UDC 616.23/25-007.253-089.83/.84:615.472
DOI http://doi.org/10.30978/GS-2026-2-46

ISSN 2786-5584 print
ISSN 2786-5592 online

Amplatzer occluder closure of postoperative bronchopleural fistula: a three-case series

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Bronchopleural fistula (BPF) remains one of the most feared complications after major thoracic surgery because it is associated with prolonged hospitalization, empyema, respiratory failure, and substantial mortality. In selected patients, bronchoscopic closure with cardiac occlusion devices originally developed for closure of septal defects may offer a minimally invasive alternative to repeat surgery.

Case presentation. We report three patients with postoperative BPF treated with an Amplatzer occluder. Case 1 developed bronchial stump insufficiency in the setting of chronic pleural empyema years after right upper lobectomy. The placement of a bronchoscopic occluder resulted in adequate occlusion of the BPF for 3 months following the procedure. Case 2, a multimorbid patient with squamous cell carcinoma, developed an early post-lobectomy BPF. Multiple prior interventions, including re-thoracotomy and segmental endobronchial valve treatment, provided only temporary control. Subsequent occluder placement at a newly identified stump fistula achieved only transient closure, and the patient passed away later from cardiorenal multiorgan failure under palliative conditions. Case 3 developed recurrent empyema secondary to bronchial stump insufficiency after right pneumonectomy. Initial bronchoscopic placement of the occluder was technically unsuccessful because of pronounced lateral angulation of the fistula. Definitive closure was achieved using a combined video-assisted thoracoscopic surgery (VATS)-guided and bronchoscopic-assisted occluder implantation with adjunctive fibrin glue installation.

Conclusions. Amplatzer occluder placement is a feasible minimally invasive option for selected postoperative BPFs. Successful treatment depends not only on fistula size, but also on anatomy, angulation, local infection control, and the patient's global physiological reserve. In anatomically complex fistulas with pronounced angulation, a hybrid VATS-guided and bronchoscopic-assisted approach may enable successful occluder implantation when purely bronchoscopic placement is not feasible.

Keywords
bronchopleural fistula, Amplatzer occluder, bronchoscopy, pneumonectomy, empyema, thoracic surgery.

ARTICLE • Received 2026-03-15 • Received in revised form 2026-04-18 • Published 2026-05-31

Bronchopleural fistula (BPF) is a pathological communication between the tracheobronchial tree and the pleural space. Although uncommon, it is a devastating complication after lung resection, particularly after pneumonectomy, where the consequences may include persistent air leak, contamination of the pleural cavity, aspiration of infected material into the contralateral lung, systemic sepsis, and death [15, 22]. The management of postoperative BPF remains challenging because treatment must simultaneously address the fistulous tract, pleural sepsis, bronchial stump integrity, and the patient's cardiopulmonary reserve [11, 13].

Traditional management strategies include chest drainage, antibiotic therapy, stump revision, muscle flap reinforcement, open-window thoracostomy, and completion surgical procedures [15, 17, 22]. However, many patients are poor candidates for operative management because they are frail, multimorbid, anatomically complex, or have already undergone several prior procedures. Consequently, bronchoscopic interventions have gained increasing attention as less invasive alternatives or bridging therapies [7, 8]. Reported endoscopic options include installation of tissue glues, blood patch, coils, spigots, endobronchial valves, covered stents, and cardiac septal or vascular occluder devices [7, 8].

Among these, the Amplatzer Occluder, originally developed for transcatheter closure of intracardiac defects such as atrial septal defects, ventricular septal defects, and patent ductus arteriosus, is particularly suitable for central postoperative fistulas, as its self-expanding nitinol mesh and dual-disc configuration anchor across the defect, ensuring immediate mechanical occlusion while allowing formation of secondary granulation tissue [2, 3, 5]. Nevertheless, evidence remains limited mainly to case reports and retrospective series (Table), and technical success appears highly dependent on fistula size, morphology, and local infectious conditions.

