

Pancreatic cysts or pancreatic cystic neoplasms? Analysis of 145 cases

Authors' Contribution:
A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

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ABSTRACT:

Introduction: Detection of the frequency of pancreatic cystic lesions has increased in the recent years. The majority are pseudocysts, the remaining cysts are mainly neoplasms. Proven risk of malignancy affects intraductal papillary mucinous neoplasms (IPMN) and mucinous cystic neoplasms (MCN).

The aim of this study was to analyze clinical data of patients with pancreatic cysts or pancreatic cystic neoplasms on operate at Department of General and Transplant Surgery in the Barlicki Hospital in Lodz.

Material and methods: In 2007-2016, there were 145 patients operated on at the Department of General and Transplant Surgery in Barlicki Hospital in Lodz, due to pancreatic cystic lesion. The type of operation, histopathological diagnosis and basic demographic data were analyzed.

Results: Non-neoplastic cyst (mainly pseudocysts) was found in 66.9% of patients, neoplasms were detected in 33.1%. The mean age was significantly higher in patients with neoplasm than without neoplasm (57.06 years vs. 50.88 years, $p=0.009$). Neoplastic cyst occurred more frequently in women (68.75% of women, 31.25% of men, $p=0.001$). Malignant tumor was found in 14.58% of neoplasms cases and in 4.83% of all pancreatic cystic lesions.

Conclusions: According to the analyzed material, there is a significant risk of malignancy in patients with pancreatic cyst. Neoplastic cysts are more common in women.

Discussion: Pancreatic cystic tumors are treated mainly by resections of pancreas. In case of benign lesions with low risk of malignancy, there are less extensive operations performed, such as enucleations of lesions. There are no guidelines that could be used satisfactorily in follow up of patients with pancreatic cysts.

KEYWORDS:

pancreas, cyst, neoplasm, surgery, cancer

INTRODUCTION

Pancreatic cystic lesions (PCLs) due to differential etiology, frequent, asymptomatic course of the disease and potentially malignant character are a significant clinical problem. The number of patients with diagnosed cystic lesions in the pancreas has increased significantly in recent years, which may be associated with the increasing availability of imaging examinations, development of radiological techniques and aging of the population. In one of the autopsy studies in 300 patients, cystic lesions in the pancreas were detected in 24.3% [1]. The frequency of occurrence increases with age [2]. From a clinical point of view, pancreatic cystic lesions can be divided into neoplastic cysts (true, simple) and non-neoplastic (post-inflammatory, pseudocysts) [1, 2]. Pancreatic cysts may occur with cysts in other organs [3]. Patients with pancreatic cysts have a higher risk of developing pancreatic cancer [4].

Approximately 75–80% of patients with cystic lesions of the pancreas have pseudocysts that are a complication of acute or chronic pancreatitis [1, 5]. Pseudocysts are a liquid collection in the pancreas or its surrounding closed by a wall without an epithelial cover, containing no solid components. Pseudocysts occur more often in men. In most of cases they develop within 2–6 weeks after diagnosis of acute pancreatitis, approximately 33% of them are associated with spontaneous regression. In other cases, if there are symptoms such as abdominal pain, nausea and vomiting, a feeling of fullness as well as complications such as mechanical jaundice, bleeding, in-

fection or cyst rupture – invasive treatment is necessary. Among interventions, endoscopic drainage, internal and external drainage as well as resection of the pancreas are performed. [1, 6-8].

Increasingly, instead of true or simple pancreatic cysts, cystic neoplasms are widely used. These include potentially malignant intraductal papillary mucinous neoplasms (IPMN) and mucinous cystic neoplasms (MCN – fig. 1). Most often benign serous cystic neoplasms (SCN – fig. 2) are diagnosed. The group of benign pancreatic cysts also includes benign solid pseudopapillary neoplasms (SPN) [9–15], that include solid pseudopapillary tumor (SPT) – a rare pancreatic tumor (<2%), mainly occurring in young women [16].

