A multi-institutional survey on the practice of endoscopic ultrasound (EUS) guided pseudocyst drainage in the Asian EUS group

Background: There is a lack of consensus on how endoscopic ultrasound (EUS) guided pseudocyst drainage should be performed. This survey was carried out amongst members of the Asian Endoscopic Ultrasonography Group (AEG) to describe their practices in performing this procedure.

Methods: This was an Asia wide multi-institutional survey amongst members of the Asian EUS group conducted between November and December 2013. The responses to a 19-question survey with regard to the practice of pseudocyst drainage were obtained.

Results: In total, 19 endoscopists responded to the questionnaire and the mean (SD) number of procedures performed by each endoscopist was 87.95 (40); 42.2% believed that prior endoscopic retrograde cholangiopancreatography (ERCP) is required and pancreatic duct stenting is indicated in patients with pancreatic duct disruption; 47.4% used tapered catheters for track dilation and 42.1% used the cystotome; 84.1% would dilate the track up to 8 to 10mm in size. Metallic stents were used by 10.5% of the respondents and transcystic catheters were employed by 26.3%. Those who were more experienced in the procedure tended to use the cystotome more frequently (P=0.02) and removed the stents in less than 3 months after insertion (P=0.011).

Conclusion: This was the first Asia wide survey in the practice of pseudocyst drainage. There were wide variations in practice and randomized studies are urgently needed to establish the best approach for management of this condition. There is also a pressing need for establishment of a consensus for safe practices.

Introduction

The use of endoscopic ultrasound (EUS) guided pancreatic pseudocyst drainage was first described in 1992 [1]. Thereafter, there have been numerous reports on the outcomes of the procedure for treatment of pseudocysts. Despite it being one of the earliest described interventional EUS procedures, the numbers of high quality randomized studies published on the topic have been surprisingly limited [2–5]. Also, the literature is scarce with regard to how the procedure should be taught and learnt, and what constitutes the minimal experience required to claim proficiency [6, 7]. Furthermore, there is a lack of consensus on how the procedure should be carried out and there remains a need for standardization of the procedure. The Asian EUS group (AEG) was first established in 2012. The group consists of regional leaders experienced in EUS, with a primary aim of promoting education and research of EUS in Asia. Recognizing the knowledge deficiencies associated with EUS guided pseudocyst drainage, a questionnaire survey was conducted amongst AEG members to assess the practice of the procedure, and to identify key areas of controversies to guide future research. The aim of the current study is to present the results of the questionnaire survey amongst AEG members on the practice of EUS guided pseudocyst drainage.

Patients and methods

A 19-question survey with regard to the practice of pseudocyst drainage was circulated amongst AEG members in November and December 2013 (Appendix 1). Before completing the survey, the participants were reminded that the questions listed were only directed towards EUS guided drainage of pure fluid containing pseudocysts and not directed to patients suffering from walled-off pancreatic necrosis or pancreatic abscesses. This was emphasized as the outcomes of the EUS guided drainage were dependent on the...
Results

In total, 19 endoscopists responded to the survey and all had prior experience in EUS guided pseudocyst drainage. Of the respondents, 17 were gastroenterologists and two were surgeons. The mean (SD) years of experience was 15.21 (6.97) years and the mean (SD) number of procedures performed by each endoscopist was 87.95 (40) procedures while the median number of procedures performed by each was 40. All respondents practiced EUS guided pseudocyst drainage and only five (26.3%) practiced other endoscopic methods of pseudocyst drainage including esophagogastroduodenoscopy (EGD) or endoscopic retrograde cholangiopancreatography (ERCP) guided drainage. The reported mean technical success rate, clinical success rate, and adverse events rates of all the respondents were 97.29 %, 92.18 %, and 13.5 %, respectively. Before the procedure, 84.2 % of the respondents would give antibiotics and admit the patient; 42.2 % believed that prior ERCP was essential and pancreatic duct stenting was indicated in patients with partial and complete pancreatic duct disruption, while 52.6 % of the endoscopists believed that ERCP before drainage was not required.

