What is the Impact of Endoscopic Ultrasound in the Management of Pancreatic Cystic Tumors?

Abstract:

Background:
Cystic tumors of the pancreas are rare neoplasms, increasingly discovered incidentally due in part to improvements in pancreatic imaging techniques (ultrasound, multidetector CT scan, MRI) and enhanced understanding of these lesions' characteristics. They encompass serous cystadenomas (SC), mucinous cystadenomas (MC), intraductal papillary mucinous neoplasms (IPMN), and solid pseudopapillary tumors (SPPT).

Method:
This is a single-center study conducted at the EFD-HGE Unit of Ibn Sina Hospital in Rabat, from September 2015 to May 2024, including all patients with pancreatic cystic tumors. Pancreatic pseudocysts were excluded from the study. Epidemiological, clinical, biological, and endoscopic ultrasound data were collected from Endoscopic Ultrasound registries.

Results:
Out of 696 biliopancreatic endoscopic ultrasounds performed, 57 patients were included, representing a prevalence of 8.18%. The mean age was 62.3 years (range 29-82 years) with a clear female predominance (M: 22, F: 35) (Sex Ratio = 0.62). Discovery circumstances were incidental in 23 cases (40.3%), epigastric pain in 18 cases (31.57%), acute pancreatitis in 6 cases (10.5%), jaundice in 5 cases (8.7%), and abdominal pain in 5 cases (8.7%). Biochemically, cholestasis was found in 14 cases (24.5%), cytolytic enzymes were elevated in 7 cases (12.2%), and elevated Ca19-9 in 6 cases (10.52%). Endoscopic ultrasound delineated tumor location, number, and size: predominantly in the pancreatic head in 25 cases (43.8%), body in 15 cases (26.3%), tail in 10 cases (17.5%), multifocal in 7 cases (12.28%), with an average tumor size of 24.5 mm (range2,5 -76,5 mm). Endoscopic ultrasound appearance and cystic fluid analysis favored IPMN in 77.1% (n=44), mucinous cystadenoma in 8.7% (n=5), SPT in 7% (n=4), serous cystadenoma in 5.26% (n=3), and adenocarcinoma in one case.

Conclusion:
Pancreatic cystic tumors are rare and often incidentally discovered. They predominantly occur in the pancreatic head, with IPMN being the most common, followed by mucinous cystadenomas, while serous cystadenomas and SPPTs are less frequent

Keywords: Pancreatic cystic tumors, Endoscopic Ultrasound, IPMN, mucinous cystadenoma, serous cystadenoma, solid pseudopapillary tumors.

Introduction:

Pancreatic cystic tumors are divided into three subgroups: benign (such as serous cystadenomas), precancerous (including mucinous cystadenomas and solid pseudopapillary tumors), and malignant (like cystadenocarcinomas).

Their incidence has increased with advancements in imaging techniques and understanding of their characteristics. Improved radiological and endoscopic characterization, sometimes involving aspiration, is crucial to avoid unnecessary surgeries and monitor lesions at risk of degeneration. Proper management requires a precise therapeutic strategy based on specific diagnosis and the natural history of each tumor type.

AIM: The objectives of our study are to evaluate the epidemiological and morphological characteristics of pancreatic cystic tumors, as well as to assess the diagnostic yield of endoscopic ultrasound in their management.

Materials and Methods:

This is a single-center study conducted at the EFD-HGE Unit of Ibn Sina Hospital in Rabat, from September 2015 to May 2024, including all patients with pancreatic cystic tumors. Pancreatic pseudocysts were excluded from the study. Epidemiological, clinical, biological, and endoscopic ultrasound data were collected from Endoscopic Ultrasound registries.

All endoscopic ultrasounds were performed under Propofol sedation using radial and/or linear Pentax video echoendoscopes, with cytology obtained via needles of various calibers (19G-20G-22G) for biochemical analysis of cystic fluid and/or histopathological examination.

