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Systematic Review

Systematic review on groove pancreatitis: management of a rare disease

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Abstract

Background: Groove pancreatitis is a focal form of chronic pancreatitis affecting the area of the paraduodenal groove. The aim of this systematic review was to assess the clinical presentation, diagnosis and treatment of patients with groove pancreatitis.

Methods: Medical literature databases (Embase, Medline via PubMed and Cochrane Central Register of Controlled Trials) were systematically searched for data recorded between 1 January 1990 and 31 August 2022 regarding patient characteristics, diagnosis, surgical treatment and outcomes. The following inclusion criteria were applied: RCTs, observational studies (cohort and case–control studies) and case studies with >3 cases including patients with groove pancreatitis undergoing medical, endoscopic or surgical treatment with available clinical and diagnostic data. Fisher's exact test for binary data and Mann–Whitney *U* test or Student *t*-test for continuous data were adopted for statistical analysis.

Results: Of 649 studies, 44 were included, involving reports on 1404 patients with a mean age of 49 years. In 41 of the 44 studies in which patient gender was described, 86 per cent ($N = 1023$) of patients were male. Information on the risk factors of alcohol and nicotine was available in 37 and 23 studies, respectively. Seventy-nine per cent ($N = 886$) of patients had a history of excessive alcohol consumption and 83 per cent ($N = 595$) were smokers. Information on clinical symptoms was available in 37 of the 44 included studies and 78.5 per cent ($N = 870$) presented with abdominal pain. Some 27 studies comprising 920 groove pancreatitis patients were treatment oriented. Seventy-four per cent ($N = 682$) of patients were treated conservatively, 26.4 per cent ($N = 134$) underwent endoscopic treatment and 54.7 per cent ($N = 503$) required surgery. There was complete relief of symptoms in 35.6 per cent ($N = 243$) after conservative treatment, 55.2 per cent ($N = 74$) after endoscopic treatment and 69.6 per cent ($N = 350$) after surgical treatment. The median follow-up time was 42 months (range, 1–161 months).

Conclusion: Groove pancreatitis shows on imaging a typical triad: cystic lesions in the pancreatic duct or duodenal wall, calcifications, and thickenings of the duodenal wall. Surgery appears to be the most effective treatment modality.

Introduction

Groove pancreatitis is an unusual form of chronic segmental pancreatitis that affects the anatomical space between the head of the pancreas, the duodenum and the common bile duct. The term 'groove pancreatitis' was first used in 1982[1], although the disease was described as 'segmental pancreatitis' as early as 1973[2]. This form of chronic pancreatitis has been described in the literature under various names, including cystic dystrophy of the heterotopic pancreas, pancreatic hamartoma of the duodenum, paraduodenal mural cyst, myoadenomatosis and groove pancreatitis[3,4]. The exact prevalence of groove pancreatitis is difficult to determine, but based on several surgical series, it appears to range from 3 per cent to 24 per cent of patients operated for chronic pancreatitis[1,5–7].

The pathogenesis of groove pancreatitis remains unclear. Possible aetiologic factors are presence of pancreatic tissue in the duodenal wall, heavy alcohol consumption and/or heavy cigarette smoking[5,6,8]. The clinical feature is similar to that of chronic pancreatitis[1,5,7,9], and differentiating groove pancreatitis from pancreatic cancer is a diagnostic challenge.

A previous systematic review described the presentation and treatment options of groove pancreatitis and its treatment options, but there were few studies included and the follow-up was short[10].

The aim of this systematic review was to describe the clinical outcomes following conservative, endoscopic and surgical treatment in patients with groove pancreatitis. Furthermore, it sought to determine how groove pancreatitis differs from chronic pancreatitis and pancreatic head cancer in terms of clinical and radiological features.

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Methods

This systematic review complies with PRISMA guidelines[11]. It was registered in an international prospective registry for systematic reviews under the study number review registry 1218.

