Patient with incidental pancreatic cyst

Diego Aponte M, MD[1]

[1] Internal Medicine – Gastroenterology Specialist. Gastroenterology Academic Coordinator for Graduate Level. Fundación Sanitas. Bogotá, Colombia.

Received: 07-09-10
Accepted: 15-09-10

Abstract
The editors of this review have taken this opportunity to present a clinical case history of an obese young adult female patient who was found to have an 18mm in diameter pancreatic cyst. Prior to performance of bariatric surgery a CAT scan was performed which revealed the existence of the cyst. This case is being presented in order to answer some of the most frequently asked questions which arise when a pancreatic cyst is found incidentally.

Keywords
Pancreatic cyst.

CASE REPORT

55 year old patient, female, with obesity grade III since she was 20 years old. Multiple complications: diabetes mellitus type 2, hypertension, sleep apnea-hypopnea and severe pulmonary hypertension. In pharmacological treatment with orlistat, thyroxine, metformin, enalapril and furosemide. In preoperative study for bariatric surgery is documented pancreatic cyst. In the physical examination the patient is in good general condition, obesity level III, body mass index of 37, with no other positive findings. Axial tomography of abdomen with contrast reported a small 18-mm simple cyst without intrinsic septa or solid component in the pancreatic uncinate process.

HOW COMMON IS IT TO FIND A PANCREATIC CYST? AND, WHAT ARE THEIR SYMPTOMS?

In recent years radiological examinations have been performed more frequently, and we have also obtained a great improvements and better resolutions in these techniques resulting in diagnostic sensitivity. Together these have generated increased incidental findings of lesions in the pancreas. Large series using Computerized Axial Tomography (CAT) or Magnetic Resonance Imaging (MRI) have reported detection rates for pancreatic cystic lesions of between 1.2% and almost 20%. This is almost the same as the rate found in autopsies which can go up to 24.3% (1-3). Although the majority of these lesions are pseudocysts, a good portion of those found, between 10% and 15% of all these cystic lesions, are cystic tumors (4).

Between 40% and 75% of pancreatic cystic tumors are asymptomatic when the lesion is incidentally diagnosed while searching for another condition. When these symptoms appear, they are not generally very specific, but rather have vague indications such as slight abdominal pain, distension and dyspepsia (5).

In the case we analyzed we this is exactly what we found. In the study prior to bariatric surgery, we found a small cystic lesion in the CAT scan as an incidental finding, in a patient without symptoms.

WHAT ARE THE POSSIBLE DIFFERENTIAL DIAGNOSES AND THEIR CLINICAL RELEVANCE? (TABLE 1)

The differential diagnoses for pancreatic cystic lesions are ample, and they are presented in two possible groups. On one hand there is a group of non-neoplastic lesions in

Table 1. Differential characteristics of the main cystic lesions of the pancreas (8).

Characteristic	Pseudocyst	Serous Cyst	Mucinous Cyst	IPMN
Epidemiology				
Gender	F=M	F>>M (4/1)	F>>>M(10/1)	F=M
Age	40-60	60-70	50-60	60-70
Image Findings				
Location	Anywhere	Anywhere	Body and Tail>>> Head	Head> diffuse > body tail
Appearance	Rounded, thick walled, atrophy, calcification pancreatitis	Beehive shaped multicystic, central calcification	Septated macrocysts, mural nodules	Lobulated, contact with duct. Polycystic.
Connects to ducts	Yes	No	Very rare	Yes
Fluid Analysis				
Cytology	Inflammatory	Glycogen rich, cuboidal cells	Mucin rich, columnar cells	Mucin rich, columnar cells
Mucin	Negative	Negative	Positive	Positive
Amylase	Very high	Low	Low	High
CEA	Low	Low	High	High

which the most frequent lesion, the pancreatic pseudocyst, is found. In this group we also find the infectious, congenital, duplication, retention and lymphoepithelial cysts. In the other group we find tumoral lesions with some neoplastic potential such as serous tumors including cystadenoma (CAS) and cystadenocarcinoma (CACS). In this group there are also mucinous cysts like mucinous cystic neoplasms (MCNs) and intraductal papillary mucinous neoplasms (IPMNs) and others such as the solid pseudopapillary tumors and solid tumors with cystic variants like cystic, acinar and neuroendocrine adenocarcinoma.

