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Clinical response to dorsal duct drainage via the minor papilla in refractory obstructing chronic calcific pancreatitis

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Abstract

Background and study aims—Complete stone removal from the main pancreatic duct might not be achieved in all patients with obstructive chronic calcific pancreatitis. We report our results for endoscopic dorsal pancreatic duct (DPD) bypass of obstructing stones in the ventral pancreatic duct (VPD).

Patients and methods—16 patients with obstructive chronic calcific pancreatitis were treated with a DPD bypass. Clinical success was defined as significant pain relief and no hospital admissions for pain management during the ongoing treatment period.

Results—Among 16 patients meeting entry criteria, 10 (62.5 %) had a history of unsuccessful endoscopic therapy, and 8 had failed extracorporeal shockwave lithotripsy (ESWL). Clinical success was achieved in 12 patients (75 %). Among these responders, 10 patients (83.3 %) had markedly improved or complete pain relief after the first stent placement, which persisted throughout the follow-up period; 11 patients (91.7 %) were able to discontinue their daily analgesics.

Conclusions—In selected patients with obstructive chronic calcific pancreatitis, the DPD bypass may be considered as a rescue endoscopic therapy, potentially obviating the need for surgery when standard endoscopic methods and ESWL fail.

Introduction

For selected patients with obstructive chronic calcific pancreatitis (CCP), endoscopic decompression of the main pancreatic duct (MPD) at endoscopic retrograde cholangiopancreatography (ERCP) is a reasonable first-line approach and alternative to surgery [1 – 6]. Despite technological advances, including extracorporeal shockwave lithotripsy (ESWL) and electrohydraulic lithotripsy, complete MPD stone removal is achieved in only 44 % – 75 % of cases [7]. In a proportion of patients, obstructive CCP is

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refractory to initial endoscopic attempts at duct clearance, and additional procedures are required. Obstructing pancreatic stones may be accompanied by a MPD stricture in 60 % – 70 % of cases [4, 5]. Failure to pass a guidewire or stone retrieval instruments through this stricture or beyond an impacted stone in the MPD precludes stone extraction [1, 8]. Alternative methods and strategies are therefore needed.

On occasion, the accessory duct take-off from the MPD may be identified upstream to an obstructing stone, in the head of the pancreas. Decompression of the dorsal pancreatic ductal system may be accomplished by intervention at the minor papilla [9]. Placement of a stent into the dorsal pancreatic duct (DPD) serves to bypass the stone and/or stricture in the ventral pancreatic duct (VPD), allowing decompression of the MPD and potentially offering symptomatic relief. The aim of this study was to evaluate the efficacy of the endoscopic DPD bypass in patients with obstructing VPD stones.

Patients and methods

This study was approved by the Indiana University Institutional Review Board (IU-IRB No. 1506157608). All patients with symptomatic CCP who underwent ERCP at Indiana University Hospital between January 2002 and May 2015 were retrospectively identified from our procedure database. All cases of successful or failed minor papilla cannulation were also included in our initial search to facilitate patient identification. The diagnosis of CCP was based on computed tomography (CT) and/or ERCP findings. Patients were eligible for study inclusion if, after failed attempts to bypass/remove stones through the VPD, a pancreatic duct stent had been placed via the minor papilla into the MPD, bypassing an obstructing stone in the head of the pancreas downstream. No patients were identified from our database who had obstructing VPD stones and in whom minor papilla cannulation had been attempted and failed. Patients with pancreas divisum or ansa pancreatica were excluded. During the study period, 16 patients were treated with the endoscopic DPD bypass.

Baseline clinical data, including etiology of CCP, previous therapy, pain character/intensity, analgesics used, and presence of other associated symptoms, were collected from the patients' charts. Endoscopic data were collected from procedure reports and review of fluoroscopic images and included: VPD stone character, presence of VPD stricture, maximal MPD diameter, DPD dilation method, and stent size and number placed. Clinical follow-up data were obtained by chart review as follows: change of pain character/intensity and analgesic use, pain-free or pain-improvement interval, further hospital admission(s), need for surgery, and changes in other associated symptoms. Clinical success was defined as significant pain improvement where the patient was satisfied with the degree of pain relief, and no further hospital admissions for pain management after DPD therapy during the study period.