Literature search

The electronic databases EMBASE, MEDLINE (via PubMed) and Cochrane Central Register of Controlled Trials were searched for the terms 'groove pancreatitis', 'paraduodenal pancreatitis', 'paraduodenal wall cysts', 'pancreatic hamartoma of duodenum', 'myoadenomatosis' and 'duodenal cystic dystrophy' (*Fig. 1*). The literature search was limited to the period between 1 January 1990 and 31 August 2022. Search results were limited to the English language. Two reviewers independently screened titles and/or abstracts and reviewed the full-text articles for eligibility. Any discrepancies were resolved through discussion with the lead author. The references of the included articles were manually reviewed to identify other suitable articles.

Selection of studies

Articles that met the following criteria were selected for inclusion: RCTs, observational studies (cohort and case–control studies) and case studies with >3 cases including patients with groove pancreatitis undergoing medical, endoscopic or surgical treatment with available clinical and diagnostic data.

Quality assessment of the studies

The quality of each study used for this systematic review was assessed using the Newcastle–Ottawa Scale (NOS) for cohort studies[12]. The assessment of study quality included rating according to the following three categories: selection (4 points), comparability (2 points) and outcome assessment (3 points). The NOS ranged from 0 to 9 points. The total NOS score was calculated as the median of all five individual NOS scores. Study quality was classified as good (≥8 points), moderate (6 or 7 points) and poor (≤5 points).

Outcome parameters

The primary outcome was defined according to the clinical success and recurrence rate after conservative, endoscopic and surgical treatment of groove pancreatitis.

To assess clinical success, the type of treatment (conservative, endoscopic, surgical) and pain control after treatment were reviewed and extracted as appropriate. Treatment outcome was stratified into complete success (complete disappearance of pain and vomiting), temporary success (improvement of symptoms but persistent or recurrent pain less acute than before treatment) and treatment failure (symptoms unchanged or worsening).

Conservative treatment: alcohol withdrawal, total parenteral nutrition or analgesics or somatostatin analogue injections. Endoscopic treatment: insertion of a duodenal stent, duodenal dilatation, endoscopic pseudocyst drainage and duct drainage. Surgical treatment: all surgical procedures for the treatment of groove pancreatitis, including pyloric resection or pylorus-preserving partial pancreatoduodenectomy, duodenum-preserving pancreatic resections, pancreas-preserving duodenal resections, antrectomy, distal pancreatectomy, drainage procedures and bypass procedures.

Secondary outcomes included clinical and radiological features of groove pancreatitis compared to pancreatic ductal adenocarcinoma (PDAC).

Parameters such as clinical symptoms, morbidity/mortality according to the Clavien–Dindo classification[13], diagnostic tests performed and patient follow-up were reviewed and extracted as appropriate. For patients who underwent surgery, data on the indication, timing and type of surgical procedures performed were collected.

Heavy drinking was defined in the studies according to either the Centers for Disease Control guidelines (men, an average of more than two drinks per day or more than 14 drinks per week; women, an average of more than one drink per day or more than seven drinks per week) or the USA guidelines for non-alcoholic fatty liver (more than 40 g/day in women and more than 60 g/day in men for more than 3 years)[14].

Statistical analysis

Descriptive statistics were used for baseline characteristics and outcome variables. Weighted overall rates were calculated for dichotomous data. Means were calculated for continuous data. The differences between patients with groove pancreatitis and cancer were analysed using Fisher's exact test for binary data and Mann–Whitney *U* test or Student *t*-test for continuous data. Microsoft Excel was used to analyse the data. Statistical analyses were performed using R statistical software (www.r-project.org). A two-sided $P < 0.05$ was considered indicative of statistical significance.

Results

Characteristics of the included studies

After excluding duplicates, the systematic search yielded a total of 606 entries. After screening of titles and abstracts, 180 articles remained for the full-text review. After screening of the full texts, 44 studies[4–6,15–55] were included in this systematic review (*Fig. 1*).

Most studies were retrospective cohort studies with more than ten cases ($N = 25$) and four studies involved reports on a prospective database that was retrospectively analysed[20,24,33,39].