With regard to technical considerations during EUS guided pseudocyst drainage, three respondents (15.8 %) never used fluoroscopy while the remaining 68.4 % always used fluoroscopy and 21 % recommended its use during the procedure. Furthermore, 89.5 % preferred using a linear echoendoscope and 10.5 % favored the use of a forward viewing echoendoscope. All the respondents performed the initial puncture with a 19-gauge needle and the majority (63.2 %) then passed a 0.035” guide-wire into the cyst; 68.4 % would insert double guide-wires for insertion of two plastic stents. Two endoscopists (10.5%) would routinely insert three stents. The choice of instruments used for track dilation included a tapered catheter (47.4%), cystotome (42.1%), needle-knife (36.8%), and balloon dilator (78.9 %), and 84.1 % would dilate the track to 8–10 mm in diameter. Metallic stents were only used by 10.5 % of the respondents and transcystic catheters were employed by 26.3 % when there were signs of infection. Post-procedurally, 89.5 % of them would continue the antibiotics up to 1 week and 68.5 % of the endoscopists would place the stents for 3 months to 1 year after the pseudocyst had resolved.

The responses of those endoscopists with an experience of ≥40 procedures were then compared with those with <40 procedures (Table 1). Significantly more endoscopists in the less experienced group practiced other methods of endoscopic pseudocyst drainage (P = 0.011), whilst those with more experience used the cystotome as the method of track dilation during cyst puncture more frequently (P = 0.02), and removed the stents in less than 3 months after insertion (P = 0.011).

In terms of technical proficiency, 68.4 % believed that at least 10 procedures were required to gain proficiency while 13.6 % believed that 25 procedures was a minimum; 42.1 % believed that prior experience in ERCP was essential before embarking on learning EUS guided drainage while 47.4 % believed that possession of the skills of ERCP was recommended and beneficial.

### Table 1

| Procedure                                      | ≥40 procedures (n = 10) | <40 procedures (n = 9) | P-value |
|------------------------------------------------|-------------------------|------------------------|---------|
| EUS, n (%)                                     | 10 (100)                | 4 (44.4)               | 0.0111  |
| Other methods of endoscopic drainage, n (%)    | 0 (0)                   | 5 (55.6)               |         |
| Prescription of antibiotics, n (%)             | 9 (90)                  | 7 (77.8)               | 0.582   |
| Insertion of pancreatic stent, n (%)           | 4 (40)                  | 4 (44.4)               | 1       |
| Double-wire technique, n (%)                   | 6 (60)                  | 7 (77.8)               | 0.628   |
| Tapered catheter, n (%)                        | 5 (50)                  | 4 (44.4)               | 1       |
| Cystotome, n (%)                               | 7 (70)                  | 1 (11.1)               | 0.0201  |
| Needle-knife, n (%)                            | 3 (30)                  | 4 (44.4)               | 0.650   |
| Use of transcystic catheters, n (%)            | 7 (70)                  | 7 (77.8)               | 1       |
| Duration of stents <3 months, n (%)            | 6 (60)                  | 0 (0)                  | 0.0111  |

EUS, endoscopic ultrasound.

1 P-values <0.05 are statistically significant.
In the current study, the practices of EUS guided pseudocyst drainage amongst members of the Asian EUS group were surveyed. There were wide variations in the techniques adopted amongst the group members, and the practice of the procedure also varied depending on the experience of the endoscopist. This is a reflection of the lack of consensus or guidelines on how the procedure should best be performed.

In an earlier survey conducted amongst American Society for Gastrointestinal Endoscopy (ASGE) members almost 10 years ago, such wide variations in the techniques of pseudocyst drainage were also observed [9]. In that study, only 50% of the respondents practiced EUS guided drainage. ERCP was performed before drainage by 47% of the endoscopists. A needle-knife was used to enter the pseudocyst by 53% of the respondents. The median number of plastic stents placed was 2 (range 1–5) and they were left in place for a median duration of 6 weeks (range 2–30 weeks).

Interestingly, despite the large number of studies published on this topic over the last decade, the variations in practice recorded in the current survey were similar to that study performed 10 years ago. This observation may be partly explained by the relative lack of practice-defining studies in the literature. Several key areas of controversy on EUS guided pseudocyst drainage remain. First, the optimal modality of draining pancreatic pseudocysts remains controversial. Although pseudocysts are increasingly drained by endoscopic means, there are a lack of randomized studies comparing endoscopic, percutaneous, or surgical approaches. In the only randomized study comparing EUS guided and open surgical cystostomy, there were no differences in success and complications rates [4]; however the EUS approach was significantly cheaper and associated with a shorter hospital stay and better quality of life scores. On the other hand, when comparing esophagogastroduodenoscopy (EGD) versus EUS guided drainage, a meta-analysis of only two randomized trials showed that both approaches had similar success and complication rates; however the EUS approach was associated with a higher technical success rate in nonbulging cysts [10].