SCN, MCN and SPN are more common in women, while IPMN are slightly more common in men [14]. IPMN and MCN are associated with proven high risk of malignancy [4]. Their characteristic feature is the production of mucinous exudation. It is visible in imaging examinations, in addition to cystic parts, solid parts in the form of compartments or nodular masses [10-14]. MCN are usually located in the body and tail of the pancreas. They constitute about 1/3 of all cystic neoplasms of pancreas and about 2% of all pancreatic neoplasms. [13, 17]. IPMN, located most often in the head of the pancreas, is divided into an invasive form (IPMN-associated with invasive carcinoma) and non-invasive (with dysplasia of various degrees and cancer in situ). IPMN can develop from the main pancreatic duct (MD-IPMN – Main Duct-Intraductal papillary mucinous neoplasm) or its branch (BD-IPMN - Branch Duct-Intraductal pa-

illary mucinous neoplasm) [10]. Risk of malignancy is higher in the case of developing from the main pancreatic duct [15].

Surgical treatment of cystic neoplasms includes resection of the pancreas, often combined with splenectomy, and enucleation of lesions (usually reserved for lesions with low malignancy potential - SCN and SPN). The type of resection depends on location. Due to the most frequent location of neoplastic cysts, which is the head of the pancreas, pancreatoduodenectomy is most often performed [18-19].

The aim of this study was to analyze clinical data of patients with pancreatic cysts or pancreatic cystic neoplasms operated on in 2007-2016 at Department of General and Transplant Surgery in Barlicki Hospital of Lodz, Poland.

MATERIAL AND METHODS

A retrospective study was conducted in 145 patients treated surgically due to pancreatic cyst or pancreatic cystic tumor. Operations were carried out in 2007 - 2016 at the Department of General and Transplant Surgery at the University Teaching Hospital No. 1 in Lodz.

The following data were analyzed: histopathological diagnosis, location of lesion in the pancreas, type of surgical treatment and demographic data: age and sex of patient. Patients were divided into 2 groups: with neoplastic cysts and non-neoplastic cysts.

Statistical analysis of the significance of predilections of both types of pancreatic cysts to sex was performed using non-parametric Mann-Whitney U test for two independent samples. The parametric Student's t test for two independent samples was used to analyze the significance of the difference in mean age. Statistical significance was found in the case of $p \leq 0.05$.

RESULTS

Of the 145 patients operated on due to cyst or cystic tumor in years 2007 – 2016, neoplastic cysts were detected in 33.1% of patients ($n = 48$), non-neoplastic in 66.9% ($n = 97$). The average age in patients with neoplasms cysts was significantly higher and was 57.06, in patients with non-neoplastic cysts was 50.88 ($p = 0.009$). The most common location of neoplastic lesions was the pancreatic head (39.58%), the second group of cysts most frequently occurring in the pancreatic body (39.18%), tab. I.

Both types of cystic lesions occurred with different frequency in both sexes. Neoplasms were found significantly more frequently in women (68.75% of women vs. 31.25% of men, $p = 0.001$), and non-neoplastic cysts significantly more often in men (64.95% of men vs. 35.05% of women, $p = 0.001$), tab. I.

The highest predilection for women was observed in the case of SCN (81.25% of women) and MCN (71.43% of women). A similar tendency was observed for IPMN - this percentage was 57.14% of women but due to a low amount of all IPMN cases ($n = 7$), this result is nonsignificant.