Overall, 1404 patients with groove pancreatitis were included. The median number of patients included in the selected studies was 22.5 (i.q.r. 38). The study duration ranged from 1 to 32 years. The median follow-up time was 32 months (i.q.r. 44). The median age was 49 years (i.q.r. 8). In 41 of the 44 studies in which patient gender was described, 86 per cent ($N = 1023$) of patients were male. Alcohol and nicotine abuse data were available in 37 and 23 studies, respectively. Seventy-nine per cent ($N = 886$) of patients had a history of heavy chronic alcohol use[6,8,15,17–25,28–39,41–44,46–49,51–55], and 83 per cent ($N = 595$) were smokers[8,19,20,24,28,29,32,34–36,38,39,41–44,46–49,52,54,55]. *Table 1* summarizes the baseline characteristics of the included studies.

Methodological quality

The overall quality of the included studies was poor as indicated by an average NOS of 5. In most studies, due to their retrospective nature, no conclusions could be drawn as to whether the outcome of interest was already present at the beginning of the study, nor could anything be said about comparability with a control group.

Clinical symptoms of the included population

Information on clinical symptoms was available in 37 of the 44 included studies. The most common clinical symptom at presentation was abdominal pain ($N = 870$, 78.5 per cent), followed by weight loss ($N = 517$, 46.7 per cent). Only 3.5 per cent

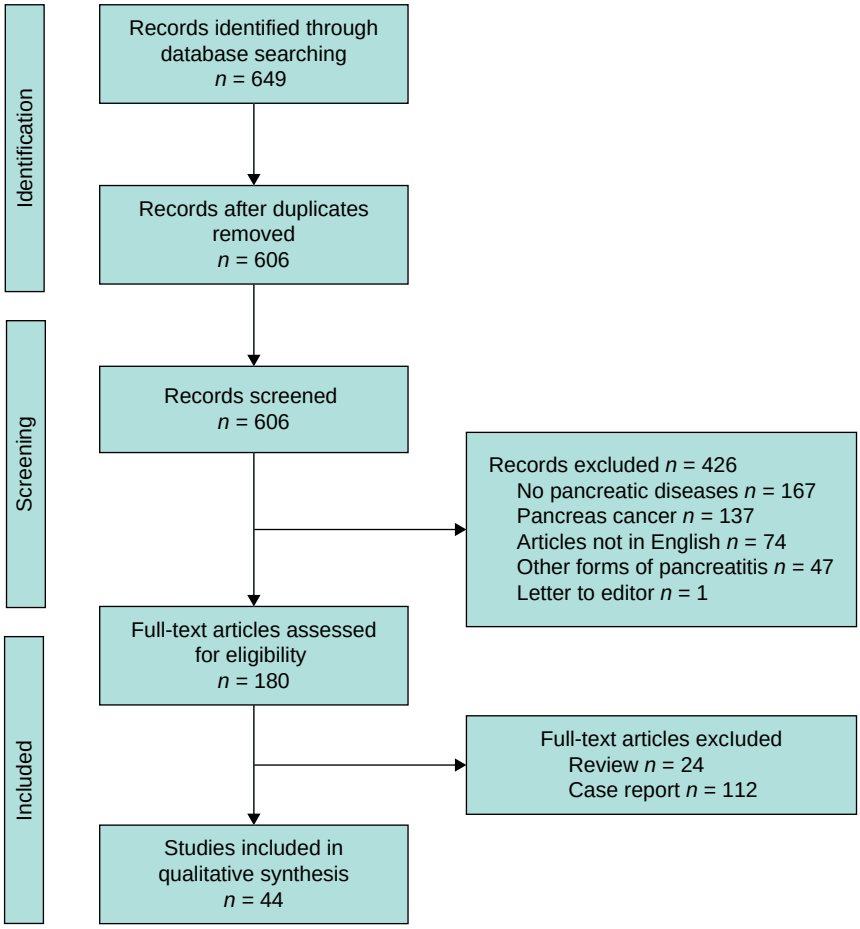

Fig. 1 PRISMA flowchart of literature research

(*N* = 39) of patients had no clinical symptoms at presentation and up to 30.7 per cent (*N* = 340) of patients had a history of acute pancreatitis (*Table 2*). Most patients presented a median of 12 months (i.q.r. 6.5) between symptom onset to diagnosis[18,20,34,38].

Diagnostic workup

Forty studies reported the diagnostic detection methods. Ultrasound (US) (*N* = 119; 10.6 per cent), endoscopic ultrasound (EUS) (*N* = 514; 45.8 per cent), CT (*N* = 912; 81.2 per cent) or MRI (*N* = 547; 48.7 per cent) were performed in 1123 patients.

