



Customized airway stenting for bronchopleural fistula after pulmonary resection by interventional technique: single-center study of 148 consecutive patients

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I have read with interest the paper by Han *et al.* (1). They presented their experience with the use of customized self-expandable covered metallic airway stents for the management of bronchopleural fistula (BPF).

Postoperative BPF has always been a challenging therapeutic condition associated with high morbidity and mortality (2). Over the years, many proceduralists attempted different techniques to treat BPF. In addition to conservative management and surgical intervention for fistula repair, various bronchoscopic interventions have been reported in the literature.

They include bronchoscopy for instillation of sealant glue, airway stenting, and other customized techniques (2). Jindal *et al.* described a case of customized Spigot placement to manage a post pneumonectomy BPF (3). In their case, BPF persisted despite conservative management. The patient was deemed a non-surgical candidate because of malnourishment. They first used fibrin glue to treat the left bronchial stump fistula but was unsuccessful. Thus, the authors used a silicone stent and customized it to make a cone-shaped device. The customization of the silicone stent was made simple by using nonabsorbable surgical sutures and was then called customized spigot. The spigot was bronchoscopically placed in the left bronchial bronchus to cover the fistula and sealant glue was placed on top of it to prevent displacement

and to close any possible small pores. The procedure was successful and the patient's BPF completely resolved with obliteration of the left hemothorax. In another paper, Varoli *et al.* treated 35 patients with post-surgical BPE (4). They used bronchoscopy to perform submucosal injection of "Polidocanol" which is an agent that stimulates granulation tissue growth to allow fistula closure. None of the patients has major bronchoscopic complications. Complete BPF closure was accomplished in two third of treated patients. Many authors described the use of innovative techniques using airway stenting for the management of BPE but there were case series with a small number of patients (5,6).

Most of the data on the bronchoscopic management of BPF is based on case series or reports and small size retrospective studies. Hence, the management of BPE continues to depend on expertise and available resources at various centers (3).

Knowing that most BPF are difficult to manage; new therapeutic modalities are always important to investigate. In the paper by Han *et al.*, they presented a new kind of customized airways stents for placement based on the location of the fistula. Interestingly, their cohort included a large number of patients. They included 148 patients with BPF who underwent airway management using the customized self-expandable hybrid stents. Prior to each operation, the stents were customized based on the

location of the BPF and this was based on data collected from computed tomography (CT), bronchoscopy and airway radiography. The highlight of the customized stents was what the authors called the “bullet head”, which is the occluded part of the stent. The bullet head of the stent intends to occlude the fistula. For optimization, the diameter of the stent was made about 15–20% larger than the corresponding airway. Remarkably, the procedure was performed by interventional radiology and under moderate sedation. The primary outcome of the study was the technical success and the cure rate, which was defined as the disappearance of the residual pleural cavity and removal of the chest tube and airway stent.

The median time from lung resection to the BPF was 38 days. Seventy percent of the patient had pneumonectomy and the rest of the patients had a lobectomy. In 143 patients (96.6%) the procedure resulted in technical success from the first attempt with complete fistula occlusion. For the other five patients, repeated procedures using different size or type of the customized stents led to complete occlusions of the fistulae. Five patients died within 30 days of the procedure from infectious complications and poor general health.

Although self-expandable customized stents were technically successful in almost all patients, there was no strong correlation between technical and clinical outcomes as most patients died during medium and long term follow up (1). This is because of the general health status of these patients who already had lung resection followed by complications such as BPF and the infectious complications associated with it.

There is no evidence in the literature regarding the timing of intervention which could be the key to the favorable outcome. Conventionally therapy is not usually effective in managing post lobectomy or pneumonectomy BPF and may delay intervention and results in worsening of the patients’ general health status. Whether early intervention to close the BPF immediately after diagnosis affects outcome remains to be determined. Bronchoscopic intervention carries low procedure-related risks.

The stents used by Han *et al.* were highly customized which make it unpractical for routine use worldwide. In contrast to the silicone stents which can be customized by the proceduralists intraoperatively (7). Authors have customized silicone stents for use for airway diseases including for BPF. The silicone stents are usually cheaper than the metallic stents and they are widely available (8). Customizing a self-expandable hybrid is not available in

many placed including at my institution and will be costly when available and is probably time-consuming causing delays in intervention.

The authors did not detail the bronchoscopy procedures and why the stents were placed using fluoroscopy and water-based dye if bronchoscopy was available to place the stents under direct visualization. Bronchoscopy remains the gold standard technique for airway stenting. It allows the proceduralists to better evaluate the airways and permits the performance of other concurrent airway interventions if needed (8,9).

Interestingly, the authors described airway measurements based on airway radiography using water-soluble contrast injected via a catheter. Bronchoscopy and chest CT imaging has been widely used to evaluate the size of the airways (10). Airway radiography has been rarely used for this purpose and lacks significant supportive data in the literature. Since computed tomography continues to advance, more detailed and thin images are available with different reformation techniques such as the coronal minimum-intensity-projection CT reformation and the 3D reconstruction images (11). Using contrast to image the airways is not practical and probably does not add any valuable data.

In conclusion, the cohort published by Han *et al.* provides another minimally invasive technique to manage a very challenging medical condition. The use of customized self-expandable hybrid stents seems to be an effective modality to manage BPF. The drawback is that customization of these stents is not widely available and will probably increase the cost of the already expansive self-expandable airway stents. Data comparing the available modalities is lacking and prospective studies are warranted.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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