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Prevalence of pancreatic neoplasms and their surgical management

Prevalencia de neoplasias pancreáticas y su manejo quirúrgico

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Palabras clave: *neoplasia, páncreas, cáncer, Whipple, prevalencia.*

ABSTRACT

Introduction: pancreatic neoplasms present a prevalence of 10% internationally; however, at the national level, it is unknown. Therefore, it is essential to know which are the most common neoplasms so that an appropriate diagnostic and therapeutic approach can be performed for each particular case. **Objective:** to investigate the prevalence of pancreatic neoplasms and diagnostic and therapeutic strategies in a tertiary-level hospital. **Material and methods:** a retrospective, observational, descriptive, and cross-sectional study of patients diagnosed with pancreatic neoplasia at the Siglo XXI National Medical Center Specialty Hospital. **Results:** from 2016 to 2020, 206 cases of pancreatic neoplasms were identified, and 69 cases were included; the average age was 56 years. Pancreatic adenocarcinoma was the most frequent type, 36%; the most performed surgical procedures were pancreatoduodenectomies. Trans and post-surgical morbidity was 27.5%, local and systemic complications occurred in 22.5 and 27.5%, respectively. **Conclusions:** there is a high prevalence of patients diagnosed with pancreatic neoplasms in our unit, where surgical interventions of high technical complexity are performed; the morbidity reported in this study compares with that reported nationally and internationally.

RESUMEN

Introducción: *las neoplasias de páncreas presentan una prevalencia de 10% a nivel internacional, sin embargo, a nivel nacional se desconoce; es indispensable conocer cuáles son las neoplasias más comunes con el fin de realizar un abordaje diagnóstico y terapéutico apropiado para cada caso en particular.* ***Objetivo:*** *conocer la prevalencia de las neoplasias de páncreas, abordaje diagnóstico y terapéutico en un hospital de tercer nivel.* ***Material y métodos:*** *estudio retrospectivo, observacional, descriptivo y transversal del hospital de especialidades del Centro Médico Nacional Siglo XXI de pacientes con diagnóstico de neoplasia de páncreas.* ***Resultados:*** *de 2016 a 2020 se identificaron 206 casos de neoplasias de páncreas, se incluyeron 69 casos, la edad promedio fue de 56 años, el adenocarcinoma de páncreas fue el tipo más frecuente 36%, los procedimientos quirúrgicos más realizados fueron las pancreatoduodenectomías, la morbilidad trans y postquirúrgica fue de 27.5%, las complicaciones locales y sistémicas se presentaron en 22.5 y 27.5%, respectivamente.* ***Conclusiones:*** *existe una alta prevalencia de pacientes con diagnóstico de neoplasias de páncreas en nuestra unidad, donde se realizan intervenciones quirúrgicas de alto grado de complejidad técnica, la morbilidad reportada en este estudio se compara con la reportado a nivel nacional e internacional.*

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Abbreviations:

ERCP = endoscopic retrograde cholangiopancreatography.
MRCP = magnetic resonance cholangiopancreatography.
COPD = chronic obstructive pulmonary disease.
CKD = chronic kidney disease.
MRI = magnetic resonance imaging.
CT = computerized tomography scan.

INTRODUCTION

The prevalence of pancreatic neoplasms has increased thanks to the advances in diagnostic methods that have made it possible to identify them promptly; it is essential to know which are the most common neoplasms

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in our environment and thus be able to make an appropriate diagnostic and therapeutic approach for each case. In summary, the most frequent neoplastic pathologies of the pancreas will be discussed.

