

Evaluation of the pancreatic malignancy with MRI & MDCT modalities

Abhishek Gupta¹, Mukesh Kumar Sharma², Dr. Bijendra kumar Meena³

¹Assistant professor, Department of Radiodiagnosis, National Institute of Medical Sciences (NIMS) Shobha Nagar, Delhi Road, Jaipur, Rajasthan, India

²Associate professor, Department of Radiodiagnosis, National Institute of Medical Sciences (NIMS) Shobha Nagar, Delhi Road, Jaipur, Rajasthan, India

³Assistant professor, Department of Radiodiagnosis, NIMS medical college and Hospital, Jaipur

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Abstract

Background: Detection of pancreatic abnormality by routine noninvasive radiological method namely plain radiography and gastrointestinal barium studies is possible but these tests are insensitive and nonspecific. In earlier era more invasive tests like retroperitoneal air insufflations with tomography used never achieved wide spread clinical application and isotope scan proved disappointing owing to their false positive rates. **Material & Methods:** The present retrospective study was conducted at department of Department of Radiology at MRI Centre, M.B. Govt. Hospital, Udaipur. The study duration was December 2012 to November 2014. The study group of 100 patients, with suspected pancreatic diseases were examined using either MDCT scan or MRI or both as prime diagnostic modality. **Results:** In the present study, Pancreatic carcinoma is a hypo vascular mass so it does not enhance at all or show a mild enhancement on post contrast study. In this study out of 14 cases, 14 cases showed mild post contrast enhancement and 2 cases showed no enhancement at all. on CECT examination, out of 10 cases of head mass, 8 cases were hypo dense and 2 were Isodense and showed dilated MPD in 9 cases 90.00% which were most common finding followed by dilated CBD in 8 cases (80.00%) and invasion of other organs in 2 cases (20%). On MRI examination, out of 4 cases of head carcinoma, 3 appeared hyperintense & 1 appeared hypointense and showed dilatation of MPD & CBD in all cases and invasion of organ in one case. Out of 14 cases of head carcinoma, 4 (28.57%) cases showed distal metastasis in liver. Out of 7 cases of body-tail mass, six appeared hypo dense and one appeared on NCCT. Distant metastasis and dilated MPD were found in 4 cases and CBD were dilated in any one case of body mass. **Conclusion:** We concluded from the present study that Dual-phasic contrast-enhanced MDCT in the pancreatic parenchymal and the venous phase is the method of choice for detection and staging of pancreatic cancer, inflammatory lesions and its vascular complications. For detection of small, hyper vascular neuroendocrine tumors, no single imaging method will reveal all tumors. In this respect, MDCT and MRI are complementary methods.

Key words: MRI, MDCT, Pancreatic malignancy.

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Introduction

The pancreas is an important organ of the body but still a difficult organ to evaluate by both clinical and routine radiological methods. Pancreatic disorders have propensity for producing high morbidity and mortality in both neoplastic and inflammatory disorders.

*Correspondence

Dr. Abhishek Gupta

Assistant professor, Department of Radiodiagnosis
NIMS medical college and Hospital, Jaipur, Rajasthan,
India.

E-mail: abhishek2785@gmail.com

They are also insidious in their presentation on most occasions [1]. Detection of pancreatic abnormality by routine noninvasive radiological method namely plain radiography and gastrointestinal barium studies is possible but these tests are insensitive and nonspecific. In earlier era more invasive tests like retroperitoneal air insufflations with tomography used never achieved wide spread clinical application and isotope scan

proved disappointing owing to their false positive rates [2].

Evaluating pancreas by USG is advantageous as it is economical, easily available, noninvasive with no radiation hazards, provide real time imaging and can be repeated as and when required. However the major limiting factor for ultrasound evaluation in patient with acute pancreatitis is failure to visualize pancreas due to distended bowel loops because of paralytic ileus, epigastric tenderness. With introduction of CT, at present Dynamic incremental bolus CT scan is the gold standard in the imaging of pancreatic pathologies [3].