On the other hand, whether endoscopic retrograde cholangiopancreatography (ERCP) is required before drainage is also uncertain. This discussion originated in surgical literature in the 1980s and still remains controversial [11,12]. ERCP serves two purposes, the first is to delineate the pancreatic ductal anatomy, and the second is to provide drainage of the pancreatic duct when there is communication with the pseudocyst; however whether pancreatic ductal drainage is still required when pseudocyst drainage has been achieved by the transmural route is debatable. Almost half of the respondents from both recent surveys would perform ERCP before drainage and they believed that pancreatic duct stenting was indicated in patients with partial or complete pancreatic duct injury. Nevertheless, such practice is only supported by a few, small retrospective studies. In two studies, partial pancreatic duct disruption with a stent bridging the site and a longer duration of stenting were factors associated with a higher likelihood of resolution of the ductal disruption [13,14]. In the only study combining transmural pseudocyst drainage and pancreatic duct stenting, the patients who received pancreatic duct stenting had significantly higher rates of treatment success (97.5% vs 80%, P=0.001) and 7.7% of the patients developed recurrences [15].

In addition, the optimal number and type of stents that should be used for drainage were also seldom addressed in previous studies. Although only a small proportion of respondents in this survey used metallic stents for drainage, such practice is increasingly reported in the literature [16–18]. The potential advantages of using metallic stents for drainage of pancreatic fluid collections include the ease of insertion, avoidance of multiple guide-wires, changes in instruments, and providing a passage for insertion of the endoscope for necrosectomy. Such potential benefits need to be balanced against the cost and the risk of increasing morbidities by up to 33%, and further studies are required to justify its routine use [18].

Furthermore, some differences in the practice of drainage were observed amongst the experienced and inexperienced groups. The experienced group tended to use the cystotome for tract dilation more often and removed the stents earlier, while the inexperienced group practiced other methods of endoscopic drainage more frequently. Such differences may be explained by the learning curve of the endoscopist and demonstrates the fact that the more experienced tended to use techniques that were safer and more efficient. In order to overcome these learning curve issues, structured training programs, such as those conducted by AEG, may potentially enhance the acquisition of knowledge and skills, and reduce the number of procedures required to gain proficiency [19]. On the other hand, since the participants in this survey consisted of mostly regional leaders, they are experienced operators and the results may not be translated into daily practice.

There are several limitations to the current study. First, this was a cross-sectional study with a small number of respondents and the findings may be the subject of type II errors. In addition, the endoscopists’ responses may not be a true reflection of their actual practice. Third, the questionnaire was not validated and may potentially introduce biases to the responses.

In conclusion, this was the first Asia wide survey into the practice of pseudocyst drainage. Despite it being one of the most described interventional EUS procedures, there were still wide variations in the practice, and randomized studies are urgently needed to establish the best approach for management of this condition. Furthermore, there is a pressing need for establishment of a consensus for safe practices.

**Competing interests:** None

**Institutions**

1Department of Surgery, Prince of Wales Hospital, Chinese University of Hong Kong, Hong Kong, China
2Department of Medicine, National University of Singapore, Singapore
3Baloda Institute of Digestive Sciences, Mumbai, India
4Department of Gastroenterology, Changhi Hospital, Shanghai, China
5Department of Gastroenterology, Kitasato University East Hospital, Sagamihara, Japan
6Department of Gastroenterology, Asan Medical Centre, Seoul, Korea
7Department of Gastroenterology, National Taiwan University Hospital, Taipei, Taiwan
8Department of Gastroenterology, Beijing Union Medical College Hospital, Beijing, China
9Interventional Endoscopy Services, California Pacific Medical Center, San Francisco, California, USA
10Center for Interventional Endoscopy, Florida Hospital, Orlando, Florida, USA

**Acknowledgments**

The authors would like to thank all AEG members in their active participation in the survey. In particular, we would like to thank Drs T Akaraviputh, TL Ang, C Xu, K Hara, IN Hilmi, TI Iwai, LS Sun...
References