Here, we present three postoperative BPF cases managed with Amplatzer occluder devices (Abbott, USA; device sizes ranging from 18 mm in case 3 to 25 mm in cases 1 and 2), including the use of a multi-fenestrated septal occluder in case 3. Case 3 required a hybrid video-assisted thoracoscopic surgery (VATS)-guided and bronchoscopic-assisted approach. These cases illustrate the heterogeneity of BPF presentation, the opportunities and limitations of occluder therapy, and practical procedural considerations for patient selection.

Case presentation

Case 1

A 54-year-old patient with chronic right-sided pleural empyema after right upper lobectomy for lung cancer in 2015 and a long-standing thoracic window since 2016 was admitted in June 2024 for bronchoscopic evaluation and secretion management. His course was complicated by chronic infection, recurrent hemoptysis, chronic wound secretion from the thoracic window, and suspected aspergilloma of the left upper lobe.

Bronchoscopy revealed a large fistulous communication between the right thoracic window and the right upper lobe bronchial stump, which was passable with the endoscope. Given the complex postoperative anatomy, chronic infectious situation, and high surgical risk, bronchoscopic closure was chosen. In June 2024, the fistula was closed bronchoscopically using an Amplatzer device deployed in the right upper lobe bronchial stump.

The intervention was technically successful (Fig. 1). Endoscopic control demonstrated stable deployment of the occluder across the fistulous opening. Post-procedural chest CT (Fig. 2) confirmed stable device positioning. During follow-up, the patient remained clinically stable. At 3 months, there was no evidence of fistula recurrence on chest X-ray or clinically, no signs for infection, and no radiological evidence of device migration. The patient reportedly died at home several months later, without documented evidence of device-related complications.

Case 2

A multimorbid patient with squamous cell carcinoma of the lung underwent right upper lobectomy in 2019 and developed an immediate postoperative BPF. Because of a persistent postoperative parenchymal air leak despite chest tube suction therapy, physiotherapy, and respiratory therapy, re-thoracotomy with atypical wedge resection of segment 8, parenchymal sutures, and TachoSil application was performed, but this resulted only in temporary improvement.

Subsequently, the leaking segment was localized bronchoscopically by balloon occlusion, and a 7-mm Spiration intrabronchial valve (IBV; Olympus Respiratory America, USA) was implanted into the superior segment of the right lower lobe bronchus (RB6) in February 2019 (Fig. 3). This resulted in immediate reduction of the air leak. In March 2023, bronchoscopy demonstrated a new large BPF at the right upper lobe bronchial stump (Fig. 4). The previously implanted RB6 valve was surrounded by purulent secretions and granulation tissue and was therefore explanted, without evidence of recurrent fistula at the RB6 site. Subsequently, an Amplatzer occluder was implanted for closure of the fistula between the right upper lobe bronchial stump and the thoracic cavity (Fig. 5). However, the fistula recurred after approximately three weeks. The patient had severe comorbidities, including end-stage COPD with chronic respiratory insufficiency, severe cardiac decompensation with moderately to severely reduced left ventricular function, hypercapnic respiratory failure, and persistent BPF requiring chest drainage. The patient died in April 2023 during palliative inpatient care due to progressive multiorgan failure related to advanced underlying

Table. **Summary of published reports on Amplatzer occluder–based closure of postoperative bronchopleural fistula**