Results:

Out of 696 biliopancreatic endoscopic ultrasounds performed, 57 patients were included, representing a prevalence of 8.18%. The mean age was 62.3 years (range 29-82 years) with a clear female predominance (M: 22, F: 35) (Sex Ratio = 0.62). (Figure 1)

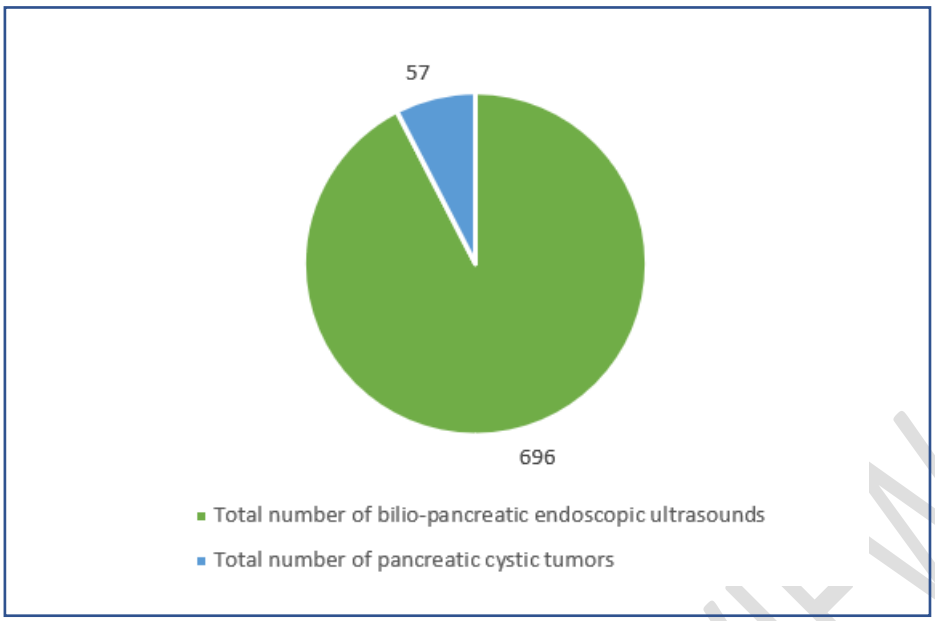

Figure 1: Prevalence of pancreatic cystic tumors

Discovery circumstances were incidental in 23 cases (40.3%), epigastric pain in 18 cases (31.57%), acute pancreatitis in 6 cases (10.5%), jaundice in 5 cases (8.7%), right hypochondrial pain in 3 cases (5.26%) and left hypochondrial pain in 2 cases (3.5%). (Figure 2)