The endoscopic DPD bypass technique is illustrated in ▶Fig. 1 and ▶Fig. 2. Single or multiple large or obstructing stones in the VPD in the pancreatic head are confirmed on ERCP examination. The VPD is obstructed by the stone(s) and/ or stricture, precluding passage of instruments upstream. In patients where the DPD is visualized after VPD contrast

injection, DPD cannulation is attempted. If initial DPD cannulation fails, cannulation with a rendezvous method (guidewire insertion through the major papilla and out the minor papilla) may be attempted (▶Fig. 3a,b). After successful DPD cannulation, dorsal pancreatic sphincterotomy is performed and a pancreatic stent is placed via the minor papilla. In most cases, we perform DPD dilation prior to attempting stent insertion (▶Fig. 3c), particularly if the accessory duct is of small caliber.

If the patient notes initial improvement, additional treatments with repeated stent placement are performed until the DPD bypass tract is sufficiently dilated to allow for adequate pancreatic ductal drainage.

Results

Baseline clinical data and ERCP findings are summarized in ▶Table 1. Among 16 patients meeting entry criteria, 10 patients (62.5%) had a history of prior unsuccessful endoscopic treatment via the VPD, i. e. at a previous ERCP. ESWL (with or without endoscopic pancreatic sphincterotomy) had been previously employed unsuccessfully in 8 of the 16 patients. ESWL had not been attempted in the remaining 8 patients. Therapy via the VPD had ultimately failed in all 16 patients, prior to attempted minor papilla cannulation at the same ERCP. Nearly all patients (15/16) had multiple (> 2) VPD stones, and the mean (standard deviation [SD]) maximal stone diameter was 9.5 (3.5) mm, with a dilated MPD upstream. A VPD stricture downstream of the stone(s) was identified in 14/16 patients, with failed VPD visualization in 2 patients. However, subsequent pancreatography performed via the minor papilla excluded pancreas divisum anatomy, with visualization of the ventral system.

The technical outcomes and follow-up data of endoscopic therapy are reported in ▶Table 2. Clinical success was achieved in 12 patients (75 %). Initial DPD dilation was performed in 15 patients (94 %). With a beneficial response to initial DPD stenting, additional ERCPs with stent upsizing was often performed, with a maximum of 4 simultaneous stents placed in this series. Removal of small stones in the upstream pancreatic duct was also performed via the dorsal duct/minor papilla in 5 of 12 responders (41.7 %).

Of the 12 patients with clinical success, 10 (83.3 %) had markedly improved or complete pain relief after initial stent placement (including improved steatorrhea in one patient who underwent DPD bypass for this indication), a benefit which persisted throughout the stenting interval. The other 2 patients (16.7 %) had markedly improved pain levels, in one case after placement of the second stent and in the other after final stent removal (▶Fig. 4). During the ongoing treatment period after DPD stenting, including treatment periods after stent removal (median 196 days, range 56 – 809), 11/12 responders (92 %) were able to discontinue analgesics entirely, 1 patient was able to have a dose reduction, and no patient required pancreatic surgery. In addition, when present, other symptoms or signs attributed to chronic pancreatitis dramatically improved in 6 of 9 patients who also experienced clinical success with a decrease in pain.

The stent indwelling time for responders ranged from 56 to 425 days (median 161 days). One patient had a stent in place for an extended period (506 days) because of severe co-morbidity. Additional intervention was not attempted or required during the follow-up period in any of the 8 responders whose stents could be removed. Post-ERCP complications [10] were limited to 1 mild post-sphincterotomy bleed (6.3 %) that spontaneously stopped without need for additional endoscopic hemostatic maneuvers.

Among the 4 patients with treatment failure (25 %) with persistent pain, 1 patient underwent a Frey procedure, 1 had a gastrojejunal feeding tube placed for pancreatic rest when surgical options were not preferred by the patient, and 2 were managed with increased analgesics alone, without additional endoscopic or surgical therapy.

