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Role of Imaging in Evaluation of Adult Patient's of Acute Pancreatitis

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Abstract: ***Acute Pancreatitis is one of the acute abdomen conditions that presents to the hospital in which rapid assessment of its severity and complications becomes necessary to avoid potential morbidity and mortality. Plain Radiography and Barium Studies though can be done are not of much help. USG being the first radiological investigation of choice to evaluate extent of organ involvement and fluid collection. CT helps in confirming the diagnosis, assessing the severity, complication and response to treatment. MRI can delineate pancreatic duct integrity, bile duct lithiasis and pancreatic haemorrhage. This study done to evaluate role of imaging in evaluation of acute Pancreatitis mainly in adult Patients. Aim of the study was to determine the role of USG, CT and MRI for evaluating extent of disease Process and its complication. Methods: This study was done in Department of Radiology Lokmanya Tilak Medical College and Lokmanya Tilak Municipal General Hospital Sion Mumbai India Over a period of 3 years May 2016 to May 2019. Each patient was studied with detailed clinical history and Biochemical results. Conclusion: we found out that USG being initial modality , both CT and MRI has equal accuracy with there own pros and cons.***

Keywords: Pancreatitis, USG, CT scan, MRI, Pseudocyst

1. Introduction

Pancreas is a soft, lobulated and elongated organ. It lies more or less transversely over the posterior abdominal wall, at the level of vertebrae L1 and L2 crossing the midline. The entire organ lies posterior to the stomach, separated from it by the lesser sac. It lies anterior to the inferior vena cava, aorta, splenic vein and left adrenal gland. The Pancreas is divided (from right to left) into the head/uncinate process, the neck, the body and tail [1],[2].

Acute Pancreatitis is one of the acute abdomen conditions that presents to the hospital in which patients condition deteriorates rapidly in certain cases while being mild and self-limiting in others. Rapid assessment of its severity and complications becomes necessary to avoid potential morbidity and mortality. With clinical diagnosis not being 100% sure its diagnosis relies on laboratory investigations and multimodality radiological imaging.

X-Rays are not a good modality used to image Pancreas. A technique to image the organ by injection of Hypaque have failed to obtain a sufficient degree of opacification of the gland to obtain clinical usefulness [3].

USG is used in assessment of pancreas and peripancreatic structures. USG is getting important role for pancreatic pathology as its non-invasiveness and continuing improvements in imaging quality. Ultrasound imaging can also rule out other causes of the acute abdomen. With increasing operator experience and advances in technology USG is able to evaluate acute pancreatitis in majority of cases [4].

Conventional CT scanners were first introduced in the 1970's which had 10 mm slice thickness and disadvantage of motion artifact. Helical (spiral) CT scanner was introduced later in 1980's, with slice thickness of 1-2mm. Its advantages were spatial resolution and ability to get Dual-Phase Helical CT. MDCT (Multi detector CT) was introduced late 1990's, which used multiple detector rows and were faster with slice thickness of 0.5 mm and improved spatial resolution and 3D reformatting to delineate anatomy clearly and in detail. It permits arterial, pancreatic and portal venous phase and iodinated medium are used as contrast agents [5].

Although CT remains the most effective imaging modality for evaluation of the pancreas, Magnetic resonance imaging (MRI) is increasingly used for further identification and characterization of pancreatic pathology. Modern technique in MRI, such as use of phased-array coils, allowing improved spatial resolution and faster T1- and T2-weighted sequences for imaging the entire upper abdomen in a single breathhold and providing cross-sectional images of pancreatic parenchyma analogous to CT images. The use of fat saturation pulses and dynamic studies following gadolinium injection increases the sensitivity of MR in detecting pancreatic pathology. MR angiography (MRA) is useful in noninvasive evaluation of splanchnic blood vessels. Half-Fourier T2-weighted pulse sequences for magnetic resonance cholangiopancreaticography (MRCP) allow pancreatic duct and side branch delineation [5].

2. Literature Survey

Rehan A et al done the Cross-sectional study of 120 patients of either gender aged 20-60 years. Study showed Mean age of the patients was 39.03 ±8.71 years. Most of the patients were females 73 (60.8%). Out of 120 patients, 43 (35.83%) patients had severe acute pancreatitis. Sensitivity, specificity, positive predictive value and negative predictive value of modified CT severity index in assessing the severe acute pancreatitis were 100%, 87%, 81.13% and 100%, respectively[6].

Ishihara T et al, observed that In severe acute pancreatitis, dynamic CT is essential to assess the severity of the disease

and evaluate the complications. MRI is comparable to CT in its capacity to provide precise information about the severity of acute pancreatitis. MRI has some advantages over CT in being free from ionizing radiation and lower toxicity of gadolinium which is used for contrast medium intravenously. The disadvantages of MRI, however, include cost, longer exam duration, limited availability and the practical difficulties of scanning a patient with ICU equipment[7].

