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A Retrospective Study of Characterization of Cystic Lesions of Pancreas by Computer Tomography Scan

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Abstract
Introduction: *Diagnosis of cystic lesions of pancreas in the contemporary generation are rapidly escalating. Substantial number of cystic lesions have been recognized due to recent evolution and persistent use of imaging modalities.[1] Accurate characterization of cystic lesions is necessary to discriminate cystic neoplasms of pancreas from pseudocysts, as they are widely misdiagnosed.[2] For inceptive identification, characterization of pancreatic cysts, Multi-detector computed tomography is the desired imaging modality.*
Materials and Methods: *This is a retrospective study done over a period of 5 years.94 patients with cystic lesions of pancreas were selected and analysed. All patients had proven final diagnosis by surgery, by endoscopy guided aspiration or by follow up. Various parameters of the cysts were studied like the age and sex distribution, incidence, size of the lesion, location, thickness of septations, nature of calcification, pancreatic duct dilatation if any, size of the largest cyst within the lesion, approximate number of cysts, presence of any solid component, nature of enhancement, presence of the wall and contour of the lesion. Descriptive statistics like percentage was used and each cyst was differentiated based on the above features*
Results: *Out of the total 94 patients, 50 patients had pseudocysts and 44 patients had neoplastic cysts proven by histopathology or endoscopy guided aspiration. The neoplastic cysts include 12 benign IPMT, 16 serous cystadenoma, 8 mucinous cystadenoma, 4 SPEN and 4 mucinous cystadenocarcinomata. All the non-neoplastic cysts were pseudocysts and were predominantly seen in males than females with high prevalence between 41-50 yrs. All of them had association with acute or chronic pancreatitis. Most (58%-22/38) of the benign neoplastic cysts were seen in females and all the 4 malignant cysts (mucinous cystadenocarcinomas) were seen in the males. All the SPEN were seen in females. About 75% (6/8) of the mucinous cystadenomas were female. All patients with mucinous cystadenoma were below 52 years and all the IPMT patients were above 54 years. Serous cystadenoma had even age distribution. All the SPEN were diagnosed before 30 years. All the IPMT were seen in the head and body of the pancreas. 75% (6/8) mucinous cystadenomas were seen in the tail of pancreas. 88% (14/16) serous cystadenomas were seen in the head and tail of the pancreas. All the SPEN were seen in the tail of the pancreas.*
Conclusion: *CT scans helps us to diagnose variouscystic lesions of pancreas based on different characteristic imaging features.*
Key Words: *cystic lesions, Multi-detector computed tomography, IPMT.*

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I. Introduction

Diagnosis of cystic lesions of pancreas in the contemporary generation are rapidly escalating. Substantial number of cystic lesions have been recognized due to recent evolution and persistent use of imaging modalities.[1] Accurate characterization of cystic lesions is necessary to discriminate cystic neoplasms of pancreas from pseudocysts, as they are widely misdiagnosed.[2] For inceptive identification, characterization of pancreatic cysts, Multi-detector computed tomography is the desired imaging modality.[3] Morphological hallmark of cyst, as well as primacy of demonstrating the connection of cyst to pancreatic duct is seen best on Magnetic resonance imaging.[4] The cystic lesions of pancreas can be classified as non-neoplastic and neoplastic lesions.[5] The non-neoplastic lesions include pseudocysts. The commonest cystic neoplasms are intraductal papillary mucinous neoplasm (IPMT), serous cystic neoplasm and mucinous cystic neoplasm. Uncommon cystic neoplasms are solid pseudopapillary epithelial neoplasm (SPEN). Solid pancreatic lesions with cystic degeneration include pancreatic adenocarcinoma, cystic islet cell tumour, metastasis, cystic teratoma and sarcoma. Ultrasonography is usually the initial investigation done to evaluate the cystic lesions of the pancreas.

Ultrasonography is good in demonstrating the internal features of the cyst like septations, vascularity, mural nodule and contents of the cyst. However, its uses are limited due to overlying bowel gas shadows and in obese patients. Recently, endoscopic ultrasound helps in detailed high-resolution imaging of the cyst with advantage of diagnostic aspiration and analysis of the fluid from the cyst.[6] Multidetector CT scan and magnetic resonance imaging (MRI) are commonly used to evaluate the internal architecture and enhancement characteristics of cystic lesions of the pancreas. CT is useful to find calcifications within the cyst. MRI has good soft tissue resolution and is useful to see the communication between the cyst and the pancreatic duct. Secretin stimulated MR cholangiopancreatography can be done for better visualization of the communication between the cyst and the pancreatic duct which helps to differentiate IPMT from other tumours.[7]