Sixteen studies reported data on laboratory investigations (*Table 1*).

EUS features of groove pancreatitis were examined in 17 studies involving 261 patients. EUS typically showed cystic changes of the duodenal wall (*N* = 163; 62.4 per cent) and thickening of the duodenal wall (*N* = 140; 53.6 per cent). Twenty-six studies including 663 patients provided data on the CT features of groove pancreatitis. CT demonstrated that cystic changes in the duodenopancreatic area were present in most patients (*N* = 469; 70.7 per cent) as a thickened duodenal wall (*N* = 308; 46.4 per cent). Nineteen studies investigated MRI features for groove pancreatitis. MRI detected cystic changes in the duodenal wall in 289 patients (77.1 per cent). A complex mass at the pancreaticoduodenal groove was detected in 104 patients (27.7 per cent). Thickening of the duodenal wall was found in 98 patients (26.1 per cent), and dilatation of the common bile duct was found in 110 patients (29.3 per cent). Concordance between CT and EUS findings was found in 71 per cent (*N* = 75)[33,44]. MRI and EUS findings were concordant in all cases (*N* = 106; 100 per cent; *Table S1*)[33,44].

Differentiation of groove pancreatitis and pancreatic cancer

In four studies[36,38,41,44] involving 104 patients with groove pancreatitis and 83 patients with PDAC, the symptoms and imaging features were compared. Patients with groove pancreatitis seemed to be more likely to be male (*N* = 83; 79.8 per cent *versus* *N* = 54; 65.1 per cent), younger (50.4 years (i.q.r. 2) *versus* 62.3 years (i.q.r. 7)), smokers (*N* = 86; 82.7 per cent *versus* *N* = 33; 39.8 per cent), heavy drinkers (*N* = 78; 75 per cent *versus* *N* = 21; 25.3 per cent), without jaundice (*N* = 8; 7.7 per cent *versus* *N* = 48; 57.8 per cent), with pain (*N* = 95; 91.3 per cent *versus* *N* = 55; 66.3 per cent), with cystic changes in the duodenal wall (*N* = 76; 73.1 per cent *versus* *N* = 17; 20.4 per cent) and with inflammatory thickening of the second part of the duodenum (*N* = 85; 81.7 per cent *versus* *N* = 39; 47 per cent) compared to those with PDAC. The proportion of patients with dilatation of the main pancreatic duct seemed similar between the two groups (*N* = 48; 46.1 per cent *versus* *N* = 47; 56.6 per cent). Patients with cancer seemed to be more likely to present with dilatation of the bile duct (*N* = 63; 60.6 per cent *versus* *N* = 81; 97.6 per cent).

Treatment of groove pancreatitis

Twenty-seven studies comprising 920 patients investigated patients' treatment (*Table 3*). Some 682 (74.1 per cent) were treated conservatively (*Table 3*).

Table 1 Identified studies for systematic review according to the PRISMA guidelines

