Presentation and Management of Cystic Neoplasms of the Pancreas in the Gastroenterology and Hepatology Teaching Hospital

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ABSTRACT:

BACKGROUND:

Pancreatic cystic neoplasms are relatively uncommon, and constitute about 1-2% of all primary pancreatic tumors and are thought to account for approximately 10-15% of all pancreatic cystic lesions. These tumors are composed of a variety of neoplasms with a wide range of malignant potential

OBJECTIVE:

To define the clinical differences among different pathologic groups of cystic neoplasm of the pancreas, distinguish these neoplasms from pancreatic pseudocysts, and benign from malignant or premalignant varieties.

PATIENTS AND METHODS:

Retrospective study of 49 patients with clinical, laboratory and imaging features suggestive of cystic neoplasms of the pancreas who were managed at the Gastroenterology and Hepatology teaching Hospital over the period from September 2004 to January 2011. All the patients underwent CT scanning and EUS. ERCP was performed for 16 patients.

RESULTS:

The mean age was 46 years, 31 patients' females and 18 males. (73%) were symptomatic, 32 lesions (65.3 %) were located in the pancreatic body and tail whereas 13 lesions (26.5 %) were located in the pancreatic head, neck and uncinate process. The mean of maximum tumor diameter was 8.76 cm. An attempted curative resection was undertaken for 21 patients. CT gave accurate result in 9 out of 16 patients in SCN,16 out of 19 in MCN and 5 out of 6 in IPMN ,EUS including EUS guided FNA gave accurate diagnosis in all patients.

CONCLUSION:

The role of imaging in detecting the cystic neoplasms of the pancreas and confirming their locations and proximity to surrounding structures is well recognized and CT or MRI is the best for this purpose. EUS including EUS-guided FNA for cytology and fluid studies has proven to be a useful addition to the diagnostic armamentarium of the clinicians.

KEY WORDS: cystic pancreatic neoplasms; pancreatic cysts; endoscopic ultrasound; surgical resection.

INTRODUCTION:

Cystic tumors of the pancreas derive their name from the presence of fluid in the tumor. Compagno and Oertel[1,2] revolutionized the pathology of cystic neoplasms of the pancreas with their 2 similar works published in 1978.

Pancreatic cystic neoplasms constitutes about 1–2% of all primary pancreatic tumours[3] and are thought to account for approximately 10–15% of all pancreatic cystic lesions.[4] . These tumors are composed of a variety of neoplasm's with a wide range of malignant potential[5]:

1-Serous Cystic Neoplasm (SCN)

Previously termed serous cystadenomas, SCN Malignant change, is extremely rare, and the condition is considered benign[6] ، there is a female predilection, and occurrence is mostly in the seventh decade of life. SCN are now subdivided into (a) serous microcystic and (b) serous oligocystic adenomas.[7]The definitive management of symptomatic SCN is surgery.

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2-Mucinous Cystic Neoplasm (MCN)

MCN are formed by mucus-producing columnar epithelial cells.These are the most frequent cystic tumors of the pancreas and almost always occur in females, predominantly in the middle-aged. It is considered potentially malignant and all surgically fit patients should undergo surgical resection.[8, 9, 10],

3-Intraductal Papillary Mucinous Neoplasm (IPMN)

Ohhashi *et al*. first reported IPMNs in 1982, [11] and were considered a distinct entity from MCN[12] and like MCN, produce mucin. A communication with the pancreatic duct is invariable,[13] IPMN are divided into (a) main-duct (b) branch-duct type according to the involvement of the pancreatic ducts.[10] All main-duct type IPMN should be resected because of the high malignancy rate whereas branch-duct type IPMN demonstrating favorable features (<3 cm size and absence of mural nodules) may be managed conservatively.[10]

4-Solid Pseudopapillary Neoplasm (SPPN)

First described by Frantz in 1959, [14] these occur almost exclusively in young women.[15] The lesion are largely benign with low malignant potential and long-term survival is excellent after resection.[16, 17] Surgery is advocated in all cases [17].

AIM OF THE STUDY:

The aim of the present study was concentrated on the following points:

* Define the clinical differences among these pathologic groups.
* Distinguish these neoplasms from pancreatic pseudocysts, and benign from malignant or premalignant varieties
* Define the role of appropriate surgical resection as a curative procedure for such lesions.