II. Materials And Methods

In this retrospective study, all patients with proven cystic lesions of pancreas who underwent CT imaging using a 64 slice GE VCT from August 2018 to August 2020 at our institution were selected. All lesions were proven either by surgery or by endoscopy guided aspiration or follow up. A total of 94 patients with proven diagnosis were selected. CT protocol for imaging pancreas includes triphasic scan which is an non-contrast study, arterial phase, a late arterial phase and a venous phase imaging. Triphasic CT protocol paves way for selective visualization of main arterial, venous structures, hence allowing assessment of vascular invasion by the tumour. Non-contrast study is done using 5mm slice thickness with 2.5 mm reconstruction starting from the liver dome up to the iliac crests. Arterial phase is done with 2.5mm slice thickness along with 1.25mm reconstructions from top to bottom of liver at 20 sec delay to obtain excellent hepatic arterial opacification with minimal contrast in portal vein. Immediately after arterial phase, at 40 sec delay, pancreatic parenchymal phase/Late arterial phase is done. Portal venous phase is done using 5mm slice thickness at 70 sec delay with 2.5 mm reconstructions. Incidence of various cystic lesions based on the histopathological findings, age and sex were analysed. The features of cystic lesions in the pancreas were studied like the overall size of the lesion, location, thickness of septation, nature of calcification, pancreatic duct dilatation if any, size of the largest cyst within the lesion, approximate number of cysts, presence of any solid component, nature of enhancement, presence of the wall and contour of the lesion were studied.

Statistical Analysis: Descriptive statistics like percentage was used for analysis. Microsoft office 2007 was used.

III. Results

Out of the total 94 patients, 50 patients had pseudocysts and 44 patients had neoplastic cysts proven by histopathology or endoscopy guided aspiration. The neoplastic cysts include 12 benign IPMT, 16 serous cystadenoma, 8 mucinous cystadenoma, 4 SPEN and 4 mucinous cystadenocarcinomata. All the non-neoplastic cysts were pseudocysts and were predominantly seen in males than females with high prevalence between 41-50 yrs. All of them had association with acute or chronic pancreatitis. Most (58%-22/38) of the benign neoplastic cysts were seen in females and all the 4 malignant cysts (mucinous cystadenocarcinomas) were seen in the males. All the SPEN were seen in females. About 75% (6/8) of the mucinous cystadenomas were female. All patients with mucinous cystadenoma were below 52 years and all the IPMT patients were above 54 years. Serous cystadenoma had even age distribution. All the SPEN were diagnosed before 30 years. All the IPMT were seen in the head and body of the pancreas. 75% (6/8) mucinous cystadenomas were seen in the tail of pancreas. 88% (14/16) serous cystadenomas were seen in the head and tail of the pancreas. All the SPEN were seen in the tail of the pancreas.

Sex Distribution	Pseudo cysts	Serous Cystadenoma	Benign IPMT	Mucinous cystadenoma	SPEN	Mucinous cystadeno-carcinoma
Male	**35**	**6**	**8**	**2**	**0**	**4**
Female	**15**	**10**	**4**	**6**	**4**	**0**

Table 1: Gender Distribution of Various Benign and Malignant Cystic Lesions of Pancreas

Age	Pseudo-cysts	Serous Cysta-denoma	Benign IPMT	Mucinous Cysta-denoma	SPEN	Mucinous Cystadeno-carcinoma
<20 years	10	0	0	2	2	0
20-50 years	30	6	0	6	2	2
>50 years	10	10	12	0	0	2

Table 2: Incidence of Cystic Lesions in Different Age Groups

Location within Pancreas	Pseudo-cysts	Serous Cysta-denoma	Benign IPMT	Mucinous Cysta-denoma	SPEN	Mucinous Cystadeno-carcinoma
Head	19	7	5	0	0	0
Body	15	3	6	2	1	0
Tail	16	6	1	6	3	4

Table 3: Distribution of Lesions within the Pancreas

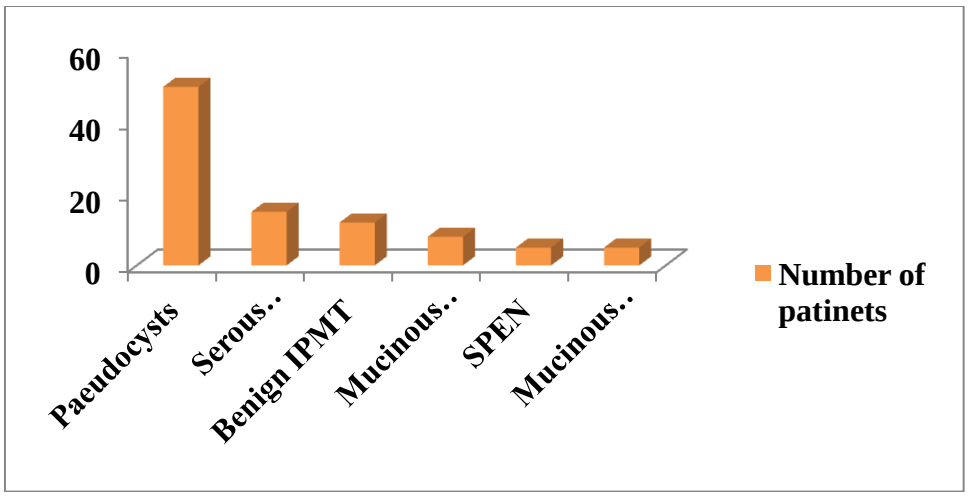

Figure 1: Incidence of Various Cystic Lesions in Pancreas

All SPENwere predominantly solid and had mild haemorrhage visualized in the plain scan. None of the other lesions had haemorrhage within it. The central necrotic areas were appearing cystic in these tumours. Thick septations (>3mm) were seen in all the mucinous cystadenocarcinomas. Benign lesions either had thin septations or no septations.