Cystic neoplasms

Cystic lesions of the pancreas present as a well-defined lesion with dilatations of the main pancreatic duct or its branches; their incidence increases with age, and they are frequently diagnosed as incidental lesions depending on the imaging method used: 2.6% in CT, 13.5% in MRI and 44.7% in MRCP. In 2008, Laffan et al. reported the incidence of asymptomatic cystic lesions in 2.6% of cases identified by imaging studies, reaching up to 30% in specialized centers.[1] The most common cystic lesions are inflammatory pseudocysts (90%); the other 10% of the total is represented by serous cystadenoma, mucinous cystic neoplasm, mucinous papillary intraductal neoplasm, among others, which are more frequent in young women and represent 1% of pancreatic tumors.[2-4] Serous cystadenoma represents the most frequent cystic neoplasm (30%) of benign behavior; it occurs predominantly in women between the sixth and seventh decade of life, and its most frequent location is in the body and tail of the pancreas (60%). Clinically, most of them are asymptomatic.[5-8] Mucinous papillary intraductal neoplasia most frequently affects males between 60 and 70 years of age, who may present symptoms of chronic or recurrent acute pancreatitis attributable to obstruction of the pancreatic duct by mucin; they are mainly located in the head and uncinate process.[9,10]

Neuroendocrine tumors

Pancreatic neuroendocrine tumors are a heterogeneous group of neoplasms originating from multipotential epithelial cells in the pancreatic ducts. They account for 1-3% of pancreatic neoplasms, although their prevalence in necropsy studies ranges from 0.5-10%. Of the functioning tumors, the most frequent are insulinomas (70%), followed by gastrinomas (25%).[11,12]

Malignant neoplasms

The most frequent exocrine neoplasm of the pancreas is ductal adenocarcinoma, which comprises more than 75% of pancreatic cancers. They often are hard, poorly differentiated tumors. There are no screening or early detection tests. However, several studies have been suggested, such as biochemical markers, endoscopic ultrasound, or CT scan from age 40 in those at high risk. Surgical options depend on the location of the tumor and vary from distal pancreatectomies to central pancreatectomies and pancreatoduodenectomies. Due to the complexity of pancreatoduodenectomy and its high morbidity rate, it should be performed by surgeons familiar with hepatopancreatobiliary surgery in high-volume centers, performing more than 20 procedures per year. The accepted mortality is less than 5%, while morbidity is around 40%.[13-16]

Cancers of the ampullary region represent only 0.2% of gastrointestinal tract cancers. The most frequent tumor is adenoma, and its progression to adenocarcinoma is admitted in the same sense as the adenoma-carcinoma sequence of colon polyps. Most ampullary carcinomas are adenocarcinomas, but histology can be variable, including papillary, adenosquamous, mucinous, and adenocarcinoma tumors.[17]

This study aims to know the prevalence as well as the demographic and epidemiological characteristics, the main clinical manifestations, the approach and imaging modalities used for diagnosis, the surgical interventions performed for each type of neoplasm, the local and systemic post-surgical complications, and the follow-up of patients with a diagnosis of pancreatic neoplasms treated in the period from January 01, 2016 to December 31, 2020 at the Hospital de Especialidades del Centro Médico Nacional Siglo XXI.

MATERIAL AND METHODS

All patients with a diagnosis of pancreatic neoplasia that were hospitalized and operated on at the Gastro Surgery Service of the *Hospital de Especialidades "Dr. Bernardo Sepúlveda"* of the *Centro Médico Nacional Siglo XXI*, during the

period from January 1, 2016, to December 31, 2020, were included. Electronic and physical records were reviewed to obtain the patients' clinical and epidemiological characteristics, including age, gender, clinical manifestations, diagnostic method, histology, intervention, and complications. Inclusion criteria were established as male and female patients over 18 years of age treated in the unit. The exclusion criteria were under 18 years of age, not having undergone surgery in the unit, not having a histopathological report, and lost to follow-up. A descriptive and inferential statistical analysis was performed. For quantitative variables, the Kolmogorov-Smirnov normality test was applied. For qualitative variables, frequencies and maximum and minimum percentages were used; in the bivariate analysis, the t-Student test and Mann-Whitney U test were used.

The authors declare that this article complies with the policies and standards of our institutional ethics committee. It does not present personal information or patient identification.