CT is the preferred technique in the diagnosis of pathology, assessment of severity, staging and detection of the complication. It serves as a useful prognostic indicator of morbidity and mortality and can identify high risk patients. CT can detect complications early and image guided aspiration and drainage procedure can then be carried out. CT also provides anatomic details to optimize surgical interventions [4]. Newer imaging techniques like helical CT scanning by obtaining volumetric data reduces the misregistration artifacts and respiratory artifacts, relationship with adjacent contrast enhanced vessels can be better appreciated (5). Hence, present study was conducted for reevaluation of the pancreatic malignancy with MRI & MDCT modalities.

Materials & Methods

The present retrospective study was conducted at department of Department of Radiology at MRI Centre, M.B. Govt. Hospital, Udaipur. The study duration was December 2012 to November 2014. The study group of

100 patients, with suspected pancreatic diseases were examined using either MDCT scan or MRI or both as prime diagnostic modality.

Each patient was studied in detail with relevance to clinical history, examination and laboratory investigation. USG was done in all patients prior to CT and MRI scan. Patients were explained about the procedure and the risks involved. All patients were subjected to sign on consent form. The following patients were excluded from the study: Patients who had contraindications to MR evaluation - patients with claustrophobia, metallic implants etc, Patients who had history of hypersensitivity to intravenous contrast agents or deranged renal function test (serum creatinine > 1.5 mg/dl), Patients who were unable to restrain movement during the course of examination even after appropriate sedation, Post-surgical patients and Pregnant women. Scanning was done with Philips Brilliance 16 slice and Siemens 128 slice multidetector CT SCAN machine and with MRI on 1.5-T superconducting Interaacheiva; Philips system with phased array body coil. The test of significance was utilized to decide the measurable centrality of the information by applying the chi-square test.

Results

In present study, we enrolled 100 patients, with suspected pancreatic diseases were examined using either MDCT scan or MRI or both as prime diagnostic modality. Out of total study participants 100 patients, pancreatic lesions were most common in 4th and 5th decade of life [47 cases, (47%)] and least common in 1st decade of life [1 case (1%)]. (Table 1)

Table 1: Distribution of study subjects according to age and gender.

Age Group	No. of Male	No. of Female	Total	Percentage
<1-10	0	1	1	1%
11-20	6	1	7	7%
21-30	14	1	15	15%
31-40	23	4	28	27%
41-50	17	3	20	20%
51-60	9	6	15	15%
61-70	7	4	11	11%
>70	1	3	4	4%
Total	77	23	100	100.00%

In present study, out of total study participants 100 patients Pancreatic carcinoma were seen in 14(63.63%) cases of pancreatic masses & islet cell tumor in 3 (13.60%) of cases and cystic pancreatic tumors were seen in 4.54% of cases. (Table 2)

Table 2: Distribution of study subjects according to the type of malignancy

Type of Malignancy	No. of Cases	Percentage
Pancreatic carcinoma	14	63.63%
Islet cell tumor	3	13.60%
Cystic pancreatic tumor	1	4.54%
Other (Sarcoma, Lymphoma)	3	13.60%
Pancreatic metastasis	1	4.54%

Table 3: Distribution of study subjects according to the site of carcinoma

Site	No. of Cases	Percentage	Clark <i>et al</i>
Head	10	71.42%	60%
Body	3	21.42%	20%
Tail	1	7.14%	10%
Total	14		

In present study, out of total study participants, out of 14 cases, 10 cases had malignancy in head region (71.42%), 3 cases had in body region (21.42%) and one case had in tail region (7.14%),

Table 4: Distribution of study subjects according to the CT Scan findings of head of pancreas

Features	No. of Cases	Percentage
Hyperdense	-	0.00%
Hypodense	8	100%
Isodense	-	0.00%
Dilated MPD	7	87.50%
Dilated CBD	7	87.50%
Post Contrast enhancement	6	75%
Invasion of other organs	2	25%

In present study, out of 8 cases (100%) of the pancreatic carcinoma appearing hypodense on NCCT, 6 cases showed mild post contrast enhancement. Dilated MPD was seen in 7 cases (87.50%) and dilated CBD in 7 cases (87.50%). Invasion of other organs was found in 2 cases (25%)

Table 5: Distribution of study subjects according to the MRI findings of head of pancreas

Features	No. of Cases	Percentage	
T2W images	Hyperintense	2	100%
	Hypointense	-	0.00%
Dilated MPD	2	100%	
Dilated CBD	2	100%	
Invasion of other organs	1	50%	

In present study, Both cases (100%) of the pancreatic carcinoma appeared hyperintense on T2W images and dilated MPD and dilated CBD was seen in all cases and invasion of other organs found in one case (50%).

