

# Study of role of computerized tomography (CT) in evaluation of groove pancreatitis

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## Abstract

**Background:** Groove pancreatitis is a rare form of chronic pancreatitis affecting the groove between the pancreatic head, duodenum and common bile duct. The exact cause of the disease is not known, although there are strong associations with long term alcohol abuse, functional obstruction of duct of Santorini and brunner gland hyperplasia. The purpose of this study was to describe the imaging findings of groove pancreatitis (GP) on Contrast enhanced CT Abdomen. **Material and Methods:** Present study was retrospective study conducted, with help of medical records of 16 patients with a final diagnosis of Groove pancreatitis. CT, MRI and MRCP findings were analysed. Statistical analysis was done using descriptive statistics. **Results:** In present study, two types of groove pancreatitis (GP) as pure type (50%) and segmental type (50%) were noted. Other important findings were focal duodenal wall thickening (62.5%) and cysts in the duodenal wall itself or in groove between the pancreatic head and the duodenum (37.5%), CBD dilatation and distal smooth tapering (62.5%) including all the segmental types and 2 of the pure type leading to intra- and extra-hepatic biliary system dilatation. MRI and MRCP were available in 6 patients in our study. There was a CT similarity regarding the sheet of tissues within the pancreaticoduodenal groove. These were seen expressing T1 hypo-intense and T2 slightly hyperintense signal in 3 patients with depiction of mild enhancement in the delayed phases in three of them (50%). On the MDCT examinations hypodense sheet at the PD groove was seen in 12 patients with modest enhancement identified in delayed phase seen in 6 of the them. Duodenal wall thickening was seen in 10 patients while associated cysts within the duodenal wall or in PD groove were seen in 6 patients. Pancreatic head enlargement with diffuse enhancement was seen in 8 patients. Mild pancreatic duct dilatation was seen in 8 patients while dilatation of the CBD was seen in 10 patients with distal tapering and intra-hepatic biliary dilatation. **Conclusion:** Groove pancreatitis (GP) is a disease that should be considered in the list of differential diagnosis of masses implicating the pancreatic head and medial duodenal wall. Imaging findings that are suggestive of GP include chronic inflammatory changes with fibrosis in the PD groove with or without implication of the nearby head of the pancreas, duodenal medial mural thickening with luminal stenosis and cysts at the PD groove or within the duodenal wall.

**Keywords:** Groove pancreatitis (GP), CT scan, MRI, CBD dilatation.

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## INTRODUCTION

The pancreaticoduodenal (PD) groove contains lymph nodes, portion of the common bile duct, distal main pancreatic duct, distal accessory pancreatic duct as well as the major minor papilla. Small vessels are passing within this space, and the most important of these is the superior PD artery. Groove pancreatitis (GP) is a rare form of chronic pancreatitis affecting the groove between the pancreatic head, duodenum and common bile duct.<sup>1</sup> The exact cause of the disease is not known, although there are strong associations with long term alcohol abuse,

functional obstruction of duct of Santorini and brunner gland hyperplasia The clinical presentation can vary greatly in its acuity. Some patients can have a presentation similar to that of acute pancreatitis and others have a more chronic course. In acute setting patients present with severe abdominal pain, nausea and vomiting and in chronic setting patients present with jaundice and chronic weight loss.<sup>2</sup> The average duration of symptoms is 3-6 months . Pancreatic enzymes are often normal or minimally elevated and tumor markers are usually negative. The purpose of this study is to describe the imaging findings of groove pancreatitis (GP) on Contrast enhanced CT Abdomen.