1. Grimm H, Binmoeller KF, Soehendra N. Endosonography-guided drainage of a pancreatic pseudocyst. Gastrointest Endosc 1992; 38: 170–171
2. Varadarajulu S, Christein JD, Tambane A et al. Prospective randomized trial comparing EUS and EGD for transmural drainage of pancreatic pseudocysts (with videos). Gastrointest Endosc 2008; 68: 1102–1111
3. Park DH, Lee SS, Moon SH et al. Endoscopic ultrasound-guided versus conventional transmural drainage for pancreatic pseudocysts: a prospective randomized trial. Endoscopy 2009; 41: 842–848
4. Varadarajulu S, Bang JY, Sutton BS et al. Equal efficacy of endoscopic and surgical cystogastrostomy for pancreatic pseudocyst drainage in a randomized trial. Gastroenterology 2013; 145: 583–590.e1
5. Voermans RP, Ponchon T, Schumacher B et al. Forward-viewing versus oblique-viewing echoendoscopes in transmural drainage of pancreatic fluid collections: a multicenter, randomized, controlled trial. Gastrointest Endosc 2011; 74: 1285–1293
6. Varadarajulu S, Tambane A, Blakely J. Graded dilation technique for EUS-guided drainage of peripancreatic fluid collections: an assessment of outcomes and complications and technical proficiency (with video). Gastrointest Endosc 2008; 68: 656–666
7. Harrewood GC, Wright CA, Baron TH. Impact on patient outcomes of experience in the performance of endoscopic pancreatic fluid collection drainage. Gastrointest Endosc 2003; 58: 230–235
8. Varadarajulu S, Bang JY, Phadnis MA et al. Endoscopic transmural drainage of peripancreatic fluid collections: outcomes and predictors of treatment success in 211 consecutive patients. J Gastrointest Surg 2011; 15: 2080–2089
9. Yusuf TE, Baron TH. Endoscopic transmural drainage of pancreatic pseudocysts: results of a national and an international survey of ASGE members. Gastrointest Endosc 2006; 63: 223–227
10. Panamonta N, Ngamruengphong S, Kijsririchareanchai K et al. Endoscopic ultrasound-guided versus conventional transmural techniques have comparable treatment outcomes in draining pancreatic pseudocysts. Eur J Gastroenterol Hepatol 2012; 24: 1355–1362
11. Nealon WH, Townsend CM Jr, Thompson JC. Preoperative endoscopic retrograde cholangiopancreatography (ERCP) in patients with pancreatic pseudocyst associated with resolving acute and chronic pancreatitis. Ann Surg 1989; 209: 532–538
12. Nealon WH, Walker E. Main pancreatic ductal anatomy can direct choice of modality for treating pancreatic pseudocysts (surgery versus percutaneous drainage). Ann Surg 2002; 235: 751–758
13. Telford JJ, Farrell JJ, Saltzman JR et al. Pancreatic stent placement for duct disruption. Gastrointest Endosc 2002; 56: 18–24
14. Varadarajulu S, Noone TC, Tutuian R et al. Predictors of outcome in pancreatic duct disruption managed by endoscopic transpapillary stent placement. Gastrointest Endosc 2005; 61: 568–575
15. Trevino JM, Tambane A, Varadarajulu S. Successful stenting in ductal disruption favorably impacts treatment outcomes in patients undergoing transmural drainage of peripancreatic fluid collections. J Gastroenterol Hepatol 2010; 25: 526–531
16. Belle S, Collet P, Past S et al. Temporary cystogastrostomy with self-expanding metallic stents for pancreatic necrosis. Endoscopy 2010; 42: 493–495
17. Berzosa M, Maheshwari S, Patel KK et al. Single-step endoscopic ultrasonography-guided drainage of peripancreatic fluid collections with a single self-expandable metal stent and standard linear echoendoscope. Endoscopy 2012; 44: 543–547
18. Weillert F, Binmoeller KF, Shah JN et al. Endoscopic ultrasound-guided drainage of pancreatic fluid collections with indeterminate adherence using temporary covered metal stents. Endoscopy 2012; 44: 780–783
19. Wang M, Lim GL, Bang MH et al. Structured endoscopic ultrasound training programs improved knowledge and skills of trainees – results from the Asian EUS group. Gastrointest Endosc 2014; 79: AB318

Appendix

online content viewable at: www.thieme-connect.de