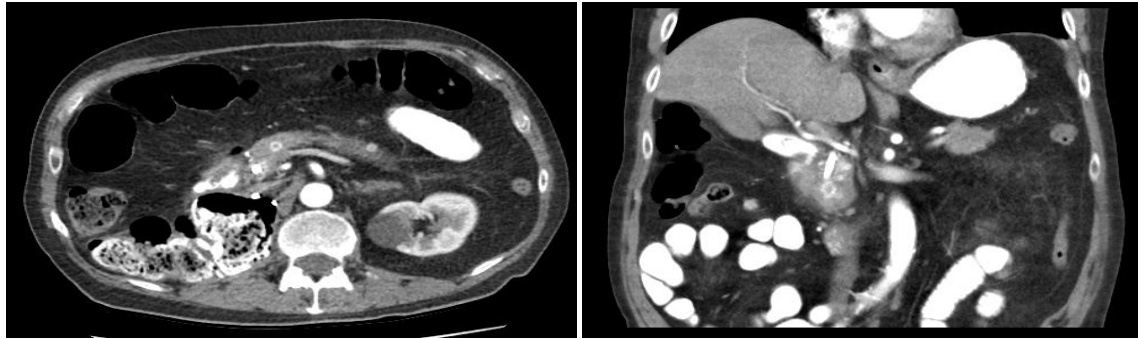


Fig 1. A) AXIAL B) CORONAL CECT IMAGES SHOW AVIDLY ENHANCING MASSES IN THE HEAD, NECK AND TAIL REGION (METASTASIS FROM RENAL CELL CARCINOMA)

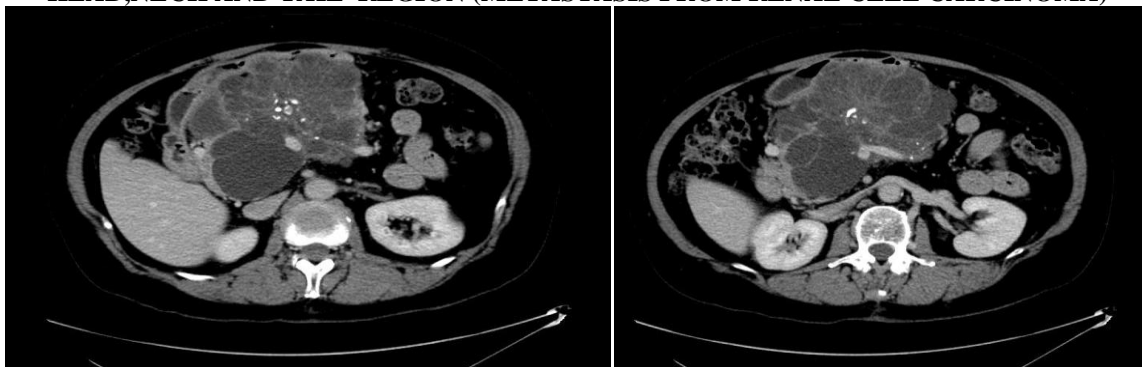


Fig 2. A) AXIAL B) AXIAL SHOWS MICROCYSTIC NEOPLASM WITH CENTRAL STELLATE CALCIFICATION S/O SEROUS CYSTADENOMA IN THE HEAD OF PANCREAS

