly screening improves perinatal outcome directly through termination of pregnancy for certain anomalies. Congenital fetal anomalies are one of the most threatening complications which are prevalent in the society associated with severe morbidity and mortality in the new born fetus or neonates. Ultrasound is the best possible non-invasive technique available to detect any congenital anomalies in pregnant women which will help to identify the severity of the disease, its outcome leading to pregnancy termination or gives an opportunity for fetal therapy or better neonatal care.

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A study on the significance of neonatal and infantile spinal sonography

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Abstract
Sonography is an ideal, effective, noninvasive tool for evaluation of the spinal cord in neonatal and early infantile age groups owing to lack of ossification of the posterior elements of spine. Understanding normal anatomical appearances is a prerequisite for the interpretation of various pathologies of the spinal canal and its contents. This review elucidates normal appearances of the spinal cord in this age group, in both axial and sagittal planes.

Usefulness of Doppler sonography is briefly discussed, and special emphasis is placed on normal anatomical variants that may mimic spinal abnormalities. Sonographic appearances of common intraspinal pathologies, both congenital and acquired, are exhaustively described. Key points regarding sonographic diagnosis of important spinal anomalies are emphasized and explained in detail. To conclude, spinal ultrasound is a reliable and widely available screening tool, albeit the usefulness of which is often underestimated.

Keywords: myelomeningocele, spinal dysraphism, spinal sonography, split cord malformation

Introduction

In neonates and infants with suspected spinal and paraspinal anomalies, magnetic resonance imaging (MRI) was and remains the imaging gold standard. However, ultrasonography has recently witnessed tremendous improvement in image quality with the advent of new generation high frequency ultrasound scanners that have brought its diagnostic value on par with that of MRI [1]. in certain conditions. Relative advantages of sonography over MRI include wide and cheap availability, no need for sedation or general anesthesia, and lack of vulnerability to artefacts due to patient movement, cerebrospinal fluid (CSF) pulsation, and vascular flow which can adversely affect MR image quality [2].

In newborns and infants, the spinal arches are predominantly cartilaginous which provide an acoustic window allowing passage of the ultrasound beam. However, in older children, ultrasound suffers from diminished utility due to progressive ossification of the spinal arches. Sonography is a well-established method for investigating the spinal canal, cord, and meningeal coverings and for characterizing nearly all spinal anomalies with high geometric resolution in the neonatal and infantile age groups [3, 4]. The objective of this pictorial review is to present an educational exhibit of spinal sonography encompassing normal appearances, normal anatomical variants, and some common congenital and acquired spinal pathologies.

Technique

Sonography of the spine should be performed with a high frequency (7-12 MHz), high resolution linear transducer. Both axial and sagittal plane scanning is mandatory. The axial scanning can either be performed in a cranial to caudal direction or caudocranial direction. Localization of the conus medullaris is crucial for the detection of low-lying cord or high termination of cord. Location of conus should be interpreted in relation to the lumbar vertebral bodies. Sagittal scanning should be performed both in the median and paramedian planes.

Normal Appearances

Axial scan

The spinal cord is seen axially as a round or oval hypoechoic structure with central echogenicity within the anechoic subarachnoid space [Figure 1]. Paired dorsal and ventral nerve roots are seen to arise from the cord. The vertebral bodies and arches are seen ventral to the spinal cord as echogenic structures with distal acoustic shadowing [Figure 2]. The paravertebral muscles are seen below the level of L2 vertebra [1, 6]. The cord diameter is variable and is the largest at the cervical and lumbar levels, which are known as cervical and lumbar "enlargements" (which give rise to nerve roots of respective nerve plexuses). In terms of dorsal/ventral orientation, the cord normally lies a third-to-half way between the anterior and posterior walls of the spinal canal [1].

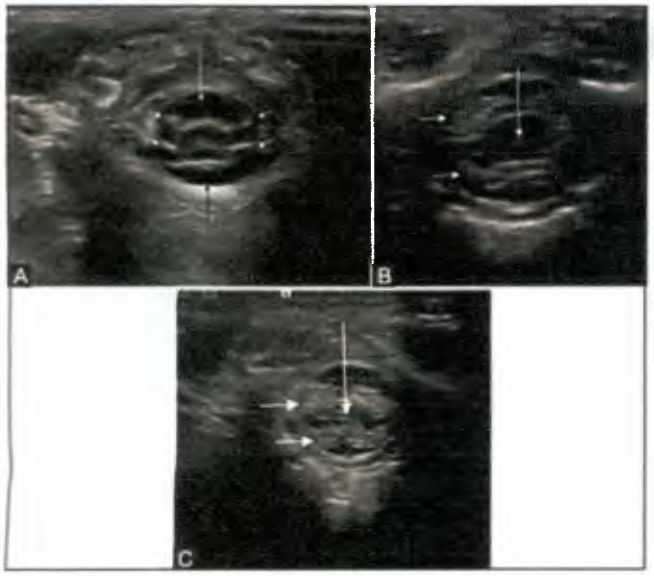

Figure 1 (A-C): (A-C) Normal sequential axial sonogram of thoracolumbar spine. The spinal cord appears hypoechoic, covered by an echogenic pial lining, and surrounded by anechoic CSF spaces. Note that the ventral (black arrow) and dorsal (white arrow) CSF spaces are nearly equal in dimension. The nerve roots appear echogenic (small arrows). On a more caudal section (B), there is normal enlargement of cord at conus medullaris, which tapers distally. Hence, a more caudal section would reveal only a bunch of nerve roots as echogenic structure (block arrows), with a central hypoechoic filum terminale (arrow in C)

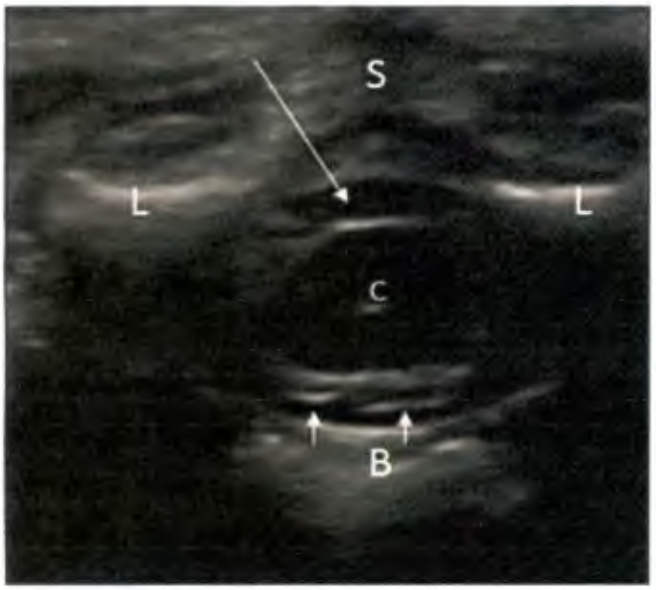

Figure 2: Normal conus medullaris on axial image. The spinal cord is seen as hypoechoic rounded structure, surrounded by anechoic CSF (arrow). The pial margin on the cord surface appears echogenic; the central canal (C) also appears echogenic. The ventral roots of spinal nerves appear as echogenic strands (small arrows). Note the echogenic laminae (L), unossified spinous process (S), and vertebral body (B) of a lumbar vertebra

Sagittal scan

The cervical cord and craniocervical junction can be difficult to evaluate on ultrasonography. On sequential scanning from cervical to lumbar level, the cervical and lumbar enlargements are well visualized. A systematic scanning from both the parasagittal to mid-sagittal planes is required [Figure 3]. While the parasagittal image is ideal for the evaluation of the paraspinal structures, the mid-sagittal image is ideal for the evaluation of the cord [6, 7]. The caudal end of the spinal cord is represented by the conus medullaris and filum terminale [Figure 4]. The conus is identified as the apex of the taper of the distal spinal cord, and its level is designated according to the adjacent intervertebral disk space or mid-vertebral body. For identifying the vertebral level, palpable landmarks such as the tip of the lowest rib and the iliac crest which correspond to the levels of the L2 and L5 vertebrae, respectively, may be used. Alternately, the lumbosacral junction may be identified by looking for the first clear angulation in the caudal spine with the L5 vertebral body lying immediately cranial to this level. In a healthy newborn, the tip of the conus medullaris is located between L1 and L2 vertebral levels. This method can be fallacious in cases of transitional vertebra.

Another method of detection of vertebral level is to identify the coccyx and counting cranial to it [6, 7]. The normal cord and nerve roots show pulsatile movements which must be specifically looked for to rule out cord tethering.

Normal sacrum in mid-sagittal scanning

Sacrum should be evaluated in the sagittal plane [Figure 5] for the presence of the spinal dysraphism. Because the posterior elements of the sacrum are unossified at this age, they appear hypoechoic.

Doppler ultrasound imaging of the spinal cord

Although not routinely used for the evaluation of vascular anatomy and abnormality of spinal canal, Doppler ultrasound with the new generation scanners on a high frequency transducer can provide an insight of the vascular anatomy in considerable detail [Figure 6].

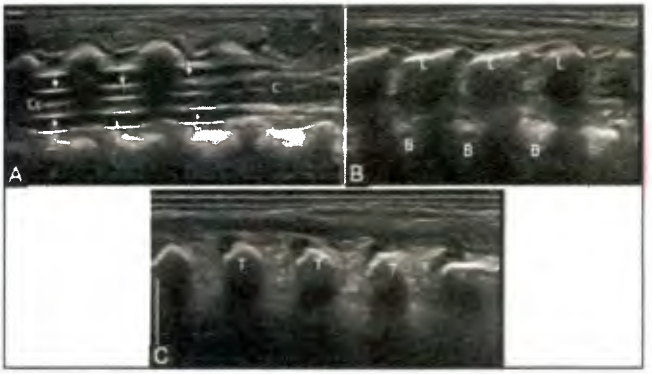

Figure 3 (A-C): Mid-sagittal (A) to parasagittal (B) and further lateral (C) sagittal image of the thoracolumbar spine. The spinal cord is visualized as a hypoechoic tubular structure with a central echogenicity (central echo complex) representing the central canal (C, c). The pial lining is shown with small arrows. Note the enlargement of cord at the conus medullaris (C). The arachnoid-dura mater complex of the thecal sac is represented by the echogenic borders of the spinal canal seen anterior and posterior to the CSF filled anechoic subarachnoid space. The spinous process of the vertebral bodies are visible in a mid-sagittal section (S), the laminae (L) and transverse processes (T) seen more laterally

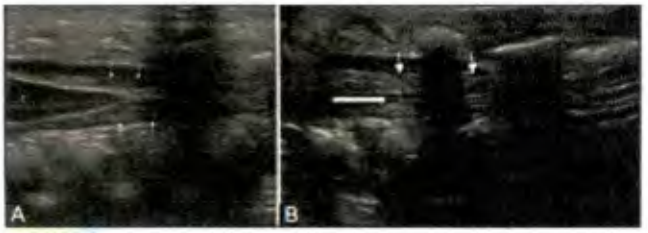

Figure 4 (A and B): (A and B) Normal conus medullaris and filum terminale in sagittal section. The conus medullaris (c) tapers into filum terminale (block arrow, within the cursors in B); which appears as a cordlike structure surrounded by the echogenic cauda equina nerve roots (arrows)

Figure 5 (A and B): (A and B). Normal sacrum mid-sagittal view. The spinous processes are marked in B. The dura (arrowheads) ends at S1 level. Echogenic nerve roots are seen within the spinal canal. Beyond the dural attachment, the space within the sacral spinal canal is occupied by echogenic fatty tissue (arrow)

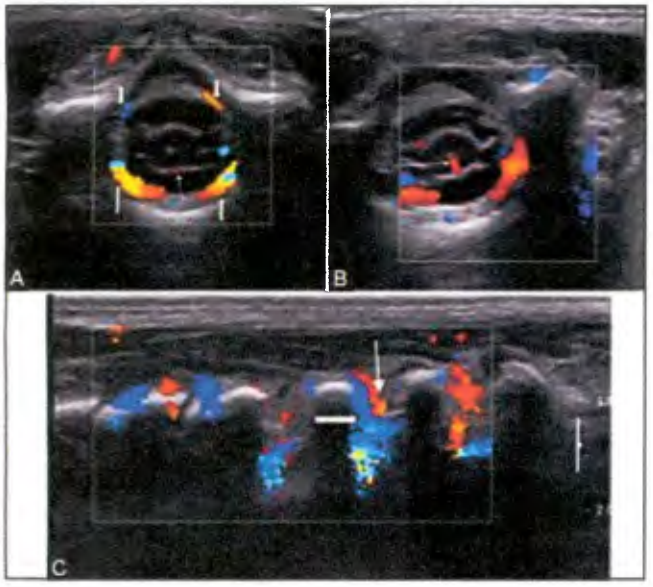

Figure 6 (A-C): (A-C) Doppler USG of normal thoracic spine. Axial images with Doppler interrogation (A, B) show the anterior spinal artery (arrow in A); the sulco-commisural artery (arrow in B) and the ventral and dorsal dural arcades (block arrows). The parasagittal image (C) reveals the dorsal division of the dorsal spinal artery (arrow) with accompanying vein (block arrow) arising from the segmental arteries at multiple levels

Normal Variants

Many normal anatomical variants such as ventriculus terminalis and transient dilatation of the central canal are often incidentally detected on spinal ultrasonography (USG).

Ventriculus terminalis

Canalization and retrogressive differentiation of the caudal end of the developing spinal cord gives rise to a small, ependymal lined, oval, cystic structure (ventriculus terminalis) [Figure 7] located at the transition from the tip of the conus medullaris to the origin of the filum terminale [8]. This structure usually measures 8-10 mm in longitudinal diameter and 2–4 mm in transverse diameter [8]. This condition is asymptomatic and regresses in the first few weeks after birth.

Transient dilatation of the central canal

Mild central canal dilatation [Figure 8] is an often detected incidental finding in many healthy newborns in the first few weeks of life which disappears later on. It should be differentiated from syringomyelia, which persists on follow-up imaging.

Filum terminale cysts

These refer to anechoic, centrally located, thin-walled unilocular cysts within the filum terminale, which appear spindle-shaped in the sagittal plane and round in the axial plane. When found isolated, they do not carry any clinical significance.