There were 77.08% ($n = 37$) of pancreatic resections performed in patients with neoplasms, the most common was distal resection of pancreas in 51.35% of resection cases ($n=19$). Pancreatoduode-

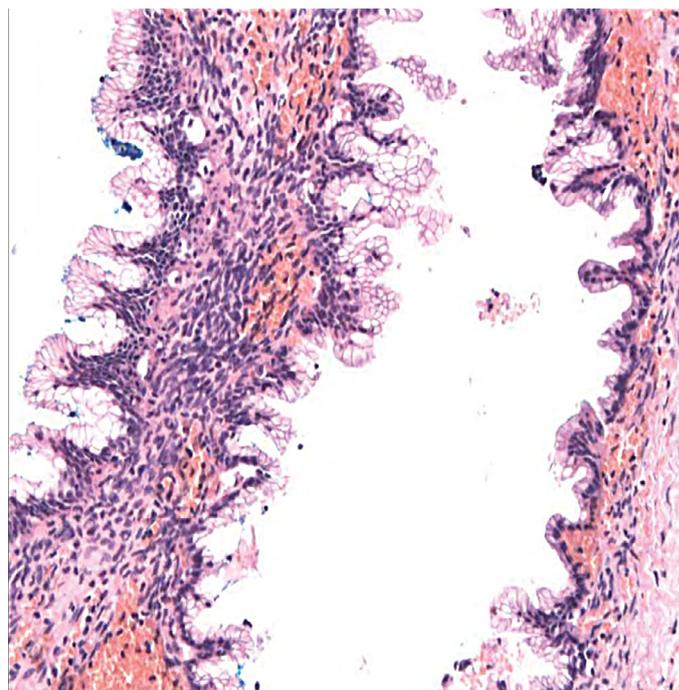


Fig. 1. Mucinous cystadenoma. Cystic spaces are covered by high glandular epithelium containing mucus. Coloration H+E, x100. Own material.

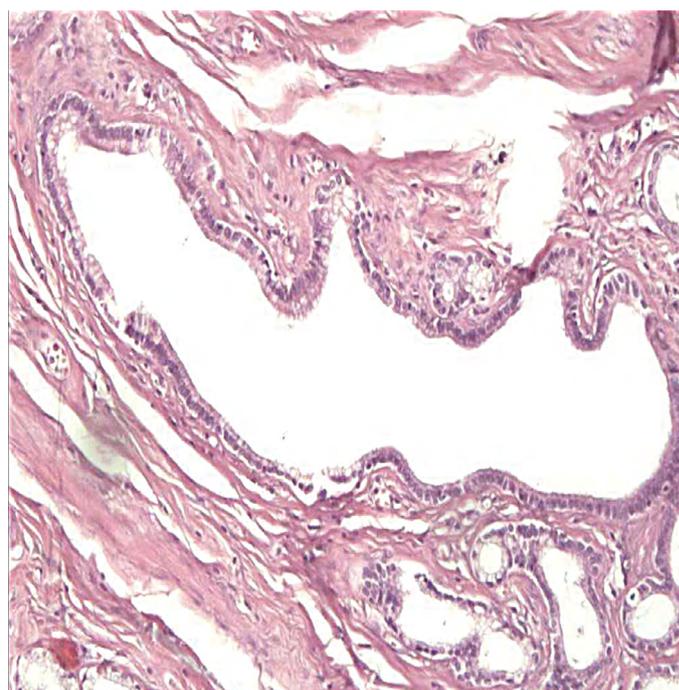


Fig. 2. Serous cystadenoma. Cystic spaces are covered by low glandular epithelium. Coloration H+E, x100. Own material.

-nectomy was performed in 37.84% of pancreatic resections ($n = 14$), resection of the head of pancreas (Beger procedure) in 5.41% cases of pancreatic resections ($n = 2$). Central resection of pancreas was performed in one patient, excision of the uncinate process of pancreas was performed in one patient as well.

In the cases of cystic neoplasms, enucleation of the tumor was performed in 12.5% of all operations in this group ($n = 6$). In a small percentage of patients (6.25%, $n = 3$), when the tumor was unresectable, only a biopsy of the lesion and palliative procedure was performed. A detailed description of surgical procedures is presented in tab. II.

Tab. I. General characteristic of patients operated due to pancreatic cystic lesion.