The group is ample and heterogeneous with a broad range of potential malignant cysts from simple cysts without importance, to cystadenomas serous with almost no malignant potential, on to premalignant lesions such as mucinous cystic tumors, noninvasive intraductal mucinous neoplasias, and finally to invasive malignant lesions (6).

Cystic tumoral lesions must be differentiated one from the other, since there are great variations among them. Nevertheless this differentiation is not easy in many cases, and incorrect identification can lead to incorrect treatment with all of its potential consequences. For this reason some groups have proposed surgical resection of all cystic tumoral lesions in patients with good health (7). Although this aggressive treatment would diminish the risk of missing inadvertent lesions with malignant components, and would prevent evolution of some lesions to malignant status, many healthy subjects with benign lesions would have to undergo unnecessary surgical morbidity, the rates of which can sometimes be very high. Nevertheless, in the last years awareness of this has increased and knowledge of the natural history of these lesions has improved. Consequently, it has become perfectly possible to identify the lesions that really need surgery.

Is it a pseudocyst?

Clinical history acquires real importance in some of these cases, so we must take into consideration important data such as previous episodes of pancreatitis, associated risk factors such as alcohol consumption, biliary pathology, trauma and family history of pancreatopathy. These data can help in diagnosing whether or not the lesion is a pancreatic pseudocyst. However, besides clinical history to make this diagnosis we also need to connect it to morphologic elements of the images taken. These include whether or not the lesions are rounded, thick walled, unilocular and generally circumscribed. We also have to see if they are macrocystic or parenchymal, findings associated with acute or chronic pancreatitis. In some cases the histopathologic study should be complemented with percutaneous needle aspiration, especially when there are observations of hemorrhaging with necrotic, turbid content rich in pancreatic enzymes such as amylase.

Is it a serous cystic tumor?

Serous cystic tumors, described initially in 1978 by Compango (8), are one of the most common cystic tumors of the pancreas accounting for up to 30% of all cystic tumors. These are considered to be benign, although some reports have presented a very rare malignant version (3%

of serous tumors). This has led the WHO to reclassify them into 2 categories: serous cystadenoma and cystadenocarcinoma. Both serous tumors can be large, up to 7 cm at the time of diagnosis. They can generate vague symptoms, and can be located in the head, body and/or tail of the pancreas. Two factors which are more frequent among malignant cases than among benign cases, and which can be used in the attempt to differentiate them, are the presence of more symptoms (86% vs. 66%) and old age (66 vs. 60) (9-11). The characteristic images corresponding to polycystic tumors with microcysts resemble honeycombs with central calcifications that appear in 30% of the cases.

Is it a mucinous tumor?

Mucinous tumors are another differential diagnosis. Two different types of mucinous tumors exist: intrapapillary mucinous neoplasias (IPMNs) and mucinous cystic neoplasms (MCNs). Both share some characteristics such as mucin production and a definite potential for malignancy. However, they differ in distribution by age and sex as well as in symptoms and location within the pancreas. MCNs represent between 10-40% of all pancreatic cystic neoplasms. They are located in the body and the tail of the pancreas in 90% of the time. They are found almost exclusively in women patients who are 50 years old on average, but who are younger than patients with cases of serous cystic tumors and of IPMN. However, when adenocarcinomas are present, patients' average age is 15 years older, reflecting the process through which malignancies progress. In these cases symptoms generally occur more frequently, appearing in 60% of the cases, although they are vague and unspecified due to compression rather than to invasion. 10 to 20% of these patients have prior histories of pancreatitis and present symptoms such as jaundice, weight loss, anorexia, portal hypertension or diabetes mellitus and are more likely to be malignant (12-15). in a CAT scan they usually appear as a septated cystic mass with heavy walls and with macro cysts larger than 2 cm. Normally they do not communicate with the pancreatic conduit and can compress it or expand it, causing this lesion to be confused with IPMN in which this characteristic is more common. In the image it is possible to observe egg Shell calcifications in the periphery of the cyst and mural nodules that correspond to a solid component in the periphery which is present in 20% of these cases. Differentiating between benign and malignant tumors in these cases is very difficult, but some elements which tend to indicate malignancy are invasion of vascular structures, biliary obstruction, hepatic metastatic lesions and ascites (16).

