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Plastic or Metal Stents for Transmural Drainage of Pancreatic Fluid Collections

Acute pancreatitis is a disease of varying severity and associated with various local and systemic complications. Peripancreatic fluid collections are an important local complications of acute pancreatitis and have been recently subdivided into four broad categories by the revised Atlanta classification as follows:[1] Acute pancreatic fluid collection: fluid collection in nonnecrotizing pancreatitis within 4 weeks of onset of pain; pancreatic pseudocyst (PC): fluid collection with well-formed wall in nonnecrotizing pancreatitis after 4 weeks of onset of pain; acute necrotic collection: fluid collection in necrotizing pancreatitis within 4 weeks of onset of pain; and walled-off necrosis (WON): fluid collection with well-formed wall in necrotizing pancreatitis after 4 weeks of onset of pain. The symptomatic WON or PC need some form of drainage procedure either by endoscopic, interventional radiological, or surgical approach. With the advances in endoscopic techniques, minimally invasive endoscopic procedure, particularly endoscopic ultrasound (EUS)-guided transmural drainage through stomach or duodenum, is now the mainstay of treatment of symptomatic walled-off pancreatic fluid collections.[2]

EUS-guided transmural drainage of pancreatic fluid collections was earlier done by double-pigtail plastic stents (DPPSs). The plastic stent was able to achieve drainage of the fluid component effectively and thus PCs could be safely and effectively treated with one or more transmural plastic stents. However, this strategy was not effective in WON as the plastic stents were not able to effectively drain the solid necrotic component.[3-5] To overcome this problem, either multiple plastic stents or a larger diameter fully covered metal stent are being used for the drainage of WON.[6,7]

With the development of dedicated metal stents for WON drainage like lumen-apposing metal stent (LAMS) like Axios stent (Boston Scientific, Natick, MA, USA) or biflanged metal stent (BFMS) like Nagi stent (Taewoong Medical, Gyeonggi-do, South Korea), the management of pancreatic fluid collections with lots of solid debris has become easier. These stents are fully covered and easy to deploy with high rate technical success. Moreover, it is easy to perform direct endoscopic necrosectomy (DEN) through the stent whenever, required. However, the metal stents are costly and have their own set of complications such as bleeding, stent migration, and blockage of stent lumen by necrotic material. Direct comparative studies looking at safety and efficacy between plastic and metal stents for drainage of PFC are lacking. In this news and views, we will discuss two different studies in different centers in the USA comparing the outcome of plastic versus metal stent in the management of pancreatic fluid collections published recently. The first study is by Abu Dayyeh *et al*. who compared the outcome of endoscopic management of WON using a large caliber BFMS versus DPPSs in 94 patients.[8] The second study is by Lang *et al*. who compared the efficacy of drainage of PPFC (both PC and WON) by LAMS versus DPPSs in 103 patients.[9]

Abu Dayyeh *et al*. retrospectively evaluated 94 patients with WON who underwent EUS-guided drainage.[8] The drainage was done by standard technique with a 19-gauge needle to make the cystogastrostomy/cystoduodenostomy tract. Fifty-eight patients received a large caliber fully covered self-expanding metal stent (LC-SEMS) either a 15 mm diameter LAMS (Axios; Boston Scientific) or a 6 cm long and 18 or 20 mm diameter tubular LC-SEMS (Niti-S; Taewoong Medical). Thirty-six patients received 2 or more 7F or 10F DPPSs. Few patients underwent initial DEN at the time of initial endoscopy. Subsequent DEN was performed if remaining solid material was more than 80% by visual inspection or the WON does not decrease by >50% in subsequent scheduled cross-sectional imaging, or if the patient had persistent symptoms infection or gastric outlet obstruction with the presence of residual WON. DEN was performed by entering the WON cavity with a standard or therapeutic channel endoscope followed by mechanical debridement of necrotic material using irrigation, cap suction, snares, baskets, forceps, or a combination of these. Dilute hydrogen peroxide was instilled during endoscopic transmural necrosectomy in some cases. Some patients also underwent concomitant percutaneous drainage.

The mean size of WON was 6.5 cm and 5.8 cm in LC-SEMS and DPPS group, respectively. Overall rate of WON resolution was 93.6% when concomitant percutaneous drainage was not considered failure of endoscopic management and 79.8% when concomitant percutaneous drainage was considered a failure of transmural drainage. Median time to WON resolution overall was 8 weeks (interquartile range 6–12 weeks). There was no difference in WON resolution rate or time to WON resolution between the DPPSs and LC-SEMS. The size and location of the WON also did not influence the WON resolution rate between the two groups. Even when the comparison was made between the LAMS and DPPS, there was no difference in the rate of and time required to WON resolution. However, when transmural

drainage was done without a subsequent DEN procedure, WON resolution was more frequent in LC-SEMS group as compared to DPPS group (60.4% vs. 30.8%, $P = 0.01$). In patients with larger WON (>13 cm), resolution rate decreased to 40% and 10% for LC-SEMS and DPPS, respectively, without subsequent DEN. Higher resolution of WON was also there in LC-SEMS group when DPPS was compared only with LAMS (odds ratio [OR] = 4.1, 95% confidence interval [CI], 1.46–12.7). With subsequent DEN procedure, the number of DEN required in LC-SEMS group was lower than DPPS group, but the difference did not reach significance level ($P = 0.12$). The hospital stay and Intensive Care Unit stay were lower in LC-SEMS group as compared to DPPS group. Most of the adverse events were similar in both the groups except for the clinically significant bleeding requiring endoscopic intervention which was higher in DPPS group as compared to SEMS group (14% vs. 2% $P = 0.02$). Rate of perforation, stent migration, and stent occlusion were similar in both the groups. When tubular LC-SEMS was compared with LAMS, there was no difference in outcome variables. The authors concluded that endoscopic drainage of pancreatic WON with LC-SEMSs appears to decrease both the need for repeated DEN as well as the risk of intervention-related hemorrhage.