Discussion

For patients with intractable pain from obstructive CCP, repeated endoscopic procedures or surgery may be required. Pancreatic endotherapy, with or without ESWL, in patients with CCP can provide good short-term relief of pain with appropriate patient selection [8]. Furthermore, long-term pain relief has been reported in 57 % of patients 5 years after final stent removal [11]. However, approximately one-third of patients are unable to complete definitive endoscopic therapy, with incomplete duct clearance, and often require surgery [4, 5].

When traditional endoscopic methods via the major papilla fail because of inability to traverse a stricture and/or obstructing VPD stone(s), the DPD bypass method should be considered as an alternative approach. We acknowledge that minor papilla interventions are frequently employed in patients without pancreas divisum, and endoscopic DPD intervention has previously been reported as a technically feasible method in CCP [9]. However, this is the first report of the DPD bypass method with pancreatic duct stenting in CCP with subsequent clinical improvement.

We herein present our experience using this technique in 16 patients, in whom short-term clinical success was achieved in 12 (75 %). We anticipate that this bypass technique will have results comparable to standard ERCP maneuvers when the MPD is cleared of obstructing stones, although additional follow-up data are required. Currently, follow-up data are available in only 6 patients following final stent removal in this series (▶Fig. 4). However, our preliminary data suggest that the success of this DPD approach may be predicted by the response to initial stent placement.

The limitations of this study are the retrospective design, limited number of patients, lack of a validated pain questionnaire used to assess outcomes, and limited follow-up. Furthermore, it is possible that additional patients may have undergone attempted DPD bypass but insufficient or inadequate documentation in our ERCP database or the medical record may have precluded identification. The retrospective nature of our report makes success rates difficult to determine with complete accuracy, as entry into the database may not be uniform, making it difficult to identify all potential candidates. However, in this series, 16 patients with CCP were identified in whom endotherapy via the ventral system failed, and in 12

dorsal duct drainage via the minor papilla showed a short-term clinical success (i. e., a clinical success rate of 75 %).

In conclusion, in selected patients with obstructive CCP in whom standard endoscopic approaches, including ESWL, have failed, endoscopic DPD bypass is feasible and provides at least short-term clinical benefit in the majority of treated patients. This technique may be considered as a rescue method for obviating surgery in patients with refractory obstructing stones in the VPD.

