ORIGINAL PAPER

DOI: http://dx.doi.org/10.15403/jgld-4530

Endoscopic Ultrasound-guided Trans-esophageal Transmural Drainage of Mediastinal Pseudocysts: A Case Series

Surinder Singh Rana[1], Arup Choudhary[1], Daya Krishna Jha[1], Pankaj Kumar[1], Rajesh Gupta[2]

1) Gastroenterology Departement, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh;
2) Surgical Gastroenterology Departement, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh, India

Address for correspondence:
Prof **Surinder S. Rana**, MD, DM, FASGE, AGAF
Gastroenterology Department
Postgraduate Institute of Medical Education and Research (PGIMER)
Chandigarh-160012
India
drsurinderrana@yahoo.co.in

Received: 06.08.2022
Accepted: 22.10.2022

ABSTRACT

Background & Aims: Mediastinal pseudocysts (MP) are rare, and surgery is the conventional treatment modality. However, in the last decade, excellent outcomes have been reported with endoscopic transpapillary drainage. Endoscopic ultrasound (EUS) guided trans-esophageal transmural drainage of MP is a minimally invasive and effective non-surgical treatment modality, but the experience is limited. We aimed to report our experience of EUS-guided transmural drainage in 10 patients with MP's.

Methods: A retrospective analysis of patients with pancreatic fluid collections treated with EUS-guided transmural drainage over the last ten years was completed to to identify patients with MP's.

Results: Ten patients (8 males, with a mean age of 34.9±9.17 years) with MP treated with EUS-guided transesophageal transmural drainage were identified. Nine patients with MP had concurrent chronic pancreatitis, and only one had MP following acute necrotizing pancreatitis. The mean size of MP was 5.70±1.64 cm, and nine patients (90%) had concurrent abdominal pseudocyst. EUS-guided transesophageal transmural drainage was technically successful in all ten patients. Transmural plastic stents were placed in 9 patients, whereas one patient underwent single-time complete aspiration of the MP. There were no immediate or delayed procedure-related complications. All ten patients had a successful outcome, with the mean resolution time being 2.80±0.79 weeks. There has been no recurrence of PFC or symptoms in nine (90%) successfully treated patients over a mean follow-up period of 43.3 months.

Conclusions: EUS-guided trans-esophageal drainage of MP is safe with a high technical and clinical success rate.

Key words: pseudocyst – mediastinum - acute pancreatitis – chronic pancreatitis – endoscopic ultrasound - endoscopic retrograde pancreatography.

Abbreviations: CE-CT contrast-enhanced computed tomography; ERP: endoscopic retrograde pancreatography; EUS: endoscopic ultrasound; MP: mediastinal pseudocyst; PFC: pancreatic fluid collections.

INTRODUCTION

Pancreatic fluid collections (PFCs) can occur due to the disruption of the main pancreatic duct or its side branch and can occur in acute pancreatitis, chronic pancreatitis, pancreatic ductal obstruction, or after blunt/penetrating abdominal trauma [1]. The usual location of PFCs is in the peri-pancreatic region; however, they can occur in the liver, spleen, mediastinum, pelvis, neck, and kidney, depending on the path taken along the fascial planes by the enzyme-rich pancreatic fluid [2]. A high index of suspicion is required to diagnose these atypically located pseudocysts, and their management might be challenging [3].

Mediastinal pseudocysts (MPs) are rare and have been reported as case reports and small case series [4-11]. Their incidence is unknown and has been reported in children usually secondary to pancreatic trauma and in adults as a consequence of both acute as well as chronic pancreatitis [4, 7]. They are typically seen in patients in whom the pathways of spread of pancreatic juice to common intra-abdominal locations offer higher resistance due to fibrosis from previous episodes of inflammation [8]. The common mediastinal site of PFC is retro-cardiac, and extension up to the neck has also been reported [9]. The primary pathology in these patients is the posterior disruption of the pancreatic duct into the retroperitoneum and subsequent cephalad tracking of the pancreatic juice along either the esophageal hiatus, aortic

hiatus, foramen of Morgagni, or by direct perforation of the diaphragm [9]. Mediastinal pseudocysts are either detected incidentally on cross-sectional imaging or present with a myriad of symptoms such as dysphagia, chest pain, palpitation, and in extreme cases, respiratory distress, cardiac tamponade, pericardial effusion, or hemoptysis [10].