Spinal Pathologies

Spinal pathologies can be broadly categorized as congenital malformations and acquired diseases. Congenital anomalies are attributed to missteps in embryological development of the spinal cord, which result in a diverse range of pathologies that present as myriad sonographic appearances. On the other hand, acquired intraspinal diseases following birth trauma or intraspinal extension of neurogenic tumors can also be detected with ultrasound.

Congenital anomalies

Open spinal dysraphism M e n i n g o c e l e, m y e l o m e n i n g o c e l e, m y e l o c e l e, hemi-myelocele, hemi-myelomeningocele, etc, are included in the open spinal dysraphism group. These lesions are not skin covered. Myelomeningoceles constitute >98% of open spinal dysraphism [9]. In myelomeningocele [Figure 9], an expansion of the ventral subarachnoid space displaces the neural placode dorsally resulting in portions of the spinal cord, nerve roots, and leptomeninges lying within the sac; whereas in myelocele, the neural placode remains flush with the skin surface and there is no expansion of ventral CSF space [9].

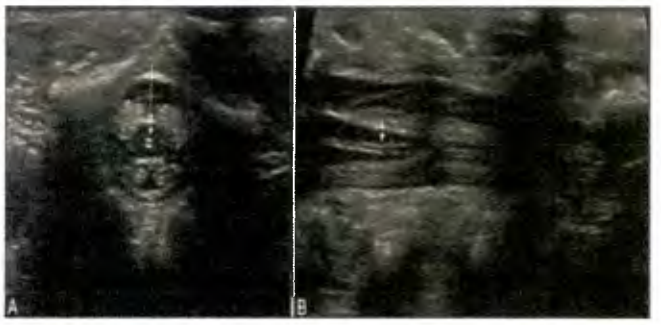

Figure 8(A and B): Axial (A) Sagittal (B) sonogram of the distal conus medullaris and filum terminal revealing mild dilation of the canal (arrow) in a healthy newborn

Some authors caution against preoperative imaging for these anomalies owing to risk of infection or injury [5, 6]. However, by observing strict aseptic precautions, including covering the probe with a sterile cover and using sterile gel, proper sonographic examination can be performed using the intact

normal skin surrounding the parchment membrane of the lesion as the acoustic window. In addition to local examination, sonography is also useful in recognition of associated malformations such as Chiari II syndrome, tethered cord, hydromyelia/syringomyelia, and arachnoid cyst [6].

Ultrasound also finds an important role in post-repair cases because cord tethering is a common postoperative complication on account of postoperative scarring. When myelomeningocele or myelocele is associated with split cord malformation (discussed later), they are termed as hemi-myelomeningocele/hemi-myelocele.

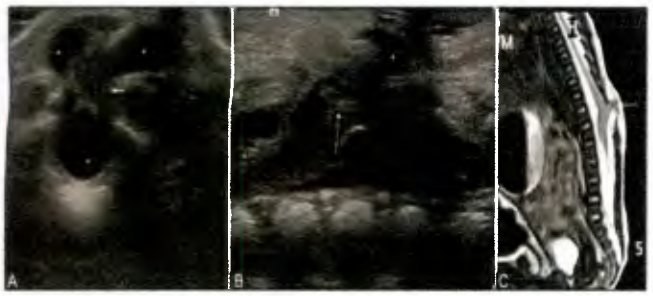

Figure 9(A and B): Lumbar myelomeningocele. Axial (A) Sagittal (B, C) US images reveal herniation of the couns (arrow) with an expansion of ventral CSF space (asterisk). Sagittal T2-weighted MR image reveals the defect in posterior elements of upper lumbar vertebrae with herniation of neural tissue and CSF spaces (arrow)

Conclusion

Ultrasound is an inexpensive, easily performed, widely available, radiation free investigative technique, which is now considered to be the initial imaging modality of choice for investigating the spinal cord in neonates and infants up to 6 months of age. Its wide ranging diagnostic utility coupled with its high accuracy, especially in expert hands, plays a pivotal role in choosing the type and timing of therapeutic intervention. In addition, spinal sonography also carries therapeutic applications and is useful as an image guidance modality for certain procedures. However, despite all these advantages, spinal ultrasound remains an underutilized and often underestimated modality largely due to lack of awareness. Thus, popularization of spinal sonography for diagnostic and therapeutic uses in neonatal and early infantile population and spreading awareness regarding its merits is an urgent need of the hour.

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A study on the significance of abdominal lymphatic malformation

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Abstract: Lymphatic malformations are congenital vascular malformations with lymphatic differentiation. Although the most common locations for lymphatic malformation are the neck and axilla, they can occur at several locations in the body including the abdomen. The abdominal location is rather rare and accounts for approximately 5% of all lymphatic malformation. Abdominal lymphatic malformation can arise from mesentery, omentum, gastrointestinal tract, and retroperitoneum. Clinical presentation includes an abdominal lump, vague abdominal discomfort, and secondary complications including intestinal obstruction, volvulus, ischemia, and bleeding. There is a broad spectrum of radiological manifestation. In the present review, we discuss the imaging appearance of abdominal lymphatic malformation. The diagnosis of lymphatic malformation in our series was based on the histopathological examination (in cases who underwent surgery) and fine needle aspiration cytology.

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A study on the significance of abdominal lymphatic malformation

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Abstract

Lymphatic malformations are congenital vascular malformations with lymphatic differentiation. Although the most common locations for lymphatic malformation are the neck and axilla, they can occur at several locations in the body including the abdomen. The abdominal location is rather rare and accounts for approximately 5% of all lymphatic malformation.

Abdominal lymphatic malformation can arise from mesentery, omentum, gastrointestinal tract, and retroperitoneum. Clinical presentation includes an abdominal lump, vague abdominal discomfort, and secondary complications including intestinal obstruction, volvulus, ischemia, and bleeding. There is a broad spectrum of radiological manifestation. In the present review, we discuss the imaging appearance of abdominal lymphatic malformation. The diagnosis of lymphatic malformation in our series was based on the histopathological examination (in cases who underwent surgery) and fine needle aspiration cytology.

Keywords: abdomen, lymphatic malformation, mesentery, retroperitoneum

Introduction

Lymphatic malformations are a form of congenital vascular malformations. The usual location is head and neck. Abdominal lymphatic malformation are rare, comprising only 5% of all lymphatic malformations. Within the abdominal cavity, they occur in mesentry, retroperitoneum, solid organs (liver, spleen, pancreas) and gastrointestinal tract. Complications including gastrointestinal obstruction, hemorrhage and volvulus mandate treatment in all cases. Surgery remains the treatment of choice. The less invasive form of treatment including per cutaneous sclerotherapy have a greater recurrence rate. In this review we present the imaging spectrum of abdominal lymphatic malformations.

Embryological Basis

The lymphatic system of the body is derived between 12th and 16th weeks of gestation from endothelial channels located in the neck, root of the mesentery, and the femoral and sciatic vein bifurcation [1]. Sequestration of the lymphatic channels leads to the development of lymphatic malformations. Continued growth of these lesions represents both the accumulation of fluid and the proliferation of pre-existing spaces. Histopathological appearance Grossly, lymphatic malformations appear as thin-walled cystic lesions with a smooth external surface.

Cut surface may reveal macroscopic or microscopic cysts [2]. The fluid in the cysts may be serous, hemorrhagic, or chylous [3]. Microscopically, the cysts are lined by flattened endothelial cells. The cyst fluid is eosinophilic. The stroma shows collagen fibres, lymphocytes, and occasional lymphoid aggregates [2].

Clinical features

Both male and female predominance has been reported in abdominal lymphatic malformation. The majority of abdominal lymphatic malformations are diagnosed in children. The clinical presentation is highly variable depending on the size and exact location of the lesion [1]. They are symptomatic in as many as 88% [2]. Presenting features are abdominal pain, abdominal distension, nausea, vomiting, constipation, diarrhea, and abdominal mass.

Specific sites

Mesenteric lymphatic malformation the mesentery is the most common site for abdominal lymphatic malformations [3]. Mesenteric lymphatic malformations are known to produce serious complications including hemorrhage, intestinal ischemia, obstruction, and volvulus [4].

On ultrasound, lymphatic malformations appear as multilocular cystic masses [Figure 1A]. They are often anechoic but may also contain echogenic debris. Less commonly, the lesions may appear as predominantly solid [Figure 1B] [5]. On computed tomography, the fluid component of the lymphatic malformation is homogeneous and shows low attenuation values [Figure 2A]. Following administration of intravenous contrast, enhancement of the cyst wall and septa is seen [Figure 2B] [5]. Less common computed tomography (CT) manifestation includes negative attenuation values due to the presence of predominantly chylous fluid [4].

Calcification and hemorrhage are other uncommon imaging findings on CT [Figure 2C] [6-8]. Magnetic resonance imaging (MRI) signal intensity parallels that of the fluid appearing hypointense on T1-weighted images and markedly hyperintense on T2-weighted images [Figrue 3A]. Heterogeneous signal intensity is seen in the presence of hemorrhage and infection [Figure 3B].

In addition to suggesting a diagnosis of lymphatic malformation, imaging provides information regardingthe extent of lesions, aiding in accurate surgical planning [9]. Percutaneous biopsy is not recommended in typical cases as there is low cellularity and negative yield in most cases. In addition, in rare cases of cystic malignancy, there is a theoretical risk of needle tract seeding. Fine needle aspiration cytology (FNAC) is a less invasive technique compared to biopsy. It allows confident diagnosis of lymphatic malformation, especially in patients with atypical presentation, age, and location. It is a safe alternative to more cumbersome

and time-consuming surgical modalities of diagnosis [10].

The differential diagnoses of mesenteric lymphatic malformations include uncomplicated ascites (free of septations) and fluid-containing masses in the abdomen [Figure 4] [4, 11]. Ascites is characterized by the lack of septations or displacement of bowel loops. Moreover, ascitic fluid tends to gravitate to the dependent sites including paracolic gutters, Morison's pouch, and pelvis.

Mesothelial cysts, enteric duplication cysts, and pseudocysts mimic mesenteric lymphatic malformations closely, and preoperative imaging diagnosis may be impossible. Several other conditions simulating mesenteric lymphatic malformations have been described. These include malignant gynecological lesions (ovarian malignancies) and abdominal tuberculosis. Overall, the features that support lymphatic malformation on imaging include the absence of solid areas, fine septa, low-level septal vascularity, and absence of significant mass effect on adjacent structures.

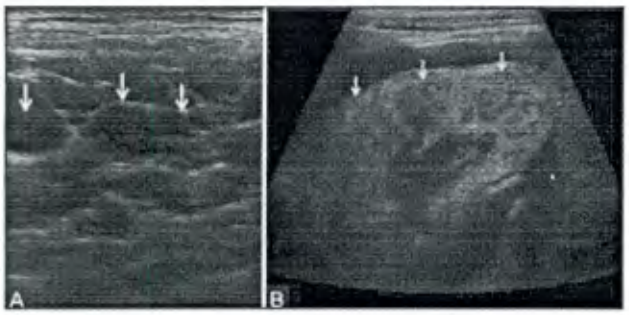

Figure 1 (A and B): Gray scale ultrasound (US) image (A) showing mesenteric lymphatic malformation as multiple anechoic cystic spaces (arrows). US image (B) showing the mesenteric lymphatic malformation as a solid echogenic lesion (arrows). The diagnosis in later case (B) was confirmed at surgery

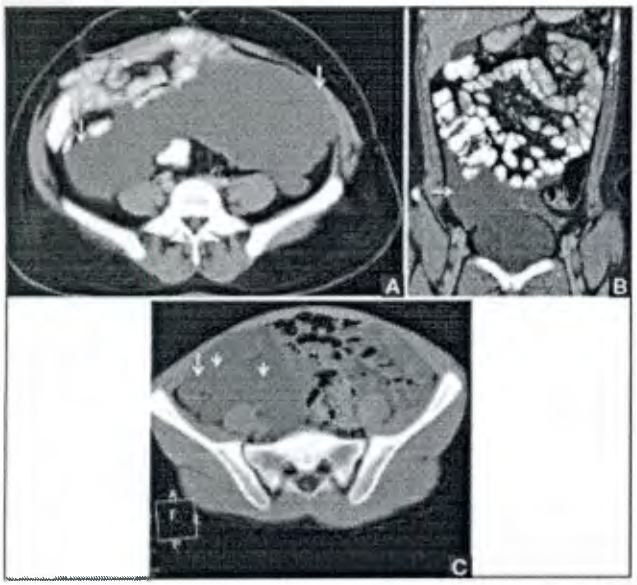

Figure 2 (A-C): Axial contrast-enhanced computed tomography (CECT) image (A) showing mesenteric lymphatic malformation as a low attenuation lesion (arrows). Coronal reformatted CECT image (B) showing a mesenteric lymphatic malformation with peripheral thin contrast enhancement (arrow). Axial non-contrast CT image (C) showing punctate calcific focus (short arrow) within the lymphatic malformation (arrow)

MRI and ultrasound are better at discriminating the cystic nature of the lesions. The role of chemical shift MRI to differentiate mesenteric lymphatic malformations from other cystic masses has also been described [12]. As described above, in certain cases with atypical clinical features, FNAC may aid in diagnosis.

Retroperitoneal lymphatic malformations

Retroperitoneal lymphatic malformations are extremely rare and comprise less than 1% of the abdominal lymphatic malformations [13, 14]. They usually present in older children and adults. Clinically, they present as palpable abdominal masses, abdominal pain, intestinal or ureteric obstruction, and hematuria.

Asymptomatic lesions may be detected incidentally during imaging evaluation for unrelated indications. Histologically, the retroperitoneal lesions are almost always of cystic variety [1]. The imaging features are similar to those of cystic mesenteric lymphatic malformations [Figure 5A and B]. An important feature on imaging that differentiates these lesions from other pathologies is the insinuating nature crossing multiple compartments. Retroperitoneal cystic teratoma is an important differential diagnosis [1].

Gastrointestinal tract lymphatic malformations

Gastrointestinal tract (GIT) is an infrequent location for abdominal lymphatic malformations [15]. These intramural lesions are frequently asymptomatic and detected incidentally on radiologic studies or at endoscopy [15]. The lesions appear as smoothly marginated intramural masses on barium studies and deform with compression. Homogeneous low-attenuation is seen at CT [Figure 6A and B]. Endoscopic ultrasound confirms the cystic nature of these lesions.