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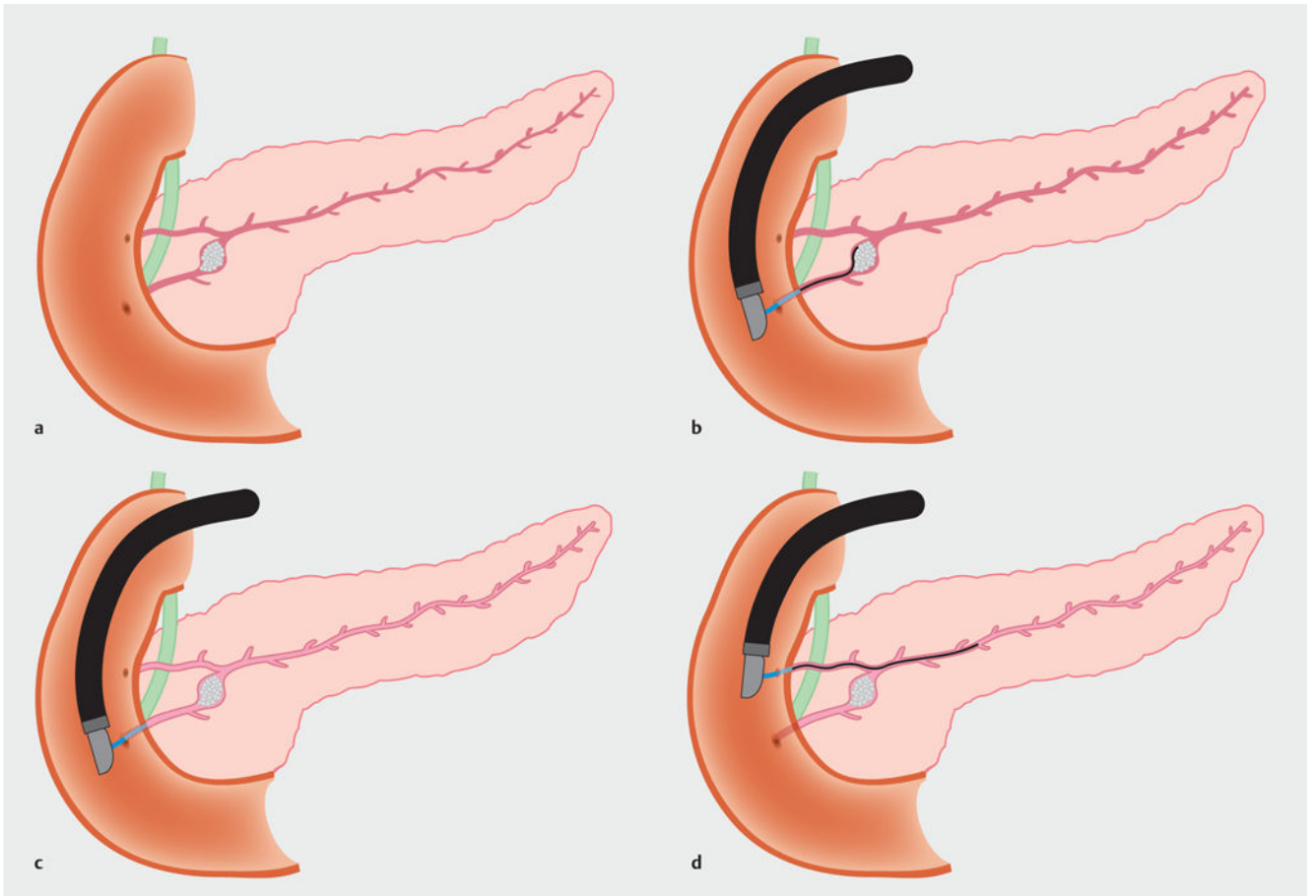
Fig. 1.
Illustration of the dorsal pancreatic duct (DPD) bypass method. **a** The ventral pancreatic duct in the head is partially obstructed by a large stone upstream from a stricture. **b** A guidewire cannot be inserted beyond the stone. **c** Contrast injection opacifies the main pancreatic duct (MPD), branch ducts, and a narrow DPD. **d** A guidewire is successfully advanced into the DPD, allowing subsequent dorsal pancreatic sphincterotomy and stent placement into the MPD via the minor papilla.
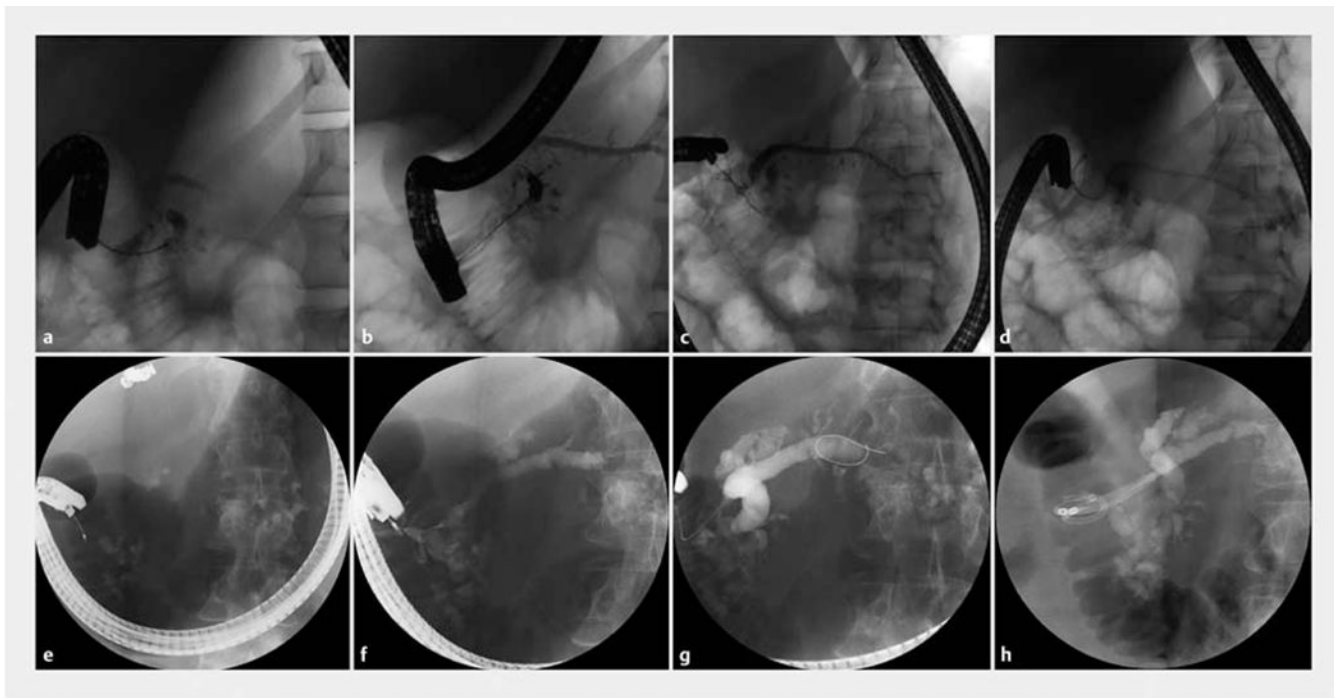
Fig. 2.
Two representative cases illustrating the dorsal pancreatic duct (DPD) bypass. **a** – **d** A 47-year-old woman had experienced numerous pain