**MATERIAL AND METHODS**

Present study was retrospective study conducted at Kamineni Institute of Medical Sciences, Telangana, India. Study duration was of 17 months (August 2019 to December 2020.). Study was approved by institutional ethical committee. Patient’s consent was waived by the Institutional Research Ethics Board assuring confidentiality. Medical records, with a final diagnosis of Groove pancreatitis were considered for this study. Patients with the final diagnosis of pancreatic groove carcinoma, ampullary cancer or pancreatic head cancer were excluded. Images were obtained using a Siemens

Emotion 64 Multislice CT scanner. Non-ionic IV contrast was injected with a dose of 1.5 ml/kg (maximum = 150 ml), with average rate of 4 ml/s using automatic pump injector and standard protocol with pancreatic phase timing fixed at 45 s, portal phase at 70 s, and delayed phase after 5 min from the start of contrast injection respectively was performed. Six of these patients were additionally examined by MRI including MRCP; using a 1.5 T closed MRI scanner (Siemens Magnetom Essenza) Non-ionic IV contrast was injected with a dose of 1.5 ml/kg (maximum = 150 ml), with average rate of 4 ml/s using automatic pump injector. The pancreatic phase timing was fixed at 45 s, portal phase at 70 s, and delayed phase after 5 min from the start of contrast injection respectively, and examination was done using Siemens Emotion 6 and 64 MSCT. Six of these patients were additionally examined by MRI including MRCP; using a 1.5 T closed MRI imager. The pulse sequences used were transverse T2FSE with and without fat saturation, T1 chemical shift sequences (In/opposed phase), Dynamic pre- and post-Gadolinium Volumetric Interpolated Breath-Hold Examination (VIBE) sequences, and MRCP sequences. MRCP examinations were obtained with a single-shot, heavy T2W FSE sequence, HASTE (Siemens) by using respiratory gating and fat saturation.

Statistical analysis was done using descriptive statistics.

**RESULTS**

The patients presented with variable clinical pictures including epigastric pain referred to the back (62.5%), obstructive jaundice (elevated indirect bilirubin) (50 %), mild elevation of amylase (50%), vomiting (37.5%), weight loss (37.5%), mild elevation of lipase (37.5%) and diarrhea (25%). None of the patients showed significant rise of the CEA, CA19.9 or other tumor markers.

**Table 1: Clinical features**

Clinical features	No. of patients	Percentage
Epigastric pain referred to the back	10	62.5
Obstructive Jaundice (elevated indirect bilirubin)	8	50
Mild elevation of amylase	8	50
Vomiting	6	37.5
Weight loss	6	37.5
Mild elevation of lipase	6	37.5
Diarrhea	4	25

GP has two types; pure type (50%) and segmental type (50%). Other important findings were also noted in our study including focal duodenal wall thickening seen in 10 cases (62.5%) and cysts in the duodenal wall itself or in groove between the pancreatic head and the duodenum in 6 cases (37.5%). In our study CBD dilatation and distal smooth tapering were seen in 10 patients (62.5%) including all the segmental types and 2 of the pure type leading to intra- and extra-hepatic biliary system dilatation. MRI and MRCP were available in 6 patients in our study. There was a CT similarity regarding the sheet of tissues within the pancreaticoduodenal groove. These were seen expressing T1 hypo-intense and T2 slightly hyperintense signal in 3 patients with depiction of mild enhancement in the delayed phases in three of them (50%). Multiple findings were seen on the MDCT examinations of the 16 patients including a hypodense sheet at the PD groove was seen in 12 patients with modest enhancement identified in delayed phase seen in 6 of the them. Duodenal wall thickening was seen in 10 patients while associated cysts within the duodenal wall or in PD groove were seen in 6 patients. Pancreatic head enlargement with diffuse enhancement was seen in 8 patients. Mild pancreatic duct dilatation was seen in 8 patients while dilatation of the CBD was seen in 10 patients with distal tapering and intra-hepatic biliary dilatation.