Hepatic lymphatic malformations

Primary hepatic lymphatic malformations are extremely uncommon. Hepatic lymphatic malformations may be seen in isolation or as a part of systemic lymphatic malformation or hepatosplenic lymphatic malformation [16]. Isolated hepatic lesions are seen in relatively older children and adults compared to systemic or hepatosplenic lymphatic malformation that usually present during infancy, or early childhood. Hepatic lymphatic malformations present as single or multiple cysts [Figure 7].

The imaging features are similar to lymphatic malformations elsewhere in the body. Hyperechoic lesions resembling hemangiomas are also seen infrequently [5]. This appearance is related to small size lymphatic spaces separated by abundant fibrous tissue. The differential diagnosis includes other hepatic cysts including polycystic liver disease, hydatid cysts, and cystic tumors including cystic metastasis and mesenchymal hamartoma [5].

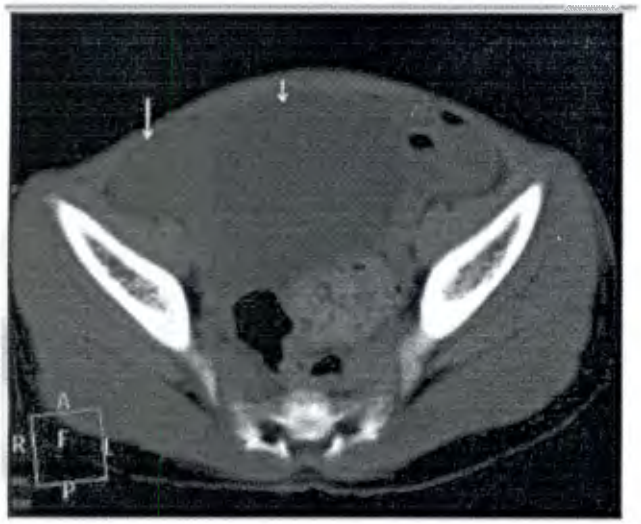

Figure 4: Axial non-contrast CT image showing lymphatic malformation as a hypodense lesion (arrow) mimicking ascites. Shorter arrow points toward urinary bladder. Aspiration cytology of the fluid supported the diagnosis of lymphatic malformation

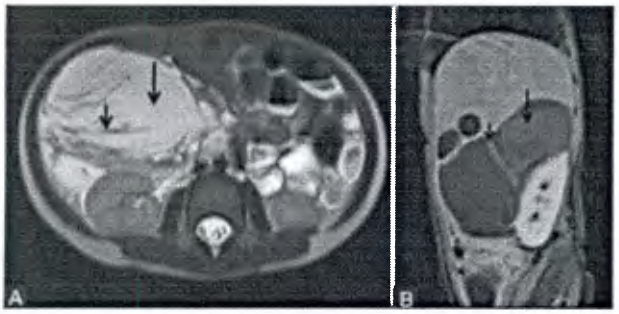

Figure 5 (A and B): Axial T2-weighted magnetic resonance (MR) image (A) showing lymphatic malformation in the anterior pararenal space along with fluid component (arrows) and septations (short arrows). Parasagittal T1-weighted postcontrast image (B) shows the lesion to be hypointense (arrows) with enhancing septum (short arrow)

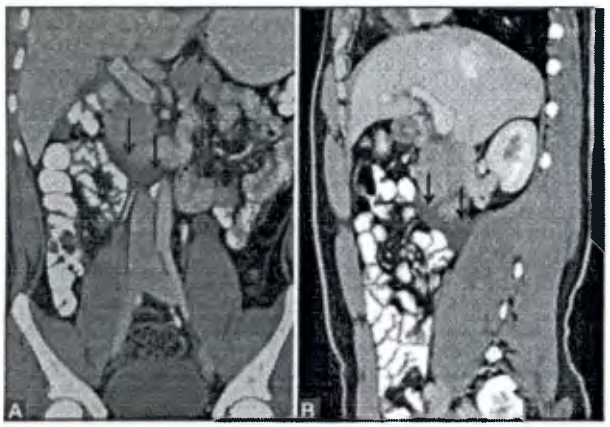

Figure 6 (A and B): Coronal (A) and sagittal (B) reformatted images showing duodenal lymphatic malformation as an ill-defined hypodense lesion along the second and third parts of duodenum (arrows). The diagnosis was confirmed following surgery

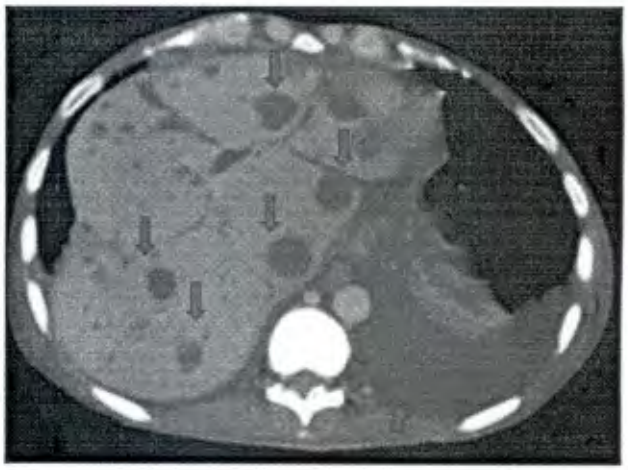

Figure 7: Axial computed tomography image shows multiple well-defined hypodense lesions (arrows) in the liver as a part of hepatic lymphatic malformation. Also note left moderate pleural effusion. The diagnosis of lymphatic malformation was supported by aspiration cytology

Splenic lymphatic malformations

Splenic lymphatic malformations usually occur in subcapsular locations [Figure 8A]. This location reflects the anatomic distribution of lymphatics draining splenic parenchyma. Less common sites for splenic lymphatic malformations include intraparenchymal location presenting as well defined lesions [Figure 8B] or global splenic enlargement [17]. There are no distinct imaging features of splenic lymphatic malformations. Lesions closely resembling splenic lymphatic malformations include true splenic cysts, pseudocysts, infective lesions including pyogenic abscesses and hydatidcysts, infarction, peliosis, and neoplastic lesions including hemangioma, lymphoma, and cystic metastasis [17].

Lymphatic malformations of extrahepatic biliary tree

This is a rare site for abdominal lymphatic malformations. These lesions usually arise from the gallbladder and are characterized by multilocular cystic appearance compressing the gallbladder lumen [18].

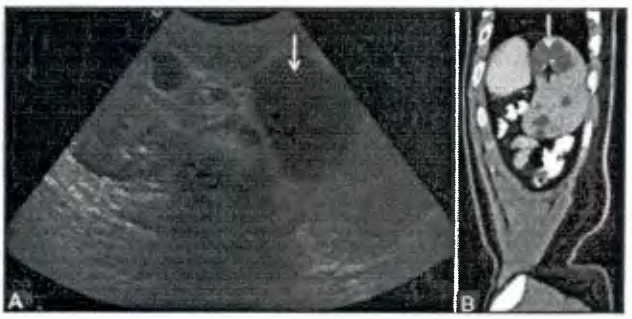

Figure 8 (A and B): Axial gray scale ultrasound image (A) shows a splenic subcapsular lymphatic malformation (arrows). Short arrows in (A) outline the spleen. Sagittal contrast-enhanced computed tomography image (B) shows splenic lymphatic malformation as multiple focal lesions (arrows). Also note punctate calcification (short arrow). The diagnosis in this case was confirmed by fine needle aspiration cytology

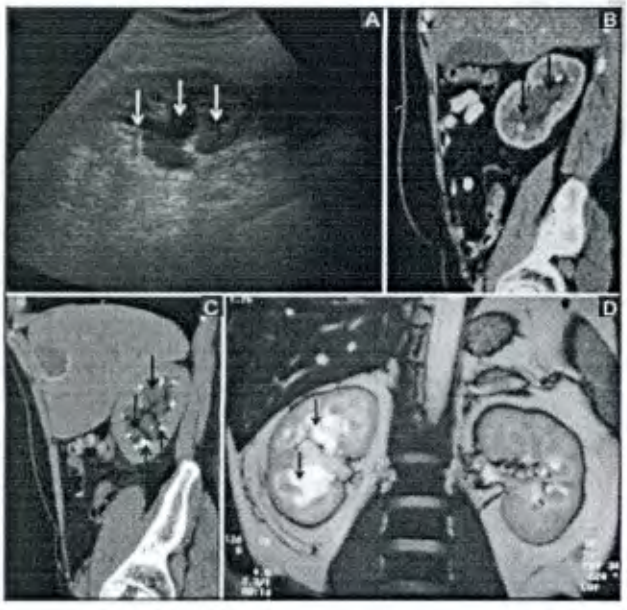

Figure 9 (A-D): Gray scale ultrasound image shows anechoic structures within the renal sinus (arrows) mimicking hydronephrosis. Sagittal contrast-enhanced computed tomography image (B) of the same patient shows the lesion as hypodense tubular structures (arrows) that were seen distinct from the pelvicalyceal system in the excretory phase (short arrows, C). Also note a well-defined liver lesion with peripheral hyperdense rim suggestive of a liver hydatid. Coronal T2-weighted magnetic resonance image (D) shows the abnormality as hyperintense channels in the right renal sinus (arrows)

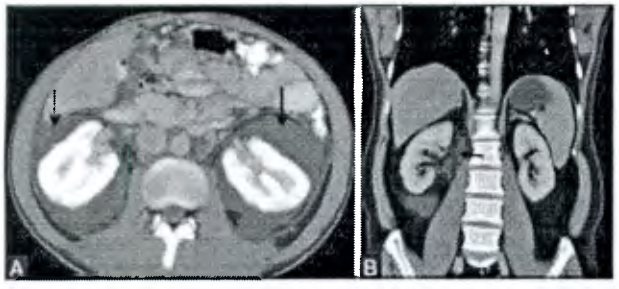

Figure 10 (A and B): Axial contrast-enhanced computed tomography (CECT) (A) image shows bilateral diffuse perinephric lymphatic malformations (arrows).Coronal CT image (B) shows right perinephric lymphatic malformation (arrows)

Renal lymphatic malformations

Renal lymphatic malformations are rare lesions and usually present as focal lesions [Figure 9A-D] [19]. Less commonly, these present as diffuse lymphatic malformations or renal lymphangectasia [Figure 10]. They appear as cystic lesions (uni or multilocular) on imaging. Rare cases of solid appearing lymphatic malformations have been reported [7]. The proposed mechanism for such appearance is the numerous interfaces between microcysts of the lymphatic malformation.

Differential diagnosis on imaging in adults includes hydronephrosis, benign renal cysts, renal abscess, and cystic renal tumors including multilocular cystic nephroma and renal cell carcinoma. Multilocular cystic nephroma is the chief differential diagnosis in children.

Pancreatic lymphatic malformations

Lymphatic malformations are said to be of primary pancreatic origin only when they are located within the pancreatic parenchyma, are attached to the pancreas by a pedicle, or have a broad area of contact with the pancreas [Figure 11] [20].

The most common cystic lesion in relation to the pancreas is a pseudocyst. Other differential considerations are cystic neoplasms including cystic neuroendocrine neoplasms, mucinous or serous neoplasms, solid pseudopapillary epithelial neoplasms, and intraductal papillary mucinous neoplasms. Definite imaging diagnosis is difficult as these lesions closely resemble lymphatic malformations.

Treatment

Treatment is recommended in all (even asymptomatic) cases as the incidence of several complications such as bleeding, infection, bowel obstruction, and volvulus tends to increase with time as the lesion size increases [21, 22]. Complete resection has conventionally been advocated as the treatment of choice for all types of abdominal lymphatic malformations. For all sites combined, a recurrence rate of 40% after incomplete resection and 17% after macroscopically complete resection was shown. Moreover, recurrence is more common in larger lesions [23].

Sclerotherapy is the less invasive form of treatment. A variety of sclerosing agents, including ethanol, sodium tetradecylsulfate, bleomycin, doxycycline, and OK-432 (picibanil), has been shown to be effective in the treatment of macrocystic lesions [21]. Variable recurrence has been reported following sclerotherapy, with up to 100% in some series [24, 25]. The rate of recurrence depends on the lesion location, size, and complexity [26, 27].

Conclusion

Abdominal lymphatic malformations, although rare, should be kept in the differential diagnosis of cystic lesions occurring in the various abdominal compartment and abdominal viscera, both solid and GIT. Clinical presentation is extremely variable. Preoperative diagnosis may be facilitated by FNAC. Definite treatment is required in most cases due to the fear of complications. Surgery is the mainstay of treatment. Other forms of treatment may have a higher recurrence rate.

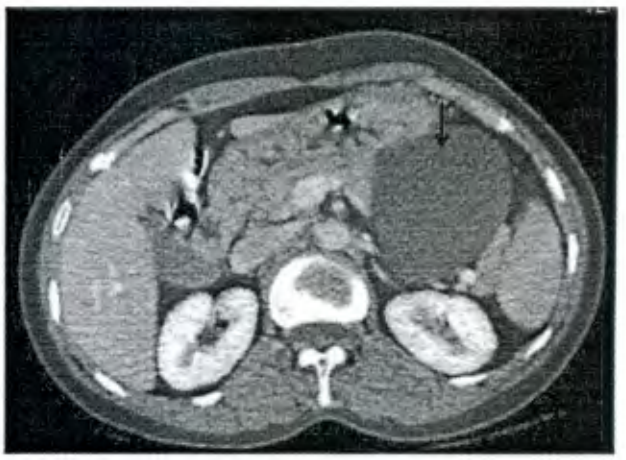

Figure 11: Axial contrast-enhanced computed tomographyimage shows a well-defined hyperdense lesion (arrow) having a broad area of contact with the distal pancreatic body and tail.Fine needle aspiration cytologyof the lesion led to a diagnosis of lymphatic malformation

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CLINICAL EVALUATION OF DIFFUSION WEIGHTED IMAGING OF BREAST MASSES IN FEMALE PATIENTS FROM BIHAR REGION

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Abstract
Breast masses range from benign to malignant with varied etiologies. Fibroadenoma the Commonest benign and invasive ductal carcinomas are the commonest malignant lesions. Breast carcinoma is the most common and the second leading cause of deaths in women. It is present fully accepted that breast magnetic resonance is amongst the most sensitive diagnostic imaging techniques for breast lesions. DWI-MR (diffusion weighted magnetic resonance) provides new and different information about the biophysical properties of tissue. The consequent reduction of macroscopic motion effect makes possible the use of DWI in detection and characterization in breast MRI imaging. These facts and figures defines the need for early detection and treatment of breast for favourable prognosis. DWI has sufficient capacity to diagnose invasive, non-invasive breast lesions and has the ability to provide steady, high-resolution tissue images and there is a need to apply DWI to clinical practice while taking advantage of this high contrast resolution. Diffusion weighted Imaging is a potential resource as an adjuvant to breast MRI to differentiate benign from malignant lesions. Such sequence can be easily added to the standard breast magnetic resonance protocol.
The present study was planned in Department of Radio- Diagnosis, Katihar Medical College and Hospital, Katihar, Bihar, India. Total 20 cases of the breast lesions refereed to our hospital were evaluated in the present study. Those patients who had come for breast MRI examinations and were detected to have lesions greater than 1 cm in size were included in the study and DWI was performed after obtaining prior consent. Patients who were referred for mammography and sonomammography and who were detected to have solid lesions greater than 1 cm were also included in this study after obtaining prior consent; diffusion-weighted sequences were performed for these patients only to characterize the lesions detected on mammography and sonomammography.
The data generated from the present study concludes that DWI for breast lesions can differentiate benign from malignant lesions with a high sensitivity and specificity. The usefulness of this technique needs to be further evaluated with larger double-blind studies.
Keywords: Diffusion Weighted Imaging, DWI, Breast Masses, etc.