RESULTS

In the mentioned period, a total of 204 cases with a diagnosis of pancreatic neoplasia were obtained, of which only 69 met the inclusion criteria; in the rest of the cases, pancreatic pathology was ruled out; they were operated on in another unit or did not undergo surgical management. The mean age of the patients was 56 ± 17 years, with an age range of 18 to 87 years, being more prevalent the diagnosis in the female gender with 60 (41) and 40% (28) for the male gender. About the family history of pancreatic neoplasia, this was found in only 7% (5) of the cases. The comorbidities present at the time of diagnosis of pancreatic neoplasia were diabetes mellitus as the main one in 28% (20) of the patients, followed by systemic arterial hypertension in 26% (18); concerning breast cancer, heart disease, and liver cirrhosis constituted 5% (4) each, and in the case of COPD and CKD 2% (2). About the clinical manifestations present, abdominal pain was found as the main symptom in 73% (51), jaundice 57% (40), nausea 43% (30), weight loss 40% (28), vomiting 24% (17), cholangitis 18% (13), hypoglycemia 15% (11); oral intolerance was the least frequent symptom 14% (10).

The histopathological types reported were: ampuloma in 24 patients (35%), adenocarcinoma in 21 patients (30%), cystic neoplasms in 13 patients (19%), insulinoma in 6 patients (9%), and nesidioblastosis in 5 patients (7%). The mean in-hospital stay from diagnosis to discharge was 21 ± 13 days *(Table 1)*.

The imaging modalities used during the diagnostic approach in the preoperative period were abdominal CT scan in 100% (69) of the cases, endoscopic ultrasound in 79% (54), abdominal ultrasound in 72% (46), nuclear magnetic resonance in 34% (23) and ERCP in 32%. In the review of each imaging modality used according to each subtype of neoplasm, it was found that abdominal CT scan and endoscopic ultrasound were the most used modalities in adenocarcinomas (100 and 90% respectively), in ampulomas (80 and 71%), cystic neoplasms (92 and 77%), insulinoma (57 and 57%) and in nesidioblastosis (80 and 100%), with ERCP being the least used modality in general. The anatomical location where the tumors were found in the study group was distributed as follows: head of the pancreas and ampulla of Vater 36% (25) followed by the uncinate process 15% (11), neck 5% (4), tail of the pancreas 4% (3), and pancreatic body 1% (1).

Regarding tumor size, the patients were grouped into five groups for analysis, with a range of 1 to 100 mm, and were defined as follows: the first group with a size of 10-20 mm corresponding to 46% (32) of the cases, being the most frequent; the second group, had tumors larger than 41 mm 24% (17), the third group of 21-30 mm and the fourth of 31-40 mm corresponded to 13% (9), and the fifth group with a tumor size of 1-9 mm occupying 2% (2) of the total number of cases. The most frequently performed surgical procedure was pancreatoduodenectomy without pylorus preservation and open pylorus preservation in 22 (32%) and 8 (12%) cases, as shown in *Figure 1*. *Figure 2* describes the procedure according to the underlying pathology.

Trans operative complications were 39%, with hypovolemic shock the most frequent at 35% (grade 1: 8%, grade 2: 23%, grade 3:

Table 1: Demographic characteristics. N = 69.

	n (%)
Age, (years)*	56 ± 17
Sex	
• Female	41 (60)
• Male	58 (40)
Family history of pancreatic neoplasia	5 (7)
Comorbidities	
• T2D	20 (28)
• HBP	18 (26)
• Breast cancer	4 (5)
• Heart disease	4 (5)
• Liver cirrhosis	4 (5)
• COPD	2 (2)
• ERC	2 (2)
Clinical manifestations	
• Abdominal pain	51 (73)
• Jaundice	40 (57)
• Weight loss	28 (40)
• Cholangitis	13 (18)
• Nausea	30 (43)
• Vomiting	17 (24)
• Hypoglycemia	11 (15)
• Intolerance to the oral route	10 (14)
Histopathological diagnosis	
• Ampuloma	24 (35)
• Adenocarcinoma	21 (30)
• Cystic neoplasms	13 (19)
• Insulinoma	6 (9)
• Nesidioblastosis	5 (7)
Days of in-hospital stay*	21 ± 13

* Values presented as mean ± standard deviation. T2D = type 2 diabetes. COPD = chronic obstructive pulmonary disease. CKD = chronic kidney disease. HBP = high blood pressure.