**Table 2: Summary of different CT and MRI findings**

FINDING	CT (No. of patients)	%	MRI (No. of patients)	%
Hypodense sheet	12	75	4	66.6
Duodenal wall thickening	10	62.5	6	100
CBD dilatation and distal tapering	10	62.5	4	66.6
Pancreatic head enlargement	8	50	3	50
Pancreatic duct dilatation	8	50	4	66.6
Delayed enhancement	6	37.5	3	50
Duodenal cysts	6	37.5	4	66.6

Six patients out of the above described 16 patients had MRI, showing T1 low signal and T2 iso to hyperintense signal sheet at the PD groove was seen in 4 patients with delayed enhancement in 3 of them. Duodenal wall thickening with T2 high signal was seen in 6 patients while associated cysts of T2 fluid signal within the duodenal wall were seen in 4 patients. Pancreatic head enlargement with low T1 signal alteration was seen in 4 patients. Mild pancreatic duct dilatation was seen in 4 patients with pancreatic body and tail atrophy in 2 of them while dilatation of the CBD was seen in 4 patients with distal tapering and intra-hepatic biliary dilatation. The pancreatic head was enlarged. Segmental form of groove pancreatitis. The MRCP of these patients showed dilated CBD with distal tapering and a distance separating its end from the duodenal wall in addition to fluid filled cysts at the duodenal wall is seen in 4 patients while the other 2 patients had almost unremarkable MRCP. Six patients out of the above described 16 patients had MRI, showing T1 low signal and T2 iso to hyperintense signal sheet at the PD groove was seen in 4 patients with delayed enhancement in 3 of them. Duodenal wall thickening with T2 high signal was seen in 6 patients while associated cysts of T2 fluid signal within the duodenal wall were seen in 4 patients. Pancreatic head enlargement with low T1 signal alteration was seen in 4 patients. Mild pancreatic duct dilatation was seen in 4 patients with pancreatic body and tail atrophy in 2 of them while dilatation of the CBD was seen in 4 patients with distal tapering and intra-hepatic biliary dilatation. None of the patients showed peri-pancreatic fluid collections, ascites, loco-regional suspicious nodes or other stigmata of intra abdominal metastatic disease. No MPD dilatation or calcification. Pancreatic parenchyma showed normal homogenous enhancement. Multiple small peri-pancreatic and mesenteric lymph nodes noted.

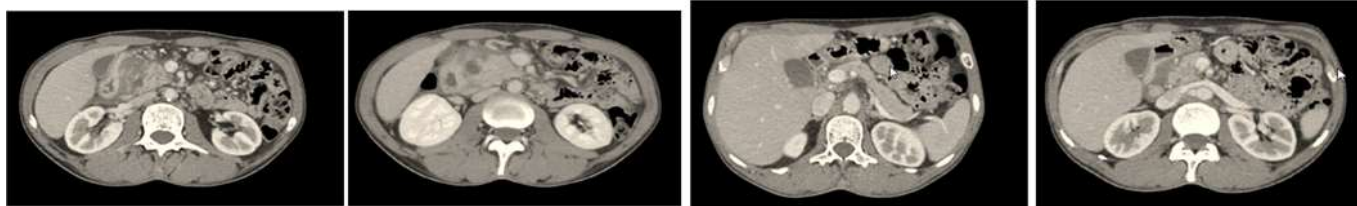


Figure 1

Figure 2

Figure 3

Figure 4

Significant sheet-like soft tissue thickening in the pancreaticoduodenal groove with few cysts. Mild thickening of the first and second parts of the duodenum. No MPD dilatation or calcification. Pancreatic parenchyma showed normal homogenous enhancement. Multiple small peri-pancreatic and mesenteric lymph nodes noted.