PATIENTS AND METHODS:

Forty-nine patients with clinical, laboratory and imaging features suggestive of cystic neoplasms of the pancreas who were managed at the Gastroenterology and Hepatology teaching Hospital from September 2004 to January 2011 were included in this study.

The work-up of each patient started with careful history, physical examination followed by laboratory investigations, abdominal ultrasound examination was performed for all the patients. Abdominal CT scanning and endoscopic ultrasonography were used according to the results of the abdominal ultrasound and done for all patients. 16 patients underwent ERCP as indicated.

The following variables were analyzed: age, sex, clinical presentation, past medical history, history of pancreatitis, tumor size and location, preoperative diagnosis, appearance on CT scan, EUS and EUS-guided FNA cytology findings, The specific morphologic findings of the cystic lesion were recorded, also the intraoperative results, surgical treatment and resectability, and histopathological reports for resected specimens. A P value <0.05 adjusted to 0.017 was considered significant. The size and location of the tumors were determined from the pathological specimens or the radiologic reports when a resection was not performed. The pathologic findings were reviewed to reconcile the original diagnosis with the current nomenclature-specificity.

The clinical presentation of each type of cystic neoplasm was compared to that of other cystic tumors. A comparison between the serous and mucinous varieties seemed the most clinically valuab`le.

RESULTS:

Types: Of the 49 patients included in this study, the following cystic neoplasms were found: 14 SCNs
, 19 MCNs, 6 IPMNs, 6 SPPNs and 4 cases of ductal adenocarcinoma with cystic degeneration
The mean age was 46 years (range 16 – 80 years) and most of these patients were found to be in the 6th decade of life (30.6%). Thirty-one patients (63%) were female and.
36 (73%) were symptomatic Male: Female with ratio of 18: 31
Thirty two lesions (65.3%) were located in the pancreatic body and tail whereas 13 lesions
(26.5%) were located in the pancreatic head, neck and uncinate process
The mean of maximum diameter was 8.76 cm (size range = 1–16 cm). Most of the patients were presented with a cyst size of more than 5 cm (53.1%).
Abdominal pain was present in 28 patients (and radiated to the back in thirteen) for a median of 16 (range 1–34) months before admission. Weight loss of more than 5 kg was present in 16 patients. Risk factors for pancreatitis included alcohol consumption (one patient), known gall-stones or previous cholecystectomy (eight) or both (eleven). A documented attack of acute
pancreatitis thought to have been associated with pseudocysts occurred in three patients (one in the head and two in the body of the pancreas). There
were eleven diabetic patients (new-onset diabetes in four patients). Thirteen patients were asymptomatic and the lesions were discovered incidentally.
An erroneous diagnosis of pseudocysts had been made in four patients at some stage before admission. A palpable abdominal mass was present in nineteen patients. Six of the eight
patients with palpable masses in the pancreatic head were clinically jaundiced.
Laboratory findings: Raised serum amylase levels were noted in seven patients (three with MCN, three with IPMN, one with SCN) with a median level of 380 (normal range 80–300) units/l recorded at admission. Four of those patients were found to be without a previous documented episode of acute
pancreatitis (MCNs). Abnormal liver enzymes (total serum bilirubin, serum alanine aminotransferase, serum aspartate amino-transferase, and serum alkaline phosphatase) were noted in sixteen patients
In comparison for the characteristics of the serous and mucinous cystic neoplasms (table 1 & 2), three significant differences were detected between them. 1-On average, patients with mucinous tumors were younger (mean age 46 years, range 28 to 65 years) than patients with serous cystic neoplasms (mean age 61 years, range 39 to 76 years) (P <0.008). 2-Patients were predominantly females(73%, P<0.001) inMCNs whereas there was a little difference in the sex ratio in SCNs.3- Lastly , the incidence of
symptoms was 95% in mucinous tumors and 43% in serous tumors (P <0.001). The most frequent
complaint among patients with mucinous neoplasms was recurrent attacks of abdominal
pain in 16 patients (84%). Four of 19 patients with mucinous cystic neoplasms presented with obstructive jaundice, significant weight loss, and/or steatorrhoea-symptoms that were not seen in those with serous cystic neoplasms, except for abdominal pain in five patients, obstructive jaundice in three, and weight loss in one patient. Among the six symptomatic patients with serous cystic neoplasms, five patients complained of abdominal pain. The remaining eight patient were incidentally discovered during pre-admission period with the aid of ultrasound (n = 3) or on CT scans (n = 5), which was performed for unrelated complaint.
The clinical characteristics of patients with IPMN are summarized in Table 1 & 2. Most patients
with IPMN (83%) were male, a feature that was unique to this particular cystic neoplasm. On average, patients with IPMN were elderly (mean age 64 years, range 58– 71 years).Most of these patients presented with a history of recurrent pancreatitis and/or malabsorptive symptoms (steatorrhoea).
The clinical characteristics of the six patients with solid pseudopapillary neoplasms are summarized in Table 1 & 2. Solid Pseudopapillary neoplasms were large (mean size 11.6 cm), all the lesions were located in the body or tail of the pancreas (100%), they were seen only in women, and these patients were young with a mean age of 31 years (range 18 – 43 years).