Current study was done to compare the role of imaging modality in diagnosing the acute pancreatitis mainly in the adult patients.

3. Methods

Study was done in Depatment of Radiodiagnosis Lokmanya Tilak Medical College and General Hospital Sion Mumbai in the 3 yr Span from 2016 to 2019 with Due Permission from the institutional review board, human ethics committee, Sion, Maharashtra, India

Patients with relevant clinical features and laboratory parameters were taken in Study and subjected to imaging modalities like USG, CT and MRI after taking valid consent form.

Equipment Used:-
1) USG- SSA-6608 Xario Toshiba.
2) CT Philips 64 slice scanner.
3) Philips Achieva 3.0T MRI scanner.

Inclusion Criteria:
- Adult patients mainly age greater than 18 yrs with clinical suspicion of acute pancreatitis.
- Patients who are willing to undergo USG abdomen, CT abdomen and pelvis and MRI abdomen.

Exclusion Criteria
- Patients of chronic pancreatitis.
- Patients not consenting for the study
- Pregnancy.
- Children.
- Patients with known h/o contrast allergy.
- Patients with raised renal function test values.
- Patients with cardiac pacemaker, cochlear implants, orbital foreign body.
- Prosthesis.
- Artificial or prosthetic limb.
- Claustrophobia

Statiscal Analysis:-
Statistical Analysis was carried out after collecting all required data and using proper statistical methods.

4. Results and Discussion

Study was done in Department of Radiodiagnosis Lokmanya Tilak Medical College and General Hospital Sion Mumbai in the 3 yr Span from 2016 to 2019 with Due Permission from the institutional review board, human ethics committee, Sion, Maharashtra, India
Patients with relevant clinical features and laboratory parameters were taken in Study and subjected to imaging modalities like USG, CT and MRI after taking valid consent form. Total of 100 patients were examined and comparison done between all three modalities. Observations of study are as follows

Table 1: Demographic Profile

Age Group	11-20 (>18 yr)	21-30	31-40	41-50	51-60	>60
Per %	11	21	19	31	13	5

In the current study incidence of the pancreatitis is seen in 18 yrs to above 63 yr with mean age of acute pancreatitis 38.9 yrs Std deviation being 12.9, maximum patients are seen in 41-50 yrs age group contributing nearly 31% to study group, near about similar contribution was observed from 21-30 and 31-40 yrs age group 21 % and 19 % respectively. Over all 70 % of patient were male and 30 % female.

Symptomatology of Acute Pancreatitis
All the patients in the study group were presented with pain in abdomen so the frequency of the pain in abdomen in study is 100 %, next common symptom was seen to be vomiting which was present in 65 % of the patient, third common symptom observed was fever seen in 54 % of patient, patient of acute pancreatitis uncommonly can also present with weight loss seen only in 12 % of patients.

Table 2: Etiology of Acute Pancreatitis

Etiology	Gall bladder stone	Alcohol	Similar episodes in past	Others (Autoimmune, traumatic)
Per %	45	34	12	9

In study it was observed that most common etiological factor associated with acute pancreatitis was gall bladder stone which was contributing about 45 % , second most common etiological factor associated with acute pancreatitis was alcohol , 34 % cases were associated with history of alcohol consumption. In about 9 % cases causes were like autoimmune pancreatitis, trauma etc. Smoking was a risk factor observed in 25 % of study population.

Table 3: Association of Acute Pancreatitis with Laboratory Parameters

Lab Parameters	Serum Amylase	Serum Lipase	TLC
Raised	49	34	51
Normal	51	66	49

Pancreatitis is an inflammatory pathology, different inflammatory parameters are raised in acute pancreatitis. Sr amylase was seen raised in about 49 % of patients, lipase seen raised in about 34 % of patient . Combined Sr Amylase and lipase were raised in about 83% cases of study subjects. As the fever is one of the common symptom in acute pancreatitis TLC was seen raised in about 51 % patients of acute pancreatitis.

Table 4: USG diagnosis of Cases

Acute Edematous Pancreatitis	Acute Pancreatitis with Peripancreatic fluid collection	Acute Pancreatitis with Pseudocyst	Normal	Obscured	Intraparenchymal Necrosis
30	12	13	20	23	02

Out off hundred cases ultrasonography successfully diagnosed 57 cases, in about 23 cases pancreas were not visualized due to bowel gases or obesity, 20 % cases were given normal report , 2 % had other findings , most common type of pancreatitis observed was acute edematous interstitial pancreatitis constituting about 30 % cases , acute pancreatitis with Pseudocyst and peripancreatic fluid collection together constitutes about 23 % of cases.