1%, and grade 4: 1%); cardiogenic shock at 3% and vascular disruption in 1%. Regarding local complications, they were pancreatic fistulas (20%), surgical site infection (19%), and surgical wound dehiscence (9%), occurring mainly in patients diagnosed with ampuloma or adenocarcinoma who underwent open pancreatoduodenectomy, as shown in *Table 2*.

DISCUSSION

Pancreatic neoplasms are very diverse and involve both benign and malignant diseases, manifesting themselves clinically in a similar way and almost always late, which increases the complexity of medical-surgical management, with a high percentage of morbidity and mortality in the case of malignant neoplasms. This percentage has been improved thanks to advances in diagnostic imaging modalities, with which they are often detected incidentally and, in other cases, allow planning of the appropriate surgical management according to the type and location of the tumor at the pancreatic level.

The surgical techniques used for the resection of pancreatic tumors are twofold: one consisting of tumor enucleation indicated only for small benign pancreatic tumors that do not affect any adjacent structure or the pancreatic duct, and the other in which extensive pancreatic resections such as cephalic, total, or distal duodenopancreatectomy are performed.

Pancreatic resection is a surgery with a mortality rate in most hospitals with a certain degree of experience that does not exceed 6%. However, postoperative morbidity continues to be high, being reported up to 50-60%, among them the medical and surgical complications common to any postoperative major abdominal surgery (Clavien-Dindo classification), others belonging to a specific group concerning these procedures, such as pancreatic fistula, hemorrhage and delayed gastric emptying as defined by the group of experts of the *"International Study Group of Pancreatic Surgery"* (ISGPS), which is why many authors recommend performing such management in high volume centers to reduce postoperative morbidity. Comparing with the results published in a German study on mortality in patients undergoing pancreatic resections performed in hospitals with low and high surgical volume, they report 11.8 vs. 8.6% mortality, respectively, which shows a significant decrease in mortality in specialized centers where at least 5 pancreatic procedures are performed per year.[18,19]

At present, in our country, there are no national statistical reports on the prevalence of this diagnosis; there are only reports from reference centers such as the *Hospital de*

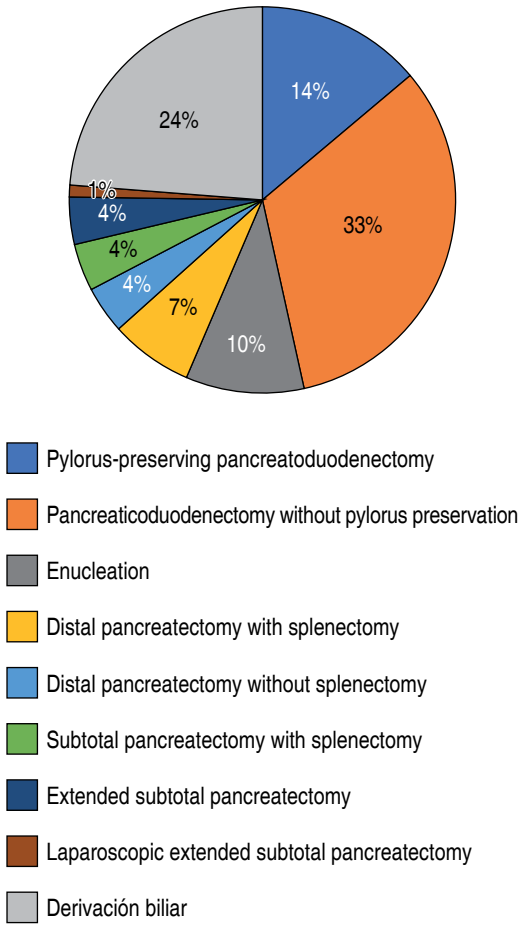

Figure 1: *Surgical procedures performed at the Hospital de Especialidades del Centro Médico Nacional Siglo XXI.*