Because of its rarity, there are no guidelines on its appropriate management. Traditionally they have been managed by surgery or image-guided percutaneous drainage. However, the last decade has witnessed excellent outcomes with minimally invasive endoscopic techniques [11]. Endoscopic drainage can be achieved either by transpapillary route or transmurally, depending on cyst cavity size and communication with the pancreatic duct. We had previously reported successful resolution of MPs (size 2-8 cm) following endoscopic transpapillary drainage with a bridging endoprosthesis in 11 patients with partial duct disruption [4]. Advent of endoscopic ultrasound (EUS) has revolutionized the endoscopic management of PFC by facilitating transmural drainage even of non-bulging collections and collections associated with a disconnected pancreatic duct. Compared to transpapillary drainage, endoscopic transmural drainage is the preferred drainage route for large collections because of faster resolution and less chance of getting infected [1]. EUS-guided trans-esophageal transmural drainage of MPs has been reported previously, but the experience is limited [12, 13]. In this case series, we aimed to report the safety and efficacy of EUS-guided transmural drainage in 10 patients with MP.

METHODS

A retrospective analysis of the database of patients with PFC treated with EUS-guided transmural drainage at a tertiary care center in North India over the last ten years (January 2012 to March 2022) was done to identify patients with MPs. The diagnosis and classification of PFCs were based on the revised Atlanta classification [14]. Patient demographics, etiology of pancreatitis, size of PFCs, endoscopic transmural drainage procedure details, outcome details, and complications were retrieved from the database. All patients were symptomatic and had MP documented on the contrast-enhanced computed tomography (CE-CT) scan. All patients provided informed consent at the time of endoscopic drainage, and the Institutional Ethics Committee approved the protocol of retrospective analysis.

All endoscopic drainage procedures were performed by a single experienced endoscopist (S.S.R.) under conscious sedation and after obtaining detailed informed consent. The MP and the pancreas were evaluated using linear EUS (EG-3870 UTK Linear Echoendoscope Pentax Inc., Tokyo, Japan, or GF-UCT 180 Linear Echoendoscope; Olympus Pvt. Ltd., Tokyo, Japan). The PFCs were carefully evaluated for the presence of any solid necrotic debris to exclude walled-off pancreatic necrosis. The optimal site for transmural drainage was chosen under EUS and color Doppler guidance avoiding any intervening vessels. Patients were given intravenous antibiotics before the procedure, and antibiotics continued post-procedure in patients with infected PFCs. The collection was punctured under EUS guidance with a 19-gauge needle (Echotip; Cook Endoscopy, Winston-Salem, NC, USA) (Fig. 1), and the aspirated fluid was sent for culture and biochemical analysis. Thereafter, a 0.035-inch/0.025-inch guidewire was introduced and coiled into the PFC under EUS with/without fluoroscopic guidance. After securing the guide wire deep into the cavity, the transmural access site was dilated by a non-cautery method using an endoscopic retrograde pancreatography (ERP) cannula or 4 mm biliary balloon dilator. If it was not possible to dilate the transmural tract with a non-cautery method because of the thickened wall, the tract was dilated using co-axial electrocautery 6Fr cystotome. The tract was further dilated with a wire-guided hydrostatic balloon (Controlled Radial Expansion Balloon; Boston Scientific, Natick, MA, USA) up to 8–10 mm. Following dilatation, one or two 7-Fr double-pigtail plastic stents, 3 or 5 cm in length, were inserted into the PFC, depending upon the size of the MP.

After successful initial drainage, the patients were re-assessed clinically and with a CE-CT after 3 days. No further intervention was made in patients who responded clinically, along with a >50% reduction in the size of the PFC. Patients who did not have symptomatic improvement or had new onset organ failure or fever along with < 50% reduction in the size of collection underwent re-insertion of multiple plastic stents along with a nasocystic drain for irrigation.