Out of the total 8 unilocular cysts without any septations, 6 had no visible wall and were finally diagnosed as IPMT and the remaining 2 had thin visible wall and were diagnosed as mucinous cystadenomas. Two patients had peripheral calcification, and both were diagnosed as mucinous cystadenomas.6 patients had central chunky calcification and were diagnosed as serous cystadenomas6 patients had diffuse mild dilatation of the main pancreatic duct and all were diagnosed as IPMT. 4 of these patients showed communication of the cyst with the dilated duct. One patient showed bulging major papillae. 6 patients had obstruction of the MPD with mild upstream dilatation, all of them were mucinous cystadenoma.

Size of the biggest cyst within the lesion in all the serous cystadenomas were between 1 to 2cm. Most of the mucinous cystadenoma and cystadenocarcinomas (8/12-67%) had biggest cyst size >2cm. All the IPMT had biggest cysts in the range of 0-2 cms. Solid component was visualized in all patients with mucinous cystadenocarcinoma (n=4) and SPEN (n=4). Mild enhancement of the solid component was seen in the venous phase images. No hyper vascularity seen in any of the cystic lesions. Pancreatic parenchymal phase images were ideal in studying the characteristics of cysts like nature of wall, septations and the cysts. Most of the IPMT (10/12-83%) and serous cystadenoma (12/16-75%) had no visible wall. About half of the patients (6/14) with a visible wall were mucinous cystadenoma. Most of the mucinous cystadenoma (6/8-75%) had a smooth wall and most of the serous cystadenoma (14/16-88%) and IPMT (10/12-83%) had lobulated wall. All the IPMT had few (1-2) cysts within the lesion. Most of serous cystadenomas (12/16-75%) had more than 6 cysts and all the mucinous cystadenomas and cystadenocarcinomas had fewer than 6 cysts within the lesion.

IV. Discussion

Crippa et al reported IPMT accounted for 38% of pancreatic cystic lesions, mucinous cystic neoplasm for 23%, serous cystic neoplasm for 16% and SPEN about 3%. Fernandez et al reported serous and mucinous cystadenomas and mucinous cystadenocarcinoma comprise >75% and IPMT constitute ~21-30% of pancreatic cystic lesions. In our study pseudocysts are the commonest overall cysts and serous cystadenoma is the commonest neoplastic cyst. Mucinous cystadenoma, serous cystadenoma and SPEN are common in females. IPMT and pseudocyst have equal sex distribution. In our study IPMT and pseudocysts are common in males. Karoumpalis et al reported SPEN is seen at 20-40 years, mucinous cystadenoma between 40-50 years, serous cystadenoma between 50-70 years and IPMT between 60-70 years. They further reported that IPMT is mainly

seen in head and mucinous cystadenoma mainly in body and tail. No difference in distribution of the rest of the lesions within the pancreas. IPMT is commonly seen in head (50%), body (39%), tail (7%) and uncinated process (4%). Young reported 76.9% of mucinous cystadenomas and 54% of serous cystadenomas are seen in body and tail. In our study most of mucinous cystadenoma are seen in the tail and the serous cystadenomas were equally distributed in head and tail of pancreas. IPMN is commonly smaller than 3cmswhereas mucinous and serous cystic neoplasm, SPEN and pseudocyst are commonly >3cms. 73% of mucinous cystadenomas were round and 80% serous cystadenomas were lobulated and irregular. Pseudocysts are usually unilocular. But they can be rarely multiple in 10% of cases and sometimes also irregular and multilocular. Pseudocysts in acute pancreatitis is seen in 5-16% whereas in chronic pancreatitis it is seen higher in about 20-40%.[9]

EUS with FNA of the fluid improves the accuracy in differentiating the cystic lesions. Due to partial volume averaging thin septations and small nodules within the cyst can be missed and hence a mucinous cystadenomamay be misdiagnosed as pseudocyst. Thin section CT with multiplanar reformats are helpful to differentiate.[10]

Main limitation of this study is not considering MRI for cyst characterization. MRI has advantage of demonstrating connection with MPD on T2 wt. image to differentiate IPMT from other tumours. MRI is useful in follow up because it lacks radiation exposure.

V. Conclusion

Pseudocysts are the most common cysts of the pancreas followed by serous cystadenomas. Pseudocysts are associated with pancreatitis. Serous cystadenomas show a lobulated contour with an imperceptible wall containing smaller and multiple cysts and central chunky calcifications. Mucinous cystadenomas show a smooth contour, visible wall with peripheral rim calcifications and fewer bigger cysts. Malignant cysts show enhancing solid components. IPMT show duct dilatation with ductal communication, bulging papillae and are mostly unilocular without any visible wall. SPEN is seen in young females with solid areas, necrosis and haemorrhage. Hence, CT features help in characterizing the different cystic lesions of the pancreas.

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