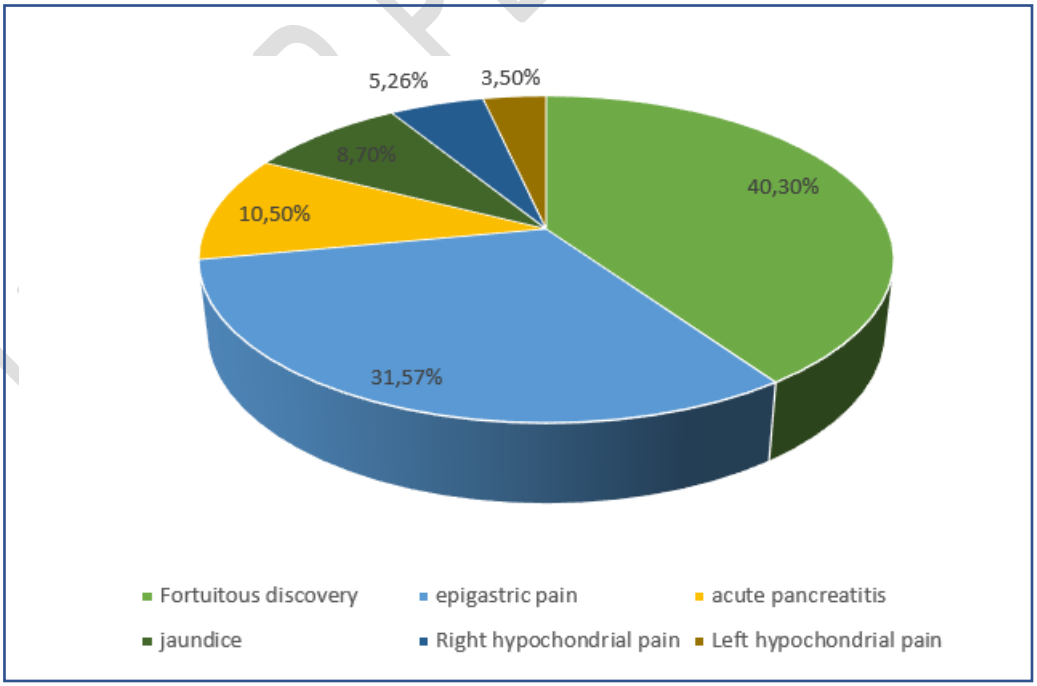

Figure 2: Discovery circumstances

Biologically, cholestasis was found in 14 cases (24.5%), cytolytic enzymes were elevated in 7 cases (12.2%), and elevated Ca19-9 in 6 cases (10.52%). (Figure3)

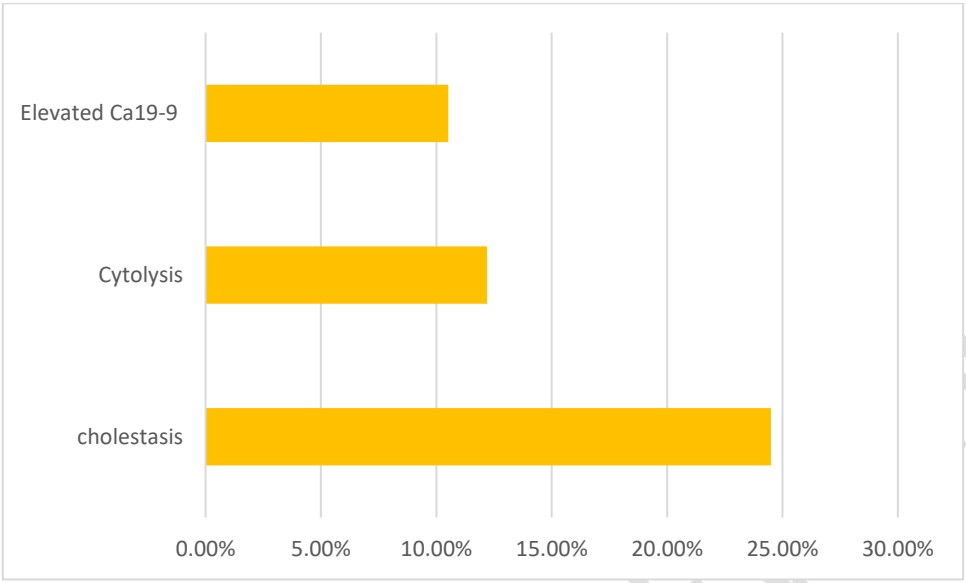

Figure 3: Biological assessment

Endoscopic ultrasound delineated tumor location, number, and size: predominantly in the pancreatic head in 25 cases (43.8%), body in 15 cases (26.3%), tail in 10 cases (17.5%), multifocal in 7 cases (12.28%), with an average tumor size of 24.5 mm (range 2,5 -76,5mm). (Figure 4)

