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Assessment of Pancreatic Duct Dilation in Patients with Pancreatic Cancer and Chronic Pancreatitis using Ultrasonography: A Retrospective Study

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Abstract

Background: The present study aimed to assess the main pancreatic duct (PD) in patients with chronic pancreatitis (CP) and pancreatic cancer (PC) to determine the prevalence of dilation in both conditions.

Methods and Results: A retrospective study was conducted at King Fahad Medical City in Riyadh from December 2019 to March 2020 on the use of ultrasonography to assess PD in patients with PC and CP. The sample included 73 patients: 39 (21 females and 18 males) with PC and 34 (20 males and 14 females) with CP. The diameter of the main PD was measured by ultrasonography. The mean age for PC patients was 61.17±13.96 years, and for CP patients was 42.14±17.08 years (P=0.000). The diameter of the main PD in PC was 0.52±0.22 cm, and in CP, it was 0.51±0.28 cm (P=0.865). Our results suggest that the dilation of the PD is one feature that accompanies PC and CP. In our study, there was no significant difference in in the prevalence of dilation in both conditions (64.1% and 64.7%). Additionally, PC is 2.4 times more likely to be associated with diabetes mellitus than CP.

Conclusion: PC occurs more commonly in the older age group, while CP occurs more commonly in the younger age group. Most cases of PC and CP were associated with dilation of the PD with no significant difference in the amount of dilation. (**International Journal of Biomedicine. 2023;13(1):91-94.**)

Keywords: pancreatic cancer • chronic pancreatitis • ultrasound • pancreatic duct dilatation

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Abbreviations

CP, chronic pancreatitis; **ERCP**, endoscopic retrograde pancreatography; **MRCP**, magnetic resonance cholangiopancreatography; **PD**, pancreatic duct; **PC**, pancreatic cancer.

Introduction

The pancreas is both an exocrine accessory digestive organ and a hormone-secreting endocrine gland. The exocrine portion consists of acinar and duct tissue, and an endocrine portion is made up of islets of Langerhans. Chronic pancreatitis (CP) is a common chronic inflammatory disease that causes irreversible changes in the pancreatic parenchyma

and function. Pancreatic cancer (PC) is one of the most lethal diseases.[1] The most common type of PC begins in the cells that line the ducts (pancreatic ductal adenocarcinoma). Previous studies have suggested that CP markedly increases the risk of PC, varying from 2.2- to 26.7-fold.[1-4] Known risk factors for PC also include diabetes mellitus, obesity, cigarette smoking, family history of PC, heavy alcohol consumption, and a history of acute pancreatitis.[5]

Several imaging modalities, including abdominal ultrasonography, ERCP, MRCP, and CT, can be used to diagnose pancreatic disorders.[6,7] A frequently encountered condition is a dilated pancreatic duct (PD). PD dilatation can be caused by cancers or benign neoplasms. Dilated PDs can result from pancreatic tumors and, under the right circumstances, may require endoscopic evaluation and therapy, including stenting and dilation. PD dilatation can occur secondary to CP and may or may not warrant endoscopic intervention, delpending on the overall symptom profile. Finally, the PD may dilate due to aging or normal physiological processes.[8] The PD assessment is important in the cases of PC and CP to aid in managing the disease. In cancer cases, PD dilation is linked with the advanced stage.

The present study aimed to assess the main PD in patients with CP and pancreatic carcinomas to determine the prevalence of dilation in both conditions.

Materials and Methods

A retrospective study was conducted at King Fahad Medical City in Riyadh from December 2019 to March 2020 on the use of ultrasonography to assess PD in patients with PC and CP. The sample included 73 patients: 39 (21 females and 18 males) with PC and 34 (20 males and 14 females) with CP. Patients with other pancreatic diseases, such as acute pancreatitis, pancreatic cysts, or pancreatic stones, were excluded.

Ultrasound technique

The pancreas was examined by abdominal ultrasound scanning with a low-frequency curve transducer to maintain deep penetration and full clearance to improve image quality (Philips iU22 and GE logiq E9 XDclear 2.0 Ultrasound Machine). The pancreas was scanned with the patients in a state of fasting for at least 6 hours before the appointment to eliminate stomach gases, which usually obscure images of the pancreas when the patient is in the supine position. With the patient lying supine, the gel was applied to the patient's skin at the midline of the abdomen to eliminate the air between the transducer and the skin; transverse and longitudinal scanning of the pancreas was performed using B-mode grayscale image and color Doppler. The diameter of the main PD was measured at the body on the longitudinal view of the pancreas, between the upper edge of the anterior line and the posterior line of the main pancreatic duct. The normal limit of the main PD diameter in the area of the body was up to 2 mm; if the diameter is more than 2 mm, it is considered to be a dilated PD (Figure 1).

