Postoperative bronchopleural fistula: Does one size fit all?

Bronchopleural fistula (BPF) is an abnormal communication between the major, lobar, or segmental bronchi and the pleural cavity. BPFs are most commonly observed following lung surgeries, whereas trauma, lung abscess, and radiation therapy are less common causes. The incidence of postoperative BPF varies from 0.5% to as high as 20% and depends on several factors.[1-3] BPF has been observed more frequently, following pneumonectomies (than lobectomy or segmentectomy, 14.3 vs. 1.4%, respectively, in a recent series[4]), right-sided surgeries (than left), prior chemotherapy or mediastinal irradiation, and in those with coexisting illness (diabetes mellitus, chronic obstructive pulmonary disease, and malnutrition). Apart from the nature of surgery (right vs. left, pneumonectomy vs. lobectomy), several other factors such as the length of the bronchial stump, closure technique (manual vs. stapler), and employing pericardial fat or omentum to augment the bronchial stump might influence the development of BPF following surgery.[5] Postoperative BPF may be early or late (usually defined as >30 days) and can present as empyema, tension pneumothorax, an air leak in chest drain (new or persistent), or as a reduction in the fluid level on serial chest radiograph.[1,2]

Conventionally, surgical therapy has been considered as the cornerstone of treating BPF.[5-7] However, contemporary literature suggests that nonsurgical management with or without bronchoscopic therapies may be a reasonable treatment option, especially in those with small BPF.[3,4,8,9] Further, many patients with postoperative BPF may not be suitable for immediate surgery in view of infection and associated morbidity. In such situations, bronchoscopic modalities may act as a bridge to definitive surgical management.[10-12]

In the current issue, Marwah *et al*. describe a series of 11 patients who underwent bronchoscopic device closure of postoperative BPF.[13] A majority (n = 9, 81.8%) of the patients had undergone lung resection for tuberculosis or its sequelae. The bronchoscopic intervention was noted to have a successful long-term outcome in 9 (81.8%) of the 11 patients (median follow-up duration of 24 months [range, 6–24 months]).

This case series highlights the utility of bronchoscopic intervention in carefully selected patients with postoperative BPF before subjecting them to a redo surgery, which is generally associated with considerable morbidity and mortality.[7] The study is especially pertinent to developing countries like India, where tuberculosis is a common indication for lung resection. In contrast, lung cancer is the most common indication for lung resection in the developed world.[4,8] The rate of BPF following surgery for tuberculosis appears to be higher than that of lung cancer surgeries.[9,14] Unlike patients with early-stage lung cancer who are better preserved, patients with tuberculosis usually have a longer duration of illness and are often malnourished. Besides, patients with sequelae of tuberculosis often harbor bacteria or fungi. These factors might result in an increased risk of postoperative complications or may even preclude a redo surgery.

While the current case series does provide an optimistic view of the bronchoscopic interventions for BPF, several other factors also need to be considered before interpreting the results. The retrospective data in this study were collected over 10 years and are subject to selection bias. The bronchoscopic procedures were performed by skilled interventional pulmonologists with considerable experience in the use of occlusive devices and stents. All the procedures reported in this study were successfully performed with flexible bronchoscopy. However, proficiency in rigid bronchoscopy is likely to provide additional confidence to the interventionist. For instance, unexpected complications such as a malpositioned stent or occlusive device may be managed more readily using rigid bronchoscopy rather than flexible bronchoscopy. Finally, whether bronchoscopic intervention is indicated in all patients of BPF or should be the first-line treatment is also not clear. Several recent case series [Table 1] have indicated that a significant proportion of patients with BPF may improve with conservative management alone, especially when the BPF is small.[3,9,15,16] Even in the current study, six patients had a BPF size of ≤5 mm. Whether these patients could have been successfully managed with conservative management is still uncertain.

In conclusion, the management of BPF must be individualized. A "one size fits all" approach cannot be advocated. In general, a large and early postoperative BPF in a patient with a good general condition should be surgically managed. In poor surgical candidates or those with a small BPF, conservative management with antibiotics and chest tube drainage may be tried for a brief period. In those with persistent BPF and at risk for complications during surgery, bronchoscopic procedures may serve as a bridge to definitive surgical treatment. The current study provides assurance that in carefully selected cases of postoperative BPF, bronchoscopic techniques may yield satisfactory outcomes without a redo surgery in those unfit for surgery. More data are required on the long-term results of bronchoscopic therapies in postoperative BPF.

Table 1: Summary of a few large series published in the last five years, describing the various treatment modalities for managing postoperative bronchopleural fistula

Reference	Study population	Number of patients with BPF, *n* (%)	Management	Details of bronchoscopic procedures	Success rate	Remarks
Cardillo *et al*. 2015[8]	3832 patients who underwent lung resection, predominantly (91%) for malignancy (lobectomy 3651, pneumonectomy 181) (retrospective data between 2001 and 2013)	52 (1.4)	Bronchoscopic therapy (*n*=35) Surgical therapy (*n*=17)	≤2 mm: Managed with mechanical abrasion 2-3 mm: Treated with submucosal injection of sclerosant 3-6 mm: Managed with endobronchial glue >6 mm: Managed with rigid bronchoscopy with spigots/coils or hybrid procedures	Bronchoscopic therapy 80%; surgery 88% BPF following lobectomy had a better success rate with Bronchoscopy (86%) as compared to postpneumonectomy BPF (63%)	Majority of BPFs ≤6 mm successfully managed with bronchoscopic therapies Whether small BPFs could have improved with conservative management remains uncertain
Fuso *et al*. 2016[4]	835 patients who underwent lung resection, predominantly (99%) for lung cancer (lobectomy 786, pneumonectomy 49) (Retrospective data between 2003 and 2013)	18 (2.2)	Conservative therapy with chest tube drainage alone (*n*=7) Bronchoscopic therapy and chest tube drainage (*n*=9)	Endobronchial glue application (*n*=9)	-	In four of the nine patients managed with bronchoscopy, a repeat procedure to instill glue was required as the first one failed
Gursoy *et al*. 2018[9]	436 patients who underwent pneumonectomy for lung cancer (retrospective data between 2000 and 2017)	47 (10.8)	Conservative therapy (antibiotics with or without drainage) (*n*=33) Bronchoscopic therapy (*n*=8) Surgical therapy (*n*=6)	Endobronchial glue application (*n*=7) Endobronchial stent (*n*=1)	Conservative therapy: 36% Bronchoscopic therapy: 75% Surgery: 83.3%	Right pneumonectomy and history of tuberculosis were associated with increased risk of BPF
Mazzella *et al*. 2018[3]	733 patients who underwent pneumonectomy for lung cancer (retrospective data between 1999 and 2014)	60 (8.2)	Surgical therapy: All early BPFs (<14 days of surgery) (*n*=14) were managed with surgery Late BPFs (14 days or more) (*n*=46) were managed initially with conservative therapy (chest tube and pleural cavity irrigation with iodopovidone). In 15 (32.6%) patients, BPF healed with conservative management alone. Six patients required bronchoscopy subsequently, which yielded a successful result in four patients. All others (*n*=27) had to undergo open window thoracostomy	Endobronchial glue application (*n*=3) Endobronchial stenting Bronchopleural fistula (*n*=2) Endobronchial application of sclerosant (*n*=1)	Surgery for early BPF: 100% Conservative therapy for late BPF: 33% Bronchoscopic therapy for late BPF: 67%	The 30 days mortality and median hospital stay was similar in all three management categories

BPFs: Bronchopleural fistulas

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