

News and Views

Endoscopic “Step-up” Treatment Approach for Walled off Pancreatic Necrosis

Acute pancreatitis associated with pancreatic necrosis is associated with a severe and protracted disease course. Acute necrotizing pancreatitis (ANP) in the initial phase is associated with acute necrotic collections (ANC) and this over a period of 4 weeks or more gets liquefied and walled off leading on to formation of walled off necrosis (WON).^[1] The WON have a variable clinical course with some spontaneously resolving and some getting symptomatic or infected. These symptomatic WON needs to be treated and the majority of these are to be drained. Simple catheter drainage is not effective for these necrotic collections as they contain varying amount of solid necrotic debris that cannot be removed through small caliber catheters. These collections were earlier treated with surgical necrosectomy but over past decade there has been paradigm shift in their management toward minimally invasive interventional radiologic, laparoscopic, and endoscopic procedures.^[2]

Endoscopic transmural drainage is the preferred drainage route for WON. However, the initial results endoscopic transmural drainage with a single plastic stent was disappointing because of ineffective drainage of solid necrotic material by thin caliber plastic stent. However, with use of more aggressive endoscopic drainage techniques such as larger tract dilation, placement of multiple stents, insertion of nasocystic catheter (NCC) along with aggressive irrigation, use of fully covered self-expanding metallic stents (FCSEMS)/lumen apposing metal stents, and direct debridement of solid necrotic tissue by endoscopic necrosectomy has led on to considerable improvement in the results of endotherapy.^[3-8]

Out of all the endoscopic procedures, direct endoscopic necrosectomy (DEN) has been reported to be most effective as it involves direct removal of necrotic tissue and therefore leads on to quicker resolution.^[6] However, DEN, is associated with increased risk of complications such as perforation and bleeding and is also a time-consuming procedure. Moreover, lack of specific necrosectomy accessories makes it a difficult procedure that can be done by experts only. Furthermore, there is evidence in the literature that majority of patients with WON can be treated with large balloon dilatation and multiple plastic stents.^[4,5,7] Therefore, a “step-up” endoscopic approach has been advised for treatment for WON where DEN is reserved for patients not responding to drainage and irrigation. This approach is similar to step-up approach used for ANC that involves an initial

percutaneous drainage (PCD) followed by endoscopic or surgical or laparoscopic necrosectomy if required.^[9,10] In this news and views, we will discuss two different step-up endoscopic approaches used for treatment of WON at two different tertiary care centers in India and published recently.

First by Lakhtakia *et al.* from Asian Institute of Gastroenterology, reported the efficacy of endoscopic step-up approach using a dedicated covered biflanged metal stent (BFMS) in 205 patients of WON.^[11] Second study by Rana *et al.* from Postgraduate Institute of Medical Education and Research reported the efficacy of endoscopic step-up approach using multiple plastic stents in 84 patients.^[12]

Lakhtakia *et al.* reported a retrospective study wherein consecutive patients with symptomatic WON seen over a 3-year period were treated with BFMS. All the patients were treated with endoscopic ultrasound (EUS)-guided transmural drainage. The EUS-guided drainage procedure was performed in a standard manner wherein the WON was punctured using a 19-gauge needle followed by insertion of guide wire. The transmural tract was dilated using a 6F cystotome followed by 6-mm balloon dilator. Thereafter, the stent delivery catheter of BFMS (Nagi; Taewoong Medical, Gyeonggi-do, South Korea) was advanced over the guidewire across the WON wall and deployed. After the drainage, patients were admitted and observed and in patients with persistent or new onset symptoms, a noncontrast computed tomography (CT) was done CT to assess response and diagnose any adverse events. In nonresponders, endoscopic assessment of BFMS was done to look for stent clogging by the necrotic material. As first step in this step-up approach, any occluding debris was cleared using endoscopic devices such as snare or forceps. Patients not responding with de-clogging, underwent placement of a nasocystic tube (NCT) through the lumen of the BFMS. The WON cavity was intermittently irrigated with 3% hydrogen peroxide (H₂O₂), and saline solution with each session of irrigation being done at 8 hourly intervals using 20 ml of H₂O₂ followed 10 min later by 100 ml saline solution. Patients still not responding underwent DEN using gastroscope (Olympus GIF XTQ160 or GIF HQ190) with water jet facility through the BFMS using accessories such as braided snares, forceps, nets, and stone retrieval baskets.