IPMNs were described in 1982 by Oshhashi. They represent 25% of pancreatic cystic tumors, although diagnoses have been increasing in the last 2 decades. Typically they are associated with advanced ages, between 60 and 70 years old, and time of transformation from benign to malignant is from 5 to 7 years. They affect men and women equally. 50% are located in the head of the pancreas, while the other half are multifocal. 25% are asymptomatic, but the majority of the patients experience unspecified and vague symptoms. More than 20% of patients experience recurrent attacks of acute or chronic pancreatitis because of duct obstruction by mucous or tumors which can also obstruct the common bile duct as well as generate symptoms of endocrine or exocrine dysfunction. Even so, the presence of symptoms should cause the physician to be suspicious of invasive disease. Differentiating between IPMN of the main and secondary ducts is very important since the former is much more aggressive and presents malignant lesions in 70% of cases, whereas the latter presents malignancies only 25% of time (16-18).

In the images we observe a polycystic tumoral lesion with macro cysts. The most important feature how it communicates with the main or secondary duct.

In the case presented by the publishers, we observe a cystic lesion, poorly defined in the image, in a young adult woman. We do not know the location of the lesion, which makes it impossible to present a differential diagnosis. However, due to absence of symptoms and history in a young woman, it is probable that it represents a simple congenital cyst, or less probably, a serous cyst. Even so, a more complete study such as endoscopic ultrasonography (EUS) should be performed done in order to better define morphology and to define whether there is a need for needle aspiration.

CAT SCANS, MRIS OR EUS?

CAT scans are considered to be excellent first line tests for evaluation of pancreatic cysts since they provide good characterizations of cyst morphology. Moreover, with appropriate technique and large capacity high resolution equipment, the physician can suitably differentiate cystic lesions. However, in cases in which identification is difficult, the MRI confers advantages for characterization of morphologic characteristics, and may improve evaluation of the communication between cysts and the ductal system. This can help to differentiate IPMNs from MCNs. Magnetic resonance cholangiopancreatography (MRCP) has the advantage of correctly evaluating these communications without being invasive as is endoscopic retrograde cholangiography (ERCP). ERCPs have a role only if IPMN is suspected in special individual cases. It improves the sensitivity of the visualization the communication of the pancreatic ducts and is able to see mucinous material exiting

through the papilla, all of which would help in diagnosing IPMN. EUS has the advantage of clearly defining the morphologic characteristics of cysts with great size and clarity. Nevertheless, it has the obstacle of subjectivity and physicians must spend a long time learning this technique.

DOES THE PUNCTURE OF THE INJURIES HAVE ADDITIONAL UTILITY FOR DEEPEN YOUR STUDY?

The other main advantage of EUS is that it allows for aspiration and sample taking for cytological biochemical study and for testing for tumoral antigens. A theoretical risk of seeding of tumoral cells during the passage of the aspiration needle has been considered, but has not been found in various series (19). In any case, the risk involved in taking percutaneous samples is low (20).

In the material obtained by fine needle aspiration in initial EUS studies the sensitivity of the cytological studies was only 50%. However, more recently published studies have shown sensitivities of 93%. (21, 22) In my opinion, this is due to improvement in fine needle aspiration technique, better evaluations of the samples obtained, as well as the reading by pathologists who are experts in this subject. On the other hand, the most frequently analyzed aspect of the fluid obtained is the levels of amylase and tumoral markers. An increase in the amylase level indicates that the lesion communicates to the ductal system. It is frequently associated with pseudocysts or IPMNs, and less frequently with MCNs which communicate to the pancreatic duct. Therefore, although amylase points to the identity of the lesions, it is not totally precise in differentiating among the different types. Diverse tumoral markers have been evaluated in the diagnosis of pancreatic cystic tumors, among them: Ca 19.9, Ca 125, Ca 72.4 . The one which has been studied most and which is most frequently used clinically carcinoembryonic antigen (CEA).

Several studies of CEA have been done. By using different cut-off points they have attempted to improve sensitivity and specificity in order to differentiate non-mucinous lesions from mucinous lesions (23-25). As we all know increasing the cut-off points improves sensitivity but at the cost of diminution of specificity. Although there are no clear standardized values, the best recognized and most commonly used study is that by Dr. Bruggue and colleagues (25).

That study used a cut-off value of 192 mg/ml for evaluating aspirated liquids for diagnosis. Values higher than this indicated mucinous lesions with a diagnostic precision of 79% , sensitivity of 75% and specificity of 84%. On the other hand, lesions with measurements of less than 5 mg/ml are not likely to be mucinous. Bruggue et al. demonstrated that use of this method alone is a more precise diagnostic tool than cytology, morphology or Ca 19.9 levels. CEA levels can also help differentiate invasive mucinous tumors from noninvasive tumors. Values greater than 6,000 mg/ml are more suggestive of cystadenocarcinomas.