Introduction:

A breast mass, also known as a breast lump, is a localized swellings that feel different from the surrounding tissue. Breast pain, nipple discharge, or skin changes may be present. Concerning findings include masses that are hard, do not move easily, are of an irregular shape, or are firmly attached to surrounding tissue. Causes include fibrocystic change, fibroadenomas, breast infection, galactoceles, and breast cancer. Breast cancer makes up about 10% of breast masses. Diagnosis is typically by examination, medical imaging, and tissue biopsy. Tissue biopsy is often by fine needle aspiration biopsy. Repeated examination may be required. Treatment depends on the underlying cause. It may vary from simple pain medication to surgical removal. Some causes may resolve without treatment. Breast masses are relatively common. It is the most common breast complaint with the women's concern generally being that of cancer.[1]

A breast cyst is a non-cancerous, fluid-filled sac in the breast. They generally feel smooth or rubbery under the skin and can be quite painful or cause no pain at all. Cysts are caused by the hormones that control the menstrual cycle and are rare in women older than 50. A sebaceous cyst is a non-cancerous, closed sac or cyst below the skin that is caused by plugged ducts at the site of a hair follicle. Hormone stimulation or injury may cause them to enlarge but if no symptoms are present, medical treatment is not required.[8]

Breast abscesses are non-cancerous pockets of infection within the breast. They can be quite painful and cause the skin over the breast to turn red or feel hot or solid. Abscesses of the breast are most common in women who are breast-feeding. Adenomas are non-cancerous abnormal growths of the glandular tissue in the breast. The most common form of these growths, fibroadenomas, occur most frequently in women between the ages of 15 and 30 and in women of African descent. They usually feel round and firm and have smooth borders. Adenomas are not related to breast cancer.[2]

Intraductal papillomas are wart-like growths in the ducts of the breast. These lumps are usually felt just under the nipple and can cause a bloody discharge from the nipple. Women close to menopause may have only one growth, while younger women are more likely to have multiple growths in one or both breasts. Breast cancer usually feels like a hard or firm lump that is generally irregular in shape and may feel like it is attached to skin or tissue deep inside the breast. Breast cancer is rarely painful and can occur anywhere in the breast or nipple.[2]

Breast masses are broadly classified as benign or malignant. Common causes of benign breast lesions include fibrocystic disease, fibroadenoma (see the image below), intraductal papilloma, and abscess. Malignant breast disease encompasses many histologic types that include, but are not limited to, in situ ductal or lobular carcinoma, infiltrating ductal or lobular carcinoma, and inflammatory carcinoma. The main concern of many women presenting with a breast mass is the likelihood of cancer. Reassuringly, most breast masses are benign.

The mammary glands arise from a caudal section of the ectodermal tissue known as the “milk lines,” which extend along the anterior surface of the developing fetus from the axilla to the groin. During puberty, pituitary and ovarian hormonal influences stimulate female breast enlargement, primarily owing to accumulation of adipocytes. Each breast contains approximately 15-25 glandular units know as breast lobules, which are demarcated by Cooper ligaments. Each lobule is composed of a tubuloalveolar gland and adipose tissue. Each lobule drains into the lactiferous duct, which subsequently empties onto the surface of the nipple. Multiple lactiferous ducts converge to form one ampulla, which traverses the nipple to open at the apex. [3]

Below the nipple surface, lactiferous ducts form large dilations called lactiferous sinuses, which act as milk reservoirs during lactation. When the lactiferous duct lining undergoes epidermalization, keratin production may cause plugging of the duct, resulting in abscess formation. [4] This may explain the high recurrence rate (an estimated 39%-50%) of breast abscesses in patients treated with standard incision and drainage, as this technique does not address the basic mechanism by which breast abscesses are thought to occur.

Postpartum mastitis is a localized cellulitis caused by bacterial invasion through an irritated or fissured nipple. It typically occurs after the second postpartum week and may be precipitated by milk stasis. There is usually a history of a cracked nipple or skin abrasion or failure to clean nipples after breastfeeding. Sleeping position may also affect the progression of mastitis to breast abscess. Staphylococcus aureus is the most common organism responsible, but Staphylococcus epidermidis and streptococci are occasionally isolated. Drainage of milk from the affected segment should be encouraged and is best achieved by continued breastfeeding or use of a breast pump. [5]

Nonlactating infections may be divided into central (periareolar) and peripheral breast lesions. Periareolar infections consist of active inflammation around nondilated subareolar breast ducts—a condition termed periductal mastitis. Peripheral nonlactating breast abscesses are less common than periareolar abscesses and are often associated with an underlying condition such as diabetes, rheumatoid arthritis, steroid treatment, granulomatous lobular mastitis, trauma, and smoking. Primary skin infections of the breast (cellulitis or abscess) most commonly affect the skin of the lower half of the breast and often recur in women who are overweight, have large breasts, or have poor personal hygiene. [6]

Breast masses can involve any of the tissues that make up the breast, including overlying skin, ducts, lobules, and connective tissues. Fibrocystic disease, the most common breast mass in women, is found in 60%-90% of breasts during routine autopsy. Fibroadenoma, the most common benign tumor, typically affects women aged 30 years or younger and accounts for 91% of all solid breast masses in females younger than 19 years. Infiltrating ductal carcinoma is the most common malignant tumor; however,

inflammatory carcinoma is the most aggressive and carries the worst prognosis. Mammary Paget disease, or adenocarcinoma of the nipple epidermis, is relatively rare but may be misdiagnosed as a benign dermatosis if care is not taken. [7]

Recurrent or chronic infections, pain, and scarring are causes of morbidity. Mastitis is usually seen in lactating women, but the presence in a nonlactating woman should spur evaluation for an inflammatory carcinoma, newly onset diabetes, infection with Mycobacterium tuberculosis, and other idiopathic causes. [8]

Abscess formation complicates postpartum mastitis in fewer than 10% of cases. Neonatal mastitis usually occurs in term or near-term infants, is twice as common in females, and progresses to development of a breast abscess in approximately 50% of cases. [9]

Diffusion-weighted magnetic resonance imaging (DWI or DW-MRI) is the use of specific MRI sequences as well as software that generates images from the resulting data that uses the diffusion of water molecules to generate contrast in MR images.[10] It allows the mapping of the diffusion process of molecules, mainly water, in biological tissues, in vivo and non-invasively. Molecular diffusion in tissues is not free, but reflects interactions with many obstacles, such as macromolecules, fibers, and membranes. Water molecule diffusion patterns can therefore reveal microscopic details about tissue architecture, either normal or in a diseased state. A special kind of DWI, diffusion tensor imaging (DTI), has been used extensively to map white matter tractography in the brain.

In diffusion weighted imaging (DWI), the intensity of each image element (voxel) reflects the best estimate of the rate of water diffusion at that location. Because the mobility of water is driven by thermal agitation and highly dependent on its cellular environment, the hypothesis behind DWI is that findings may indicate (early) pathologic change. For instance, DWI is more sensitive to early changes after a stroke than more traditional MRI measurements such as T1 or T2 relaxation rates. A variant of diffusion weighted imaging, diffusion spectrum imaging (DSI), was used in deriving the Connectome data sets; DSI is a variant of diffusion-weighted imaging that is sensitive to intra-voxel heterogeneities in diffusion directions caused by crossing fiber tracts and thus allows more accurate mapping of axonal trajectories than other diffusion imaging approaches.[11]

Diffusion-weighted images are very useful to diagnose vascular strokes in the brain. It is also used more and more in the staging of non-small-cell lung cancer, where it is a serious candidate to replace positron emission tomography as the 'gold standard' for this type of disease. Diffusion tensor imaging is being developed for studying the diseases of the white matter of the brain as well as for studies of other body tissues (see below). DWI is most applicable when the tissue of interest is dominated by isotropic water movement e.g. grey matter in the cerebral cortex and major brain nuclei, or in the body—where the diffusion rate appears to be the same when measured along any axis. However, DWI also remains sensitive to T1 and T2 relaxation. To entangle diffusion and relaxation effects on image contrast, one may obtain quantitative images of the diffusion coefficient, or more exactly the apparent diffusion coefficient (ADC). The ADC concept was introduced to take into account the fact that the diffusion process is complex in biological tissues and reflects several different mechanisms.[12]

Diffusion tensor imaging (DTI) is important when a tissue—such as the neural axons of white matter in the brain or muscle fibers in the heart—has an internal fibrous structure analogous to the anisotropy of some crystals. Water will then diffuse more rapidly in the direction aligned with the internal structure, and more slowly as it moves perpendicular to the preferred direction. This also means that the measured rate of diffusion will differ depending on the direction from which an observer is looking.

Traditionally, in diffusion-weighted imaging (DWI), three gradient-directions are applied, sufficient to estimate the trace of the diffusion tensor or 'average diffusivity', a putative measure of edema. Clinically, trace-weighted images have proven to be very useful to diagnose vascular strokes in the brain, by early detection (within a couple of minutes) of the hypoxic edema. [13]

More extended DTI scans derive neural tract directional information from the data using 3D or multidimensional vector algorithms based on six or more gradient directions, sufficient to compute the diffusion tensor. The diffusion model is a rather simple model of the diffusion process, assuming homogeneity and linearity of the diffusion within each image voxel.[13] From the diffusion tensor,

diffusion anisotropy measures such as the fractional anisotropy (FA), can be computed. Moreover, the principal direction of the diffusion tensor can be used to infer the white-matter connectivity of the brain (i.e. tractography; trying to see which part of the brain is connected to which other part).

Recently, more advanced models of the diffusion process have been proposed that aim to overcome the weaknesses of the diffusion tensor model. Amongst others, these include q-space imaging [8] and generalized diffusion tensor imaging.

Breast masses range from benign to malignant with varied etiologies. Fibroadenoma the Commonest benign and invasive ductal carcinomas are the commonest malignant lesions. [14] Breast carcinoma is the most common and the second leading cause of deaths in women. [15] It is present fully accepted that breast magnetic resonance is amongst the most sensitive diagnostic imaging techniques for breast lesions. [16] DWI-MR (diffusion weighted magnetic resonance) provides new and different information about the biophysical properties of tissue. The consequent reduction of macroscopic motion effect makes possible the use of DWI in detection and characterization in breast MRI imaging. [17] These facts and figures defines the need for early detection and treatment of breast for favourable prognosis. DWI has sufficient capacity to diagnose invasive, non-invasive breast lesions and has the ability to provide steady, high-resolution tissue images and there is a need to apply DWI to clinical practice while taking advantage of this high contrast resolution. Diffusion weighted Imaging is a potential resource as an adjuvant to breast MRI to differentiate benign from malignant lesions. Such sequence can be easily added to the standard breast magnetic resonance protocol.

Methodology:

The present study was planned in Department of Radio- Diagnosis, Katihar Medical College and Hospital, Katihar, Bihar, India. Total 20 cases of the breast lesions refereed to our hospital were evaluated in the present study. Those patients who had come for breast MRI examinations and were detected to have lesions greater than 1 cm in size were included in the study and DWI was performed after obtaining prior consent. Patients who were referred for mammography and sonomammography and who were detected to have solid lesions greater than 1 cm were also included in this study after obtaining prior consent; diffusion-weighted sequences were performed for these patients only to characterize the lesions detected on mammography and sonomammography.

In all patients, MRI was performed bilaterally. MRI examinations were performed using a 1.5-T MRI scanner (Magnetom Espree, Siemens Healthcare). Patients were examined in the prone position using a dedicated 4-channel phased array bilateral breast coil. Before administration of contrast media, axial bilateral fat-suppressed T2- weighted fast spin-echo, axial STIR, axial T1-weighted fast spin-echo and DWI series were acquired. DW image was performed in axial slice orientation using echo planar imaging pulse sequences incorporating with diffusion gradients.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: Women of the age group 15 to 75 years and Breast lesions larger than 1cm detected by ultrasound/ mammogram.

Exclusion Criteria: Previous history of breast surgery within preceding 18 months Chemotherapy within preceding 18 months; Radiotherapy within preceding 18 months Lesions; smaller than 1 cm.