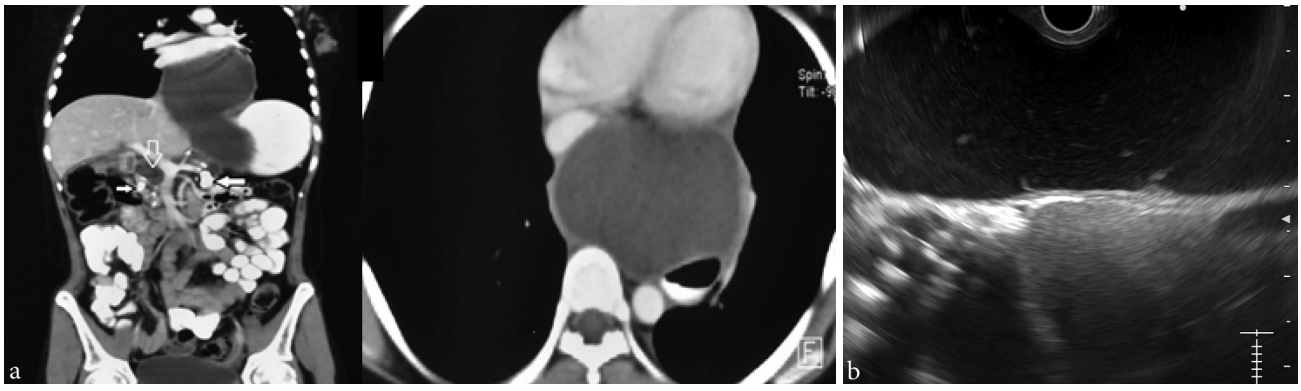

Fig 1a: CT chest and abdomen: chronic calcific pancreatitis with a large abdominal pseudocyst extending into mediastinum. Calcifications (bold arrows) along with dilated pancreatic duct (block arrow) noted. **b:** EUS - mediastinal pseudocyst with clear fluid content.

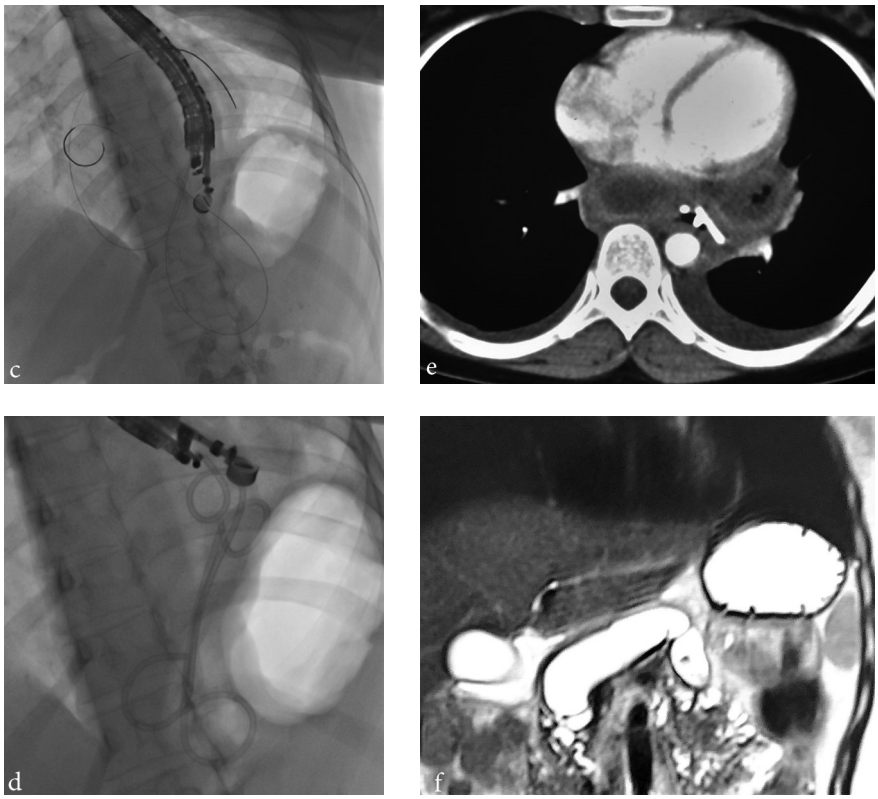

Fig 1c: Two guide wires secured deep into the collection; **d**: Two 7Fr transmural stents placed; **e**: CT 3 days after drainage: marked reduction in size of cyst with transmural stents in situ. Mild bilateral pleural effusion is noted; **f**: MR abdomen and chest at 8 weeks: resolved pseudocyst with markedly dilated main pancreatic duct.

Technical success was defined as the successful placement of EUS-guided stent placement in an initial attempt. Clinical success was defined as symptomatic improvement accompanied with the radiological resolution of PFC and avoidance of surgery or percutaneous drainage. The patients were hospitalized till clinical and radiological resolution. The complications were diagnosed according to the American Society of Gastrointestinal Endoscopy lexicon [15].

After the resolution of PFCs, all patients underwent ERP to document pancreatic duct disruption. This procedure was performed by a standard technique using a TJF 160 or TJF-Q180V (Olympus Pvt. Ltd., Tokyo, Japan) side-viewing duodenoscope. The pancreatic duct disruption was diagnosed when there was free extravasation of contrast outside the pancreatic ductal system after contrast injection. Pancreatic duct disruption was defined as complete when the main duct upstream to disruption was not visualized and partial when the main duct was visualized upstream. An attempt was made to bridge disruption as well as any obstruction in the ductal system in patients with partial disruption and place a 5/7 Fr stent across disruption. Four to six weeks later, the transpapillary stent was removed, and a pancreatogram was obtained to document the healing of the duct disruption. Following documentation of healing of duct disruption, the transmural stents were removed.