Statistical analysis was performed using statistical software package SPSS version 23.0 (Armonk, NY: IBM Corp.). Group comparisons were performed using chi-square test with Yates correction. A probability value of $P<0.05$ was considered statistically significant.

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Princess Nourah bint Abdulrahman University (No 20-0051), with institutional review board (IRB) approval from King Fahad Medical City. The data was only used for study purposes without individual details identifying the participant.

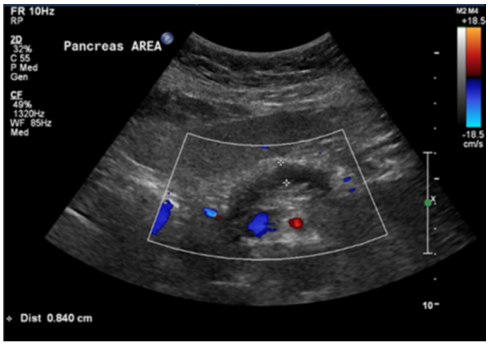

Fig. 1. *US: pancreatic duct.*

Results

PC was more common in the age group of >60 years. In contrast, CP occurred more in the groups of 29-39 years and 40-60 years. The mean age for PC patients was 61.17±13.96 years, and for CP patients - 42.14±17.08 years (P=0.000). The diameter of the main PD in PC was 0.52±0.22 cm, and in CP, it was 0.51±0.28 cm (P=0.865) (Table 1, Figure 2).

Table 1.

Demographic data and PD diameter in the study groups

Variables	PC	CP	*P*-value
Age, years	61.17± 13.96	42.14±17.08	0.000
Mean diameter of PD, cm	0.52± 0.22	0.51±0.28	0.865
Gender			
Male	18	20	0.280
Female	21	14	
Age group			
8-18 years	0	4	0.004
29-39 years	3	12	
40-60	17	13	
>60 years	19	5	
Total	39	34	

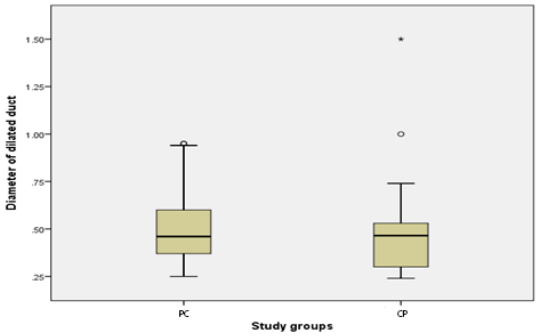

Fig. 2. *PD diameter (cm) in the study groups.*

This study found that PD dilation occurred in PC and CP with the same frequency, with no significant difference in the occurrence (Table 2, Figure 3).

Table 2.

The prevalence of PD dilation among the study groups.

PD dilation	PC	CP	*P*-value
Yes	25(64.1%)	22(64.7%)	0.957
No	14(35.9%)	12(35.3%)	

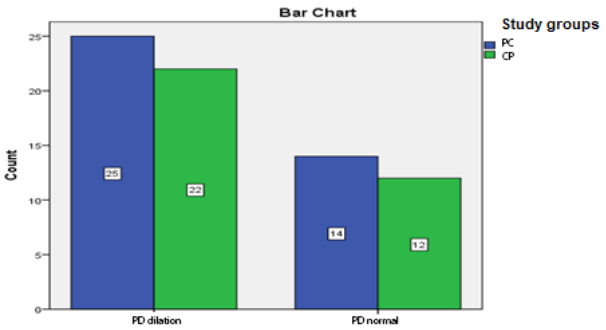

Fig. 3. *The frequency of PD dilation in the study groups.*

This study also found that PC was more likely to be associated with diabetes mellitus than CP (OR=2.42, 95%CI: 1.31-4.44, P=0.002) (Figure 4) The PD was more dilated in diabetic patients than in non-diabetic patients (Table 3, Figure 5).