Results & Discussion:

Currently one of the most important indications for MRI is the differential diagnosis between cancer recurrence and surgical scar. In fact, breast MRI has become a common practice in the evaluation for recurrence of breast cancer. Both surgery and radiation can cause scarring with architectural distortion of the breast, which makes assessment of local recurrence difficult by means of clinical examination, mammography, and ultrasound. Post-treatment changes can mimic malignancy or obscure locally recurrent breast cancer. For these reasons, breast MRI is a useful tool in the evaluation of such patients. [18] Diffusion-weighted imaging (DWI) is an unenhanced MRI sequence that measures the mobility of water molecules in vivo and provides different and potentially complementary information to (Dynamic Contrast Enhancement) DCE-MRI. DWI is sensitive to biophysical characteristics of tissues, such as cell density, membrane integrity, and microstructure. Promising findings from preliminary

DWI studies of the breast have shown significantly lower apparent diffusion coefficient (ADC) measures for breast carcinomas than for benign breast lesions or normal tissue. [19] The lower ADC in malignancies is primarily attributed to higher cell density causing increased restriction of the extracellular matrix and increased fraction of signal coming from intracellular water. [20] A recent study reported high accuracy for characterizing enhancing breast masses through a multivariate combination of DWI and DCE-MRI features. [21]

Breast MRI is the widely accepted diagnostic approach for evaluating the breast. To improve the sensitivity of detecting breast cancer, several diverse techniques are used for breast MRI (21). In particular, dynamic-enhanced MRI provides for evaluating multiple foci of carcinoma in the breast and it displays extremely high sensitivity for identifying breast cancer. However, dynamic-enhanced breast MRI has some disadvantages such as being time-consuming and costly, the possible side effects of the contrast media and the relative low specificity compared to mammography and ultrasonography. [22]

Table 1: Age and Type of Lesions

Age Group	Benign	Malignant
20 – 30 years	2	1
31 – 40 years	3	2
41 – 50 years	4	2
51 – 60 years	2	1
60 years and above	0	3
Total	11	9

Table 2: Spectrum of Lesions

Lesion histopathology	**Number of Cases**
Duct ectasia	1
Fibrocystic disease	4
Fibroadenoma	1
Galactocele	0
Granulomatous mastitis	0
Infiltrating duct ca	7
Lipoma	1
Breast abscesses	1
Paget's disease of nipple	1
Phyllodes tumour	1
Scar	2
Seroma	1
Total	**20**

Table 3: Frequency of signal of lesions on T1WI

	Benign	Malignant
Hyperintense	1	1
Hypointense	10	7
Isointense	0	1
Total	11	9

Table 4: Frequency of signal of lesions on T2WI

	Benign	Malignant
Hyperintense	9	2
Hypointense	1	1
Intermediate	1	6
Total	11	9

Table 5: Correlation between MRI diagnosis and gold standard (HPR)

HPR Diagnosis	**Benign**	**Malignant**
MRI Diagnosis		
Benign	10	0
Malignant	1	7
Total	11	9

Table 6: Mean ADC value

	No. of Cases	**Mean ADC value (x 10^{-3} mm2/s)**
Benign	11	1.21
Malignant	9	1.95

DWI is based on the principle of Fick's Law of concentration gradients and the Brownian movement of molecules. Malignant lesions, in general, have more tightly packed cells with a more compact architecture and, consequently, have lower ADC values as compared with benign lesions. There is inhibition of effective movement of water molecules and restricted diffusion in dense malignant lesions. The higher ADC values of cystic or necrotic areas reflect a lack of significant restriction of diffusion of water. [5] False-negative values can be obtained in cystic/necrotic malignancies. [23]

In the study conducted by Zhang et al. on 57 breast lesions, the threshold ADC value at b-1000 was 1.20 ± 0.25 x 10 -3 mm 2 /s. [6] They found that ADC values of malignant lesions were statistically much lower than benign lesions and peritumoral tissues. [24] The usefulness of contrast MRI in detecting breast malignancy was studied by Drew et al. in 334 women. [25] The sensitivity and specificity of dynamic contrast MRI in their study were 100% and 86% respectively for detecting malignant lesions. [7] In a study performed by Yabuuchi et al. to assess the utility of a combination of dynamic contrast MRI and DWI in lesion characterization, the sensitivity was found to be 92% and the specificity was found to be

86% for differentiating benign from malignant lesions. [26]

A study done by Yoshifumi Kuroki and Katsuhiro on 29 women with suspicious breast abnormalities showed that diffusion tensor imaging (DTI) may provide useful information to better characterize breast abnormalities on MRI. Malignant breast tumors demonstrated altered diffusion characteristics with significant differences in FA (fractional anisotropy) and ADC (apparent diffusion coefficient) compared to normal tissue and benign lesions, while benign lesions were not significantly different from normal tissue. [27]

In another study done by Mijung Park and Eun Suk Cha on fourty one patients showed that DWI has a high sensitivity for detecting breast tumors and specificity for detecting malignant breast tumors. DWI was an effective imaging technique for detecting breast lesions, as compared using the T1 and T2 weighted images. [27]

In the study done by Lalita Palle and Balaji Reddy on 200 patients with solid breast lesions also the result was similar and showed that DWI is a useful technique for characterizing breast tumors, especially for lesions that cannot be adequately characterize by ultrasonography and routine magnetic resonance imaging. [28]

Conclusion:

The data generated from the present study concludes that DWI for breast lesions can differentiate benign from malignant lesions with a high sensitivity and specificity. The usefulness of this technique needs to be further evaluated with larger double-blind studies.

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ASSESSMENT OF SUSPICIOUS OVARIAN MASSES BY COMPARATIVE STUDY OF USG AND CT TECHNIQUES

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Abstract

Undoubtedly, most ovarian lesions, endometrial pathology and uterine lesions are best detected with ultrasound. Computed tomography (CT) imaging offers better diagnostic capabilities for large pelvic masses, tubo- ovarian abscesses, postoperative and postpartum complications. In some cases, Computed Tomography (CT) is employed to achieve optimal differential Diagnosis to determine the clinical pathway to follow. Hence based on above findings the present study was planned for Assessment of Suspicious Ovarian Masses by Comparative Study of USG and CT Techniques.

The present study was planned in Department of Radio- Diagnosis, Katihar Medical College, Katihar (Al-Karim University), Bihar, India. In the present study 50 females were enrolled having Suspicious Ovarian Masses. Computed tomography (CT) and USG characteristics of different lesions were noted and recorded. The histopathological diagnosis was followed up and recorded. The results of this study were analysed and compared with other available studies in literature.

The data generated from the present study concludes that Ultrasonography is usually the first imaging modality in evaluation of female patients suspected to have pelvic pathology. Computed tomography is superior diagnostic imaging modality than USG prior to treatment which improved detection and characterization of tumour due to better diagnostic accuracy and consequently reduction of invasive procedure which lead to significant reduction of mortality and morbidity from tumour.

Keywords: Ovarian Masses, Comparative Study, USG, CT Techniques, etc.

Introduction

A pelvic mass is an enlargement or swelling in the pelvic region. Most pelvic masses are discovered during routine gynecological or physical examinations. Pelvic masses may originate from either the gynecological organs, such as the cervix, uterus, uterine adnexa, or from other pelvic organs, such as the intestines, bladder, ureters, and renal organs.

An ovarian cyst is a sac filled with liquid or semiliquid material that arises in an ovary. Although the discovery of an ovarian cyst causes considerable anxiety in women owing to fears of malignancy, the vast majority of these lesions are benign. [1-2]

Many patients with simple ovarian cysts found through ultrasonographic examination do not require treatment. In a postmenopausal patient, a persistent simple cyst smaller than 10 cm in dimension in the presence of a normal CA125 value may be monitored with serial ultrasonographic examinations. [3, 6, 4]

Oral contraceptive pills (OCPs) protect against the development of functional ovarian cysts. Existing functional cysts, however, do not regress more quickly when treated with combined oral contraceptives than they do with expectant management. [7]

Persistent simple ovarian cysts larger than 10 cm (especially if symptomatic) and complex ovarian cysts should be considered for surgical removal. The surgical approaches include an open technique (laparotomy) or a minimally invasive technique (laparoscopy) with very small incisions. The latter approach is preferred in cases presumed benign. [4] Removing the cyst intact for pathologic analysis may mean removing the entire ovary, though a fertility sparing surgery should be attempted in younger women. [4] Bilateral oophorectomy and, often, hysterectomy are performed in many postmenopausal women with ovarian cysts, because of the increased incidence of neoplasms in this population.

An ovarian cyst is a sac filled with liquid or semiliquid material that arises in an ovary. The number of diagnoses of ovarian cysts has increased with the widespread implementation of regular physical examinations and ultrasonographic technology. The discovery of an ovarian cyst causes considerable anxiety in women owing to fears of malignancy, but the vast majority of ovarian cysts are benign. [5]

These cysts can develop in females at any stage of life, from the neonatal period to postmenopause. Most ovarian cysts, however, occur during infancy and adolescence,

which are hormonally active periods of development. Most are functional in nature and resolve without treatment.

However, ovarian cysts can herald an underlying malignant process or, possibly, distract the clinician from a more dangerous condition, such as ectopic pregnancy, ovarian torsion, or appendicitis. On the other hand, there may be an inverse relationship between ovarian cysts and breast cancer. [8, 9]

Abdominal pain in the female can be one of the most difficult cases to diagnose correctly in the emergency department (ED). The spectrum of gynecological disease is broad, spanning all age ranges and representing various degrees of severity, from benign cysts that eventually resolve on their own to ruptured ectopic pregnancy that causes life-threatening hemorrhage.

When presented with this scenario, the goal of the emergency physician is to rule out acute causes of abdominal pain associated with high morbidity and mortality, such as appendicitis, ovarian torsion, or ectopic pregnancy; to assess for the possibility of neoplasm or malignancy; and either to refer the patient to the appropriate consultant or to discharge them with a clear plan for follow-up with an obstetrician/gynecologist. [9]

The median menstrual cycle lasts 28 days, beginning with the first day of menstrual bleeding and ending just before the subsequent menstrual period. The variable first half of this cycle is termed the follicular phase and is characterized by increasing follicle-stimulating hormone (FSH) production, leading to the selection of a dominant follicle that is primed for release from the ovary. [10]

In a normally functioning ovary, simultaneous estrogen production from the dominant follicle leads to a surge of luteinizing hormone (LH), resulting in ovulation and the release of the dominant follicle from the ovary and commencing the luteinizing phase of ovulation.

After ovulation, the follicular remnants form a corpus luteum, which produces progesterone. This, in turn, supports the released ovum and inhibits FSH and LH production. As luteal degeneration occurs in the absence of pregnancy, the progesterone levels decline, while the FSH and LH levels begin to rise before the onset of the next menstrual period.

Different kinds of functional ovarian cysts can form during this cycle. In the follicular phase, follicular cysts may result from a lack of physiologic release of the ovum due to excessive FSH stimulation or lack of the normal LH surge at midcycle just before ovulation. Hormonal stimulation causes these cysts to continue to grow. Follicular cysts are typically larger than 2.5 cm in diameter and manifest as a discomfort and heaviness. Granulosa cells that line the follicle may also persist, leading to excess estradiol production, which, in turn, leads to decreased frequency of menstruation and menorrhagia. [11]

In the absence of pregnancy, the lifespan of the corpus luteum is 14 days. If the ovum is fertilized, the corpus luteum continues to secrete progesterone for 5-9 weeks, until its eventual dissolution in 14 weeks' time, when the cyst undergoes central hemorrhage. Failure of dissolution to occur may result in a corpus luteal cyst, which is arbitrarily defined as a corpus luteum that grows to 3 cm in diameter. The cyst can cause dull, unilateral pelvic pain and may be complicated by rupture, which causes acute pain and possibly massive blood loss.

Theca-lutein cysts are caused by luteinization and hypertrophy of the theca interna cell layer in response to excessive stimulation from human chorionic gonadotropin (hCG) These cysts are predisposed to torsion, hemorrhage, and rupture. Theca-lutein cysts can occur in the setting of gestational trophoblastic disease (hydatidiform mole and choriocarcinoma), multiple gestation, or exogenous ovarian hyperstimulation.

These cysts are associated with maternal androgen excess in up to 30% of cases but usually resolve spontaneously as the hCG level falls. Theca-lutein cysts are usually bilateral and result in massive ovarian enlargement, a characteristic of the condition termed hyperreactio luteinalis. [12]

The prognosis for benign cysts is excellent. All such cysts may occur in residual ovarian tissue or in the contralateral ovary. Overall, 70%-80% of follicular cysts resolve spontaneously.

Malignancy is a common concern among patients with ovarian cysts. Pregnant patients with simple cysts smaller than 6cm in diameter have a malignancy risk of less than 1%. Most of these cysts resolve by 16-20 weeks' gestation, with 96% of these masses resolving spontaneously. [13] In postmenopausal patients with unilocular cysts, malignancy develops in 0.3% of cases.

In complex, multiloculated cysts, the risk of malignancy climbs to 36%. If cancer is diagnosed, regional or distant spread may be present in up to 70% of cases, and only 25% of new cases will be limited to stage I disease. [14]

Mortality associated with malignant ovarian carcinoma is related to the stage at the time of diagnosis, and patients with this carcinoma tend to present late in the course of the disease. The 5-year survival rate overall is 41.6%, varying between 86.9% for International Federation of Gynaecology and Obstetrics (FIGO) stage Ia and 11.1% for stage IV.

A distinct group of less aggressive tumors of low malignant potential runs a more benign course but still is associated with definite mortality. The overall survival rate is 86.2% at 5 years. [15] The potential of benign ovarian cystadenomas

to become malignant has been postulated but, to date, remains unproven. Malignant change can occur in a small percentage of dermoid cysts (associated with an extremely poor prognosis) and endometriomas.

Undoubtedly, most ovarian lesions, endometrial pathology and uterine lesions are best detected with ultrasound. Computed tomography (CT) imaging offers better diagnostic capabilities for large pelvic masses, tubo-ovarian abscesses, postoperative and postpartum complications. In some cases, Computed Tomography (CT) is employed to achieve optimal differential diagnoses to determine the clinical pathway to follow. Hence based on above findings the present study was planned for Assessment of Suspicious Ovarian Masses by Comparative Study of USG and CT Techniques.

Methodology:

The present study was planned in Department of Radio-Diagnosis, Katihar Medical College, Katihar (Al-Karim University), Bihar, India. In the present study 50 females enrolled having Suspicious Ovarian Masses. Computed tomography (CT) and USG characteristics of different lesions were noted and recorded. The histopathological diagnosis was followed up and recorded. The results of this study were analysed and compared with other available studies in literature.

Detailed history of allergy and renal function tests were taken before doing CT scan and if there was history of allergy then non-ionic contrast was used. Site, size, papillary projections, wall characteristics, capsular infiltrations, the presence of solid areas inside the mass and presence of ascites were recorded both by US and CT scan.