Rana *et al.* reported a different step-up approach wherein the EUS-guided drainage procedure is almost

similar to the procedure described above except that the transmural tract was dilated using an endoscopic retrograde cholangiopancreatography cannula or 4 mm biliary balloon dilator instead of a cystotome. Moreover, if it was not possible to dilate the tract with noncautery methods because of thickened wall, it was dilated using a wire-guided cautery needle knife. Thereafter, the tract was further dilated up to 8–15 mm with a wire-guided hydrostatic balloon. Also in this study, the WON were assessed for the quantity of the necrotic material present. The echogenic material present in the WON on EUS was suggestive of solid debris. The quantification of necrotic debris was an approximate visual judgment of the endoscopist and mean of the findings of two experienced endosonologists who separately reviewed the EUS images to quantify the solid debris was taken as the amount of solid debris in WON. Following balloon dilatation, 1–3 7-Fr double-pigtail stents, between 3 and 7 cm in length, were inserted into WON. Moreover, in patients with >10% solid debris in walled off pancreatic necrosis (WOPN), a 7-Fr NCC was also positioned alongside stents for irrigation with 200 ml of normal saline every 4–6 hourly. No H₂O₂ was used in this study. All patients underwent CT of the abdomen 72 h after drainage and NCC was removed in patients who had symptomatic improvement with >50% reduction in size of WON. Patients with new onset fever or worsening of existing symptoms underwent repeat endoscopic transmural drainage with further dilatation of tract up to 18 mm in stomach and 12 mm in duodenum) and multiple 10 Fr stents, 3–5 cm in length were inserted. However, if after second or subsequent session of drainage, WON persisted with persisting symptoms, a decision for additional transmural drainage by stents, FCSEMS insertion, DEN or surgery was taken after reviewing imaging findings, discussion with patient and his/her family, and consultation with pancreatic surgeons.

Lakhtakia *et al.* studied 205 patients (mean age: 34.8 ± 12.8 years; 81% males) with WON who underwent EUS-guided drainage with BFMS placement. The mean size of WON was 10.8 cm and mean duration between onset of pancreatitis and drainage was 42 ± 12.5 days. The procedure was technically successful in all patients with stent deployment requiring a second procedure in 2 patients. Procedure related adverse events were observed in 8 (3.9%) patients with 4 patients having self-limiting bleeding, 2 having major bleeding with one requiring angiographic coil embolization and another patient requiring surgery. Furthermore, two patients developed perforation requiring surgery.

In the study group, reintervention was required in 49 (23.9%) patients with stent dysfunction due to

occluding debris observed in 21 patients of which 10 patients (4.8%) improved with de-clogging only. The other 11 patients required NCT placement with irrigation due to the presence of solid debris within the WON. Twenty eight patients directly underwent NCT placement and thus 39 patients required second step of NCT placement. NCT was maintained for 3–7 days and led on to resolution of WON in 10 patients. Six patients with adherent mild debris required placement of a plastic stent within the BFMS after removal of NCT. Remaining 23 patients (11%) required DEN with 12 patients requiring one session, six needing two sessions, four needing three sessions, and one needing four sessions of DEN. Four patients had treatment failure with two requiring surgery and two 2 needing additional PCD for WON extending to the left paracolic gutter. Migration of BFMS occurred in 5 (2.4%) patients during DEN and these stents could be replaced in all patients.

Of 205 patients, clinical success was achieved in 153 patients (74.6%) by step one of drainage with BFMS. Of the remaining 49 patients, 10 patients improved with de-clogging, 16 patients with NCT placement and 19 patients with DEN thereby yielding an overall treatment success rate of 96.5% patients. On follow-up, 162 (79%) patients underwent uncomplicated removal of BFMS within 4–8 weeks of placement. However, 21 patients reported late (between 3 and 12 months after placement) due to logistical reasons and removal was uncomplicated in 12 patients and nine patients required Argon plasma coagulation (APC) of the gastric wall around the BFMS with or without its piecemeal removal. Symptomatic pancreatic fluid collection (PFC) recurrence occurred in five patients and all of them patients had disconnected pancreatic duct. The recurrence was treated successfully by EUS-guided drainage using plastic stents.