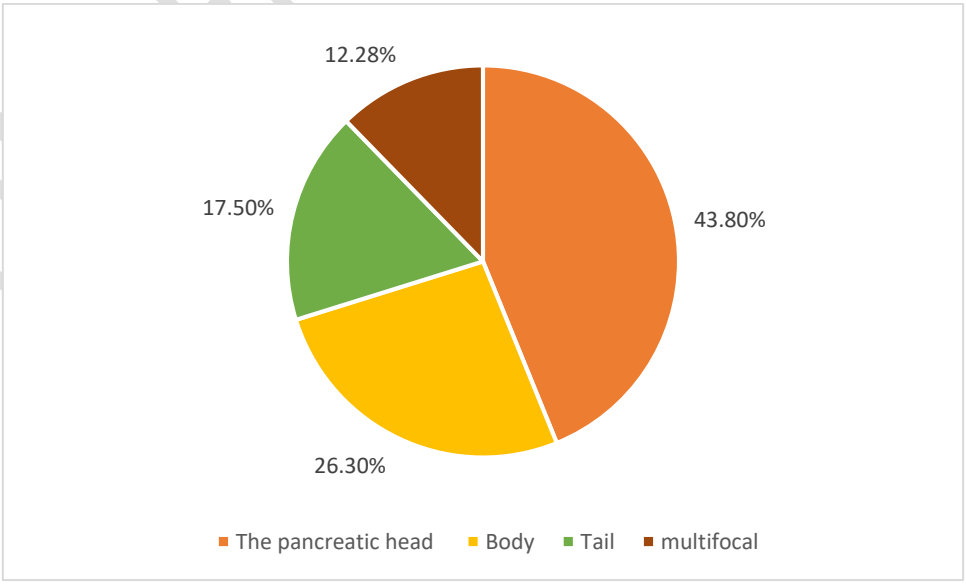

Figure 4: Distribution of patients according to the location of the cystic tumor

Communication with pancreatic ducts was observed in 44 cases (77.1%), and Wirsung duct dilation in 17 cases (29.82%). Cytology was performed in 29 cases (51%). Endoscopic ultrasound appearance and cystic fluid analysis favored IPMN in 77.1% (n=44), mucinous cystadenoma in 8.7% (n=5), solid pseudopapillary tumors in 7% (n=4), serous cystadenoma in 5.26% (n=3), and adenocarcinoma in one case. (Figure 5)

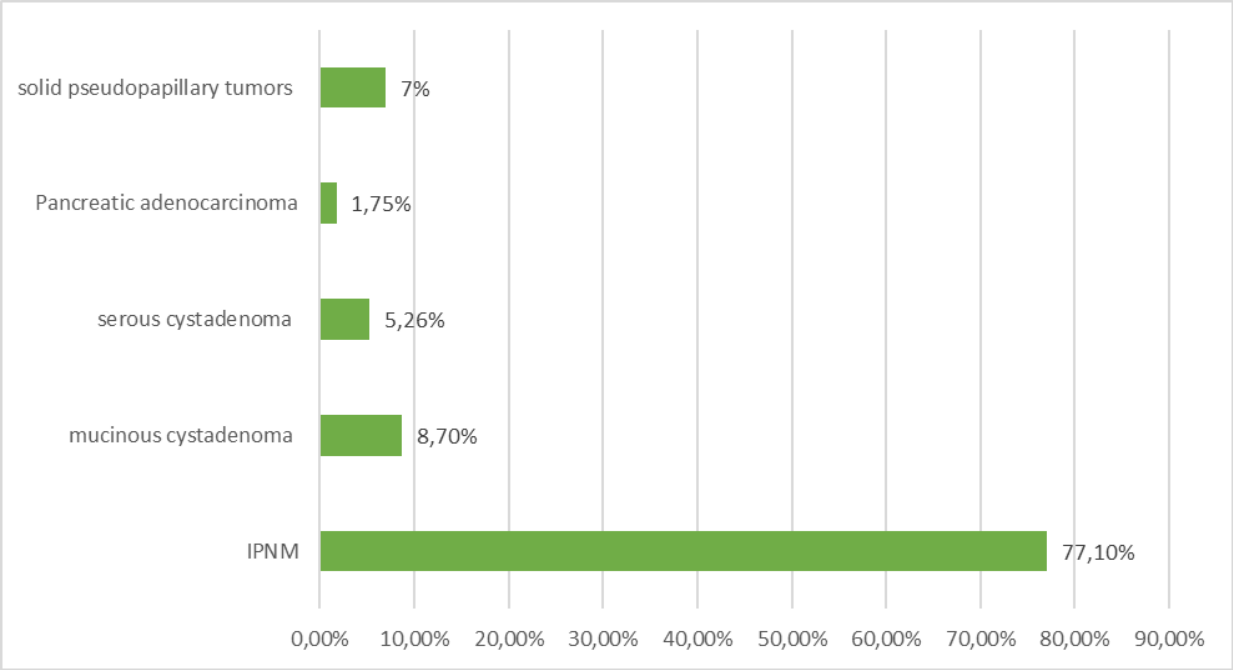

Figure 5: Endoscopic ultrasound appearance associated with cystic fluid aspect and analysis