Oncología del Centro Médico Nacional Siglo XXI and the *Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán*, where several pancreatic resections are performed, reporting morbidity and mortality rates similar to those registered in specialized centers at the international level, which are 5% and between 20-40% respectively, are associated to the high degree of surgical technical complexity since it involves partial or total resections of one or more organs, vascular dissection and complex digestive anastomosis.

In our study, 69 cases of pancreatic neoplasms were reported, ampulomas and adenocarcinomas of the pancreatic head the most frequent, unlike the international literature, where only pancreatic adenocarcinoma is mentioned as the most frequent histology, being therefore open pancreatoduodenectomies the most frequent surgical interventions performed as surgical management, which represent a high degree of complexity with high morbimortality, In our unit a total post-surgical morbidity rate of 39% was reported, being pancreatic fistula (20% of the cases) the most frequent at the local level and at systemic level with 21% of the cases, surgical site infection, pneumonia associated to health care and urinary infections the most frequent, same complications reported at international level by high volume centers, with which it is identified that in our unit we have a morbidity rate below the range reported at national and international level.[20]

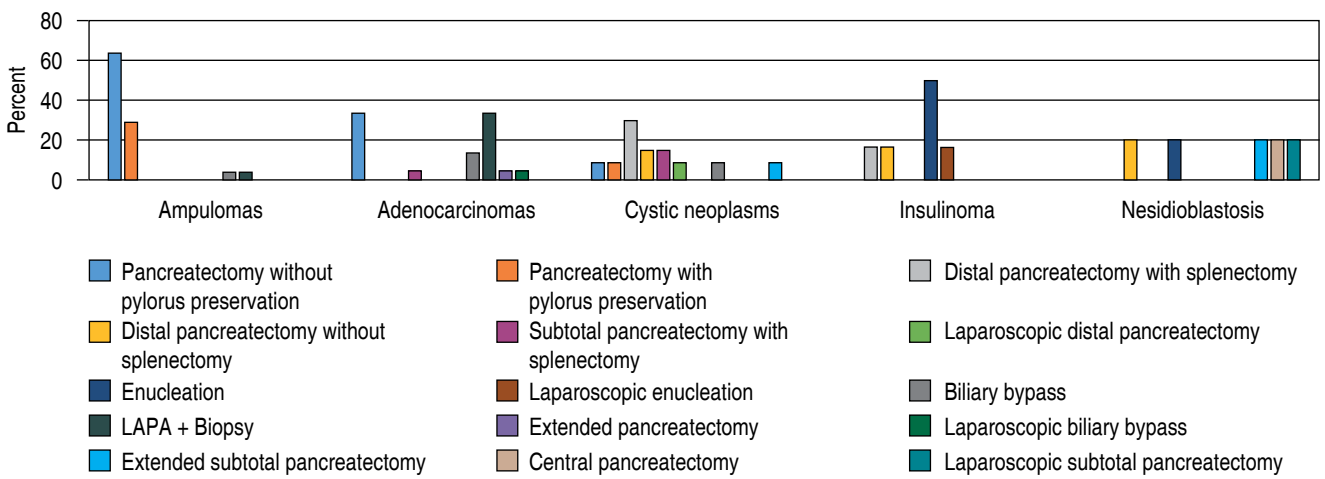

Figure 2: *Surgical procedures performed based on the type of pancreatic neoplasm.*

Table 2: Transoperative and postoperative local complications related to the procedure.