USG Characteristics of Acute Pancreatitis

On USG evaluation of acute pancreatitis, pancreas were visualized in about 73 cases, size of pancreas was seen to be increased in about 53 cases, echogenicity was changed in 57 cases.

Table 5

USG Chracteristics	*No. of Cases*
Increased in size of Gland	53
Change in echogenicity	57
Peripancreatic fat stranding	40

CT characteristics of acute pancreatitis

There are changes in the pancreatic parenchymal density in most of the cases of acute pancreatitis. There was increase in size of gland observed in about 96 cases, parenchymal density changes were observed in 96 % cases. It is obvious that CT can visualize gland in every cases. Peripancreatic fat stranding was observed in about 80 cases.

Table 6

CT Characteristics	*No. of Cases*
Increase in size of gland	96
Density Changes	96
Peripancreatic fat stranding	80

Table 7: CT diagnosis of acute pancreatitis

Acute Edematous Pancreatitis	Acute Pancreatitis with Peripancreatic fluid collection	Acute Pancreatitis with Pseudocyst	Normal	Acute Necrotizing pancreatitis
34	28	6	4	28

Out of the 100 cases of acute pancreatitis CT diagnosed nearly 96 % of cases. 34 cases were of acute edematous interstitial pancreatitis, acute pancreatitis with peripancreatic fluid collection and acute necrotizing pancreatitis comprising about 28 each. 6 patients were of acute pancreatitis with Pseudocyst formation.

MRI Characteristics of Acute Pancreatitis

There were 100 cases in current study , of these 100 cases , size of the gland increased in about 96 cases as observed by MRI , intensity changes in gland parenchyma was observed in about 96 cases. Peripancreatic fat stranding seen in 85 cases.

Table 8

MRI Characteristics	*No. of Cases*
Increase in size of gland	96
Intensity changes	96
Peripancreatic fat stranding	85

Table 9: MRI diagnosis of acute pancreatitis

Acute Edematous Pancreatitis	Acute Pancreatitis with Peripancreatic fluid collection	Acute Pancreatitis with Pseudocyst	Normal	Acute Necrotizing pancreatitis
35	31	4	2	28

In present Study MRI was able to diagnose about 98 cases , out of these 35 patients were of acute edematous pancreatitis , 31 patients were of acute pancreatitis with peripancreatic fluid collection and 28 cases were of acute necrotizing pancreatitis. Only 4 cases were of acute pancreatitis with pseudocyst formation.

Table 10: Pleural Effusion and Ascitis in Acute Pancreatitis as Observed by Different Modality

	USG	CT	MRI
ASCITES	20	22	22
PLEURAL EFFUSION	21	28	28

In our current study USG was able to diagnose pleural effusion and ascites in near about 20 to 21 % cases, rather CT and MRI diagnosed it in 28% and 22% cases.

Comparison of USG and CT

In the current study we have considered CT as gold standard, we compared USG with CT in diagnosing of Acute pancreatitis cross tabulation was done, Sensitivity of USG in comparison with CT was about 58.3% , Specificity of the USG for acute pancreatitis was observed to be about 75%. Accuracy turn out to be 59%. PPV and NPV of USG were 98.2 % and 7 % respectively.

Comparison of MRI and CT

Cross tabulation of MRI and CT was done, we compared MRI with CT in diagnosing acute pancreatitis, Sensitivity of MRI was 100%, Specificity of the MRI for acute pancreatitis was about 93.24 %. Accuracy turn out to be 98 %. PPV and NPV of MRI were 98 % and 100% respectively.

5. Conclusion

Ultrasound because of its advantages like non-invasiveness, lack of radiation hazard and ability to demonstrate structural changes in organ is initial investigation of choice in evaluation of pancreatitis. Ultrasound can detect presence of inflammation and characterize the size, & echo texture of the gland, but in most of the time it is difficult to visualize pancreas in certain situations like limited window, artifact, bowel gas and anatomical locations of pancreas limiting the imaging quality and at times leading to nondiagnostic examination. Also it is difficult to demonstrate gland necrosis on USG alone.NPV of USG is less as in about 23 % patients pancreas was not visualized and in 20 %cases USG was normal most of which diagnosed of having pancreatitis on CT and MRI. CT and MRI both modalities can diagnose acute pancreatitis with accuracy but both the modalities has their own pros and cons as MRI is time consuming , costly , requires proper breath-holding while scanning . Similar there

is radiation hazard in CT but it is not time consuming. Contrast hazard are there in both modality, considering above all CT is gold standard modality in diagnosing acute pancreatitis MRI can be used as alternative.

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