Table 1: Clinical features of cystic tumors of the pancreas (age, sex and symptoms).

Histological diagnosis	Male	Female	Age (years) , Median range	Symptomatic
SCN (n = 14)	6	8	61 (39 – 76)	6 (43%)
MCN (n = 19)	5	14	46 (28 – 65)	18 (95%)
IPMN (n = 6)	5	1	64 (58 – 71)	6 (100%)
SPPN (n = 6)	0	6	31 (18 – 43)	4 (66%)
Ductal adenocarcinoma with cystic degeneration (n = 4)	2	2	66 (54 – 74)	4 (100%)

Table 2: Clinical features of cystic tumors of the pancreas (location and tumor size).

Histological diagnosis	Head – neck	Uncinate process	Body – tail	Diffuse	Tumor size (cm)
SCN (n = 14)	3	1	10	0	8 (5 – 13)
MCN (n = 19)	3	0	13	3	9 (3 – 16)
IPMN (n = 6)	3	1	1	1	6 (1 – 13)
SPPN (n = 6)	0	0	6	0	11 (6 – 14)
Ductal adenocarcinoma with cystic degeneration (n= 4)	1	1	2	0	8 (6 – 11)

Review of ultrasonograms, computed tomography (CT), magnetic resonance imaging (MRI), and magnetic imaging cholangiopancreatography (MRCP) images confirmed a cystic mass in all patients.

Of the (14) patients with serous cystic neoplasm, nine had appearances on CT suspicious of a cystic tumor, being due to the presence of a lobulated appearance and cyst wall thickness of 4 mm in three and a septations in six patients. Of the other five patients, four had appearances of a simple cyst and one patient was misdiagnosed as a benign pancreatic pseudocysts. In none of the other cases were there radiological features suggestive of neoplasia rather than pseudocysts.

CT was done for the 19 patients with mucinous cystic neoplasm, sixteen of them had CT appearances which carry high suspicious of a cystic tumor: eight revealed multilocularity; unilocularity, six; cyst wall thickness, six; mural nodules, five; and septations in one.

The three patients with mucinous cystic neoplasm which was miss diagnosed radiologicaly as pseudocysts had CT appearances of a solitary pancreatic cyst associated with features of chronic pancreatitis in two patients (pancreatic atrophy with pancreatic calcification) or splenic infarction in one.

There is only one patient with cystic degeneration of ductal adenocarcinoma had an (8) cm unilocular cyst in the head of the gland without features on CT to suggest neoplasia rather than a wall thickness of 4 mm. For patients with IPMN; in one patient only pancreatic duct dilatation was found, and cystic neoplasms were detected in the remaining five.

An important radiologic feature that was found on MRI and MRCP done for patients with obstructive jaundice was dilatation of the biliary tree. Common bile duct (CBD) dilatation was detected in eleven patients with a median size of 16.8 mm (range 10–25mm).Of those patients with biliary obstruction: SCNs, three; MCNs, six; and IPMN, two.