Presence of lymph node enlargements, free fluid in peritoneal cavity and omental caking were considered as supporting evidence for malignancy. Trans-abdominal sonography was carried out with Philips Epic 5g machine using 3.5 and 5 Mhz curvilinear and linear transducers. Scanning in transverse, oblique and sagittal planes were carried out and probable characterization of ovarian tumours was evaluated. CT scan of the abdomen was carried out with GE 16 Slice revolution ACT . Pre and Post IV contrast images along with oral contrast were taken in the axial planes. Thin sections of 1 – 3 mm were taken in region of interest. Evaluation of pathologies of adjacent anatomical structures was determined with the help of multi planar reconstruction. All the patients underwent surgery and specimens were collected intraoperatively and postoperatively for histopathological examination.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: Only those patients willing to participate in the study were included. Patients referred to the radiology department for ovarian lesions investigation, and found to have positive findings, were included in this study. All accidentally diagnosed cases of ovarian lesions were also be included in this study.

Exclusion Criteria: Patients presenting to radiology department not willing for examination or written consent, were excluded from this study.

Results & Discussion:

Ovarian tumours present a greatest clinical challenge of all gynaecological cancers and ovarian. Carcinoma is the second most common gynaecological carcinoma in incidence. As most of them present in a late stage, clinical diagnosis alone is difficult and as benign ovarian tumours greatly outnumber malignant ones, determination of a degree of suspicion for malignant is critical and is based largely on imaging modalities.

Ultrasound and computed tomography plays an important role in the diagnosis, preoperative staging, and evaluation of tumour recurrence of ovarian carcinoma. Ovarian carcinoma has characteristic tumour appearances and modes of tumour spread within the peritoneal cavity. By recognizing these features, the radiologist can assist the clinicians in treatment planning. As benign ovarian tumours greatly outnumber the malignant ones determination of a degree of suspicion for malignancy is critical and is largely based on imaging modalities. Based on few studies already done, some say that ultrasound is an excellent method for preoperative screening and is the most practical modality readily available and has high negative predictive value for the diagnosis of ovarian tumours.

Ultrasound is the imaging modality of choice for the female pelvis. It can determine the organ or site of abnormality and provide a diagnosis or short differential diagnosis in the vast majority of patients. Doppler sonography helps assess normal and pathologic blood flow. Doppler ultrasound can also distinguish vascular structures from nonvascular structures, such as dilated fallopian tubes or fluid-filled bowel loops. The trans abdominal approach visualizes the entire pelvis and gives a global overview. Its main limitations involve the examination of patients unable to fill the bladder, obese patients, or patients with a retroverted uterus, in whom the fundus may be located beyond the focal zone of the transducer. The trans abdominal technique also is less effective for characterization of adnexal masses. High-resolution imaging of transvaginal ultrasound provides high diagnostic accuracy for pelvic pathology. Because of

the proximity of the transducer to the uterus and adnexa, transvaginal sonography allows the use of higher frequency transducers, producing much better resolution, which provides better image quality and anatomic detail.

Table 1: Basic Details

Parameters	No. of Cases
Age:	
21 – 30 years	2
31 – 40 years	4
41 – 50 years	15
51 – 60 years	20
61 & above years	9
Pelvic Pathology:	
Endometrial	11
Ovarian	12
Cervical	27
Total	50

Table 2: Comparison of USG & CT

Type of Finding	Ultrasound	CT
Benign	5	4
Malignant	44	45
Suspiciously Malignant	1	1
Total	**50**	**50**

Table 3: Association of Masses

Diagnosis by CT	Diagnosis by USG						
	Carcinoma of Cervix	Carcinoma of Endometrium	Carcinoma of Ovary	Fibroid	GTN	Simple Cyst	Total
Carcinoma of Cervix	22	0	0	0	0	0	22
Carcinoma of Endometrium	1	8	0	0	0	0	9
Carcinoma of Ovary	0	0	15	0	0	0	15
Fibroid	0	0	0	1	0	0	1
GTN	0	0	0	0	1	0	1
0	0	0	0	0	0	2	2
Total	23	8	15	1	1	2	50

Jeong et al. [16] examined the accuracy of grey scale ultrasound in delineating a malignant ovarian mass based on size and appearance. In that study fixed septa, tumor size exceeding 5cm, and multiloculations were considered warning for ovarian malignancy. The results of our study showed that morphological characteristics associated with strong probability of malignancy were the presence of solid component (63%), papillary projection (92%), and free fluid in peritoneal cavity (56%). Another study done by Onyka et al. showed comparative diagnostic values of grey-scale US versus CT Scan in the primary management of gynecological pelvic mass with emphasis on ovarian cancer detection and staging. The sensitivity of CT scan for all ovarian cancer detection was greater than that of TAUS 83% vs. 67%, but TAUS was more specific. Both methods were equally efficacious in detecting and staging advanced ovarian cancer cases. Over all CT did not offer significant additional features and did not result in a change in management plan in any of the patients reviewed. Both methods were almost equally efficacious in detecting ovarian cancer cases. [17]

The determination of a degree of suspicion for malignancy in an ovarian mass is the most significant step in its management as the decision to perform radical surgery or conservative surgery depends on accurate pre-operative diagnosis. [18] Clinical evaluation with regards to site (unilateral or bilateral), fixity, consistency, presence of nodules in Douglas pouch and presence of ascites increase the suspicious of malignancy to certain extent but if combined with other tools as tumor markers and two dimensional ultrasounds, the sensitivity for malignancy increases. [18-19] Among women with ovarian disorders, CT has been used primarily in patients with ovarian malignancies, either to assess disease extent prior to surgery or as a substitute for second look laparotomy. CT is preferred for identification of peritoneal implants, lymphadenopathy and extent of the disease. However, studies failed to demonstrate that CT is significantly superior to other modalities in characterization of ovarian cancer. [20-22] And moreover, simple ovarian cysts are better evaluated by ultrasound.

Ultrasound is the imaging modality of choice for the female pelvis. It can determine the organ or site of abnormality and provide a diagnosis or short differential diagnosis in the vast majority of patients. Doppler sonography helps assess normal and pathologic blood flow. Doppler ultrasound can also distinguish vascular structures from nonvascular structures, such as dilated fallopian tubes or fluid-filled bowel loops. The trans abdominal approach visualizes the entire pelvis and gives a global overview. Its main limitations involve the examination of patients unable to fill the bladder, obese patients, or patients with a retroverted uterus, in whom the fundus may be located beyond the focal zone of the transducer. The trans abdominal technique also is less effective for characterization of adnexal masses. High-resolution imaging of transvaginal ultrasound provides high diagnostic accuracy for pelvic pathology. Because of the proximity of the transducer to the uterus and adnexa, transvaginal sonography allows the use of higher frequency transducers, producing much better resolution, which provides better image quality and anatomic detail.

Conclusion:

The data generated from the present study concludes that Ultrasonography is usually the first imaging modality in evaluation of female patients suspected to have pelvic pathology. Computed tomography is superior diagnostic imaging modality than USG prior to treatment which improved detection and characterization of tumour due to better diagnostic accuracy and consequently reduction of

invasive procedure which lead to significant reduction of mortality and morbidity from tumour.

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Assessment of umbilical coiling index as a marker of perinatal outcome

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Abstract
The coiling of the umbilical vessels develops as early as 28 days after conception and is present in about 95% of fetuses by 9 weeks of conception. The helices may be seen by ultra sonob graphic examination as early as during the first trimester of pregnancy.
The study was planned in the Department of Gynecology and Department of Radiology in Katihar medical college and hospital. The data from the 50 patients were collected and presented as below. UCI was calculated by dividing total number of coils by the total length of the cord in centimeters.
The short umbilical coiling index is an marker of adverse perinatal outcome. It is related with low apgar score, meconium staining, and pregnancy induced hypertension. Consequently, antenatal detection of coiling index can identify fetus at risk.

Keywords: hypocoiling umbilical cord, hypercoiling umbilical cord, sonography, umbilical coiling index

Introduction
In placental mammals, the umbilical cord (also called the navel string [1]. birth cord or funiculus umbilicalis) is a conduit between the developing embryo or fetus and the placenta. During prenatal development, the umbilical cord is physiologically and genetically part of the fetus and, (in humans), normally contains two arteries (the umbilical arteries) and one vein (the umbilical vein), buried within Wharton's jelly. The umbilical vein supplies the fetus with oxygenated, nutrient-rich blood from the placenta. Conversely, the fetal heart pumps deoxygenated, nutrient-depleted blood through the umbilical arteries back to the placenta.
The umbilical cord enters the fetus via the abdomen, at the point which (after separation) will become the umbilicus (or navel). Within the fetus, the umbilical vein continues towards the transverse fissure of the liver, where it splits into two. One of these branches joins with the hepatic portal vein (connecting to its left branch), which carries blood into the liver. The second branch (known as the ductus venosus) bypasses the liver and flows into the inferior vena cava, which carries blood towards the heart. The two umbilical arteries branch from the internal iliac arteries, and pass on either side of the urinary bladder into the umbilical cord, completing the circuit back to the placenta [6].
A coil is defined as having completed a 360 spiral course of umbilical vessel around Wharton's jelly. Coiling property of umbilical cord was described by Berengarius in 1521 [1]. In 1954, umbilical coiling was first quantified by Edmonds who divided the total number of coils by umbilical cord length in centimetres and called it "Index of twist". He assigned positive and negative scores to clockwise and anticlockwise coiling, respectively [1, 3]. Later, Strong *et al* simplified it by eliminating three directional score and named it "The umbilical cord coiling index" [1, 4]. An abnormal umbilical cord coiling index includes both hypocoiled cords (cords with an umbilical cord coiling index which is < 10th percentile) and hypercoiled cords (cords with an umbilical cord coiling index which is > 90th percentile). An abnormal umbilical coiling index has been reported to be related to adverse perinatal outcomes [1, 2, 5].
The coiling of the umbilical vessels develops as early as 28 days after conception and is present in about 95% of fetuses by 9 weeks of conception. The helices may be seen by ultrasonographic examination as early as during the first trimester of pregnancy [2].
The spiral course of the umbilical vessels was first recorded by Berengarius in 1521. It was then confirmed by Columbus in 1559 and by Arantius in 1564. In 1600, Fabricius demonstrated that both right (dextral) and left (sinistral) helices of the umbilical cord exists [3]. If umbilical cord twists were to be determined randomly, one would expect both forms of twists to be equal in incidence. However, many investigators have found that majority of the cords have a left-sided twist [1, 2, 4].
The number of twists seen in first trimester is roughly the same as that seen in term cords. The total number of coils seen is between 0 and 40. Umbilical coiling appears to confer turgor to the umbilical unit, producing a cord that is strong, yet flexible. Since lengthening of the cord occurs from the fetal end, perhaps coiling of the cord represents a long-term record of fetal well-being [4].
A coil is of 360-degree spiral course of umbilical vessels. Umbilical cord index (UCI) is defined as the total number of coils divided by the total length of the cord in centimeters. A frequency distribution of umbilical cord index (UCI) was done by Rana *et al*. (1995) [5].

They grouped the UCI as follows:
<10th percentile—hypocoiled;
10th–90th percentile—normocoiled;
>90th percentile—hypercoiled.

There is no adequate data available on the UCI and its relationship with perinatal outcome in India. This study was undertaken to find outthe UCI in Indian babies.

Methodology

The study was planned in the Department of Gynecology and Department of Radiology in Katihar medical college and hospital. The data from the 50patients were collected and presented as below. The approval of the institutional ethic committee had been taken before the study. All the patients were informed consent. The aim and the objective of the study are conveyed to all patients. UCI was calculated by dividing total number of coils by the total length of the cord in centimeters.

Following is the inclusion and exclusion criteria of the present study.

Inclusion Criteria

- Women with term gestation irrespective of parity
- Singleton pregnancies
- Live baby
- Spontaneous onset of labour
- Women in active labour.
- Cephalic presentation

Exclusion Criteria

- Twin gestation
- Preterm delivery
- Intrauterine death

Result & Discussion

The data from the 50 patients were collected and presented as below. UCI was calculated by dividing total number of coils by the total length of the cord in centimeters.

Table 1: Type of UCI

Type of UCI	No. of cases
Hypocoiled	6
Normocoiled	39
Hypercoiled	5

Table 1: Umbilical coiling index and neonatal / perinatal outcome

Type of UCI	Hypocoiled	Normocoiled	Hypercoiled
No. of Cases	6	39	5
Pregnancy induced hypertension	2	5	1
Apgar < 7	2	5	0
Meconium present	4	15	1
Birth weight < 2500g	2	12	2
Intrauterine growth retardation	2	8	2
Gestational age <37weeks	1	9	1
Ponderal index (<2.5)	2	23	2

Table 2: Mean umbilical coiling index and perinatal factors

Perinatal factors	Number
Gestation age	
<37wks	10
≥37 wks	40
Sex	
Female	29
Male	21
Direction	
Anticlockwise	42
Clockwise	8
Pregnancy induced hypertension	
Absent	45
Present	5
Apgar	
<7	6
≥7	44
Intrauterine growth retardation	
Absent	41
Present	9

The umbilical cord and its vital blood vessels are the most vulnerable part of the fetal anatomy. The total number of coils for any particular cord is believed to be established early in the gestation [6, 7]. The pattern of coiling develops during the second and third trimesters, presumably due to snarls in the cord, and this coiling changes as the pregnancy advances. Despite the belief that umbilical vascular coiling occurs early in gestation, it is not yet known whether this coiling is a genetic or acquired event. Several theories have been proposed to explain the umbilical cord twist including those that interpret the twist as inherent to the cord itself, and those that explain the twist as a result of active or passive rotation of the fetus. Regardless of its origin, umbilical coiling appears to confer turgor to the umbilical unit, producing a cord that is strong but flexible [8]. In consideration of the abnormal versus normal coiling distribution in our study, we observed that 10th and 90thpercentiles for UCI were in agreement with the previous studies [7, 9].

Our study highlights that lower UCI in new borns is associated with PIH in mother, meconium staining, and low apgar score. The vessels of the cord like all hollow cylinders are prone totorsion, compression, tension, and subsequent interruption of the blood flow. This risk is minimiszed by their elicaldis position. The coiled umbilical cord, perhaps because ofits elastic properties, is able to resist external forces that might compromise the umbilical vascular flow. The coiled umbilical cord acts like a semierectile organ that is more resistant to snarling torsion, stretch, and compression than non coiled one. This is referred to as "spontaneous internal ballottement" and likened to the action of a concertina [7].Workers found higher incidence of operative intervention for fetal distress [8], preterm delivery, growth retardation, oligohydramnios, operative delivery and meconium staining [10], fetal heart rate distrubances, and low cord pH [11] among fetuses with hypocoiled cords. These findings are in agreement with the present study. A recently published study showed no statistical difference for apgar score at 1 and at 5minutes, higher prevalence of interventional deliveries, and the meconium stained amniotic fluid in labor between the

groups with normal and abnormal coiling [12].