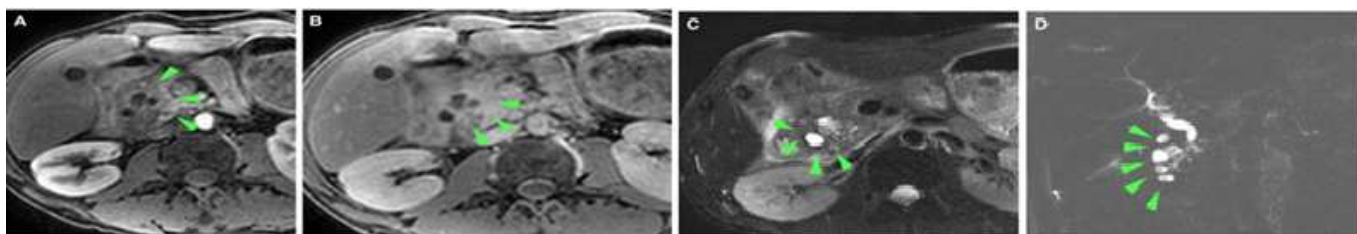


Figure 5

Axial T1VIBE late arterial phase (A) showing ill defined enhancing sheet with cystic changes at the duodeno-pancreatic groove (green arrows). Delayed phase (B) shows retained contrast enhancement (green arrows). Axial T2W (C) and coronal single shot MRCP (D), showing duodenal wall thickening and cystic changes (green arrows CandD) at the medial wall of the second part duodenum (Cystic Dystrophy of Ectopic Pancreas). The pancreatic head is enlarged. Segmental form of groove pancreatitis. The MRCP of these patients showed dilated CBD with distal tapering and a distance separating its end from the duodenal wall in addition to fluid filled cysts at the duodenal wall is seen in 4 patients while the other 2 patients had almost unremarkable MRCP.

## DISCUSSION

Groove pancreatitis (GP) has two types: pure type and segmental type, differentiation between these two forms is not usually clear. Pure type that affects exclusively the pancreatico-duodenal groove with sparing of the pancreatic head was seen on CT as hypo-dense sheet like soft tissue density within the PD groove is found in 8 cases (50%). Segmental type is seen other 8 patients (50%) where the sheet like focal hypodense lesions extended into the pancreatic head in vicinity of the duodenal wall with pancreatic head enlargement. Similar findings were reported in previous studies with emphasis on the coronal reconstructions of MDCT data that can allow better identification of ill-defined fat stranding and inflammatory changes in the PD groove accompanied with increasing delayed enhancement as a result of a significant fibrotic component.<sup>3</sup> The pure form is rather easy to identify. On the other hand, the segmental form can be difficult to diagnose, because involvement of the groove is often obscured by mass like involvement of the pancreatic head. The segmental type of GP is confused for a pancreatic head mass, and differentiating the two entities is not easy on the MRI and CT. The main pancreatic ducts showed mild dilatation in seen at the body and tail of the pancreas in the 8 cases with segmental type, while in the pure form of GP the main pancreatic ducts were not dilated. It is also reported that pancreatic duct can also be narrowed toward the head of the pancreas in a smooth gradual pattern. In more chronic stage, pancreatic parenchymal changes resembling those of ordinary chronic pancreatitis can develop including pancreatic calcifications, ductal dilatation, and ductal beading or irregularity. The pathology of GP is described as the duodenal mucosa between the major and minor papillae is markedly thickened. The involved areas show gelatinous contents, edema and fibrosis with possible cyst formation. The cysts may contain small calculi. Microscopic evaluation reveals duodenal wall thickening, with glandular and muscular inflammation and hyperplasia. Sometimes pancreatic islands heterotopia can be seen. The scarring implicates the lower portion of the common bile duct in the PD groove. The origin of the cysts in GP is controversial, and the most popular theory claims that they are cystic dystrophy of the pancreatic heterotopic islands in the duodenal wall. The specific location of the lesions around the minor papilla suggests possible anatomical or functional disorder related to this area as GP may occur in cases with pancreas divisum, absent or narrow duct of Santorini, or may be due to obstruction of the accessory pancreatic duct.<sup>4</sup> An important point noticed in our series and reported previously, is that even in severe GP, the surrounding vessels are spared without thrombosis or infiltration.<sup>5,6</sup> Also in the study we have not detected CT signs of acute

pancreatitis or loco regional metastasis or adenopathies. In our study CBD dilatation and distal smooth tapering were seen in 10 patients (62.5%) including all the segmental types and 2 of the pure type leading to intra- and extra-hepatic biliary system dilatation.