Author (ref.)	Year of publication	Study design	Study period	No. of patients	Mean age (years)	Sex	Follow-up period (months)	Laboratory, *n* (%)	
								Elevated CA 19–9 (≥37 IU/ml)	Elevated CEA (≥3 ng/ml)
Becker *et al.*[5]	1991	Retrospective	N/A	117	N/A	N/A	N/A	N/A	N/A
Fléjou *et al.*[15]	1993	Retrospective	1959–1991	10	41	10 (100%)	60	0 (0%)	0 (0%)
Irie *et al.*[6]	1998	Retrospective	1995–1996	5	41	5 (100%)	N/A	N/A	N/A
Vullierme *et al.*[16]	2000	Retrospective	1988–1998	20	44	N/A	N/A	N/A	N/A
Pessaux *et al.*[17]	2006	Retrospective	1990–2004	12	42.4	11 (91.7%)	64	N/A	N/A
Jouannaud *et al.*[18]	2006	Retrospective	1990–2002	23	45	22 (95.6%)	47	N/A	N/A
Tison *et al.* [19]	2007	Retrospective	1983–2001	9	46	9 (100%)	86	N/A	N/A
Rahman *et al.*[20]	2007	Prospective	2000–2005	11	48	10 (90.9%)	13	0 (0%)	0 (0%)
Rebours *et al.*[21]	2007	Retrospective	1995–2004	105	46	96 (91.4%)	15	N/A	N/A
Castell-Monsalve *et al.*[22]	2008	Retrospective	N/A	5	47	4 (80%)	26	N/A	N/A
Jovanovic *et al.*[23]	2008	Retrospective	1996–2006	13	41.5	11 (84.6%)	7.5	N/A	N/A
Casetti *et al.*[24]	2009	Prospective	1990–2006	58	44.7	54 (93.1%)	96.3	N/A	N/A
Levenick *et al.*[25]	2009	Retrospective	N/A	4	43	2 (50%)	N/A	1 (25%)	1 (25%)
Hur *et al.*[26]	2010	Retrospective	2001–2009	9	52	6 (66.7%)	N/A	N/A	N/A
Ishigami *et al.*[27]	2010	Retrospective	2001–2008	22	48	20 (90.9%)	N/A	N/A	N/A
Kim *et al.*[28]	2011	Retrospective	2006–2009	6	50	5 (83.3%)	32	0 (0%)	0 (0%)
Manzelli *et al.*[29]	2011	Retrospective	2006–2010	5	54.6	2 (40%)	12	N/A	N/A
Levenick *et al.*[30]	2012	Retrospective	N/A	5	47.2	2 (40%)	30.8	N/A	N/A
Kalb *et al.*[31]	2013	Retrospective	2007–2010	47	60	28 (59.6%)	N/A	N/A	N/A
Arvanitakis *et al.*[32]	2014	Retrospective	1995–2010	51	49	50 (98%)	54	N/A	N/A
Egorov *et al.*[33]	2014	Prospective	2004–2013	62	46	59 (95.2%)	19	N/A	N/A
Zaheer *et al.*[34]	2014	Retrospective	2002–2013	12	51.4	10 (83.3%)	N/A	3 (25%)	2 (16.7%)
Black *et al.*[35]	2014	Retrospective	5-year period	4	56.5	2 (50%)	N/A	N/A	N/A
Arora *et al.*[4]	2015	Retrospective	2010–2014	33	46.3	33 (100%)	10	5 (15.2%)	0 (0%)
Oza *et al.*[36]	2015	Retrospective	2000–2013	13	51.9	11 (84.6%)	11.5	5 (38.5%)	N/A
Wagner *et al.*[37]	2016	Retrospective	14-year period	76	50	73 (96%)	N/A	N/A	N/A
Lekkerkerker *et al.*[38]	2016	Retrospective	2001–2014	38	55	23 (60.5%)	45	11 (28.9%)	N/A
de Pretis *et al.*[39]	2017	Prospective	1994–2012	120	41	116 (96.7%)	124	N/A	N/A
Ray *et al.*[40]	2017	Retrospective	2004–2015	3	44	3 (100%)	45	0 (0%)	0 (0%)
Muraki *et al.*[41]	2017	Retrospective	2004–2015	47	50	36 (76.6%)	N/A	N/A	N/A
Boninsegna *et al.*[42]	2017	Retrospective	2012–2015	28	51	26 (92.8%)	N/A	0 (0%)	0 (0%)
Aguilera *et al.*[43]	2018	Retrospective	2008–2017	8	51.9	4 (50%)	18.1	N/A	N/A
Jun *et al.*[44]	2018	Retrospective	2000–2017	44	50.8	37 (84.1%)	56	N/A	N/A
Silman *et al.*[45]	2018	Retrospective	2006–2017	25	70	16 (64%)	12	N/A	N/A
Chantarojanasiri *et al.*[46]	2018	Retrospective	1999–2016	7	55.4	6 (85.7%)	20–161	0 (0%)	0 (0%)
Ooka *et al.*[47]	2020	Retrospective	2000–2014	48	53	38 (79.2%)	60	N/A	N/A
Balduzzi *et al.*[48]	2020	Retrospective	1990–2017	75	58	64 (85.3%)	60	0 (0%)	0 (0%)
Tarvainen *et al.*[49]	2020	Retrospective	2005–2015	33	55	26 (78.8%)	84	10 (30.3%)	10 (30.3%)
Egrov *et al.*[50]	2021	Retrospective	2004–2020	84	48	N/A	102	N/A	N/A
Teo *et al.* [51]	2022	Retrospective	2013–2020	8	58.5	6 (75%)	42	N/A	N/A
Değer *et al.*[52]	2022	Retrospective	2013–2019	25	55	20 (80%)	29	N/A	N/A
Kulkarni *et al.*[53]	2022	Retrospective	2007–2020	30	45.9	28 (93.3%)	12	9 (30%)	N/A
Dhali *et al.*[54]	2022	Retrospective	2007–2021	9	42.7	9 (100%)	41	N/A	N/A
Vujasinovic *et al.*[55]	2022	Retrospective	1999–2020	35	56	30 (85.7%)	24	N/A	N/A