No transpapillary stents were placed in patients with complete disruption, and the transmural stents were removed eight weeks after the documentation of the resolution of symptoms and PFCs. Thereafter, these patients were regularly followed in our clinic, with further investigations being made at the treating clinician's discretion.

RESULTS

Ten patients with MP were studied (8 males), with a mean age 34.9±9.17 years, (range 21-48 years) (Table I). Nine patients with MP had concurrent chronic pancreatitis, and only one had MP following acute necrotizing pancreatitis. The MP was located in the posterior part of the inferior mediastinum in all the patients. The etiology of chronic pancreatitis was alcohol in 8 patients; one patient had idiopathic chronic calcific pancreatitis, whereas gall stones were the etiology of acute pancreatitis.

All patients with MP had abdominal pain (100%), and the patient with acute pancreatitis had a co-existent fever. The median duration of symptoms was six weeks. None of the patients with chronic pancreatitis had fever, chest pain, or dyspnoea on presentation. One patient had dysphagia on presentation. Six patients (60%) had co-existent pleural effusion: 3 patients left-sided pleural effusion, 2 patients bilateral pleural effusion and 1 patient right-sided pleural effusion. None of the patients had concurrent ascites. On EUS, no patient had a collection with significant solid necrotic debris. The median size of the MP was 5 cm (range: 4-9 cm). Nine patients (90%) had concurrent abdominal pseudocyst (in one patient, abdominal pseudocyst was extending into the mediastinum via the aortic hiatus), and only one patient

Table I. Demographic profile of ten patients with mediastinal pseudocysts.

Age (years)	Sex	Diagnosis	Aetiology	Pain	Pleural Effusion	Ascites	Size of MP (cm)	Size of Abdominal Pseudocyst (cm)	PD disruption	No. of transmural stent	Trans papillary stent	Time of resolution (Weeks)	Follow up months	Time of removal of transmural stent (wks.)	Recurrence
38	M	CP	Alcohol	Yes	Left	No	5	4	Complete	1	No	4	78	8	No
28	M	CP	Alcohol	Yes	No	No	8	3	Complete	2	No	3	76	8	No
46	M	CP	Alcohol	Yes	Bilateral	No	6	8	Partial	0 (STA)	Yes	2	83	NA	No
21	F	CCP	Idiopathic	Yes	No	No	9	Abdominal pseudocyst extending into mediastinum	Partial	2	Yes	2	1	8	No
43	M	CP	Alcohol	Yes	No	No	5	No	Partial	1	Yes	2	16	8	No
48	M	CP	Alcohol	Yes	No	No	4	6	Complete	1	No	3	34	8	Abdominal pseudocyst
26	M	CP	Alcohol	Yes	Bilateral	No	5	8	Partial	1	Yes	4	58	8	No
39	M	CP	Alcohol	Yes	Right	No	4	8	Complete	1	No	3	47	8	No
31	M	CP	Alcohol	Yes	Left	No	5	4	Complete	1	No	2	17	8	No
29	F	AP	GSD	Yes	Left	No	6	3	Complete	2	No	3	23	8	No

AP: acute pancreatitis; CP: chronic pancreatitis; CCP: chronic calcific pancreatitis; PD: pancreatic duct; GSD: gall stone disease; STA: single time aspiration; MP: mediastinal pseudocyst; NA: not applicable.

had isolated MP. On ERP, all patients had pancreatic duct disruption: six patients (60%) complete disruption and four patients (40%) partial disruption.

Endoscopic ultrasound guided transmural drainage was technically successful in all ten patients. The transmural tract could be dilated by non-cautery methods in all ten patients. Transmural plastic stents were placed in 9 patients, whereas in one patient, a single-time complete aspiration of the MP was done. Transmural drainage with stents could not be done in this patient because of MP's distant location from the esophagus and inability to obtain a vessel-free window because of numerous venous collaterals consequent to splenic vein thrombosis. A single 7 Fr stent was placed in six patients, and two 7 Fr stents were placed in 3 (30%) patients. Four patients with abdominal pseudocyst also underwent concurrent EUS-guided transmural drainage with multiple plastic stents. No immediate or delayed EUS-guided drainage procedure complications, including pneumothorax, were observed.

Following EUS-guided transmural drainage, all ten patients had a successful outcome, with the median resolution time for PFCs being three weeks (ranging from 2-4 weeks). Only one patient required a repeat drainage procedure. There were no significant complications of EUS-guided transmural drainage. Following resolution, four patients with partial duct disruption underwent successful endoscopic transpapillary drainage with endoprosthesis (3 patients with a 5 F pancreatic stent and one patient with a 7 F pancreatic stent). Following the successful resolution of PFCs, transmural stents were removed in all patients. The median transmural stent dwell time was 11 weeks.