As a fact, CT provides superior spatial resolution, but with less contrast resolution to discriminate pancreatic cancer from inflammation. The high soft-tissue resolution of MRI provides more accurate evaluation of the pancreatic tissues, specifically for tissue characterization in inflammatory and neoplastic processes and analysis of contents of cyst. Involvement of the pancreas was reported to be well visualized on MRI compared to CT, with progressive loss of T1 signal intensity in the head of the pancreas as a result of parenchymal atrophy and fibrosis. Duodenal wall thickening was seen in the MRI of all the 6 patients with 4 of them showing mural cysts. The medial wall of duodenum is involved in the pure as well as the segmental forms of GP, with multiple T2 hyperintense cysts in both the duodenal wall and PD groove. In our study pancreatic head enlargement with low T1 signal alteration was seen in 4 patients with pancreatic duct dilatation in addition to atrophy of the rest of pancreas. This reflects chronic inflammatory disease with fibrous tissues replacing the glandular tissues of the pancreas. In the pure type of GP, the pancreas appears normal and shows relatively high T1 signal.<sup>7</sup> In our study duodenal wall thickening with T2 high signal was seen in 6 patients while associated small cysts of T2 fluid signal within the duodenal wall were seen in 4 patients. MRCP facilitates determination of relationship between these cysts and CBD and pancreatic ducts. Marked duodenal wall thickening is usually not associated with pancreatic neoplastic processes while it is common in GP. This sign can help in differentiating GP from pancreatic cancers. In our study MRCP was available in 6 patients, showing dilated CBD with distal tapering with a distance separating distal ends from the duodenal walls, fluid filled cysts at the duodenal wall or in the groove with ectatic pancreatic ducts in 4 patients. None of our cases showed abnormal dilatation of the GB. The GB tends to be normally distended in GP. Previous studies described Banana like gallbladder in cases of GP simulating those seen in traditional chronic pancreatitis patients had almost unremarkable MRCP.<sup>8</sup> Pure form of GP should be differentiated from other conditions including duodenal cancer as well as distal CBD and ampullary carcinomas. The later produces focal malignant lesions at the ampulla, while GP is more ill-defined crescentic soft tissue, still larger ampullary carcinomas may not be easily differentiated from GP on imaging basis.<sup>9</sup> Carcinoids and gastrinomas may rarely originate within the PD groove. These tumors show early hyper-enhancement due to high vascularity and

hyperintense T2 signal compared to the delayed centripetal enhancement of GP. Duodenal gastrointestinal stromal tumor (GIST) is more hypodense lesion and still more hyper-vascular and should not be easily confused with GP.<sup>10</sup> Radiological suggestion of the suspicion or suggestion that a pancreatic head lesion may represent GP should direct the surgeons for further workup before the decision of radical surgery. On the other hand, the diagnosis of groove pancreatitis should not be confirmed until the other possibility of adenocarcinoma is carefully excluded.

Limitations of our study include retrospective design, and we limited the scope of our study to describe the imaging features of the documented cases of GP with lack of comparison with cases of pancreatic head cancer that may simulate GP. Another limitation is that not all cases have MRI and MRCP examinations and we did not provide comparison between CT and MRI.

## CONCLUSION

Groove pancreatitis (GP) is a disease that should be considered in the list of differential diagnosis of masses implicating the pancreatic head and medial duodenal wall. Imaging findings that are suggestive of GP include chronic inflammatory changes with fibrosis in the PD groove with or without implication of the nearby head of the pancreas, duodenal medial mural thickening with luminal stenosis and cysts at the PD groove or within the duodenal wall.

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