Rana *et al.* studied 86 patients (73 [84.9%] males) and mean age 38.24 ± 10.11 years with symptomatic WON. The patients presented after a mean duration of 10.8 ± 2.8 weeks of onset of acute attack of ANP and mean size of WON was 10.7 ± 2.9 cm. EUS-guided transmural drainage was technically successful in 85 (98.8%) patients with no collateral-free window being identified in one patient with splenic vein thrombosis and extensive intra-abdominal collaterals. Among 85 patients who underwent endoscopic drainage, number of endoscopic procedures needed was one in 5 (6%) patients, 2 in 25 (29.5%), 3 in 30 (35.3%), 4 in 16 (18.7%) patients and more than 4 procedures in 9 (10.5%) patients. 78/85 (92%) patients underwent a NCC catheter placement at the time of initial EUS-guided drainage for a period of 3–10 days. Seventy (82.4%) were successfully drained using multiple 7/10 Fr plastic

stents alone while DEN was needed in 9 (10.6%) and FCSEMS placement in 6 (7%) patients. Of six patients in whom FCSEMS was placed, 5 (84%) required additional DEN through the metallic stent.

None of the patients required surgery but 2 (2.3%) patients' required additional PCD because of presence of undrained peripheral WON. The time to resolution of WON was 4.6 ± 1.3 weeks. The complications noted were self-limiting pneumoperitoneum because of puncture of WON cavity while performing DEN ($n = 1$), bile leak following cholecystectomy ($n = 1$), development of external pancreatic fistula following PCD ($n = 1$) and gastrointestinal bleeding requiring blood transfusion ($n = 1$). On comparison of patients who were successfully treated with multiple plastic stents versus patients who required SEMS/DEN, it was found that the patients who needed DEN/FCSEMS presented earlier and had large size collection with more solid necrotic debris as compared to patients treated with multiple plastic stents alone. The mean amount of solid debris in patients successfully treated with multiple plastic stents was 26%, and this was significantly less than the amount of solid debris in patients treated with DEN/FCSEMS (47%; $P < 0.001$).

COMMENTARY

WON is a heterogeneous group of PFC's with varying amount of solid necrotic debris, and therefore one procedure may not be effective and safe in all the patients. The results of the above-mentioned two studies reemphasize the fact that majority of patients with WON can be successfully treated endoscopically using multiple plastic stents or FCSEMS without resorting to labor intensive and complicated DEN. In patients with infected pancreatic necrosis, a "step-up" approach with minimally invasive PCD followed by necrosectomy in nonresponders has been advocated.^[9,10] This step-up approach avoids invasive necrosectomy and associated complications in almost one-third of patients. The studies by Rana *et al.* and Lakhtakia *et al.* have also shown that using an endoscopic step-up approach, 82%–89% of symptomatic patients with WON could be successfully treated with drainage techniques only and thus avoiding DEN. Bang *et al.* also reported that using a tailored algorithmic approach of multiple plastic stents/NCT and/or multiple transluminal gateway techniques based on size and extent of WOPN and stepwise response to intervention, 91% patients with WOPN will have successful outcome.^[13] Rana *et al.* also reported that WON having large size and more solid debris needed more aggressive therapeutic method for successful outcome with patients having >40% solid debris either needing DEN or surgical necrosectomy.^[8] Out of the

two step-up approaches, discussed here, which one is better can be answered by comparative studies alone. Moreover, whenever, there is more than one way to skin the cat, you should choose the one in which you are the best. We had earlier proposed a classification system for WON base on the amount of solid necrotic debris with WON having <10% solid debris labeled as acute pseudocyst that can be successfully drained with single plastic stent and WON having 10–40% solid debris as walled off liquid necrosis that can be successfully treated with multiple plastic stents.^[14] WON with more than 40% was labeled as walled off solid necrosis and these patients usually require FCSEMS with or without DEN.