Positron emission tomography (PET) scans have been shown to be useful in differentiating between malignant lesions from benign lesions, especially if PET scans are combined with CAT scans. However, the exact role of PET scans is not clear yet.

It is important to remember that these values are only diagnostic guides rather than definitive criteria. Thus, to my way of thinking, we should give the proper value to each of the diagnostic tools that we have available to us - clinical history, radiological studies for perfecting our understanding of cyst morphology, biochemical values, and tumor antigens – so that we can obtain the best diagnostic performance.

In this case case presented by the publishers of the magazine, a small cyst was considered without having clearly established its morphologic characteristics. However, these are very important for the initial analysis and for determining the cyst's location. If these characteristics were known, we could have determined if this was a simple, congenital cyst with no malignant potential. However, if we cannot clearly determine these characteristics through a CAT scan, then EUS becomes the best study to determine the cyst's characteristics and clarifying whether it is a simple lesion, or not. If it were a simple lesion, it would not have pathological potential, which is most probable in this case, and would only need a follow-up one year later.

WHAT IS THE BEST TREATMENT FOR THESE LESIONS? MONITORING VS. SURGERY

The most crucial aspect of the treatment of pancreatic cystic lesions is establishment of the correct diagnosis.

For serous tumors there are treatment options. The majority of investigators agree that surgery should only be performed on patients who present symptoms, have rapid tumoral growth, changes in appearances in images, or in those cases in which a precise diagnosis has not been established. Other investigators have promoted surgical treatment for all serous tumors except for patients who are poor candidates for surgery. Nevertheless, due to the infrequent occurrence of malignant lesions, this conduct seems to be too aggressive.

Other authors have proposed that the decision to perform surgery should be made if lesions are symptomatic, or are bigger than 4 cm (adducing that the tumors grow more quickly after reaching that point). However this is not commonly accepted conduct.

The most frequently made, best accepted and well supported recommendation of the majority of experts on this subject, is to use CAT scans and EUS to monitor patients who have no symptoms, who have morphologic characteristics which are very clear, who have no or few cytological indications, and who have benign antigen results (if these tests have been performed). If symptoms or changes develop during monitoring, surgical treatment must be considered, always taking into account the risk/benefit relation. Once resection is performed, and if it has been successful and the patient's chances for long term survival are excellent, the majority of investigators do not consider post surgical monitoring when a diagnosis of a serous tumor has been confirmed (26-28).

Due to the real risk of latent malignancies and the difficulty of differentiating between benign and malignant lesions (or lesions becoming malignant) the majority of experts agree with the 2006 guides of the International Association of Pancreatology which says that primary treatment of mucinous tumors must be surgical. Monitoring can be a reasonable option for elderly patients, or for those at high risk from surgery. This is especially true for small lesions that are not clearly malignant. Since the majority of MCNs are located in the body and the tail of the pancreas, surgical risk is generally low (29, 30) (Figure 1).

Given that there are different possible courses of clinical development that IPMNs may follow, including compromising the main pancreatic duct, compound compromises, and compromises that only affect secondary pancreatic ducts, two different algorithms are considered (Figure 2). The current recommendation for the treatment of IPMNs affecting the main duct, or the main and secondary ducts, is surgical resection of the lesion. Obviously, this depends upon whether or not the patient is a candidate for surgery with a reasonable life expectancy. This recommendation is associated with high risks of malignancy (70%) of the tumors of main duct within 5 or 6 years. The recommendation is not the same for cystic tumors of the secondary ducts since progression of malignancies is not clear. Recommendations are more conservative for some of these cases and surgical handling is suggested only when some of the following symptoms appears:

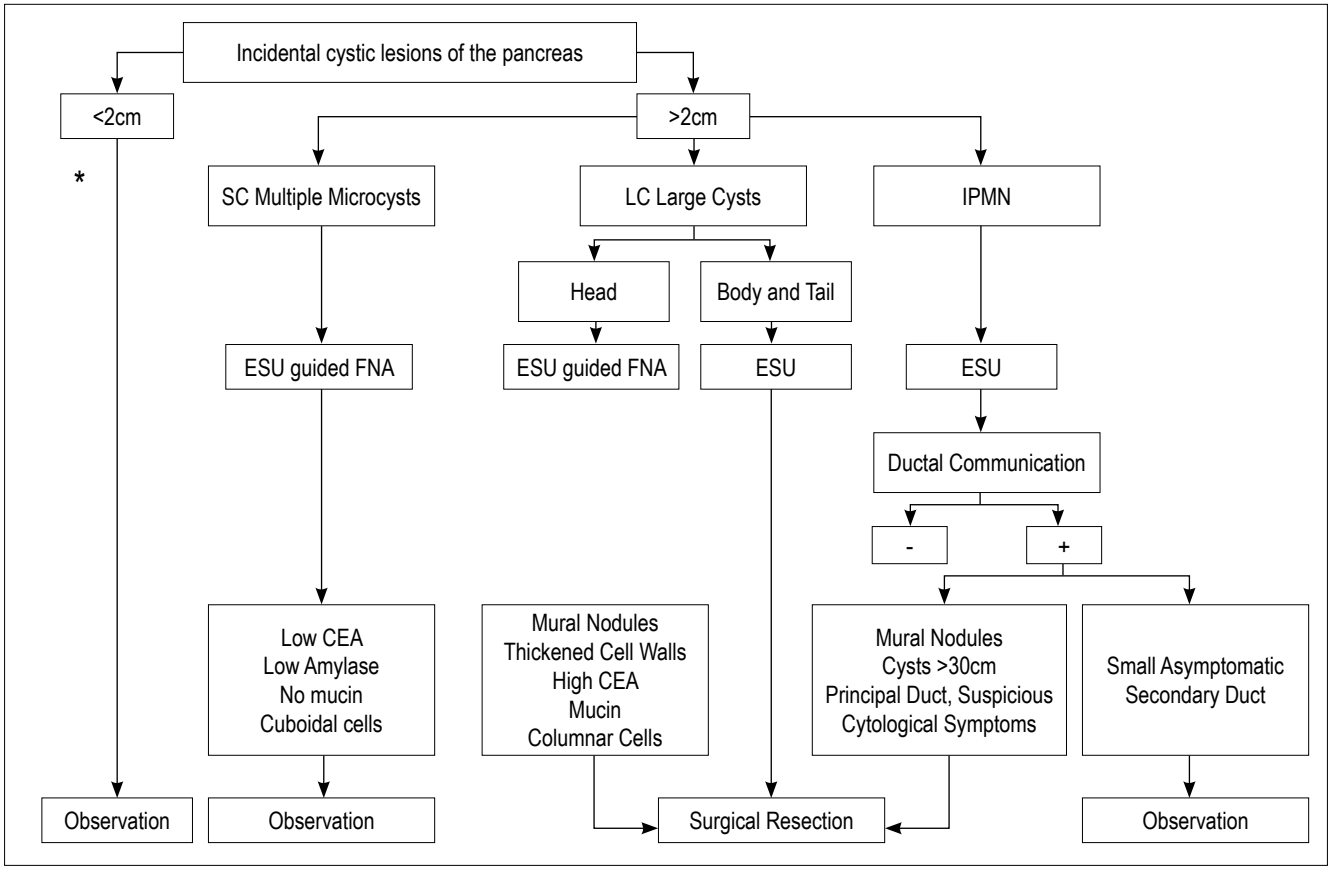

Figure 1. Recommended algorithm for diagnosis, follow-up and treatment of incidental pancreatic cysts.. SC: Serous Cysts. MC: Mucinous Cysts. ESU: Endoscopic Ultrasound. CEA: Carcinoembryonic antigen. * As long as the CAT scan shows clarity, otherwise ESU must be used in depth to improve the morphologic characteristics and to increase the clarity of the lesion. Modified from (33).

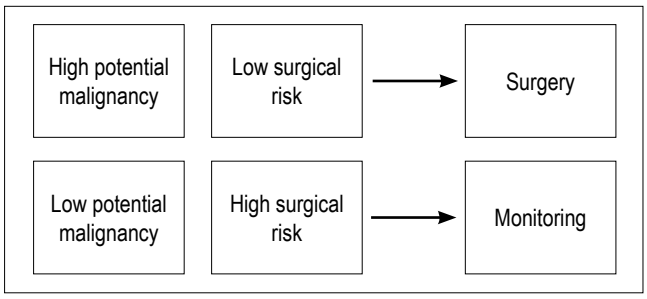

Figure 2. IPMN Algorithm.