Endoscopic ultrasonography (EUS) findings: Table (3) Eight out of the 19 MCN were monolocular cysts and 11 were multicystic, whereas all SCNs, IPMNs and SPPNs were multicystic tumors. Cystic tumors of the pancreas consisted of either macrocysts and/or microcysts; all MCN, IPMN, and SPPN tumors consisted of the macrocysts (without micro-cystic area), whereas only 2 of 14 cases of SCN were macrocystic. In SCNs, microcystic areas were located at the center of cystic tumors or beside a macrocystic area. Twelfth of 14 SCN tumors contained a microcystic area within the tumor. Microcystic areas within cystic tumors were therefore highly suggestive of SCN. All MCN tumors appeared round whereas 11/14 SCN (78.5%), all IPMN and SPPN tumors were did not appear round. This difference helped to distinguish between these types of tumor. Mural nodules were detected in 14 patients: 4 of 14 patients with SCN, 5 of 19 patients with MCN, 2 of 6 patients with IPMN, 2 of 6 patients with SPPN, and one patient with cystic degeneration of ductal

adenocarcinoma. Calcification was only found in SCNs.

Table 3:Endoscopic ultrasonography findings in cystic tumors of the pancreas.

	SCN	MCN	IPMN	SPPN	Ductal adenocarcinoma with cystic degeneration
Components of cystic tumor					
Monolocular	0	8	0	0	0
Multicystic	14	11	6	6	4
< 6 cystic formation	3	10	4	5	4
>6 cystic formation	11	1	2	1	0
With microcystic area	12	0	0	0	0
Without microcystic area	2	11	6	6	4
Appearance					
Round	3	19	0	0	0
Not round	11	0	6	6	4
Mural nodule	4	5	2	2	1
Calcification	3	1	0	0	0

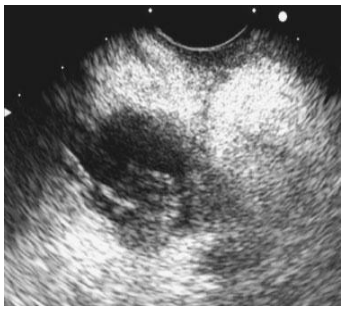

Figure 1: EUS of a malignant mucinous cystic lesion with an adjacent mass.

Endoscopicretrograde cholangiopancreatography (ERCP): ERCP was undertaken for 16 patients: IPMN, six; MCNs, six; and SCNs, four. The test was performed in all patients with IPMN and revealed a patulous papilla exuding mucin, a diffusely or localized dilated pancreatic duct communicating with cysts, and filling defects secondary to mucin plugs. This was the only group in which a correct preoperative diagnosis was made in all patients.

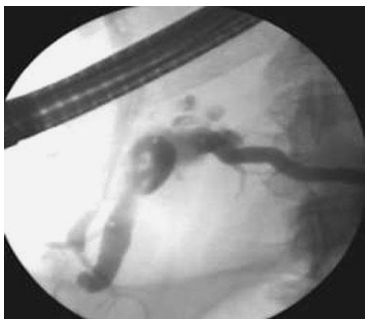

Figure 2: ERCP image of an Intraductal papillary mucinous neoplasm.

ERCP was also performed in six patients with MCNs. Of these patients, external compression of the pancreatic duct was seen in three patients; two had normal but extrinsically displaced ducts, one with cyst-duct communication and extravasations of contrast into the lesion with cytologic findings suggestive of mucinous neoplasm. In four patients with SCNs, ERCP was found to be normal.

Management procedures and outcome:

An attempted curative resection was performed for 21 of 49 patients (Whipple resection, six; distal pancreatectomy and splenectomy, eleven; distal pancreatectomy without splenectomy, four).

Five (35%) of the 14 patients with serous cystic neoplasms underwent resection: two pylorus-preserving pancreatoduodenectomies (Whipple resection), and three distal pancreatectomies. One patient who had a diffuse pancreatic involvement underwent exploratory laparotomy with a biopsy only, and another patient had a biopsy combined with gastro-jejunostomy and choledochojejunostomy. This patient was elderly with unresectable pancreatic tumor. To my knowledge, there was no operative death.

Seven (37%) of 19 patients with mucinous cystic neoplasms underwent resection: pylorus-preserving pancreatoduodenectomy in two and distal pancreatectomy in five patients. All of these seven patients recovered without complications and are well 8-18 months postoperatively. Three patients were deemed unresectable because of invasion of vascular structures and the presence of liver metastases; two underwent biliary and gastric bypass with a biopsy and one had a biopsy only.

Two (33%) of six patients with IPMNs underwent successful resections: one Whipple procedure, and one distal pancreatectomies. All the six (100%) patients with solid pseudopapillary neoplasms underwent curative resection. All these patients were treated with distal pancreatectomies.