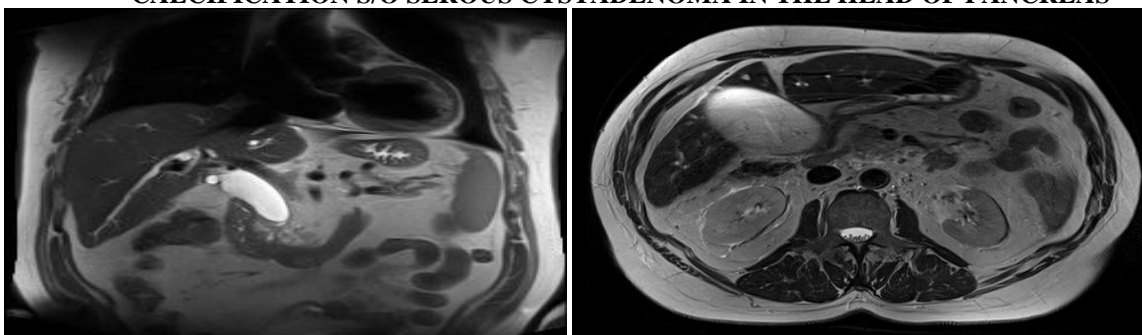


Fig 3. A) CORONAL CE CT B) T2W AXIAL IMAGE SHOW PANCREATIC HEAD MASS (ADENOCARCINOMA)

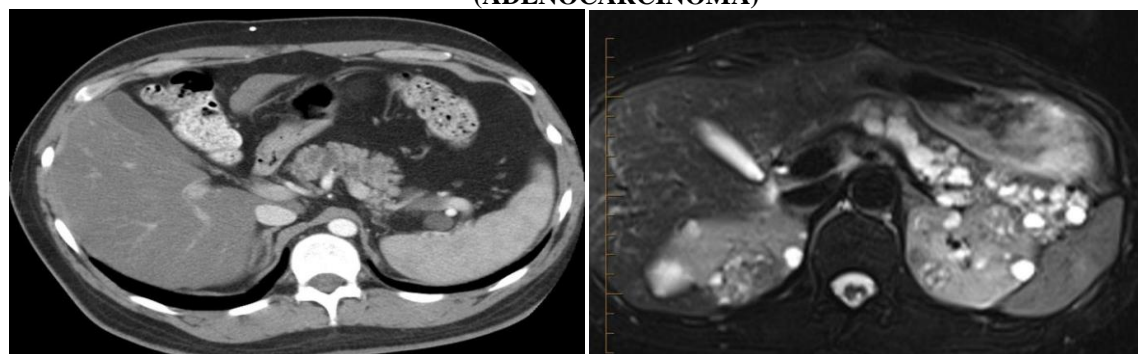


Fig 4. A) AXIAL CECT B) T2 IMAGE SHOW MULTIPLE CYSTIC LESIONS IN PANCREAS IN THE CASE OF VON HIPPEL-LINDAU SYNDROME

Discussion

In this study 100 cases of suspected pancreatic lesions were studied either by CT scan or MRI or both as a prime modality. Correlation of diagnosis was done with USG features, laboratory investigations and histopathological examination reports whenever possible, a follow up done about the outcome of patients after treatment. Pancreatic etiology was found in wide range of age groups. i.e. from 1 to 70 years with maximum incidence in 4th and 5th decade [47% cases]. Pancreatic lesions were more common in males [77%] than females [25.38%]. Commonest presenting symptoms were abdominal pain [94%] and vomiting [60%]. Alcoholism [33%] and biliary calculi [22%] were commonest etiology. This is in concordance with DC. Whitecomb study that suggest alcohol and gall stone are the most common cause of acute pancreatitis (6).

Among pancreatic pathology in descending order, Acute pancreatitis was most common pathology comprising 34 cases [34%]. Chronic pancreatitis consist of 23 cases (23%). Pancreatic malignancy consist of 22 cases (22%). Acute on chronic pancreatitis had 6 cases [6%]. Pseudocyst & trauma had 4 cases each. Two cases of Von Hippel Landau, one case of polycystic kidney disease, one case of annular pancreas & one case of pancreatic divisum were present. Clinically suspected patients were undergoing prior laboratory investigations and USG examination. Pancreatic enzymes [S.amylase, S. lipase) rise during acute pancreatitis. S.lipase was found to be increased in all cases in which it was done, because of its cost effectiveness limiting its widespread use. S.amylase was raised in 30 cases out of total 34 cases of acute pancreatitis. According to PA. banks study, the clinical diagnosis of acute pancreatitis is supported by an elevation of the serum amylase and lipase often in excess of three times the upper limit of normal (7).