There has been no recurrence of PFC or symptoms in nine (90%) successfully treated patients over a mean follow-up period of 43.30±29.45 months (range: 1-83 months). One patient with chronic pancreatitis and complete duct disruption had a symptomatic recurrence of abdominal PFC 7 months after the initial drainage. The recurrence was successfully treated with EUS-guided transmural drainage using plastic stents, and these transmural stents were left in situ for an indefinite period.

DISCUSSION

A MP is a rare complication of chronic pancreatitis and usually occurs due to posterior disruption of the main pancreatic duct and leakage of pancreatic secretion from the retroperitoneum into the mediastinum [4]. As the aortic and esophageal hiatus are located in the posterior mediastinum, MP commonly occurs in the posterior mediastinum [16]. In our case series of ten patients, the mean age was 34.9±9.17 years, and nine patients had concurrent chronic pancreatitis. Another case series of 7 patients also reported that most patients with MP had underlying chronic pancreatitis, and alcohol was the most common etiology of chronic pancreatitis [6].

There are no typical symptoms of MP. They may present with abdominal pain, chest pain, pleural effusion, and dysphagia or incidentally detected on radiological evaluation. In our study, all patients had abdominal pain, and six patients (60%) had pleural effusion on presentation. Also, nine patients had concurrent abdominal pseudocysts. A similar clinical profile of MP has been reported by previous studies [4, 6]. Pancreatic duct disruption is the triggering factor for MP, and in our series, all patients had pancreatic duct disruption, with six patients having complete duct disruption and four patients having partial duct disruption.

Management of MP depends on symptoms, location and size of the collection, pancreatic duct anatomy, and availability of expertise. There are no guidelines on the indications of drainage of MP. Patients with mediastinal symptoms need drainage of the collections, but patients with abdominal symptoms may also need drainage of the MP. These patients have disrupted pancreatic duct resulting in extravasation and collection of the pancreatic juice leading on to pseudocyst formation. The pain occurs because of the build-up of pressure in the closed system comprising the disrupted duct and the collection. The pain will get relieved only if the pressure is reduced by either bridging the disruption by transpapillary drainage or providing an alternative drainage route either by endoscopic transmural or percutaneous, or surgical drainage.

Table II. Case series/reports on mediastinal pseudocysts

Author/Year	Number of cases	Mean/ median age	Clinical features	Etiology	Mean/ median size of MP	Abdominal pseudocyst	Treatment	Outcome
Segamalai et al., [6]	7	33	Abdominal pain: 7 Dyspnea: 3 Dysphagia: 2 Chest pain: 2 Retrosternal discomfort: 1	CP: 6 AP: 1	5.7 cm	Yes, in all 7 patients	Surgery: 5 PCD: 2	Resolution in all One patient developed pseudoaneurysm 2 months later
Bhasin et al., [4]	12	36	Abdominal pain: 7 Dyspnea: 5 Dysphagia: 2	CP: 9 AP: 3	4 cm	Yes, in all 12 patients	Endoscopic transpapillary drainage	Resolution in all
Rana et al., [29]	3	38	Abdominal pain: 2	CP: 3	6 cm	Yes, in all 3 patients	EUS guided transmural drainage	Resolution in all
Nuwayhid et al., [7]	1	4	Abdominal pain and dysphagia	Post traumatic AP	13 cm	Same cyst extending into abdomen	Computed tomography guided percutaneous drainage	Resolution
Chhabra et al., [9]	1	35	Dysphagia and painless neck swelling	CP	8 cm	No	Subcutaneous Octreotide	Resolution
Ajmera et al., [10]	1	43	Dysphagia	AP	16 cm	No	Computed tomography guided percutaneous drainage	Resolution
Johston et al., [18]	1	74	Abdominal pain	AP	Not mentioned	No	Surgery	Resolution
Nabi et al., [23]	1	11	Abdominal pain	AP	Not mentioned	No	EUS guided transmural drainage	Resolution
Gupta et al., [24]	1	67	Dysphagia and dyspnea	AP	19 cm	No	EUS guided transmural drainage	Resolution
Săftoiu et al., [25]	1	30	Abdominal pain	AP	15 cm	Same cyst extending into abdomen	EUS guided transmural drainage	Resolution
Mohl et al. [26]	1	Not mentioned	Dysphagia	Not mentioned	Not mentioned	No	EUS guided transmural drainage	Recurrence and treated with repeat EUS guided drainage
Gornals et al., [27]	1	37	Abdominal pain	AP	8 cm	Same cyst extending into abdomen	EUS guided transmural drainage	Resolution
Aziz et al., [28]	1	44	Dyspnoea and abdominal pain	AP	15 cm	Same cyst extending into abdomen	EUS guided transmural drainage	Resolution
Matsusue et al., [32]	3	65	Dysphagia: 1 Abdominal fullness: 1 Dyspnea: `1	CP: 3	Not provided	Yes, in all 3 patients	Surgery: 2 PCD: 1	Resolution in all
Metaxa et al., [33]	2	29.5	Abdominal pain: 2 Dysphagia: 1	AP: 1 CP: 1	Not provided	Yes, in both	Surgery in both	Resolution in both