Only one (25%) of four patients with cystic degeneration of ductal adenocarcinoma underwent Whipple procedure. There were another two patients who had a biopsy only for metastatic disease.

ERCP with metallic stenting was performed for six patients presented with obstructive jaundice (MCN, three; SCN, one; IPMN, one and one patient with cystic degeneration of ductal adenocarcinoma).Those patients had unresectable pancreatic tumors.

The remaining 15 patients were not subjected to any interventional procedure for many reasons, some refused surgery and others were elderly or had comorbid illnesses (table 4).

Table 4: Resectability and management of cystic tumors of the pancreas.

Histological diagnosis	Resecta-bility N (%)	Pancreatico-duodenectomy	Distal Pancreatectomy	Palliative surgery	Biopsy only	ERCP	No intervention
SCN (n= 14)	5 (35.7%)	2	3	1	1	1	6
MCN (n = 19)	7 (36.8%)	2	5	2	1	3	6
IPMN (n = 6)	2 (33.3%)	1	1	0	0	1	3
SPPN (n = 6)	6 (100%)	0	6	0	0	0	0
Ductal adenocarcinoma with cystic de-generation(n = 4)	1 (25%)	1	0	0	2	1	0
Total (n = 49)	21 (42.85%)	6	15	3	4	6	15

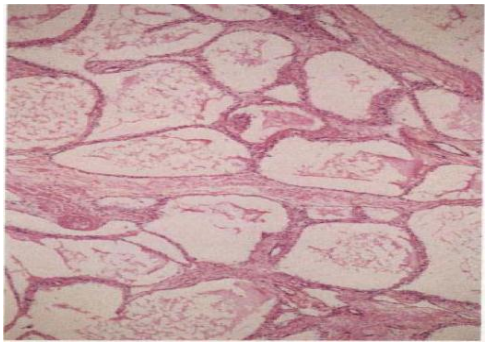

Figure 3: Serous cystic neoplasm. Note the cysts Are lined by flat cuboidal epithelium without Papillae and filled with proteinaceous fluid.

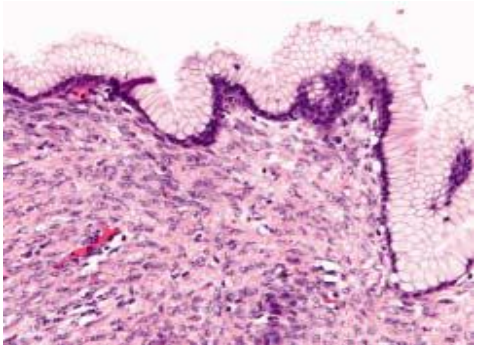

Figure 4: Mucinous cystic neoplasm. The cysts are lined by columnar cells with abundant apical Mucin-filled vacuoles.

DISCUSSION:

These are some studies which were compared with the present study: Table (5)

Martin *et al.*[18]found that both SCN and MCN have a female pre-dominance and located predominantly in the body and tail of the pancreas.

Brugge *et al.*[19] found the same criteria regarding age, sex and location and compare the cystic neoplasms with inflammatory cysts.

Al Haddad *et al.*[20] reported his findings with regard to age, sex (male patients comprise 38%), symptoms (35% symptomless), cyst location (77% are located in the body and tail), and cyst size with a median of 2.7 cm.

Kubo *et al.*[21] found on his study of 76 patients that a mean was 58 years, no difference in sex predilection, equal distribution in the head and body/tail of the pancreas with a smaller tumor size(3.8 cm). He reported that 45 patients (59.2%) have IPMN. These results are different from our study.

Table 5: A comparison of patient characteristics of the present with other studies.

Patient characteristics	Present study (n = 49)	Martin et al. (n = 21)	Brugge et al. (n = 112)	Al Haddad et al. (n = 37)	Kubo et al. (n = 76)
Age, years Mean Range	 46 16 – 80	 60 22 – 82	 60.1	 73 37 – 94	 58 29 – 85
Sex ratio (M:F)	18 : 31	5 : 16	41 : 71	14 : 23	36 : 40
Cyst location Head Body/tail	 13 32	 6 14	 49 63	 9 28	 38 38
Cyst size,cm Median Range	 8.76 1–16	 8 3 – 15		 2.7 2.0 – 5.5	 3.8 1.4 – 7.5