flares of chronic pancreatitis. **a** The ventral pancreatic duct contains several complex stones in the head of the pancreas. **b** A high grade 2-mm stenosis immediately upstream from the stones is seen in the ventral pancreatic duct and cannot be crossed with a highly tapered catheter. **c** The DPD take-off is upstream from the large stone, and deep cannulation of the DPD is accomplished. **d** After dorsal pancreatic sphincterotomy and dilation with a 4-mm balloon dilator, a 5-Fr pancreatic stent is successfully placed into the DPD. **e** – **h** A 70-year-old man had established chronic recurrent pancreatitis. **e** A conglomeration of large stones is noted fluoroscopically in the head of the pancreas. Cannulation and visualization of the ventral pancreatic duct failed. **f** Pancreatography via DPD cannulation shows multiple large obstructing stones in the ventral pancreatic duct in the head of the pancreas. The duct is obstructed by stones in the body. **g**, **h** After dorsal pancreatic sphincterotomy and dilation with a 6-mm balloon dilator, two pancreatic stents are successfully placed into the main pancreatic duct.
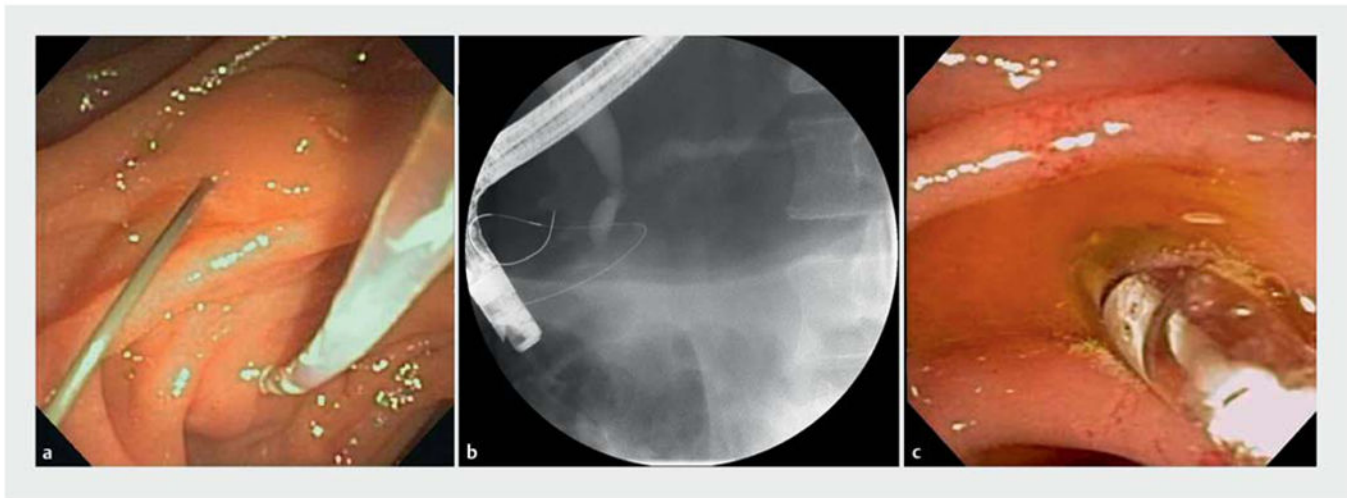
Fig. 3.
a, **b** After ventral pancreatic duct cannulation via the major papilla, a guidewire is passed through the accessory duct, exiting the minor papilla and facilitating dorsal duct cannulation.
c Endoscopic image illustrating dorsal duct dilation with a 6-mm balloon dilator.
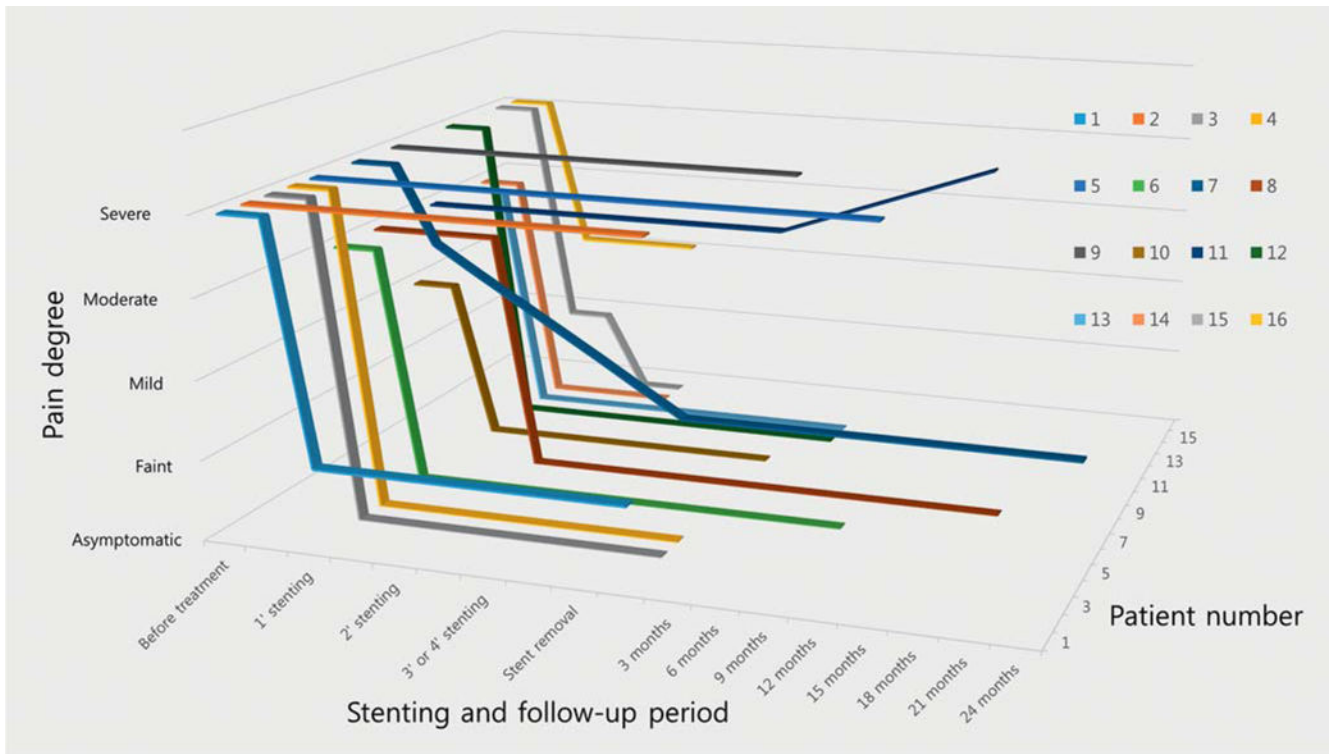
Fig. 4.
Pain improvement following dorsal pancreatic duct (DPD) bypass (see text).