Surinder Singh Rana, Sobur Uddin Ahmed

Department of Gastroenterology, Postgraduate Institute of Medical Education and Research, Sector 12, Chandigarh, India

Address for correspondence: Dr. Surinder Singh Rana, Department of Gastroenterology, Postgraduate Institute of Medical Education and Research, Chandigarh - 160 012, India. E-mail: drsurinderrana@yahoo.co.in

REFERENCES

1. Rana SS, Bhasin DK, Reddy YR, Sharma V, Rao C, Sharma RK, *et al.* Morphological features of fluid collections on endoscopic ultrasound in acute necrotizing pancreatitis: Do they change over time? *Ann Gastroenterol* 2014;27:258-61.
2. Sharma V, Rana SS, Bhasin DK. Endoscopic ultrasound guided interventional procedures. *World J Gastrointest Endosc* 2015;7:628-42.
3. Varadarajulu S, Rana SS, Bhasin DK. Endoscopic therapy for pancreatic duct leaks and disruptions. *Gastrointest Endosc Clin N Am* 2013;23:863-92.
4. Bang JY, Hawes R, Bartolucci A, Varadarajulu S. Efficacy of metal and plastic stents for transmural drainage of pancreatic fluid collections: A systematic review. *Dig Endosc* 2015;27:486-98.
5. 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.
6. Gardner TB, Chahal P, Papachristou GI, Vege SS, Petersen BT, Gostout CJ, *et al.* A comparison of direct endoscopic necrosectomy with transmural endoscopic drainage for the treatment of walled-off pancreatic necrosis. *Gastrointest Endosc* 2009;69:1085-94.
7. Rana SS, Bhasin DK, Rao C, Gupta R, Singh K. Non-fluoroscopic endoscopic ultrasound-guided transmural drainage of symptomatic non-bulging walled-off pancreatic necrosis. *Dig Endosc* 2013;25:47-52.
8. Rana SS, Bhasin DK, Sharma RK, Kathiresan J, Gupta R. Do the morphological features of walled off pancreatic necrosis on endoscopic ultrasound determine the outcome of endoscopic transmural drainage? *Endosc Ultrasound* 2014;3:118-22.
9. van Grinsven J, van Santvoort HC, Boermeester MA, Dejong CH, van Eijck CH, Fockens P, *et al.* Timing of catheter drainage in infected necrotizing pancreatitis. *Nat Rev Gastroenterol Hepatol* 2016;13:306-12.
10. Babu RY, Gupta R, Kang M, Bhasin DK, Rana SS, Singh R. Predictors of surgery in patients with severe acute pancreatitis managed by the step-up approach. *Ann Surg* 2013;257:737-50.

11. Lakhtakia S, Basha J, Talukdar R, Gupta R, Nabi Z, Ramchandani M, *et al.* Endoscopic “step-up approach” using a dedicated biflanged metal stent reduces the need for direct necrosectomy in walled-off necrosis (with videos). *Gastrointest Endosc* 2017;85:1243-52.
12. Rana SS, Sharma V, Sharma R, Gupta R, Bhasin DK. Endoscopic ultrasound guided transmural drainage of walled off pancreatic necrosis using a “step-up” approach: A single centre experience. *Pancreatology* 2017;17:203-8.
13. Bang JY, Holt BA, Hawes RH, Hasan MK, Arnoletti JP, Christein JD, *et al.* Outcomes after implementing a tailored endoscopic step-up approach to walled-off necrosis in acute pancreatitis. *Br J Surg* 2014;101:1729-38.
14. Rana SS, Bhasin DK. Should all fluid collections in delayed phase of acute necrotizing pancreatitis labeled as walled-off pancreatic necrosis? *Dig Dis Sci* 2014;59:1338-9.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code: 	Website: www.jdeonline.in
	DOI: 10.4103/jde.JDE_37_17

How to cite this article: Rana SS, Ahmed SU. Endoscopic “step-up” treatment approach for walled off pancreatic necrosis. *J Dig Endosc* 2017;8:100-3.