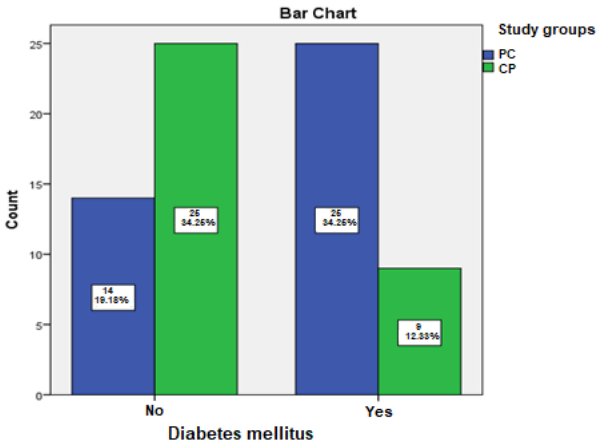

Fig. 4. *The frequency of diabetes mellitus in the study groups.*

Table. 3.

The relative risk (RR) of PC in patients with history of diabetic mellitus related to CP.

	DM		Total	*P*-value	RR	95%CI
	No	Yes				
PC	14	25	39	0.004	2.42	1.32-4.44
CP	25	9	34			
Total	39	34	73			

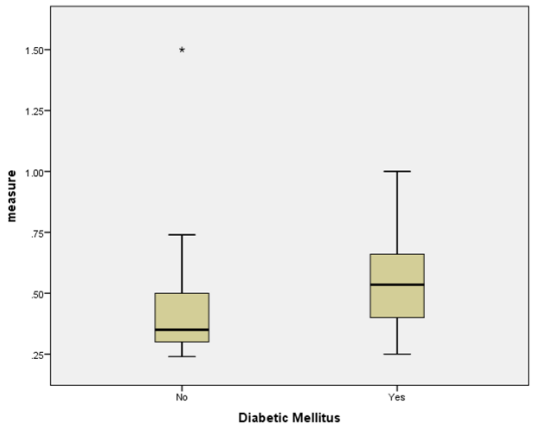

Fig. 5. *The PD diameter (cm) in diabetic and non-diabetic patients.*

Discussion

The majority of the burden of exocrine pancreatic disease is brought on by acute pancreatitis, chronic pancreatitis, and PC. Recurrent episodes of acute pancreatitis result in irreversible alterations indicative of CP.[9]

CP also has variances based on gender. Men are more likely than women to get CP, according to epidemiological studies, with a ratio of 4:5. Alcohol and tobacco use are also linked to CP in males (24:1) but not in females. In this study, CP occurred more commonly in males, while pancreatic carcinomas were more common in females. We also found that PC was more common in the age group of >60 and 40-60 years, with a mean age of 61.17 years. Moreover, the results showed that CP occurred more in younger age groups than in older ages, with a mean age of 42.14. A previous study stated that 90% of patients with newly diagnosed PC were over 55, and the risk of disease increased with age. PC rarely develops before the age of 30.[10]

In our study, 64.1% of the patients with PC had diabetes, and the risk of PC in diabetic patients was 2.4 times higher than in association with CP. Previous studies have found that diabetic patients have a twofold increased risk of developing PC. Although the association between diabetes and PC is complicated and assumed to be two-way, it has been shown that diabetes increases the likelihood of developing PC and worsens its symptoms. Compared to other types of cancers, the prevalence of diabetes among people with PC is exceptionally high.[11]

Our results suggest that the dilation of the PD is one feature that accompanies PC and CP. In our study, there was no significant difference in dilation in both conditions (64.1% and 64.7%). Edge et al.[6] found that the most common causes for dilatation of the main PD on CT were CP and PC. The result of the present study was consistent with the findings of Tanaka et al.,[12] in which it was stated that in PC, the percentage of instances with a little dilation (<2 mm in diameter on ultrasound) of the main PD was 65% in the pre-cancer group, more than four years before the surgery for PC. One of the signs of PC is a slight dilation of the PD.[6,12] The outcomes of the present study were also consistent with Luetmer et al., who found that PD dilation was found in 68% of CP.[13]

Conclusion

The present study concluded that pancreatic cancer occurs more commonly in the older age group, while chronic pancreatitis occurs more commonly in the younger age group. Additionally, pancreatic cancer is 2.4 times more likely to be associated with diabetes mellitus than chronic pancreatitis. Most cases of pancreatic cancer and chronic pancreatitis were associated with dilation of the main pancreatic duct with no significant difference in the amount of dilation.

Competing Interests

The authors declare that they have no competing interests.

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