Figure 6: Endoscopic ultrasound image of an IPMN

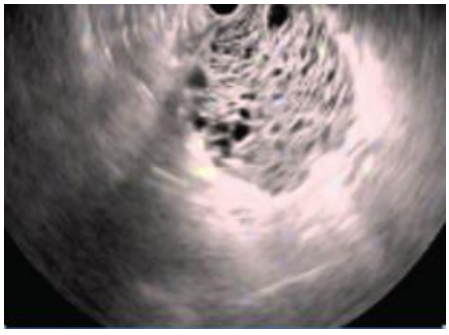

Figure 7: Endoscopic ultrasound image of a serous cystadenoma

Discussion:

Cystic tumors of the pancreas are a relatively frequent indication for biliopancreatic echo-endoscopy.

In our series, it accounted for 8.18% of all bilio-pancreatic echo-endoscopies performed.

However, its frequency varies according to the different studies carried out. In the study by Frank H. Miller et al. [1], it was 10%; in the study by Catalina Vladuţ et al. [2-3], it was 12.9%.

It is even lower, at 3%, according to the study conducted by the team of A. Lira-Trevinoa's team [4].

In our series, the average age of our patients was 62.3 years, which closely aligns with the average ages reported in the literature which is 61 years according to the study conducted by the team of Peter J. Allen et al. [5],

60 years according to the study conducted by Danielle E. Kruseet al. [6] and 66.12 years according to the study conducted by Beata Jabłońska et al. [7].

This is consistent with several studies, including Abigail Schubach et al., who observed that the incidence of cystic pancreatic tumors increases with age. This may explain the advanced average age observed in our study and in the various international series previously mentioned [8-9].

Our patients were predominantly female, with an M/F sex ratio of 0.62 representing 61% of cases, in line with various studies in the literature.

In the study by Aline Falqueto et al. [10], women accounted for 60.4% of patients, and in the study by Jennifer E. Verbesey et al. [11], 66.6%.

There are no specific and precise signs that can lead to a diagnosis of pancreatic cystic tumors. Diagnosis can be incidental, particularly following radiological or ultrasound examinations motivated by other conditions. In our study, incidental discovery was noted in 40.3% of our patients. This aligns with several studies, such as Carlos Fernández-del Castillo et al. [12], who found incidental discovery in 36.7% of patients, and Feixiang Hu et al. [13], where 49% of routine imaging exams accidentally detected pancreatic cystic lesions.

Pain is the most frequent and revealing clinical sign of pancreatic cystic lesions, typically presenting as epigastric pain. It is in 51.4% of cases according to Carlos Fernández-del Castillo et al. [12]. In our study, abdominal pain was reported in 40.33% of cases, epigastric pain in 31.57%, right hypochondrium pain in 5.26%, and left hypochondrium pain in 3.5% of cases.

Acute pancreatitis was noted in 10.5% of our patients, consistent with findings in other series such as 26.8% according to Carlos Fernández-del Castillo et al. [12] and 3.2% according to Beata Jabłońska et al. [14].

Jaundice was also noted as a mode of discovery in 8.7% of cases in our study, which is comparable to findings in other studies; for example, 13.4% according to Carlos Fernández-del Castillo et al. [12].

Routine laboratory tests are usually normal except in cases of biliary or pancreatic duct compression. In our series, 24.5% of patients had biochemical cholestasis, and 12.2% had hepatic cytolysis. Comparing our results with literature, the rate of liver function test abnormalities is similar to that found in the study by Dupas B et al. [15], where liver function disturbances were noted in 13% of cases.

An elevation in CA19-9 was noted in 10.52% of our patients, which is comparable to the 15% elevation reported in the study by Renata Talar et al. [16].