Year	Authors	Study type, number of patients	Postoperative setting	Device	Main message/outcome
2008	M. R. Kramer et al. [9]	Case series, 2 patients	Postpneumonectomy BPF	Amplatzer ASD occluder	Early proof-of-concept paper: described a novel bronchoscopic technique for postpneumonectomy BPF; both cases were treated with Amplatzer occluder placement
2009	I. Gulkarov et al. [6]	Case report, 1 patient	BPF after right completion pneumonectomy	Amplatzer septal occluder + BioGlue	A 68-year-old man with a 3-mm bronchial stump fistula was treated through an Eloesser window; the device helped achieve seal and facilitated ventilator weaning
2009	M. L. Tedde et al. [23]	Case report, 1 patient	Total postoperative BPF	Occlutech Figulla ASD N device	Demonstrated endobronchial closure of a large/total postoperative BPF with a cardiac septal occluder-type device
2011	O. Fruchter et al. [4]	Case series + literature review, 10 patients/11 BPFs	Post-lobectomy/ post-pneumonectomy	Amplatzer devices	Largest early series: 9 of 10 patients had successful closure with disappearance of BPF-related symptoms; results were maintained over a median 9-month follow-up
2011	E. Passera et al. [19]	Case report, 1 patient	Lower bilobectomy complicated by large BPF + empyema	Amplatzer device + VAC therapy	Combined endobronchial Amplatzer closure with vacuum-assisted closure for infected postoperative BPF/empyema
2012	O. Fruchter et al. [2]	Case series	Postoperative BPFs too small for standard Amplatzer disks	Amplatzer vascular plug (AVP)	Important extension of the technique: first series specifically using AVP for smaller postoperative BPFs
2012	M. Krumpolcova et al. [10]	Case report, 1 patient	Postoperative BPF	Amplatzer PFO device	Showed that a PFO occluder could also be used for postoperative BPF closure
2013	A. Ottevaere et al. [18]	Case report, 1 patient	Large BPF after lobectomy for stage I squamous cell carcinoma	Amplatzer device	Reported successful endoscopic closure in a patient considered surgically inoperable
2014	V. Marwah et al. [14]	Case report, 1 patient	Chronic postoperative BPF	Atrial septal occluder	Described chronic postoperative BPF closure with a less invasive bronchoscopic ASD occluder approach
2015	L. V. Klotz et al. [8]	Case series, 3 patients	2 after right lower lobectomy, 1 after right pneumonectomy	Amplatzer device	All 3 patients were treated successfully; no recurrence of empyema/ BPF symptoms during median 22-month follow-up
2019	C. Poggi et al. [20]	Case report, 1 patient	Late BPF after right lower lobectomy	Atrial septal occluder	Closure succeeded after prior fibrin glue and endobronchial valve attempts failed; patient remained asymptomatic for 2 years
2020	I. Y. Motus et al. [16]	Retrospective series, 13 patients	BPF after pneumonectomy	Amplatzer ASD occluder	A larger postpneumonectomy series aimed to confirm that the ASD Amplatzer device can be used in properly selected patients

Table (Continued)

Year	Authors	Study type, number of patients	Postoperative setting	Device	Main message/outcome
2021	Y. Wu et al. [25]	Two case reports, 2 patients	BPF with chronic empyema after lobectomy	Amplatzer device + pedicled muscle flap	Hybrid approach; authors concluded the combination seemed safe and effective
2021	Y. Bai et al. [1]	Case series, 10 consecutive patients	Post-pneumonectomy or lobectomy BPF	VSD occluder	100 % technical success, 70 % complete closure during follow-up, and no complications reported
2023	V. Leivaditis et al. [12]	Case report + literature review, 1 patient	Bronchial stump insufficiency/postoperative BPF	Amplatzer duct occluder	Modern report showing continued use of Amplatzer-family devices beyond ASD/PFO designs
2024	E. Gershman et al. [5]	Retrospective cohort, 72 patients / 83 devices	Mostly after pneumonectomy (40.3 %) and lobectomy (33.3 %)	Amplatzer occluders	Largest series I found: no procedural or immediate postprocedural complications/deaths; at 6 months, 7 removals (8.4 %) and 11 fistula-related deaths (15.3 %)
2025	Y. Vincent et al. [24]	Failure case report, 1 patient	Chronic BPF after right pneumonectomy	Prior Amplatzer closure had failed	Useful cautionary report: failed Amplatzer closure was associated with chronic pyothorax and very complex salvage surgery