	Total n (%)	Trans QX n (%)	Anastomotic n (%)	Intestinal n (%)	Bleeding n (%)	Sepsis n (%)	Pancreatic fistula n (%)	Other n (%)
Palliative	15 (22)	3 (4)		1 (1)				3 (4)
Central pancreatectomy/ enucleation	5 (7)	2 (2)				1 (1)	1 (1)	
Laparoscopic approach	4 (6)							1 (1)
Distal subtotal pancreatectomy + splenectomy	11 (16)	4 (5)					1 (1)	
Distal subtotal pancreatectomy without splenectomy	4 (6)							
Open pancreatoduodenectomy	30 (43)	17 (24)	16 (23)	1 (1)	2 (2)	1 (1)	12 (17)	5 (7)

As mentioned, a higher incidence of ampuloma and adenocarcinoma was found in the female sex, which differs from the international literature; a recent study reported an increased incidence of pancreatic cancer, especially in younger women; however, this has not been externally validated. Accordingly, the exact cause of the trend among younger women is unclear. It may be due to disproportionate gender exposure or response to known or yet-to-be-explored risk factors, such as increased body mass index (BMI), which favors a pro-inflammatory state.[21]

In our hospital center, minimally invasive surgical techniques have increased to reduce operative time and post-surgical complications, including pain control, reduction of bleeding, and lower incidence of pancreatic fistula. The aim is to reduce morbidity and improve patient's quality of life in our hospital, which is considered a high-volume center for complex pancreatic resections.

CONCLUSIONS

Pancreatic neoplasms can be both solid and cystic; other studies have reported that the most frequent neoplasms are of the solid type; however, a difference to what has already been published is that in our population, ampuloma was more prevalent, followed by adenocarcinoma (35% and 30% respectively), these findings justify the presence of abdominal pain as the main symptom (73%). Women were more affected. It would be useful in a later study to evaluate the use of tobacco and alcohol as well as BMI to identify if the increase in BMI is more frequent in women as well as any drug addiction that could justify the increase of this type of lesions in the female gender, unlike what has been published, which indicates that the main gender affected by these neoplasms are men. Contrast computed tomography and magnetic resonance imaging help diagnose any of these lesions.

REFERENCES

1. Laffan TA, Horton KM, Klein AP, et al. Prevalence of unsuspected pancreatic cysts on MDCT. AJR Am J Roentgenol. 2008; 191: 802-807. doi: 10.2214/AJR.07.3340.
2. Pucci M, Yeo C. Cystic neoplasms of the pancreas. In: Zinner M, Ashley S, Hines O, editors. Maingot's abdominal operations, 13th ed. McGraw-Hill Education; 2019, pp. 3286-3386.
3. Fernández D. Neoplasia intraductal mucinosa tipo II (NPIM II) A quién operar. Guía de actualización en patologías prevalentes en Cirugía General. 2019; 1-2. [6 de mayo del 2024] Obtenido de: https://aac.org.ar/guias/4_fernandez.pdf
4. Malagelada J, Guda N, Lee K, et al. Lesiones quísticas pancreáticas. World Gastroenterology Organisation 2019: 1-21. Obtenido de: https://www.worldgastroenterology.org/guidelines/pancreatic-cystic-lesions/pancreatic-cystic-lesions-spanish el 6 de mayo del 2024
5. Jorba R, Abregat J, Brorobia F, et al. Neoplasias quísticas del páncreas. Manejo diagnóstico y terapéutico. Cir Esp. 2008; 84: 296-306. doi: 10.1016/S0009-739X(08)75039-5