N/A, data not available; CA 19-9, carbohydrate antigen 19-9; CEA, carcinoembryonic antigen.

Conservative treatment included bowel rest, use of analgesics, use of proton pump inhibitors, use of pancreatic enzymes, use of somatostatin analogues and use of nutritional supplements.

Two hundred and forty-three patients (35.6 per cent) experienced complete resolution of abdominal pain after pharmacological treatment (*Table 4*), while 375 patients (55 per cent) reported failure and 64 patients (9.4 per cent) reported temporary relief of symptoms.

Fourteen studies (N = 508) reported data on endoscopic treatment. Overall, 134 patients (26.4 per cent) underwent endoscopic treatment. Endoscopic treatment was always performed after failure of conservative treatment, regardless of severity grade (*Table 3*). Patients underwent cystoenterostomy, pancreatic and/or biliary drainage, sphincterotomy and/or duodenal dilatation[32]. The number of procedures required ranged from three to 31, with most (N = 95; 70.9 per cent) being performed within the first 6 months after diagnosis.

Endoscopic treatment was successful in 55.2 per cent (N = 74) of patients and temporarily successful in 16.4 per cent (N = 22), while clinical relapse was observed in 28.4 per cent (N = 38).

Five hundred and three patients (54.7 per cent) were treated surgically (*Table 3*). The most frequent indications for surgery

were chronic pain despite tobacco and alcohol cessation, suspected malignancy, jaundice and duodenal obstruction. The median time between the beginning of medical treatment and surgery was 12 months.

Classic or pylorus-preserving partial pancreatoduodenectomy was the most commonly performed operation (*N* = 398; 79.1 per cent). A bypass procedure (digestive and biliary tract bypass) was performed in 60 patients (11.9 per cent), and other surgical procedures (duodenum-preserving pancreatic or pancreas-preserving duodenal resections or antrectomy or distal pancreatectomy or drainage) were performed in 45 patients (8.9 per cent).

Postoperative outcomes were described in 16 studies involving 306 patients. In 216 patients (70.6 per cent) the postoperative course was uneventful. The median hospital stay was 11 days. The overall postoperative complication rate was 29 per cent, and 32 patients (10.4 per cent) suffered major postoperative complications (Clavien–Dindo ≥ III).

Complete disappearance of clinical symptoms after surgery was reported in 69.6 per cent (*N* = 350) of patients, and improvement of clinical symptoms was observed in 22.4 per cent (*N* = 113). Clinical recurrence was observed in 8 per cent (*N* = 40) of patients after surgery.

Discussion

Clinical, diagnostic and therapeutic outcomes of groove pancreatitis were reviewed. An up-to-date, comprehensive review of clinical presentation, diagnostic workup and treatment success was provided.