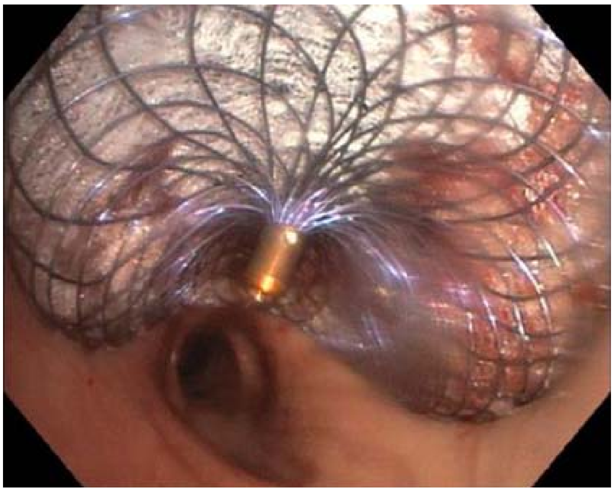

Figure 1. **Amplatzer occluder placed bronchoscopically (Case 1)**

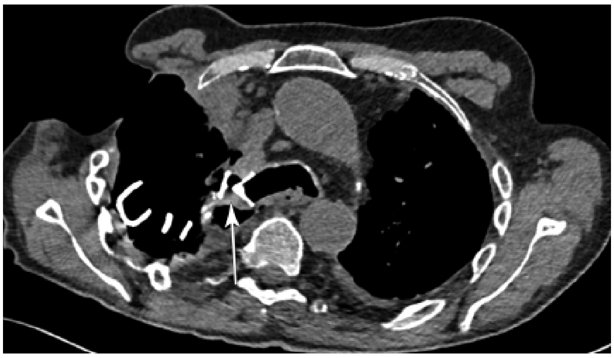

Figure 2. **Post-procedural chest CT confirming correct positioning of the Amplatzer occluder in the right upper lobe bronchial stump (Case 1)**

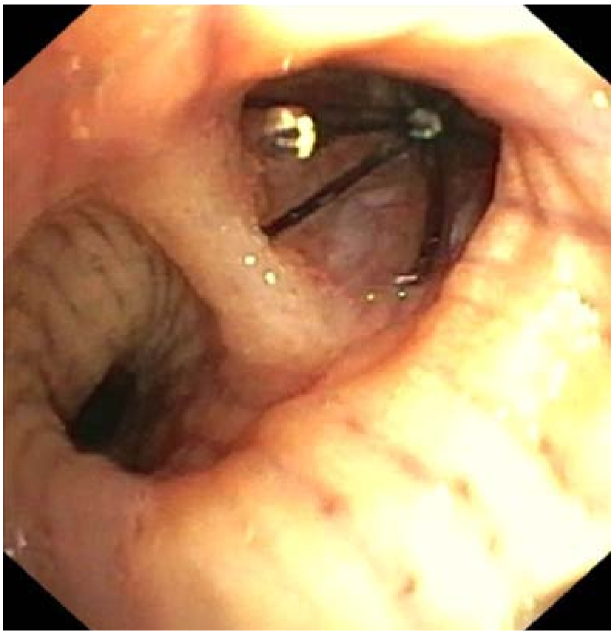

Figure 3. **Bronchoscopic view of IBV implantation into RB6 for treatment of persistent postoperative air leak (Case 2)**