Conclusion

The short umbilical coiling index is an marker of adverse perinatal outcome. It is related with low apgar score, meconium staining, and pregnancy induced hypertension. Consequently, antenatal detection of coiling index can identify fetus at risk.

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Assessment of suspicious ovarian masses by using USG & CT

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Abstract
The aim of this study is to compare the diagnostic value of trans abdominal ultrasonography (TAUS) and computed tomography (CT) in evaluation of suspicious ovarian masses whether being malignant or not former to surgical intervention This will help to a greater degree, in choice of type of surgery either conservative or radical.
The study was planned in the Department of Gynecology and Department of Radiology in Katihar medical college and Hospitals. The data from the 100patients were collected and presented as below. All patients underwent abdominal Ultrasonography and CT scan with determination of the ovarian mass characteristics.
In our study there were significant differences in the two methods i.e USG & CT. CT is showing more advantages regarding tumor localization, characterization. Hence CT can be advised if the unusual abnormalities were observed in routine USG scan inthe diagnosis of ovarian masses.

Keywords: ultrasound, CT scan, ovarian tumors etc.

Introduction
In ovarian cyst is a fluid-filled sac within the ovary. Often they cause no symptoms. Occasionally they may produce bloating, lower abdominal pain, or lower back pain. The majority of cysts are harmless. If the cyst either breaks open or causes twisting of the ovary, it may cause severe pain. This may result in vomiting or feeling faint. Most ovarian cysts are related to ovulation, being either follicular cysts or corpus luteum cysts. Other types include cysts due to endometriosis, dermoid cysts, and cystadenomas. Many small cysts occur in both ovaries in polycystic ovarian syndrome. Pelvic inflammatory disease may also result in cysts. Rarely, cysts may be a form of ovarian cancer. Diagnosis is undertaken by pelvic examination with an ultrasound or other testing used to gather further details [1].
Often, cysts are simply observed over time. If they cause pain, medications such as paracetamol (acetaminophen) or ibuprofen may be used. Hormonal birth control may be used to prevent further cysts in those who are frequently affected. However, evidence does not support birth control as a treatment of current cysts [2]. If they do not go away after several months, get larger, look unusual, or cause pain, they may be removed by surgery [1].
Most women of reproductive age develop small cysts each month. Large cysts that cause problems occur in about 8% of women before menopause [1]. Ovarian cysts are present in about 16% of women after menopause and if present are more likely to be cancer [1, 3].
Some or all of the following symptoms may be present, though it is possible not to experience any symptoms [4]:

- Abdominal pain. Dull aching pain within the abdomen or pelvis, especially during intercourse.
- Uterine bleeding. Pain during or shortly after beginning or end of menstrual period; irregular periods, or abnormal uterine bleeding or spotting.
- Fullness, heaviness, pressure, swelling, or bloating in the abdomen.
- When a cyst ruptures from the ovary, there may be sudden and sharp pain in the lower abdomen on one side.
- Change in frequency or ease of urination (such as inability to fully empty the bladder), or difficulty with bowel movements due to pressure on adjacent pelvic anatomy.
- Constitutional symptoms such as fatigue, headaches
- Nausea or vomiting
- Weight gain

Ovarian cysts are usually diagnosed by ultrasound, CT scan, or MRI, and correlated with clinical presentation and endocrinologic tests as appropriate.
Follow-up imaging in women of reproductive age for incidentally discovered simple cysts on ultrasound is not needed until 5 cm, as these are usually normal ovarian follicles. Simple cysts 5 to 7 cm in premenopausal females should be followed yearly. Simple cysts larger than 7 cm require further imaging with MRI or surgical assessment. Because they are large, they cannot be reliably assessed by ultrasound alone because it may be difficult to see the soft tissue nodularity or thickened septation at their posterior wall due to limited penetrance of the ultrasound beam. For the corpus luteum, a dominant ovulating follicle that typically appears as a cyst with circumferentially thickened walls and crenulated inner margins, follow up is not needed if the cyst is less than 3 cm in diameter. In postmenopausal patients, any simple cyst greater than 1 cm but less than 7 cm needs yearly follow-up, while those greater than 7 cm need MRI or surgical

evaluation, similar to reproductive age females [5].

An Axial CT demonstrating a large hemorrhagic ovarian cyst. The cyst is delineated by the yellow bars with blood seen anteriorly.

For incidentally discovered dermoids, diagnosed on ultrasound by their pathognomonic echogenic fat, either surgical removal or yearly follow up is indicated, regardless of patient age. For peritoneal inclusion cysts, which have a crumpled tissue-paper appearance and tend to follow the contour of adjacent organs, follow up is based on clinical history. Hydrosalpinx, or fallopian tube dilation, can be mistaken for an ovarian cyst due to its anechoic appearance. Follow-up for this is also based on clinical presentation. For multiloculate cysts with thin septation less than 3 mm, surgical evaluation is recommended. The presence of multiloculation suggests a neoplasm, although the thin septation implies that the neoplasm is benign. For any thickened septation, nodularity, or vascular flow on color doppler assessment, surgical removal should be considered due to concern for malignancy [5].

The aim of this study is to compare the diagnostic value of trans abdominal ultrasonography (TAUS) and computed tomography (CT) in evaluation of suspicious ovarian masses whether being malignant or not former to surgical intervention. This will help to a greater degree, in choice of type of surgery either conservative or radical.

Methodology

The study was planned in the Department of Gynecology and Department of Radiology in Katihar medical college and Hospitals. The data from the 100patients were collected and presented as below. The approval of the institutional ethic committee had been taken before the study. All the patients were informed consent. The aim and the objective of the study are conveyed to all patients. All patients underwent abdominal Ultrasonography and CT scan with determination of the ovarian mass characteristics.

Inclusion Criteria: Patients presented with suspicious ovarian masses detected clinically or by ultrasound examination. Patients with ovarian masses and scheduled for surgery.

Exclusion Criteria: patients with ovarian masses managed conservatively were excluded.

Complete history of all ergywas taken before doing CT scan and if there washistory of allergy then non-ionic contrast was used.

Result & Discussion

The data from the 100 patients reported to the hospital were collected and presented as below. The table 1 shows the Benign and Malignant Masses on Histopathology in Pre & Post-menopausal patients.

Table 1: Type of Masses

	Pre-menopausal	Post-menopausal
Malignant	15	28
Benign	42	15
Total	67	43

There are total 67 cases of Pre-menopausal stage and 43 cases of Post-menopausal stage having ovarian cyst. Out of 67 cases of Pre-menopausal conditions have 15 number of malignant and 42 number of benign type of ovarian mass. In the Post-menopausal group there are 28 cases of malignant and 15 cases of benign ovarian mass was observed.

Table 2: Test performance characteristics of USG & CT

	USG Study (No. of Cases)		CT Study (No. of Cases)	
	Benign	Malignant	Benign	Malignant
Sensitivity	86	62	97	84
Specificity	62	89	92	89
Positive Predictive Value	87	61	96	76
Negative Predictive value	62	85	93	95

From the above data it can be seen that CT is showing more sensitivity for the detection of the abnormal ovarian mass in the present population. Ovarian tumours present a greatest clinical challenge of all gynecological cancers and ovarian. Carcinoma is the second most common gynaecological carcinoma in incidence. As most of them present in a late stage, clinical diagnosis alone is difficult and as benign ovarian tumours greatly outnumber malignant ones, determination of a degree of suspicion for malignant is critical and is based largely on imaging modalities. The determination of a degree of suspicion for malignancy in an ovarian mass is the most significant step in its management as the decision to perform radical surgery or conservative surgery depends on accurate pre-operative diagnosis [6].Clinical evaluation with regards to site (unilateral or bilateral), fixity, consistency, presence of nodules in Douglas pouch and presence of as cites increase the suspicious of malignancy to certain extent but if combined with other tools as tumor markers and two dimensional ultrasounds, the sensitivity for malignancy increases [6,7]. Among women with ovarian disorders, CT has been used primarily in patients with ovarian malignancies, either to assess disease extent prior to surgery or as a substitute for second look laparotomy. CT is preferred for identification of peritoneal implants, lymphadenopathy and extent of the disease. However, studies failed to demonstrate that CT is significantly superior to other modalities in characterization of ovarian cancer [8]. And moreover, simple ovarian cysts are better evaluated by ultrasound. Jeong *et al*. showed that morphological characteristics associated with strong probability of malignancy were the presence of solid component (63%), papillary projection (92%), and free fluid in peritoneal cavity (56%) [9]. Onyka *et al*. found the sensitivity of CT scan for all ovarian cancer detection greater than that of US 83% vs. 67%, but US was more specific. He

found both the methods were equally efficacious in detecting and staging advanced ovarian cancer cases [10].

Conclusion

In our study there were significant differences in the two methods i.e USG & CT. CT is showing more advantages regarding tumor localization, characterization. Hence CT can be advised if the unusual abnormalities were observed in routine USG scan in the diagnosis of ovarian masses.

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STUDY OF CONGENITAL FETAL ANOMALIES WITH THE HELP OF SONOGRAPHIC EVALUATION

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Abstract:

Information regarding specific anatomic anomalies affords the physician the opportunity to offer the patient sophisticated prenatal procedures, such as fetal surgery or selective fetal reduction in multiple gestations. Likewise, prenatal knowledge about genetic, physiologic, and/or anatomic abnormalities enables the physician to tailor or manage the timing and mode of delivery for optimal maternal and fetal outcomes. Prenatal diagnosis also allows the neonatal and paediatric specialists to be adequately prepared for a potentially ill neonate at delivery. Recent progress in the fields of maternal fetal medicine, radiology, and genetics has resulted in great advances in prenatal diagnosis. Ultrasonography is the initial modality for evaluation of pregnant patient because of its widespread availability and reasonable cost, with other modalities used only if Ultrasonography results are non diagnostic. Hence based on above data the present study was planned Study of Congenital Fetal anomalies with the Help of Sonographic Evaluation.

The present study was planned in Department of Radio- Diagnosis, Katihar Medical College and Hospital, Katihar, Bihar, India. All pregnant females of second trimester who are referred from obstetrics and gynaecology department and thus sent to department of Radio diagnosis for antenatal Sonographic examination. A complete antenatal ultrasound examination of pregnant women included in the study will be done using gray scale & colour duplex examination.

Obstetric ultrasonography has become an important part of routine antenatal care. Routine anomaly screening improves perinatal outcome directly through termination of pregnancy for certain anomalies. Congenital fetal anomalies are one of the most threatening complications which are prevalent in the society associated with severe morbidity and mortality in the new born fetus or neonates. Ultrasound is the best possible non-invasive technique available to detect any congenital anomalies in pregnant women which will help to identify the severity of the disease, its outcome leading to pregnancy termination or gives an opportunity for fetal therapy or better neonatal care.

Keywords: Congenital Fetal anomalies, Sonography, etc.

Introduction

A birth defect, also known as a congenital disorder, is a condition present at birth regardless of its cause. Birth defects may result in disabilities that may be physical, intellectual, or developmental. The disabilities can range from mild to severe. Birth defects are divided into two main types: structural disorders in which problems are seen with the shape of a body part and functional disorders in which problems exist with how a body part works.[4] Functional disorders include metabolic and degenerative disorders. Some birth defects include both structural and functional disorders.[1]

Birth defects may result from genetic or chromosomal disorders, exposure to certain medications or chemicals, or certain infections during pregnancy. Risk factors include folate deficiency, drinking alcohol or smoking during pregnancy, poorly controlled diabetes, and a mother over the age of 35 years old. Many are believed to involve multiple factors. Birth defects may be visible at birth or diagnosed by screening tests. A number of defects can be detected before birth by different prenatal tests.[2]

Treatment varies depending on the defect in question. This may include therapy, medication, surgery, or assistive technology. Birth defects affected about 96 million people as of 2015. In the

United States, they occur in about 3% of newborns. They resulted in about 628,000 deaths in 2015, down from 751,000 in 1990. The types with the greatest numbers of deaths are congenital heart disease (303,000), followed by neural tube defects (65,000).[3]

A congenital physical anomaly is an abnormality of the structure of a body part. It may or may not be perceived as a problem condition. Many, if not most, people have one or more minor physical anomalies if examined carefully. Examples of minor anomalies can include curvature of the fifth finger (clinodactyly), a third nipple, tiny indentations of the skin near the ears (preauricular pits), shortness of the fourth metacarpal or metatarsal bones, or dimples over the lower spine (sacral dimples). Some minor anomalies may be clues to more significant internal abnormalities.

Birth defect is a widely used term for a congenital malformation, i.e. a congenital, physical anomaly that is recognizable at birth, and which is significant enough to be considered a problem. According to the Centers for Disease Control and Prevention(CDC), most birth defects are believed to be caused by a complex mix of factors including genetics, environment, and behaviors, though many birth defects have no known cause. An example of a birth defect is cleft palate, which occurs during the fourth through seventh weeks of gestation. Body tissue and special cells from each side of the head grow toward the center of the face. They join together to make the face. A cleft means a split or separation; the "roof" of the mouth is called the palate.[4]

A congenital malformation is a physical anomaly that is deleterious, i.e. a structural defect perceived as a problem. A typical combination of malformations affecting more than one body part is referred to as a malformation syndrome. Some conditions are due to abnormal tissue development: A malformation is associated with a disorder of tissue development. Malformations often occur in the first trimester. A dysplasia is a disorder at the organ level that is due to problems with tissue development.[5]

Conditions also can arise after tissue is formed: A deformation is a condition arising from mechanical stress to normal tissue. Deformations often occur in the second or third trimester, and can be due to oligohydramnios. A disruption involves breakdown of normal tissues.[5] When multiple effects occur in a specified order, they are known as a sequence. When the order is not known, it is a syndrome.