EUS (Endoscopic Ultrasound) is an essential tool in the evaluation of pancreatic cystic lesions, providing high-resolution imaging. Its diagnostic efficacy is comparable to MRI for characterizing lesions and demonstrating their communication with the main pancreatic duct. Moreover, EUS is superior in detecting multifocal, synchronous, or metachronous lesions, and identifying intramural nodules considered to have a high risk of malignancy. In all cases, whenever technically feasible, tissue should be sampled for histopathological study, as EUS imaging alone cannot confirm or exclude malignancy [17].

EUS-guided Fine Needle Biopsy (EUS-FNB) offers high diagnostic precision for pancreatic cystic tumors by enabling tissue acquisition for histological analysis. A multicenter randomized controlled trial by van Riet et al., comparing EUS-FNA and EUS-FNB, demonstrated that EUS-FNB had superior histological yield (82% vs. 72%) and greater accuracy in diagnosing malignancy (87% vs. 78%) compared to EUS-FNA [18].

There are several types of pancreatic cystic tumors, including IPMNs (Intraductal Papillary Mucinous Neoplasms), mucinous cystadenomas, serous cystadenomas, and solid pseudopapillary neoplasms of the pancreas. The actual incidence of IPMNs varies between studies. In our series, the frequency of this diagnosis was 77.1%. This aligns with various international studies reporting rates of 65% in the study by William R et al. [19], 67% in the study by Laura D. Wood et al. [20], and up to 78.3% in the study by Tsuyoshi Hamada et al. [21].

Mucinous cystadenomas of the pancreas are cystic tumors that are much more common in women, typically occurring in their fifth decade of life. They are generally asymptomatic but can cause abdominal pain, weight loss, anorexia, fatigue, or jaundice [19].

EUS (Endoscopic Ultrasound) reveals thin-walled cysts with septations and fluid-filled cavities. Communication with ducts is rare. Suspicious features of malignancy on EUS include irregular cyst wall, thickening, and intracystic solid components [19].

In our series, mucinous cystadenoma was suspected in 8.7% of cases. This aligns with findings from other studies, reporting a pancreatic cystadenoma diagnostic rate of 10.8% in the study by Feixiang Hu et al. [13], 18.8% in the study by A. Lira-Treviñoa et al. [4], and up to 21.3% in the study by Srinivas Bojanapu et al. [22].

Solid pseudopapillary neoplasms (SPN) of the pancreas are tumors typically found in young women, with a low incidence and an excellent prognosis following surgical resection. They tend to be moderately symptomatic or asymptomatic [24].

SPNs represent nearly 4% of pancreatic cystic tumors. Smaller lesions are predominantly solid, while larger lesions may contain more cystic components. There is typically no connection with the main pancreatic duct, resulting in low amylase levels in the fluid [23].

EUS-guided Fine Needle Biopsy (EUS-FNB) is often diagnostic, and smaller lesions may appear solely solid, whereas larger ones may show cystic degeneration, sometimes with a hemorrhagic appearance upon sampling [3].

In our study, the frequency of SPN diagnosis was 7%.

Serous cystadenomas are the most common benign lesions, accounting for 6% of all pancreatic cysts [25]. They are mostly asymptomatic, with an average age at diagnosis of 62 years [3]. Serous cystadenomas are frequently seen in patients with von Hippel-Lindau (VHL) syndrome [25].

Diagnosis through imaging (CT, MRI, EUS) is crucial, revealing honeycomb-like multilocular cystic lesions with a central scar or star-shaped calcification (seen in 20% of cases). The latter is pathognomonic for serous cystadenomas [3].

In our series, serous cystadenomas were suspected in 5.26% of cases during endoscopic ultrasound.

Conclusion:

Pancreatic cystic tumors present a daily challenge in gastroenterology, often discovered incidentally due to advancements in imaging such as ultrasound and MRI. Endoscopic ultrasound (EUS) plays a crucial role in accurately characterizing these tumors and optimizing their management, with biopsy and guided aspiration techniques significantly enhancing diagnostic specificity. Our study confirmed a predominance of cystic tumors located in the pancreatic head, particularly IPMNs and mucinous cystadenomas, consistent with existing literature. Despite advances in imaging technology, EUS remains pivotal in the short and medium term for the management of pancreatic cystic tumors.

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