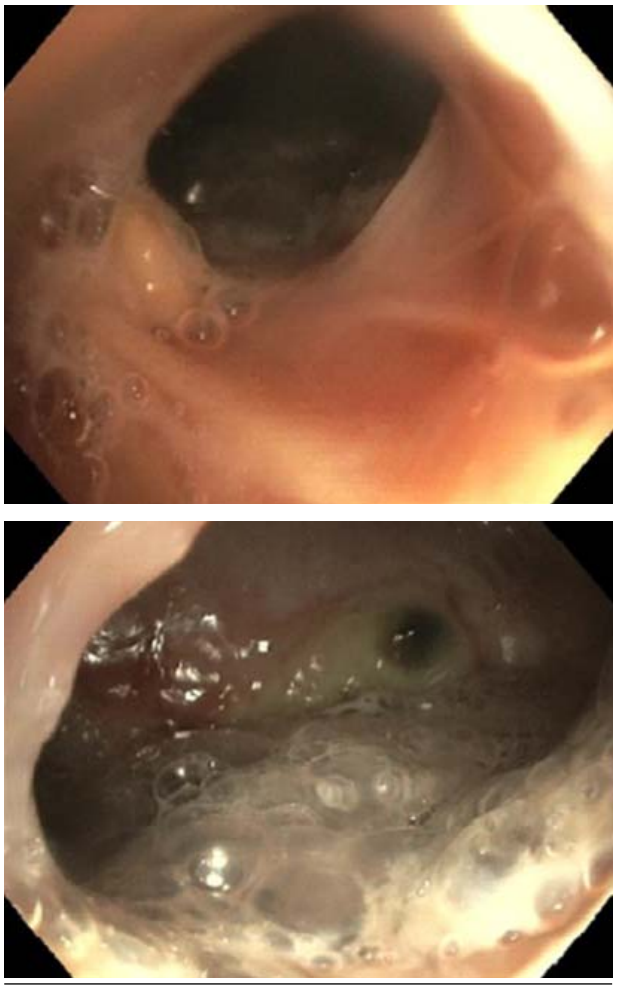

Figure 4. **Bronchoscopic views demonstrating a large bronchopleural fistula at the right upper lobe bronchial stump (Case 2)**

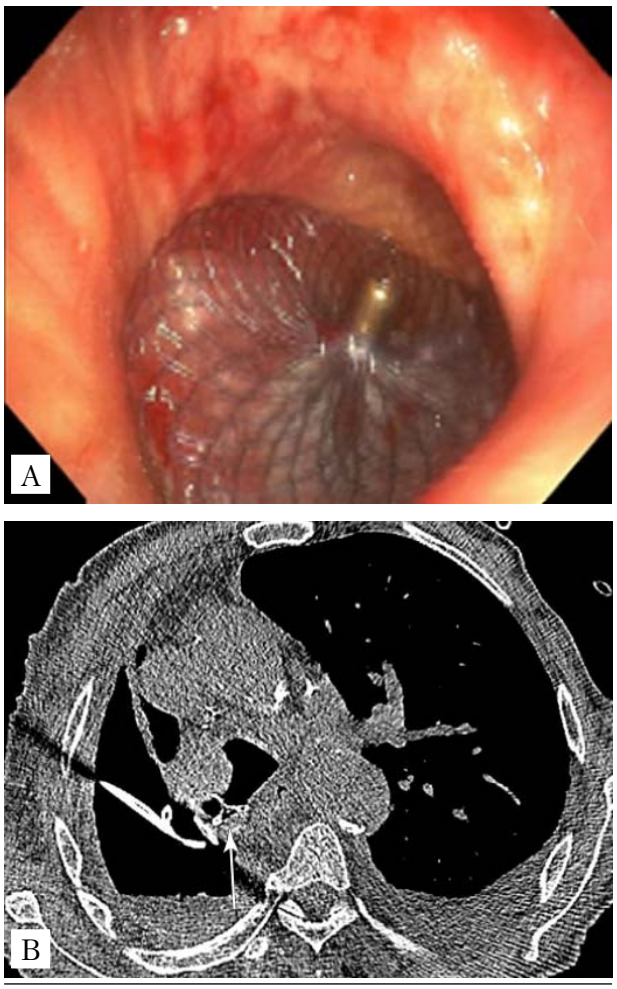

Figure 5. **Bronchoscopic view (A) and CT scan (B) demonstrating Amplatzer occluder placement at the bronchopleural fistula of the right upper lobe bronchial stump with chest drainage for seropneumothorax (Case 2)**

disease. Although death was not directly attributable to the device procedure itself, this case highlights that anatomical closure alone may be insufficient to stabilize the patient when the underlying physiological reserve is profoundly limited and disease burden is advanced.

Case 3

A patient underwent right pneumonectomy in 2014 for squamous cell carcinoma of the lung. In 2022, recurrent empyema developed secondary to bronchial stump insufficiency. Given the chronic post-pneumonectomy anatomy, pleural empyema, underlying pleural carcinomatosis, and a prior unsuccessful fistula repair, redo surgery was considered high risk, and a minimally invasive approach was preferred. Prior to bronchoscopic intervention, a PleurX® catheter was inserted for pleural space drainage and management of the chronic seropneumothorax. Initial bronchoscopic occluder placement was technically unsuccessful because pronounced lateral angulation of the fistula (Fig. 6) prevented stable device deployment.