	NEOPLASTIC CYSTS	NON-NEOPLASTIC CYSTS	P
Frequency	n = 48. 33.1%	n = 97. 66.9%	
Mean age (years)	57.06	50.88	0.009
Sex	Men – 31.25% p = 0.001 Women – 68.75%	Men – 64.95% p = 0.001 Women – 35.05%	
Location	Head of pancreas – 39.58% Tail of pancreas – 31.25% Body of pancreas – 25% Uncinate process of pancreas – 4.17% Plural – 0%	Body of pancreas – 39.18% Head of pancreas – 29.9% Tail of pancreas – 18.56% Plural – 12.37%	

Tab. II. Type of performed operations in neoplastic cysts.

Resections of pancreas	37 (77.08%)
Pancreatoduodenectomy	14 (37.84% of resections)
Distal resection of pancreas	13 (35.14% of resections)
Resection of body and tail of pancreas	6 (16.22% of resections)
Resection of head of pancreas (Beger procedure)	2 (5.41% of resections)
Central resection of pancreas	1 (2.7% of resections)
Excision of uncinate process of pancreas	1 (2.7% of resections)
Excision of lesion	6 (12.5%)
Biopsy	3 (6.25%)
Anastomosis of pancreatic cyst with jejunum (Roux loop)	2 (4.17%)

Tab. III. Type of performed operations in non-neoplastic cysts.

Internal drainage	46 (47.42%)
Anastomosis of pancreatic cyst with jejunum (Roux loop)	45 (97.83% of internal drainages)
Anastomosis of pancreatic cyst with stomach	1 (2.17% of internal drainages)
External drainage	32 (32.99%)
Resections of pancreas	11 (11.34%)
Distal resection of pancreas	9 (81.82% of resections)
Pancreatoduodenectomy	2 (18.18% of resections)
Enucleation of lesion	6 (6.19%)
Biopsy	2 (2.06%)

In the group of patients with non-neoplastic cysts, the most common procedure was internal drainage (47.42%, n = 46), that includes, performed most commonly, anastomosis of the pancreatic cyst with the small intestine using Roux loop which is performed most commonly (97.83%, n = 45). In one case, it was anastomosis of the cyst with the stomach. External drainage was performed in 32.99% cases (n = 32). Drainage operations were carried out globally in 80.41% of patients (n = 78) with non-neoplastic cysts. Of the remaining ones, pancreatic resection was most often performed (11.34%, n = 11). Operating procedures are presented in tab. III.

Malignant neoplasms were found in 14.58% of neoplasms (n = 7), which constitutes 4.83% of all analyzed pancreatic cystic lesions. There were 85.42% of neoplastic cases that were benign (n = 41). Among non-neoplastic cysts, 94.85% were pseudocysts, 5.15% others. Tab. IV. shows the histopathological results of operated neoplastic cysts.

DISCUSSION

Patients diagnosed with cystic neoplasms of pancreas constitute about 1/3 of the analyzed group in this publication. Radical treat-

ment of these lesions includes resection of the pancreas and depend on the location of cystic tumor. The most common - the head of pancreas - is an indication for pancreatoduodenectomy in various modifications. The cases of pancreatoduodenectomy presented in this study concern the Whipple procedure. Lesions located in the body or tail of the pancreas require distal resections of pancreas or central pancreatic resection. In the case of a cystic tumor in the tail, splenectomy is commonly performed. If the cystic tumor covers the entire pancreas, pancreatectomy is performed [18, 19].

Due to the risk of malignancy, it is important to improve surgical treatment early. Most cystic neoplasms of pancreas are asymptomatic or cause nonspecific signs, which may delay surgical treatment. Only a small part of pancreatic neoplasms causes typical clinical signs, insulinoma is example - a rare pancreatic tumor (about 1-2%) [20].

According to the current state of knowledge, cystic mucinous neoplasms (MCN) and intraductal papillary mucinous neoplasms (IPMN) are a group of neoplasms with high malignant potential [4, 11]. Transformation from adenomas of these groups into cancers is proven (IPMN-associated with invasive carcinoma and MCN-associated with invasive carcinoma) [19].