Table 2 Pooled analysis of symptom characteristics for studies and percentage of patients

Clinical symptoms	Total (*N* = 1108) *N* (%)
More than 1 symptom	502 (45.3)
Abdominal pain	870 (78.5)
Weight loss	517 (46.7)
Nausea/vomiting	396 (35.7)
Episodes of acute pancreatitis	340 (30.7)
Jaundice	175 (15.8)
Steatorrhea	116 (10.4)
Exocrine insufficiency	79 (7.1)
No clinical symptoms	39 (3.5)

Table 4 Results of specific treatments for groove pancreatitis patients with adequate follow-up

	Medical treatment (*N* = 682)	Endoscopic treatment (*N* = 134)	Surgical treatment (*N* = 503)
Complete success, *N* (%)	243 (35.6)	74 (55.2)	350 (69.6)
Temporary success, *N* (%)	64 (9.4)	22 (16.4)	113 (22.4)
Failure, *N* (%)	375 (55)	38 (28.4)	40 (8)

Complete success = complete disappearance of pain and vomiting; Temporary success = symptom improvement/increase in BMI/recurrent pain less acute than before treatment; Failure = unchanged/worsened symptoms.

Table 3 Studies according to type of treatment (surgical *versus* endoscopic *versus* medical treatment)

Author (ref.)	No. of patients (*N* = 920)	Type of treatment				Mean time between medical management and surgery (months)	Follow-up (months)
		Neither medical nor surgical (*N* = 22)	Medical (*N* = 682)	Endoscopy (*N* = 134)	Surgery (*N* = 503)		
Fléjou *et al.*[15]	10	N/A	N/A	N/A	10	N/A	60
Pessaux *et al.*[17]	12	N/A	7 (58.3%)	4 (33.3%)	12 (100%)	25	64
Jouannaud *et al.*[18]	23	3 (13%)	20 (87%)	2 (8.7%)	14 (60.9%)	12	47
Tison *et al.*[19]	9	N/A	N/A	N/A	9 (100%)	N/A	86
Rahman *et al.*[20]	11	N/A	N/A	N/A	11 (100%)	N/A	13
Rebours *et al.*[21]	105	19 (18.1%)	86 (81.9%)	16 (15.2%)	29 (27.6%)	N/A	15
Jovanovic *et al.*[23]	13	0 (0%)	4 (30.8%)	0 (0%)	13 (100%)	12	7.5
Casetti *et al.*[24]	58	N/A	N/A	N/A	58 (100%)	N/A	96.3
Kim *et al.*[28]	6	0 (0%)	N/A	N/A	6 (100%)	N/A	32
Levenick *et al.*[30]	5	0 (0%)	N/A	N/A	5 (100%)	11	30.8
Arvanitakis *et al.*[32]	51	N/A	24 (47.1%)	42 (82.3%)	12 (23.6%)	6	54
Egorov *et al.*[33]	62	0 (0%)	60 (96.8%)	1 (1.6%)	52 (83.9%)	N/A	19
Zaheer *et al.*[34]	12	0 (0%)	N/A	N/A	12 (100%)	N/A	N/A
Arora *et al.*[8]	33	N/A	33 (100%)	N/A	1 (3%)	N/A	10
Lekkerkerker *et al.*[38]	28	0 (0%)	14 (50%)	9 (32.1%)	8 (28.6%)	10.5	45
de Pretis *et al.*[39]	120	N/A	116 (96.7%)	N/A	81 (67.5%)	70	124
Aguilera *et al.*[43]	8	N/A	N/A	N/A	8 (100%)	N/A	18.1
Chantarojanasiri *et al.*[46]	7	0 (0%)	7 (100%)	7 (100%)	0 (0%)	N/A	20–161
Ooka *et al.*[47]	48	0 (0%)	48 (100%)	N/A	7 (14.6%)	N/A	60
Balduzzi *et al.*[48]	75	0 (0%)	65 (86.7%)	11 (14.7%)	47 (62.7%)	11	60
Tarvainen *et al.*[49]	33	0 (0%)	30 (90.1%)	16 (48.4%)	9 (27.3%)	N/A	84
Egrov *et al.*[50]	84	0 (0%)	84 (100%)	N/A	72 (85.7%)	39	102
Teo *et al.*[51]	8	0 (0%)	N/A	N/A	8 (100%)	N/A	42
Değer *et al.*[52]	25	N/A	14 (56%)	14 (56%)	1 (4%)	N/A	29
Kulkarni *et al.*[53]	30	0 (0%)	26 (86.7%)	3 (10%)	4 (13.3%)	N/A	12
Dhali *et al.*[54]	9	0 (0%)	N/A	0 (0%)	9 (100%)	24	41
Vujasinovic *et al.*[55]	35	0 (0%)	35 (100%)	9 (25.7%)	5 (14.3%)	N/A	24

N/A, data not available. The sum exceeds the value of 100, because individual patients have received several different therapy methods.