6. Bauer F. Pancreatic cystic lesions: diagnostic, management and indications for operation. Part I. Chirurgia. 2017; 112: 97-109. doi: 10.21614/chirurgia.112.2.97
7. Chiang A, Lee L. Clinical approach to incidental pancreatic cysts. World J Gastroenterol. 2016; 22: 1236-1245. doi: 10.3748/wjg.v22.i3.1236
8. European Study Group on Cystic Tumours of the Pancreas. European evidence-based guidelines on pancreatic cystic neoplasms. Gut. 2018; 67: 789-804. doi: 10.1136/gutjnl-2018-316027.
9. Konings I, Harinck F, Poley J, et al. Prevalence and progression of pancreatic cystic precursor lesions differ between groups at high risk of developing pancreatic cancer. Pancreas. 2017; 46: 28-34. doi: 10.1097/MPA.0000000000000725.
10. Tanaka M, Fernández-del Castillo C, Kamisawa T, et al. Revisions of international consensus Fukuoka guidelines for the management of IPMN of the pancreas. Pancreatology. 2017; 17: 738-753. doi: 10.1016/j.pan.2017.07.007.
11. González-Palacios J. Tumores endócrinos pancreáticos. Rev Esp Patol. 2003; 36: 405-412. [06 de mayo del 2024] Obtenido de: http://www.patologia.es/volumen36/vol36-num4/36-4n07.htm
12. Varas M. Tumores neuroendocrinos: fascinación e infrecuencia. Rev Esp Enferm Dig. 2009; 101: 195-208. [6 de mayo del 2024] Obtenido de: https://scielo.isciii.es/scielo.php?pid=S1130-01082009000300006&script=sci_arttext&tlng=es
13. Chan C, Franssen B. Cáncer de páncreas; el punto de vista del cirujano. Revista de Gastroenterología de México. 2011; 76: 353-361. [6 de mayo del 2024] Obtenido de: http://www.revistagastroenterologiamexico.org/es-cancer-pancreas-el-punto-vista-articulo-X0375090611838987
14. Ayuso C, Sánchez M, Ayuso J, et al. Diagnóstico y estadificación del carcinoma de páncreas (II). Radiología. 2006; 48: 283-294. [6 de mayo del 2024] Obtenido de https://www.elsevier.es/es-revista-pediatrics-10-pdf-13093296
15. Chan C, Villar A, Torres D. Neoplasias del páncreas. Revista de Gastroenterología de México. 2013; 78: 45-47. [6 de mayo del 2024] Obtenido de http://www.revistagastroenterologiamexico.org/es-neoplasias-del-pancreas-articulo-S0375090613000888
16. Heinrich S, Besselink M, Moehler M, et al. Opinions and use of neoadjuvant therapy for resectable, borderline resectable, and locally advanced pancreatic cancer: international survey and case-vignette study. BMC Cancer. 2019; 19: 1-9. doi: 10.1186/s12885-019-5889-5.
17. Ahn D, Bekaii-Saab T. Ampullary cancer: an overview. Am Soc Clin Oncol Educ Book. 2014; 112-115. doi: 10.14694/EdBook_AM.2014.34.112.
18. Medrano R, Luna M, Chable W, et al. Morbimortalidad de la pancreatoduodenectomía en pacientes con cáncer de páncreas y tumores periampulares en el Hospital de Oncología del Centro Médico Nacional Siglo XXI de 2008 a 2013. Cir Cir. 2019; 87: 69-78. doi: 10.24875/CIRU.18000580.
19. Abboud Y, Samaan JS, Oh J, et al. Increasing pancreatic cancer incidence in young women in the United States: a population-based time-trend analysis, 2001-2018. Gastroenterology. 2023; 164: 978-989. doi: 10.1053/j.gastro.2023.01.022.
20. Nimptsch U, Peschke D, Mansky T. Minimum caseload requirements and inhospital mortality: observational study using nationwide hospital discharge data from 2006 to 2013. Gesundheitswesen. 2017; 79: 823-834. doi: 10.1055/s-0042-100731.
21. Bassi C, Marchegiani G, Dervenis C, et al. The 2016 update of the International Study Group (ISGPS) definition and grading of postoperative pancreatic fistula: 11 years after. Surgery. 2017; 161: 584-591. doi: 10.1016/j.surg.2016.11.014.

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