A limb anomaly is called a dysmelia. These include all forms of limbs anomalies, such as amelia, ectrodactyly, phocomelia, polymelia, polydactyly, syndactyly, polysyndactyly, oligodactyly, brachydactyly, achondroplasia, congenital aplasia or hypoplasia, amniotic band syndrome, and cleidocranial dysostosis. Congenital heart defects include patent ductus arteriosus, atrial septal defect, ventricular septal defect, and tetralogy of Fallot.

Congenital anomalies of the nervous system include neural tube defects such as spina bifida, encephalocele, and anencephaly. Other congenital anomalies of the nervous system include the Arnold-Chiari malformation, the Dandy-Walker malformation, hydrocephalus, microencephaly, megalencephaly, lissencephaly, polymicrogyria, holoprosencephaly, and agenesis of the corpus callosum. Congenital anomalies of the gastrointestinal system include numerous forms of stenosis and atresia, and perforation, such as gastroschisis. Congenital anomalies of the kidney and urinary tract include renal parenchyma, kidneys, and urinary collecting system.[6] Defects can be bilateral or unilateral, and different defects often coexist in an individual child.

The mother's consumption of alcohol during pregnancy can cause a continuum of various permanent birth defects: cranofacial abnormalities, brain damage, intellectual disability, heart disease, kidney abnormality, skeletal anomalies, ocular abnormalities. The prevalence of children affected is estimated at least 1% in U.S. as well in Canada. Very few studies have investigated the links between paternal alcohol use and offspring health. However, recent animal research has shown a correlation between paternal alcohol exposure and decreased offspring birth weight. Behavioral and cognitive disorders, including difficulties with learning and memory, hyperactivity, and lowered stress tolerance have been linked to paternal alcohol ingestion. The compromised stress management skills of animals whose male parent was exposed to alcohol are similar to the exaggerated responses to stress that children with fetal alcohol syndrome display because of maternal alcohol use. These birth defects and behavioural disorders were found in cases of both long- and short-term paternal alcohol ingestion. In the same animal study, paternal alcohol exposure

was correlated with a significant difference in organ size and the increased risk of the offspring displaying ventricular septal defects at birth.[7]

Substances whose toxicity can cause congenital disorders are called teratogens, and include certain pharmaceutical and recreational drugs in pregnancy, as well as many environmental toxins in pregnancy. A review published in 2010 identified six main teratogenic mechanisms associated with medication use: folate antagonism, neural crest cell disruption, endocrine disruption, oxidative stress, vascular disruption, and specific receptor- or enzyme-mediated teratogenesis.[8]

An estimated 10% of all birth defects are caused by prenatal exposure to a teratogenic agent. These exposures include medication or drug exposures, maternal infections and diseases, and environmental and occupational exposures. Paternal smoking use has also been linked to an increased risk of birth defects and childhood cancer for the offspring, where the paternal germline undergoes oxidative damage due to cigarette use. Teratogen-caused birth defects are potentially preventable. Nearly 50% of pregnant women have been exposed to at least one medication during gestation. During pregnancy, a woman can also be exposed to teratogens from the contaminated clothing or toxins within the seminal fluid of a partner. An additional study found that of 200 individuals referred for genetic counseling for a teratogenic exposure, 52% were exposed to more than one potential teratogen.[9]

A low socioeconomic status in a deprived neighborhood may include exposure to "environmental stressors and risk factors". Socioeconomic inequalities are commonly measured by the Cartairs-Morris score, Index of Multiple Deprivation, Townsend deprivation index, and the Jarman score. The Jarman score, for example, considers "unemployment, overcrowding, single parents, under-fives, elderly living alone, ethnicity, low social class and residential mobility". In Vos' meta-analysis these indices are used to view the effect of low SES neighbourhoods on maternal health. In the meta-analysis, data from individual studies were collected from 1985 up until 2008. Vos concludes that a correlation exists between prenatal adversities and deprived neighbourhoods. Other studies have shown that low SES is closely associated with the development of the fetus in utero and growth retardation. Studies also suggest that children born in low SES families are "likely to be born prematurely, at low birth weight, or with asphyxia, a birth defect, a disability, fetal alcohol syndrome, or AIDS".[63] Bradley and Corwyn also suggest that congenital disorders arise from the mother's lack of nutrition, a poor lifestyle, maternal substance abuse and "living in a neighborhood that contains hazards affecting fetal development (toxic waste dumps)". In a meta-analysis that viewed how inequalities influenced maternal health, it was suggested that deprived neighborhoods often promoted behaviors such as smoking, drug and alcohol use. After controlling for socioeconomic factors and ethnicity, several individual studies demonstrated an association with outcomes such as perinatal mortality and preterm birth.[10]

Prenatal diagnosis has revolutionized prenatal care from the perspective of both the patient and the physician. For the patient, prenatal diagnosis provides genetic, anatomic, and physiologic information about the fetus or fetuses that can be used to make informed and individualized decisions regarding the pregnancy. For the physician, prenatal diagnosis provides vital information that can be utilized for better antepartum management. Information regarding specific anatomic anomalies affords the physician the opportunity to offer the patient sophisticated prenatal procedures, such as fetal surgery or selective fetal reduction in multiple gestations. Likewise, prenatal knowledge about genetic, physiologic, and/or anatomic abnormalities enables the physician to tailor or manage the timing and mode of delivery for optimal maternal and fetal outcomes. Prenatal diagnosis also allows the neonatal and paediatric specialists to be adequately prepared for a potentially ill neonate at delivery. Recent progress in the fields of maternal fetal medicine, radiology, and genetics has resulted in great advances in prenatal diagnosis. Ultrasonography is the initial modality for evaluation of pregnant patient because of its widespread availability and reasonable cost, with other modalities used only if Ultrasonography results are nondiagnostic. Hence based on above data the present study was planned Study of Congenital Fetal anomalies with the Help of Sonographic Evaluation.

Methodology:

The present study was planned in Department of Radio- Diagnosis, Katihar Medical College and Hospital, Katihar, Bihar, India. All pregnant females of

second trimester who are referred from obstetrics and gynaecology department and thus sent to department of Radio diagnosis for antenatal sonographic examination. A complete antenatal ultrasound examination of pregnant women included in the study will be done using gray scale & colour duplex examination.

A complete second trimester antenatal ultrasound examination of pregnant women was done using gray scale & color duplex examination on PHILIPS HD7 machine with a transducer of frequency 3.5 to 5 MHZ. The information about the gestational age, location of placenta, fetal biometry & fetal anomalies was collected. The scans were performed as a standard level one ultrasonography. In casesof uncertain abnormal findings, the women were reviewed by a level two scan with repeated scans. This data was compared with the findings at delivery / termination of pregnancy & appropriate statistical analysis was performed.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: All pregnant women coming for antenatal sonographic examination during the second trimester at Department of Radio diagnosis.

Exclusion Criteria: Females with Multiple gestations.

Results & Discussion:

The recent development of high-resolution ultrasound equipment has markedly improved the diagnostic accuracy of ultrasound. In particular, the introduction of high-frequency vaginal probes has enabled early diagnosis of certain fetal abnormalities from the 12th to 14th week of pregnancy. Such early testing is of special importance for women with a history of pregnancies associated with birth defects.

The study would determine the sensitivity and specificity of ultrasound modality in evaluating congenital fetal anomalies. Many modalities are available to detect congenital anomalies at an early stage like laboratory & imaging studies, out of which sonography has emerged as the investigation of choice. Ultrasound is non-invasive and safe and hence can be used repeatedly. It is quick, inexpensive, and sensitive causing no discomfort to the patient at any time of gestation. Fetal anomaly scan is usually carried out at second trimester of pregnancy.

Table 1: Age of Pregnant Females

Age	No. of Cases	Number of anomalies detected by ultrasound
Below 20 years	30	0
21 – 25 years	225	8
26 – 30 years	128	5
31 – 40 years	117	1
Total Cases	500	14

Table 2: Type of Anomalies

Organ system	**Number of anomalies detected by ultrasound**
CNS	4
Genitourinary	3
Gastrointestinal	2
Cardiovascular	2
Musculoskeletal	1
Craniofacial	1
Others	1
Total Cases	**14**

Women who delay child bearing are at an increased risk of having an adverse outcome of pregnancy. [11] Increasing maternal age is independently linked with definite adverse pregnancy as well as fetal abnormalities and multiple gestation. [12] Bobrowski R et al have statistically shown that mothers between 25 to 30 years of age stand at a higher risk of producing malformed babies. [13] Sugunabai [14] reported a higher incidence of malformation in babies born to mothers aged over 35 years, whereas Datta et al [15] documented statistically insignificant association of increased maternal age and congenital anomalies.

A study conducted by Trish Chudleigh [16] from Rosie Ultrasound Department, Cambridge University Hospitals NHS Foundation Trust stated that Ultrasound screening for fetal abnormalities has been available to pregnant women in England for over two decades. The Department of Health commissioned the Fetal Anomaly Screening Programme to develop and extend the second trimester anomaly scan to ensure an effective and accessible service for all pregnant women in England.

Muhammad Nafees, Muhammad Hamid Akram, Makki Muhammad Afridi and Aqsa Javed have conducted an ultrasonographic study on 200 patients

out of which 134 had different congenital anomalies. [17] The most common congenital anomalies detected were from central nervous system with relatively more prevalent in cousin marriages.

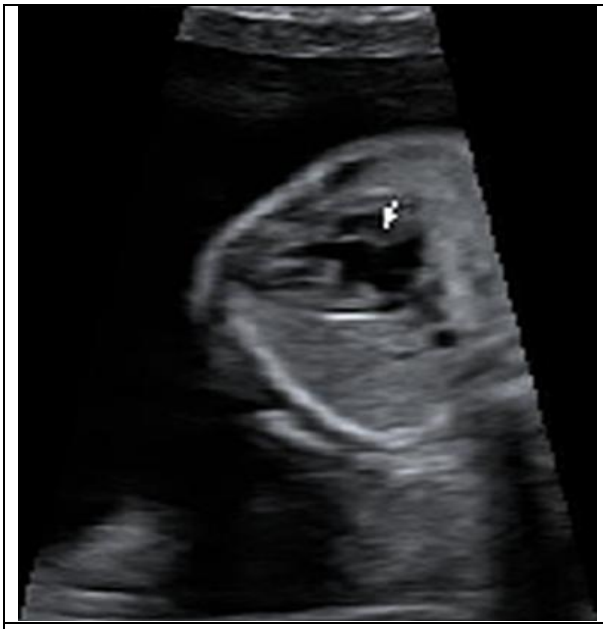

Figure 1: Sonographic imaging demonstrates atrio-ventricular septal defect

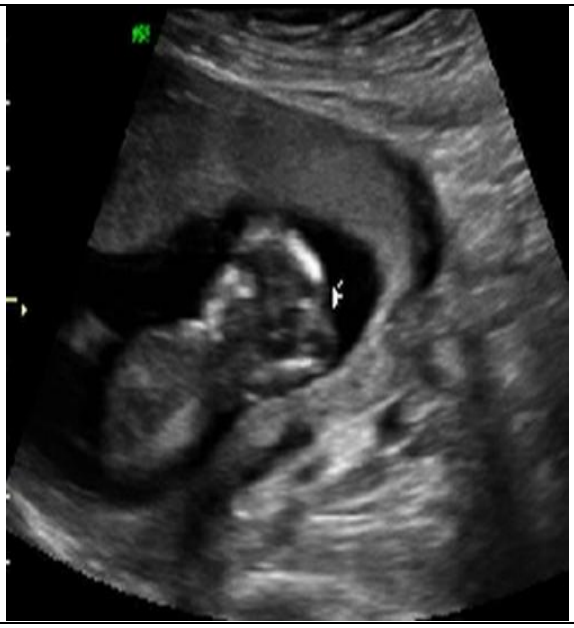

Figure 2: Image demonstrates protrusion over occipital region of fetal head

According to Sarah A. Waller, Theodore J. Dubinsky and Manjiri Dighe [18] Ultrasonography provides patients with an excellent means of screening for anomalies, and the use of soft markers has individualized each patient's decision to pursue diagnostic testing.

A study conducted by Grandjean H et al, on the purpose of the Eurofetus study was to evaluate the accuracy of the antenatal detection of malformations by routine ultrasonography in unselected populations concluded that systemic ultrasonographic screening during pregnancy can now detect a large population of fetal malformations. [19]

A report published in 'The society of Obstetricians and Gynaecologists of Canada' by Yvonne Cargill and Lucie Morin was done to review the benefits and requirements for a complete second trimester ultrasound and the documentation needed. The outcome of the report was that a complete second trimester ultrasound provides information about the number of fetuses, the gestational age, the location of the placenta, and fetal and maternal anatomy. [20]

The benefits of scanning in early pregnancy are therefore divided into several levels: first, earlier diagnosis of normal and abnormal intrauterine pregnancy and the detection of ectopic pregnancy; second, more accurate dating of early pregnancies on the basis of the measurement of the gestational sac and the crown-rump length; third, measuring the nuchal translucency (NT) at 12 to 14 gestational week as a marker for chromosomal abnormalities (mainly Down syndrome) and certain organ anomalies (mainly in the cardiovascular system); fourth and perhaps most importantly, the ability to detect structural anomalies during the first and early second trimester of pregnancy. [21]

Early diagnosis of presence or absence of congenital anomalies is beneficial to mother, both physically and psychologically. A negative sonogram is certainly reassuring particularly for the couples with an increased risk of fetal anomalies. This reassurance was particularly seen in parents with previous congenital anomalies, where normal early scan reduced the anxiety levels to a great extent. On the other hand, anticipation of a positive diagnosis may be valuable in itself. Earlier detection of fetal structural malformations would allow for earlier antenatal referral to a tertiary care facility and coordination of care among appropriate subspecialists. [22] Parents are mentally prepared for these anomalies and a better co-ordination with specific sub-specialties can be assured to the baby.

Conclusion:

Obstetric ultrasonography has become an important part of routine antenatal care. Routine anomaly screening improves perinatal outcome directly through termination of pregnancy for certain anomalies. Congenital fetal anomalies are one of the most threatening complications which are prevalent in the society associated with severe morbidity and mortality in the new born fetus or neonates. Ultrasound is the best possible non-invasive technique available to detect any congenital anomalies in pregnant women which will help to identify the severity of the disease, its outcome leading to pregnancy termination or gives an opportunity for fetal therapy or better neonatal care.

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