Lang *et al*. retrospectively evaluated 103 patients (mean age 51.6 years, 60% male) with PPFC (WON or PC) who underwent EUS-guided drainage.[7] In this study, either plastic double-pigtail stents (7F or 10F Cook Medical, Winston-Salem, NC, USA) or LAMS (AXIOS, Boston Scientific; Marlborough, MA, USA) were deployed in 84 and 19 patients, respectively, for transmural drainage. The number of DPPSs, size of LAMS (10 or 15 mm), need for initial debridement, balloon dilatation of the LAMS, and whether or not a DPPS was placed through the LAMS were determined by the physician performing the procedure. A cross-sectional imaging was done within 2–4 weeks postprocedure to assess the response. Stents were removed at a time period determined by the physician performing the procedure after resolution of PPFC. Some patients also underwent ERCP and pancreatic duct stenting at the discretion of the physician.

Eighty (78%) patients had PC whereas 23 (22%) patients had WON. The mean diameter of PPFCs was 88 mm (range 41–178 mm) and 104 mm (range 67–155 mm) in DPPS and LAMS group, respectively. Median number of DPPS placed were 2 (range: 1–3). Initial DEN was performed in 3 patients in DPPS and 2 patients in LAMS group whereas subsequent DEN was performed in 1 patient in DPPS and 13 in LAMS group. Overall clinical success rate, determined by complete resolution of the PPFC within 6 months, was 95% (96% in DPPS and 94% in LAMS) with the difference being not significant. Adverse events were also higher in LAMS group (53%) as compared to the DPPS group (12%). Among all the adverse events including perforation, bleeding, and requirement of unplanned endoscopy, bleeding was significantly higher in LAMS group ($P = 0.0003$) compared to DPPS, and there was a trend toward significance in higher need for unplanned endoscopy in LAMS group ($P = 0.07$). Bleeding was 1% in DPPS group and 21% in LAMS group (OR - 22.1; 95% CI 2.3–211.9). Bleeding in DPPS group was due to stent eroding the opposite gastric wall around 30 days after its insertion. In LAMS group, one case of bleeding was due to intracavitary vessel bleed, one was due to injury to collateral during insertion, and in two patients, the bleeding was due to bleeding from splenic artery pseudoaneurysm. Stent obstruction by necrotic material was seen in 5 (56%) patients. Four of these patients underwent subsequent DDPS placement through LAMS and these patients did not develop further stent block. The authors concluded that both DPPSs and LAMSs are effective methods for treatment of PPFCs and in their cohort of patients, LAMS were associated with significantly higher rates of procedure-related bleeding and greater need for repeat endoscopic intervention.

Commentary

The management of pancreatic fluid collection developing after acute pancreatitis has evolved greatly in recent times from major morbid surgical necrosectomy to minimally invasive percutaneous radiological interventions and endoscopic transmural drainage. Although endoscopic transmural drainage is now the preferred modality of treatment for pseudocysts as well as WONs, the choice of stents for ransmural drainage in WON is a debatable topic. Few studies that have compared the plastic and metal stents for treatment of WON have shown conflicting results in terms of efficacy and adverse events.[10-13]

Theoretically larger diameter of the metal stents would allow passage of solid material more easily as compared to narrower diameter of plastic stents. However, a recent retrospective case–control study found no significant difference in treatment success, reinterventions, clinical and stent-related adverse events between patients treated with LAMS versus plastic stents.[14] A recent meta-analysis published in an abstract form reported that metal stents are equally effective in draining PC and WON but have better clinical success rate in draining WON as compared to plastic stents.[15] Similarly, both the studies discussed above have demonstrated equal efficacy of both plastic and metal stents in treating pancreatic fluid collections. Furthermore, for removal of solid necrotic debris, patients

treated with plastic stents will require more sessions of DEN as compared to metal stents as shown by Abu Dayyeh *et al*. With the use of metal stents, DEN becomes easier and number of re-interventions required are also less. However, necrotic solid material can clog the lumen of the metal stent after draining the fluid component. Putting a plastic stent through the metal stent may prevent this complication as shown by Lang *et al*. Among the metal stents, the specially designed LAMS have not been shown to be more effective then tubular LC-SEMS in most studies including the two studies discussed here. Regarding the adverse outcomes of plastic versus metal stents, different studies have shown different results, some showing more adverse events with plastic stents and some showing otherwise and the same has been the trend in the two studies discussed here. Bleeding has been shown to be more common with metal stents as compared to plastic stents in most studies. However, the study by Abu Dayeeh *et al*. discussed above has shown more bleeding episodes with plastic stents. Metal stents cause rapid decompression of the PPFC and thus causing shrinkage of the WON cavity leading bleeding. In spite of increasing number of studies available looking at the safety and efficacy of plastic versus metal stents in the treatment of pancreatic WON, because of the differing results and conclusions, the final verdict on the choice of stents is still not out. The final answer to this management dilemma will be probably answered by a multicentric prospective comparative randomized study only.

Sobur Uddin Ahmed, Surinder Singh Rana

Department of Gastroenterology, Postgraduate Institute of Medical Education and Research, 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

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