Groove pancreatitis is often misdiagnosed for pancreatic head cancer[4,28,56–60], bile duct disease[28,61,62] or duodenal disease[28,56,62]. PDAC may originate from the duodenal groove, making differential diagnosis from groove pancreatitis difficult[28,57,59,60].

In groove pancreatitis, swelling of the pancreas and duodenum could lead to obstruction of the pancreatic duct and bile duct. As a result, dilatation of the two ducts could be equally encountered in patients with PDAC and groove pancreatitis[41,44]. Consistent signs in groove pancreatitis patients were the presence of cystic lesions in the pancreatic groove or duodenal wall; calcification of the head of the pancreas and inflammatory thickening of the second portion of the duodenum[8,31,34,37–39,42,44,49,61].

Analgesic treatment[17,18,21,32,39,48,63] and use of octreotide[17,18,21,32,39,48] did not seem to be helpful in groove pancreatitis, as complete pain relief was observed rarely. Questions regarding the duration of a conservative treatment approach and when to use a step-up approach to endoscopic or surgical treatment could not be answered based on the available data.

Endoscopic therapy was successful in half of patients and should be reserved for patients with recurrent pain not responding to conservative treatment and for those with moderate to marked morphological changes[17,18,21,32,38,46,48,49,63]. Most patients in the reviewed studies underwent more than one endoscopic procedure[18,21,32,38,46,49]. Factors for treatment response to endoscopic treatment are largely unknown.

Surgery should be performed when conservative and endoscopic options have failed, when malignancy is suspected and when local complications such as symptomatic obstruction of the pancreatic duct, bile duct or duodenum are present. If surgery was performed, it had a high treatment success rate of >90 per cent. Whether surgical or endoscopic therapy should be offered first is the subject of ongoing debate. This analysis showed that surgical treatment was efficient in eliminating pain. Three RCTs compared surgical and endoscopic treatment in chronic pancreatitis[64–66]. All studies showed better long-term pain relief with surgery than with endoscopy. Surgical treatment led to a higher improvement in quality of life. Another factor that might influence the success of surgery was the optimal timing for surgical treatment. Previous data on patients with chronic pancreatitis described that surgical outcomes were superior when patients were referred for surgical treatment within 2–6 months of starting opioid treatment and before having four or more endoscopic procedures[64,67].

The present review had some limitations, mainly related to the type of included studies. The overall quality was poor, as indicated by an average NOS of 5. Patients who did not undergo surgery lack a pathological confirmation of the diagnosis. Despite the large numbers of cases involved, the present study did not enable us to elucidate certain details of the different treatments, such as the ideal timing of step-up approaches (from conservative to endoscopic to surgical treatment), which should be evaluated in further prospective studies.

Typical clinical presentations, radiological features and treatment options with respective success rates in patients with groove pancreatitis are summarized in the current review. Compared to patients with PDAC, patients with groove pancreatitis seemed to be younger, had pain and heavy alcohol consumption. The recommended first treatment should be conservative. However, a step-up approach including endoscopic and surgical treatment should be considered after failure of conservative treatment. Surgery was associated with the highest treatment success of all three options.

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Supplementary material

Supplementary material is available at *BJS Open* online.

Data availability

The authors confirm that the data supporting the findings of this study are available within the article and its *Supplementary material*.

Author contributions

Kristjan Ukegjini (Conceptualization, Data curation, Formal analysis, Methodology, Writing—original draft, Writing—reviw & editing); Thomas Steffen, Ignazio Tarantino, Jan P. Jonas, Fabian Rössler, Henrik Petrowsky, Christoph Gubler (Formal analysis, Writing—reviw & editing); Philip C. Müller (Formal analysis, Methodology, Writing—original draft, Writing—reviw & editing) and Christian E. Oberkofler (Conceptualization, Formal analysis, Methodology, Writing—original draft, Writing—reviw & editing).

Paper presentation

Our work has not yet been presented at any meeting.

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