Table 1

Patients with chronic calcific pancreatitis (CCP) treated with endoscopic dorsal pancreatic duct bypass (n = 16): clinical data and endoscopic retrograde cholangiopancreatography (ERCP) findings.

Age, median (mean [SD]), years	59.5 (39.0 [11.2])
Sex, male : female, n	8 : 8
Etiology of chronic pancreatitis, n (%)	
■ Alcohol	9 (56.3)
■ Smoking	2 (12.5)
■ Idiopathic	5 (31.3)
Pain (or main symptom) pattern, n (%)	
■ Daily	10 (62.5)
– Severe	7
– Moderate	2
– Mild	1
■ Intermittent	6 (37.5)
– Severe	3
– Moderate	3
– Mild	0
Other symptoms or signs attributed to CCP, n (%)	
■ At least one symptom or sign	11 (68.8)
■ Weight loss	6 (37.5)
■ Steatorrhea or diarrhea	6 (37.5)
■ Diabetes	6 (37.5)
■ Jaundice	1 (6.3)
■ Ascites	1 (6.3)
Previous treatment, n (%)	10 (62.5)
■ ERCP with endoscopic pancreatic sphincterotomy	2
■ Extracorporeal shock wave lithotripsy (ESWL)	2
■ Both	6
Number of stone(s) in ventral pancreatic duct, n (%) patients	
■ Multiple (> 2) stones	15 (93.8)
■ 2 stones	1 (6.3)
■ 1 stone	0
Maximal diameter of stone in ventral pancreatic duct, median (mean [SD]), mm	9 (9.5 [3.5])
Maximal diameter of main pancreatic duct upstream from stone, towards tail, median (mean [SD]), mm	8 (8.8 [3.5])
Ventral pancreatic duct stricture length downstream from stone, towards head, median (mean [SD]), mm	10 (9.8 [4.8])

SD, standard deviation.

Table 2

Chronic calcific pancreatitis (CCP) treated with endoscopic dorsal pancreatic duct bypass (n = 16 patients): technical data and follow-up results.

Initial dorsal pancreatic duct dilation, n (%)	15 (94.0)
▪ Catheter dilator	11
– 3-4-5 Fr alone	8
– 3-4-5 Fr + 4-5-7 Fr	2
– 3-4-5 Fr + 5-7-8.5 Fr	1
▪ Balloon dilator	1
▪ Both	3
– 4-mm balloon dilator + catheter dilator	1
– 6-mm balloon dilator + catheter dilator (One patient underwent dilation with the 4-mm followed by the 6-mm balloon)	3
Number of stents placed at initial ERCP, n patients	
▪ 1 stent	13
▪ 2 stents	3
Maximal diameter of initial stent, n patients	
▪ 7 Fr	7
▪ 6 Fr	3
▪ 5 Fr	3
▪ 4 Fr	3
Length of initial stent, median (mean [SD]), cm	8 (8.1 [2.7])
Clinical success, n (%)	12 (75.0)
Total ERCP sessions in 12 patients with clinical success, n patients	
▪ 1 session	2
▪ 2 sessions	6
▪ 3 sessions	3
▪ 4 sessions	1
Maximum number of final stents placed at one time in 12 patients with clinical success, n patients	
▪ 1 stent	7
▪ 2 stents	3
▪ 3 stents	1
▪ 4 stents	1
Length of final stent in patients with clinical success, median (mean [SD]), cm	8 (8.7 [2.7])
Stenting duration in patients with clinical success, median (mean [SD]), days	161 (163.1 [113.4])
Pain (or major symptom) relief in patients with clinical success, n	12
▪ After 1st stent placement	10
▪ After 2nd stent placement or final stent removal	2
Changes in pain relief medication in patients with clinical success, n	12
▪ Discontinuation/stop	11

▪ Dose reduction	1
Changes of other symptoms and signs in patients with clinical success	9
▪ Markedly improved	6
▪ Non-improved	3

ERCP, endoscopic retrograde cholangiopancreatography; SD, standard deviation