We compare some of the clinical features of different types of cystic pancreatic neoplasms with two studies: Kubo *et al*. reported that patients with MCN are younger with a female predilection in most types of cystic neoplasms. All MCN tumors are located in the body/tail, two-third of IPMN tumors in the head, SCN tumors are equally distributed

Another research by Goldsmith J D. revealed that patients with MCN and SPPN tumors are younger, and all the types have a female predominance. According to his results, SCN and MCN tumors are

located primarily in the body/tail whereas IPMN tumors are located in the head and these findings are compatible with our study apart from the presence of SPPN tumors entirely in the pancreas

In the past, many have advocated an aggressive resection approach[3, 9, for] all cystic neoplasms of the pancreas on the basis that almost all lesions, except for SCN, have the potential to be malignant and there are currently no reliable preoperative tests to determine malignant potential.

The current management of a cystic lesion of the pancreas should be tailored according to the risk-benefit ratio of surgical resection which is primarily determined by the risk of a cyst being malignant or becoming malignant versus the operative risk of pancreatic surgery. The risk of a cystic neoplasm being malignant can be determined preoperatively by the various preoperative diagnostic tests discussed previously whereas the operative risk will be determined primarily by the age and co-morbidities of the patient, surgical volume of the centre and the type of resection (distal pancreatectomies or pancreaticoduodenectomy) which in turn is determined by the size and location of the cystic neoplasm.

To incorporate the multiple interrelated factors involved in determining the surgical candidacy of these patients, a surgical risk scoring system was developed by using a modified Delphi approach.[22] This scoring system has 4 components, including age of the patient (<65, 65–79, and > 80 years), surgical risk in terms of American Society of Anesthesiologists (ASA) score, size of the cystic lesion (<3 cm, 4–5 cm, and >5 cm), and location of the cystic lesion (tail, body,[23] or head of the pancreas) .

The total operability score defined the probability of an individual patient for undergoing surgical resection and also determined perioperative mortality in the patient. So the typical patient was considered to be in the age group of <65 years, with an ASA score of I or II and a 3–cm, cystic lesion located in the tail of the pancreas.

According to this scoring system, we found that most of the patients who underwent surgical resection of the cystic tumors were ASA I, age <65 years, cyst lesion in the body/tail (15 distal pancreatectomies vs. 6 pancreaticoduodenectomy), but a greater number of these tumors were larger than 3 cm

CONCLUSION:

1. Cystic pancreatic neoplasms are uncommon but these are increasingly detected especially in asymptomatic patients due to imaging studies performed for other indications.

2. A wide spectrum of disease entities have been recognized which may present as a cystic lesion of the pancreas and can range from obviously benign to indeterminate or borderline malignant potential lesions to overt malignancy.
3. Benign serous neoplasms are difficult to distinguish from other cystic neoplasms, but in general they tend to be asymptomatic and occur in older patients. On the other hand, mucinous neoplasms tend to be symptomatic, occur in younger patients with a female predominance. Solid Pseudopapillary neoplasms are larger and are seen in younger women and were located exclusively in the body/tail of the pancreas. IPMN typically is found in men with characteristic ERCP findings and most frequently located in the head of the pancreas.

REFERENCES:

1. Compagno J, Oertel JE. Mucinous cystic neoplasms of the pancreas with overt and latent malignancy (cystadenocarcinoma and cystadenoma). A clinicopathologic study of 41 cases . *Am J Clin Pathol* 1978;69:573–80.
2. Compagno J, Oertel JE. Microcystic adenomas of the pancreas (glycogen-rich cystadenomas): a clinicopathologic study of 34 cases. *Am J Clin Pathol*. 1978;69:289-98.
3. Fernandez-del Castillo C, Warshaw AL. Cystic tumors of the pancreas . *Surg Clin North Am* 1995; 75:1001–16.
4. Visser BC, Muthusamy VR, Yeh BM, Coakley FV, Way LW. Diagnostic evaluation of cystic pancreatic lesions. HPB (Oxford) 2008;10 :63-69.
5. Brugge WLG, Sahani D, Fernandez C, Warshaw A. Current concepts of cystic neoplasms of the pancreas and their management. N Engl J Med 2004 (In press).
6. Brugge WR, Lauwers GY, Sahani D, Fernandez-del Castillo C, Warshaw AL. Cystic neoplasms of the pancreas. N Engl J Med 2004;351:1218-26.
7. Goh BK, Tan YM, Yap WM, Cheow PC, Chow PK, Chung YF, et al. Pancreatic serous oligocystic adenomas: clinicopathologic features and a comparison with serous microcystic adenomas and mucinous cystic neoplasms. World J Surg 2006;30:1-7.
8. Goh BK, Tan YM, Chung YF, Chow PK, Cheow PC, Thng CH, et al. Pancreatic cysts: a proposed management algorithm based on current evidence. Am J Surg 2007;193:749-55.
9. Goh BK, Tan YM, Chung YF, Chow PK, Cheow PC, Wong WK, et al. A review of mucinous cystic neoplasms of the pancreas defined by ovarian-type stroma: clinicopathological features of 344 patients. World J Surg 2006;30:2236-45.
10. Tanaka T, Chari S, Adsay V, Fernandez-del Castillo C, Falconi M, Shimizu M, et al. International consensus guidelines for management of intraductal papillary mucinous neoplasms and mucinous cystic neoplasms of the pancreas. Pancreatology 2006;17-32.
11. Ohhashi K, Murakami Y, Takekoshi T. Four cases of mucin-producing cancer of the pancreas on specific findings of the papilla Vater [Japanese]. Prog Dig Endosc 1982;20:348-51.
12. Goh BKP, Tan YM, Cheow PC, Chung YF, Chow PK, Wong WK, et al. Cystic neoplasms of the pancreas with mucin-production. EJSO 2005;31:282-87.
13. Zamboni G, Scarpa A, Bogina G, Iacono C, Bassi C, Talamini G, Sessa F, Capella C, Solcia E, Rickaert F, Mariuzzi GM, Kloppel G. Mucinous cystic tumors of the pancreas: clinicopathological features, prognosis, and relationship to other mucinous cystic tumors. Am J Surg Pathol 1999;23:410–22.
14. Frantz VK. Papillary tumors of the pancreas: Benign or malignant? Tumors of the pancreas. In: Frantz VK, editor. Atlas of Tumor Pathology. 1st Series. Fascicles 27 and 28. Washington DC: Armed Forces Institute of Pathology, 1959:32-33.
15. Mao C, Guvendi M, Domenico DR, Kim K, Thomford NR, Howard JM. Papillary cystic and solid tumors of the pancreas: A pancreatic embryonic tumor? Studies of three cases and cumulative review of the world's literature. Surgery 1995;118:821-28.
16. Klimstra DS, Wenig BM, Heffess CS. Solid-pseudopapillary tumor of the pancreas: a typically cystic carcinoma of low malignant potential. Semin Diagn Pathol 2000;17:66-80.
17. Goh BK, Tan YM, Cheow PC, Chung AY, Chow PK, Wong WK, et al. Solid pseudopapillary neoplasms of the pancreas: an updated experience. J Surg Oncol 2007;95:640-44.

18. Martin I, Hammond P, Scott J, Redhead D, Carter DC, Garden OJ. Cystic tumours of the pancreas. Br J Surg 1998;85:1484-86.

19. Brugge WR, Lewandrowski K, Lewandrowski EL, Centeno BA, Fernandez-del Castillo C, Warshaw AL. Diagnosis of pancreatic cystic neoplasms: A report of the cooperative pancreatic cyst study. Gastroenterol 2004;126:1330- 36.

20. Al-Haddad M, Gill KRS, Raimondo M, Woodward TA, Krishna M, Crook JE, Skarvinko LN, Jamil LH, Hasan M,Wallace MB. Safety and efficacy of cytology brushings versus standard fine-needle aspiration in evaluating cystic pancreatic lesions: a controlled study. Endosc 2010; 42: 127 -32.

21. Kubo H, Nakamura K, Itaba S, Yoshinaga S, Kinukawa N, Sadamoto Y, Ito T, Yonemasu H, Takayanagi R. Differential diagnosis of cystic tumours of the pancreas by endoscopic ultrasonography. Endosc 2009;41:684 -89.

22. Adler M, Ziglio E, editors. Gazing into the oracle: the Delphi method and its application to social policy and public health. London (UK): Jessica Kingsley Publishers; 1996.

23. Owens WD, Felts JA, Spitznagel EL Jr. ASA physical status classifications: a study of consistency of ratings. Anesthesiology 1978;49:239-43.