PCD: percutaneous drainage; EUS: endoscopic ultrasound. For the rest of abbreviations see Table I.

It can be argued that the same effect can be achieved by draining the abdominal pseudocyst. Although the abdominal pseudocyst and MP are consequences of the same duct disruption and may be communicating with each other, transmural drainage of the abdominal pseudocyst does not always lead to the resolution of the MP. Moreover, incompletely drained MP following drainage of abdominal pseudocyst increases the risk of infection and mediastinitis. It has been reported that creating multiple endoscopic transmural tracts for the drainage of pancreatic fluid collections increases the treatment success rates [17]. Therefore, we prefered draining both the pseudocysts in the same sitting as was done in this case series.

Surgical treatment, including pancreatic resection and internal or external drainage, has been the commonly used therapeutic management in patients with MP [18]. Advances in pancreatic endotherapy have revolutionized the management of PFC and both endoscopic transmural as well as transpapillary drainage have been successfully used in patients with abdominal pseudocysts [1]. Advent of EUS has made endoscopic drainage of even non-bulging PFC possible and expanded the indications of endoscopic transmural drainage [19, 20].

Successful resolution of MP using endoscopic transpapillary drainage has been reported previously [4]. However, non-communicating PFC as well as PFC associated with complete duct disruption, do not resolve following endoscopic transpapillary drainage [21]. Also, there is an increased risk of infection of large-sized PFCs following endoscopic transpapillary drainage [22]. Non-communication PFCs as well as large-sized PFCs can be successfully treated with EUS-guided transmural drainage [1]. Moreover, PFCs with complete duct disruption can be successfully treated with EUS-guided transmural drainage [1]. However, the safety and efficacy of EUS-guided transmural drainage of MP have been infrequently evaluated.

There are few case reports describing the successful resolution of MPs with EUS-guided transmural drainage of pseudocyst via transesophageal or trans-gastric route [13, 23-33]. These are case reports or small series describing EUS-guided trans-esophageal drainage of abdominal fluid collections. We have previously reported successful resolution of MP in 3 patients following EUS-guided transmural drainage [29], and these patients have been included in the current case series.

Previous case series and reports describing clinical features of MP and their management are sumarised in Table II.

In the current series of 10 patients with MPs, we observed that EUS-guided trans-esophageal drainage is safe and effective with no significant complications. EUS-guided trans-esophageal drainage of fluid collections is tricky as compared to transgastric or trans-duodenal drainage because of the potential of mediastinal soiling and consequent infective mediastinal complications as well as the risk of development of pneumothorax [27]. These complications can be minimized by avoiding excessive dilatation of the transmural tract. In our case series, the transmural tract was maximally dilated up to 10 mm. Also, the cross-sectional imaging was carefully reviewed to ensure the formation of a well-formed enclosing wall. EUS-guided transmural drainage of MP has also been reported using lumen apposing metal stent (LAMS) [27, 28]. Although both patients with MP had successful outcomes following drainage with LAMS but both patients had serious adverse effects. One patient developed pneumothorax requiring drainage and the other developed pleuritic chest pain necessitating removal of LAMS. Also, use of LAMS has been reported to be associated with increased risk of bleeding events, including pseudoaneurysm bleeding compared to plastic stents [30]. Moreover, contact of sharp edges of LAMS with delicate mobile intra-thoracic structures such as pleura and pericardium can results in serious complications and therefore the use of LAMS should be discouraged when draining supra-diaphragmatically from the esophagus. The mean time of resolution of MPs in our study following transmural drainage was 2.8 weeks and this is shorter as compared to the median duration of 4 weeks following transpapillary drainage as reported by us previously [4].

Pancreatic fluid collection consequent to disconnected pancreatic duct is a therapeutic dilemma because of the increased risk of recurrence following removal of transmural stents [31]. Therefore, to decrease the risk of a PFC recurrence, the strategy of leaving transmural plastic stents in situ for an indefinite period is usually advocated [31]. However, there are concerns of serious adverse effects of leaving trans-esophageal plastic stents in the mediastinum and therefore, we removed the transmural stents following resolution in all the patients, including patients with complete duct disruption. On follow-up, one patient with complete duct disruption had a recurrence of the abdominal pseudocyst and was successfully treated with repeat EUS-guided transmural drainage.