1. Presence of symptoms.
2. Expansion of the main pancreatic duct to over 10 mm.
3. Cyst size over 30 mm.
4. Presence of intramural nodules.
5. Cytological suspicion of malignancy. These characteristics have been associated with risks of malignancy.

On the other hand small, asymptomatic IPMNs of secondary ducts can be medically treated with careful periodic monitoring (29, 31, 32)

What appears to me to be key is the evaluation and analysis of 2 concepts:

1. The risk of surgery to the patient.
2. The potential for the lesion to become malignant.

If the surgical risk is low, for example in young patients and in cysts located in the body or tail of the pancreas, and the risk of becoming malignant is high, for example in cases of IPMNs or MCNs, treatment should clearly be surgical. On the other hand, if there is high surgical risk and low potential for malignancy, for example an 85 years old patient with EPOC and coronary problems, with a serous cystic tumor in the head of the pancreas, the obvious treatment would be medical but not surgical. The greatest difficulties are found when patients are at intermediate points, where all of the tools at hand need to be applied to individually analyze each case in a medical meeting with gastroenterologists, radiologists, surgeons and pathologists in order to offer the best possible outcome.

It is also important to define potential malignancy and surgical risk in each case. Multidisciplinary evaluations must be done for each case.

CONCLUSIONS

Incidental identification of cystic pancreatic lesions is occurring more frequently to the point that they have become a common finding in clinical practice. Several radiological and endoscopic advances in the fields of the biological behavior and natural history have been made in identification of different sub-groups of cystic lesions. This has generated new recommendations for diagnosis, follow-up and treatment of these lesions. Current knowledge indicates that the great majority of found lesions can be observed without surgical treatment. Nevertheless, all the tools available must be evaluated and used to detect premalignant and malignant lesions at the opportune moment in order to perform surgery when needed. In order to do this a multimodal and multidisciplinary approach must be taken in the study of this type of lesions. In addition we must clearly establish the potential for malignancy of all lesions and determine the risk of treatment in order to make the best decision. Currently there is not enough support evidence to decide which is the ideal intensity, frequency and modality for monitoring and follow-up. Therefore, for now, the scientific evidence available should be used in order to provide the best possible outcome for all of our patients.

REFERENCES

1. Spinelli KS, Fromwiller TE, et al. Cyst pancreatic neoplasms: observe or operate. Ann Surg 2004; 239(5): 651-7.
2. Zhang XM, Mitchel DG, et al, Pancreatic cysts depiction on single shot fast spin-echo MR images. Radiology 2002; 223(2): 547-53.
3. Kimura W, Nagai H, Koruda A, et al. Analysis of small cyst lesions of the pancreas . Int J Pancreatol 1995: 18(3): 197-206.
4. Fernández del Castillo C, Warshaw AL, et al. Cystic neoplasms of the pancreas. Pancreatology 2001; 1 (6): 641-7.
5. Sarr MG, Murr M, Smyrc TC, et al. Primary Cystic neoplasms of the pancreas. Neoplastic disorders of emerging importance-current state of the art, and unanswered questions. J Gastrointest Surg 2003; 7(3): 417-28.
6. Brugge WR, Lawers GY, et al. Cystic neoplasms of the pancreas. N Eng J Med 2004; 351(12): 1218-26.
7. Horvath KD, Chaboth JA, et al. An aggressive resectional approach to cystic neoplasms of the pancreas. Am J Surg 1999; 178(4): 269-74.
8. Hop S, Tran Cao, et al. Cystic Neoplasms of the pancreas. Surg Oncol Clin N Am 2010; 19: 267-295.
9. Le Borgne J, De Calan L, et al. Cystadenomas and cystadenocarcinomas of the pancreas: a multiinstitutional retrospective study of 398 cases. French Surgical Association. Ann Surg 1999; 230(2): 152-61.
10. Galanis C, Zamani A, et al. Resected serous cystic neoplasms of the pancreas: a review of 158 patients with recommendations for treatment. J Gastrointest Surg 2007; 11(7): 820-6.
11. Strobel O, Zgraggen K, et al. Risk of malignancy in seros cystic neoplasms of the pancreas. Digestion 2003; 68(1): 24-33.
12. Fernández-del Castillo C, Targarona J, Thayer SP, et al. Incidental pancreaticcysts: clinicopathologic characteristics and comparison with symptomatic patients. Arch Surg 2003; 138(4): 427-33.