In contrast to MCN and IPMN, serous cystic neoplasms (SCN) are considered benign [5, 9, 13]. Due to the fact that mortality after pancreatic resections amounts to about 3%, in the case of a significant suspicion of SCN, especially in older patients who are affected by many diseases, enucleation of the lesion should be considered. Authors who analyzed the results of more than 2.600 operations conclude that pancreatic resections should be performed in patients with an uncertain diagnosis, coexisting clinical symptoms and suspicion of malignancy [21].

In the case of pseudocyst, which is the most frequent complication of acute and chronic pancreatitis, several therapeutic strategies are used. Drainage operations (open and endoscopic) are mainly performed in the case of large, symptomatic cysts. Pancreatic resection operations are reserved for cases suspected of neoplasm and located mainly in the tail of pancreas [6-8]. In the analyzed material, resections of the pancreas constituted 11.34% of operations in the non-neoplastic group.

In this study, among cystic neoplasms, PDAC (pancreatic ductal adenocarcinoma) was found in 2 cases (due to cystic form of the tumor), however, it is not classified as cystic neoplasm. This cancer is characterized by a very poor prognosis and is the most common malignant neoplasm of pancreas [22]. Although IPMN and PDAC are thought

to be distinct disease entities, there are many reports of synchronic or metachronous development of PDAC in patients with IPMN [23].

An important issue is the follow-up of patients with pancreatic cystic lesions. Guidelines, presented by the American Gastroenterological Association (AGA) in 2015, consider 3 features in imaging examinations that increase the risk of malignant tumor: cysts with a diameter of > 3 cm, presence of solid structures and widening of the pancreatic duct.

The presence of at least two high risk features or the appearance of one of them during the cyst's observation is an indication for the EUS with FNA (Endoscopic Ultrasonography with Fine Needle Aspiration). Sensitivity of this examination in the detection of malignant neoplasm is approximately 60% and specificity is about 90% [24, 25]. In one multicenter, retrospective study of 300 patients who underwent resection of pancreas, in the group of 179 patients, who required clinical observation according to these guidelines, cancer was detected in 9 cases [26].

Management of pancreatic cysts is still a subject of discussion. These issues are of interest to surgery, gastroenterology, radiology, oncology and pathology. While radiology plays an important role in the preoperative diagnosis of pancreatic cystic lesions [17, 27], the predominant role of the pathomorphologist in diagnosis is postoperative histopathological evaluation. The important role of cooperation of the surgeon and pathologist should be mentioned (specimens should be accurately described and marked), because specimens after pancreatic resections are difficult in evaluation [28].

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Tab. IV. Histopatologia operowanych nowotworów torbielowatych.

BENIGN LESIONS, N=41	
Mucinous cystic adenoma (MCN)	17 (35,42%)
Serous cystic adenoma (SCN)	16 (33,33%)
Intraductal papillary mucinous adenoma (IPMN)	6 (14,58%)
Solid pseudopapillary tumor (SPT)	2 (4,17%)
ZMIANY ZŁOŚLIWE, N=7	
Mucinous cystic adenocarcinoma (MCN)	4 (8,33%)
Intraductal papillary mucinous adenocarcinoma (IPMN)	1 (2,08%)
Pancreatic ductal adenocarcinoma (PDAC)	2 (4,17%)
SUM 100%	

MCN – Mucinous cystic neoplasms
 SCN – Serous cystic neoplasms
 IPMN – Intraductal papillary mucinous neoplasms
 SPT – Solid pseudopapillary tumor

CONCLUSIONS

According to the analyzed material, there is a significant risk of malignancy in patients with pancreatic cyst.

- The majority of cystic neoplasms are benign.
- Cystic neoplasms of pancreas occur more common in women, while non-neoplastic cysts in men.
- The mean age of patients with cystic neoplasms of pancreas is higher than in patients with non-neoplastic cysts of pancreas.

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