CONCLUSIONS

Mediastinal pseudocyst is a rare complication of pancreatitis and rarely presents with respiratory symptoms or dysphagia. EUS-guided trans-esophageal drainage of MP is safe with a high technical and clinical success rate.

Conflicts of interest: None to declare.

Authors' contribution: S.S.R. perfomed the procedures, collected and analysed the data, drafted and revised the manuscript. A.C., D.K.J, P.K, R.G collected the data. A.C., D.K.J, drafted the manuscript. All the authors approved the final version of the manuscript.

REFERENCES

1. Varadarajulu S, Rana SS, Bhasin DK. Endoscopic therapy for pancreatic duct leaks and disruptions. Gastrointest Endosc Clin N Am 2013;23:863-892. doi:10.1016/j.giec.2013.06.008
2. Bhasin DK, Rana SS, Nanda M, et al. Endoscopic management of pancreatic pseudocysts at atypical locations. Surg Endosc 2010;24:1085-1091. doi:10.1007/s00464-009-0732-8
3. Oh CH, Lee JK, Song TJ, et al. Clinical Practice Guidelines for the Endoscopic Management of Peripancreatic Fluid Collections. Clin Endosc 2021;54:505-521. doi:10.5946/ce.2021.185
4. Bhasin DK, Rana SS, Rao C, et al. Clinical presentation, radiological features, and endoscopic management of mediastinal pseudocysts:

experience of a decade. Gastrointest Endosc 2012;76:1056-1060. doi:10.1016/j.gie.2012.06.021
5. Kumar P, Gupta P, Rana S. Thoracic complications of pancreatitis. JGH Open 2019;3:71-79. doi:10.1002/jgh3.12099
6. Segamalai D, Abdul Jameel AR, Kannan N, et al. Mediastinal Pseudocyst: Varied Presentations and Management-Experience from a Tertiary Referral Care Centre in India. HPB Surg 2017;2017:5247626. doi:10.1155/2017/5247626
7. Nuwayhid Z, Kassira N, Neville HL, Casillas J, Sola JE. Percutaneous retropleural drainage of a posttraumatic pancreatic mediastinal pseudocyst in a child. J Pediatr Surg 2011;46:585-587. doi:10.1016/j.jpedsurg.2010.12.006
8. Ball JB Jr, Clark RA. CT of mediastinal pancreatic fluid collections. Comput Radiol 1982;6:295-300. doi:10.1016/0730-4862(82)90117-2
9. Chhabra P, Rana SS, Sharma V, Bhasin DK. An unusual neck swelling: Extension of mediastinal pseudocyst into the neck. Endosc Ultrasound 2017;6:71-72. doi:10.4103/2303-9027.200210
10. Ajmera AV, Judge TA. Mediastinal extension of pancreatic pseudocyst--a case with review of topic and management guidelines. Am J Ther 2012;19:e152-e156. doi:10.1097/MJT.0b013e3181f62947
11. Dąbkowski K, Białek A, Kukla M, et al. Mediastinal Pancreatic Pseudocysts. Clin Endosc 2017;50:76-80. doi:10.5946/ce.2016.089
12. Piraka C, Shah RJ, Fukami N, Chathadi KV, Chen YK. EUS-guided transesophageal, transgastric, and transcolonic drainage of intra-abdominal fluid collections and abscesses. Gastrointest Endosc 2009;70:786-792. doi:10.1016/j.gie.2009.04.049
13. Trevino JM, Christein JD, Varadarajulu S. EUS-guided transesophageal drainage of peripancreatic fluid collections. Gastrointest Endosc 2009;70:793-797. doi:10.1016/j.gie.2009.05.023
14. Banks PA, Bollen TL, Dervenis C, et al. Classification of acute pancreatitis—2012: revision of the Atlanta classification and definitions by international consensus. Gut 2013;62:102-111. doi:10.1136/gutjnl-2012-302779
15. Cotton PB, Eisen GM, Aabakken L, et al. A lexicon for endoscopic adverse events: report of an ASGE workshop. Gastrointest Endosc 2010;71:446-454. doi:10.1016/j.gie.2009.10.027
16. Moorthy N, Raveesha A, Prabhakar K. Pancreaticopleural fistula and mediastinal pseudocyst: an unusual presentation of acute pancreatitis. Ann Thorac Med 2007;2:122-123. doi:10.4103/1817-1737.33701
17. Varadarajulu S, Phadnis MA, Christein JD, Wilcox CM. Multiple transluminal gateway technique for EUS-guided drainage of symptomatic walled-off pancreatic necrosis. Gastrointest Endosc 2011;74:74-80. doi:10.1016/j.gie.2011.03.1122
18. Johnston RH Jr, Owensby LC, Vargas GM, Garcia-Rinaldi R.. Pancreatic pseudocyst of the mediastinum. Ann Thorac Surg 1986;41:210-212. doi:10.1016/s0003-4975(10)62672-0
19. Rana SS, Dawra S, Sharma R, Kang M, Gupta R. Clinical manifestations, imaging features, and endoscopic management of renal pseudocysts: a case series. Ann Gastroenterol 2020;33:313-317. doi:10.20524/aog.2020.0476
20. Rana SS, Sharma R, Chhabra P, Sharma V, Gupta R, Bhasin DK. Endoscopic management of splenic pseudocysts associated with acute and chronic pancreatitis. Ann Gastroenterol 2016;29:373-377. doi:10.20524/aog.2016.0038
21. Varadarajulu S, Noone TC, Tutuian R, Hawes RH, Cotton PB. Predictors of outcome in pancreatic duct disruption managed by endoscopic transpapillary stent placement. Gastrointest Endosc 2005;61:568-575. doi:10.1016/s0016-5107(04)02832-9
22. Tandan M, Nageshwar Reddy D. Endotherapy in chronic pancreatitis. World J Gastroenterol 2013;19:6156-6164. doi:10.3748/wjg.v19.i37.6156
23. Nabi Z, Ramchandani M, Lakhtakia S, Fugazza A, Chavan R, Reddy DN. Endoscopic Transesophageal Drainage of Mediastinal Pseudocyst in a Child. J Pediatr Gastroenterol Nutr 2018;66:e109. doi:10.1097/MPG.0000000000001871
24. Gupta R, Munoz JC, Garg P, Masri G, Nahman NS Jr, Lambiase LR. Mediastinal pancreatic pseudocyst--a case report and review of the literature. MedGenMed 2007;9:8.
25. Săftoiu A, Ciurea T, Dumitrescu D, Stoica Z. Endoscopic ultrasound-guided transesophageal drainage of a mediastinal pancreatic pseudocyst. Endoscopy 2006;38:538-539. doi:10.1055/s-2006-925229
26. Mohl W, Moser C, Kramann B, Zeuzem S, Stallmach A. Endoscopic transhiatal drainage of a mediastinal pancreatic pseudocyst. Endoscopy 2004;36:467. doi:10.1055/s-2004-814385
27. Gornals JB, Loras C, Mast R, Botargues JM, Busquets J, Castellote J. Endoscopic ultrasound-guided transesophageal drainage of a mediastinal pancreatic pseudocyst using a novel lumen-apposing metal stent. Endoscopy 2012;44 Suppl 2 UCTN:E211-E212. doi:10.1055/s-0032-1309384
28. Aziz M, Fatima R, Mohy-Ud-Din N, Pervez A, Rastogi A. Endoscopic Cyst Esophagostomy Using a Lumen-Apposing Stent for a Large Mediastinal Pancreatic Pseudocyst Compressing the Left Atrium. ACG Case Rep J 2019;6:e00016. doi:10.14309/crj.0000000000000016
29. Rana SS, Sharma V, Sharma RK, et al. Nonfluoroscopic endoscopic ultrasound-guided transmural drainage of pancreatic pseudocysts at atypical locations. J Dig Endosc 2016;07:137-143. doi:10.4103/0976-5042.195739
30. Brimhall B, Han S, Tatman PD, et al. Increased Incidence of Pseudoaneurysm Bleeding With Lumen-Apposing Metal Stents Compared to Double-Pigtail Plastic Stents in Patients With Peripancreatic Fluid Collections. Clin Gastroenterol Hepatol 2018;16:1521-1528. doi:10.1016/j.cgh.2018.02.021
31. Verma S, Rana SS. Disconnected pancreatic duct syndrome: Updated review on clinical implications and management. Pancreatology 2020;20:1035-1044. doi:10.1016/j.pan.2020.07.402
32. Matsusue E, Fujihara Y, Maeda K, et al. Three cases of mediastinal pancreatic pseudocysts. Acta Radiol Open 2016;5:2058460116647213. doi:10.1177/2058460116647213
33. Metaxa D, Balakrishnan A, Upponi S, et al. Surgical intervention for mediastinal pancreatic pseudocysts. A case series and review of the literature. JOP 2015;16:74-77. doi:10.6092/1590-8577/2904