As USG has got many advantages like easy availability, cost effectiveness, non-invasive, no radiation hazards and can be repeated as when required, it was done in every case before a CT and MRI. On CT and/or MRI examination of patients with acute pancreatitis, most common finding was peripancreatic fat stranding 34 cases (100%), increase in size 33 cases (97%) followed by ascites 21 case (61.76%), pleural effusion in 19 cases (55.88%), heterogeneous enhancement in 26 cases (76.47%) necrosis in 8 cases (23.52%). Out of 10 cases of moderate pancreatitis (MCTSI, 4-6), no mortality was found. There were 8 cases of severe pancreatitis (MCTSI, 8-10), in which 1 mortality (20%) was found.

According to Frank H Miller et al study, 1.16% mortality was found in mild pancreatitis, 4% mortality was found in moderate pancreatitis and 14.28% mortality was found in severe pancreatitis (8).

Out of 22 cases of pancreatic masses, pancreatic adenocarcinoma consist of highest 14 (63.63%) cases, islet cell tumor consist of 3 (13.60%) cases, lymphoma had 2 cases and each cystic pancreatic tumor metastasis & sarcoma had 1 case. Out of 14 cases of pancreatic carcinoma, 10 cases (71.42%) were found in head region, 3 cases (21.42%) in body and 1 case (7.14%) in tail region. Among pancreatic malignancy, adenocarcinoma was most common and it was most commonly found in head region. In Clark study majority (60%) of pancreatic carcinoma occur in the head, whereas 20% and 10% occur in the body and tail, respectively (9).

Pancreatic carcinoma is a hypo vascular mass so it does not enhance at all or show a mild enhancement on post contrast study. In this study out of 14 cases, 14 cases showed mild post contrast enhancement and 2 cases showed no enhancement at all. On CECT examination, out of 10 cases of head mass, 8 cases were hypo dense and 2 were Isodense and showed dilated MPD in 9 cases 90.00% which were most common finding followed by dilated CBD in 8 cases (80.00%) and invasion of other organs in 2 cases (20%). On MRI examination, out of 4 cases of head carcinoma, 3 appeared hyperintense & 1 appeared hypointense and showed dilatation of MPD & CBD in all cases and invasion of organ in one case. Out of 14 cases of head carcinoma, 4 (28.57%) cases showed distal metastasis in liver. Out of 7 cases of body-tail mass, six appeared hypo dense and one appeared on NCCT. Distant metastasis and dilated MPD were found in 4 cases and CBD were dilated in any one case of body mass. Study by McNulty et al shows sensitivity of MDCT for detection of pancreatic carcinoma is 96% (10).

One case of polycystic disease and two cases of Von Hippel Lindau Syndrome were treated conservatively. Both CT scan & MRI had done in case of pancreatic divisum and annular pancreas. On CT scan possibility of annular pancreas is kept which on latter confirmed by MRI. MRI more definitely show winding of pancreatic tissue around 2nd part of duodenum. Diagnosis of pancreatic divisum was missed on CT scan and showed only presence of focal head pancreatitis while MRI (MRCP) definitely showed the

diagnosis of pancreatic divisum by opening of dorsal duct system through duct of Santorini in to minor papilla(11).

Conclusion

We concluded from the present study that Dual-phasic contrast-enhanced MDCT in the pancreatic parenchymal and the venous phase is the method of choice for detection and staging of pancreatic cancer, inflammatory lesions and its vascular complications. Three-dimensional reconstructions (CPR, MIP, or VRT) are of great value for demonstration of tumors and the anatomical relationship between tumor and peripancreatic for the surgeon. For cystic lesion characterization, MDCT is comparable to MRI with MRCP, although MRI will increase the diagnostic confidence. For detection of small, hyper vascular neuroendocrine tumors, no single imaging method will reveal all tumors. In this respect, MDCT and MRI are complementary methods.

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