13. Zamboni G, Scarpa A, Bogina G, et al. Mucinous cystic tumors of the pancreas: clinicopathological features, prognosis and relationship to other mucinouscystic tumors. Am J Surg Pathol 1999; 23(4): 410-22.
14. Warshaw AL, Compton CC, Lewandrowski K, et al. Cystic tumors of the pancreas. New clinical, radiologic, and pathologic observations in 67 patients. Ann Surg 1990; 212(4): 432-43.
15. Yamaguchi K, Ogawa Y, Chijiiwa K, et al. Mucin-hypersecreting tumors of the pancreas: assessing the grade of malignancy preoperatively. Am J Surg 1996; 171(4): 427-31.
16. Sakorafas GH, Sarr MG. Cystic neoplasms of the pancreas: what a clinician should know. Cancer Treat Rev 2005; 31(7): 507-35.
17. Fritz S, Warshaw AL, Thayer SP. Management of mucin-producing cystic neoplasms of the pancreas. Oncologist 2009; 14(2): 125-36.
18. Salvia R, Fernández-del Castillo C, Bassi C, et al. Main-duct intraductal papillary mucinous neoplasms of the pancreas: clinical predictors of malignancy and long-term survival following resection. Ann Surg 2004; 239(5): 678-85.
19. Le Borgne J, de Calan L, Partensky C. Cystadenomas and cystadenocarcinomas of the pancreas: a multiinstitutional retrospective study of 398 cases. French Surgical Association. Ann Surg 1999; 230(2): 152-61.
20. Edirimanne S, Connor SJ. Incidental pancreatic cystic lesions. World J Surg 2008; 32(9): 2028-37.
21. van der Waaij LA, van Dullemen HM, Porte RJ. Cyst fluid analysis in the differential diagnosis of pancreatic cystic lesions: a pooled analysis. Gastrointest Endosc 2005; 62(3): 383-9.
22. Moparty B, Logrono R, Nealon WH, et al. The role of endoscopic ultrasound and endoscopic ultrasound-guided fine-needle aspiration in distinguishing pancreatic cystic lesions. Diagn Cytopathol 2007; 35(1): 18-25.
23. Linder JD, Geenen JE, Catalano MF. Cyst fluid analysis obtained by EUS-guided FNA in the evaluation of discrete cystic neoplasms of the pancreas: a prospective single-center experience. Gastrointest Endosc 2006; 64(5): 697-702.
24. van der Waaij LA, van Dullemen HM, Porte RJ. Cyst fluid analysis in the differential diagnosis of pancreatic cystic lesions: a pooled analysis. Gastrointest Endosc 2005; 62(3): 383-9.
25. Brugge WR, Lewandrowski K, Lee-Lewandrowski E, et al. Diagnosis of pancreatic cystic neoplasms: a report of the cooperative pancreatic cyst study. Gastroenterology 2004; 126(5): 1330-6.
26. Salvia R, Festa L, Butturini G, et al. Pancreatic cystic tumors. Minerva Chir 2004; 59(2): 185-207.
27. Bassi C, Salvia R, Molinari E, et al. Management of 100 consecutive cases of pancreatic serous cystadenoma: wait for symptoms and see at imaging or vice versa? World J Surg 2003; 27(3): 319-23.
28. Reese SA, Traverso LW, Jacobs TW, et al. Solid serous adenoma of the pancreas: a rare variant within the family of pancreatic serous cystic neoplasms. Pancreas 2006; 33(1): 96-9.
29. Tanaka M, Chari S, Adsay V, et al. International consensus guidelines for management of intraductal papillary mucinous neoplasms and mucinous cystic neoplasms of the pancreas. Pancreatology 2006; 6(1-2): 17-32.
30. Lillemoe KD, Kaushal S, Cameron JL, et al. Distal pancreatectomy: indications and outcomes in 235 patients. Ann Surg 1999; 229(5): 693-8.
31. Sugiyama M, Suzuki Y, Abe N, et al. Management of intraductal papillary mucinous neoplasm of the pancreas. J Gastroenterol 2008; 43(3): 181-5.
32. Waters JA, Schmidt CM. Intraductal papillary mucinous neoplasm – when to resect? Adv Surg 2008; 42: 87-108.
33. Sang Hyub Lee. Clinical approach to incidental Pancreatic Cystic Lesions. Korean J Gastroenterol 2010; 55: 154-161.