In January 2025, the patient underwent a combined VATS-guided and bronchoscopic-assisted procedure. Under thoracoscopic guidance and endoscopic visualization, the Amplatzer occluder was advanced and deployed with improved directional control (Fig. 7). Fibrin glue was additionally applied to augment sealing. One week later, bronchoscopy confirmed a correct device position, although sealing remained incomplete; therefore, a second fibrin glue application was performed (Fig. 8). At 3-week follow-up, the patient was clinically stable and reported improved exercise tolerance without signs of recurrent infection. Follow-up CT imaging six weeks after implantation confirmed stable positioning of the Amplatzer occluder at the BPF

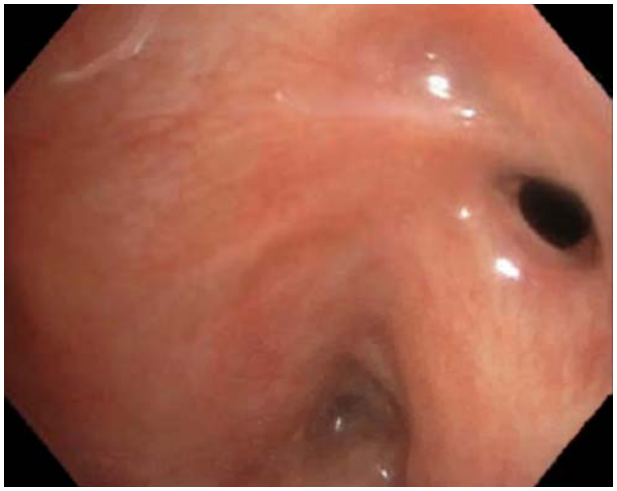

Figure 6. **Bronchoscopic view demonstrating pronounced lateral angulation of the bronchopleural fistula with unfavorable deployment axis for occluder implantation (Case 3)**

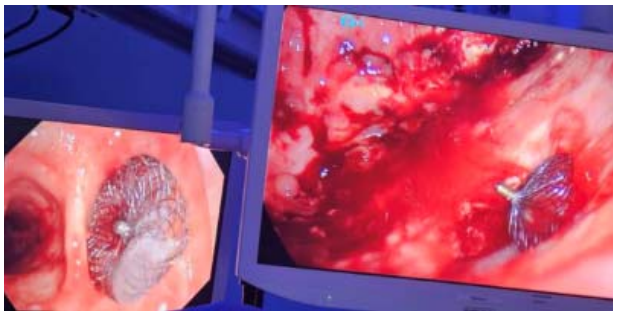

Figure 7. **Combined VATS-guided and bronchoscopic-assisted placement of an Amplatzer occluder in a patient with pronounced lateral angulation of the BPF (Case 3)**

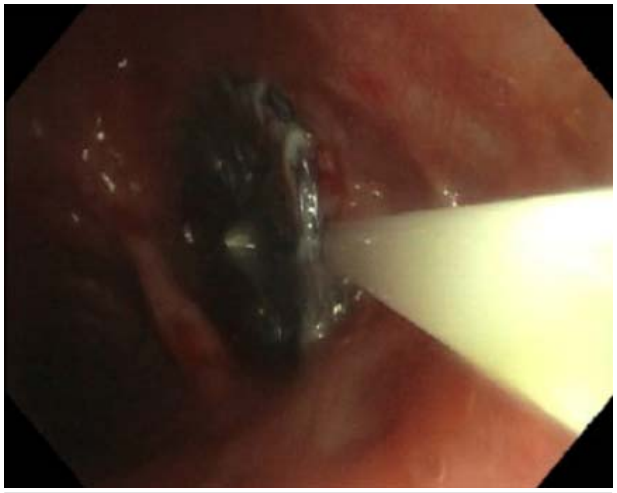

Figure 8. **Bronchoscopic view during adjunctive fibrin glue application after Amplatzer occluder implantation (Case 3)**

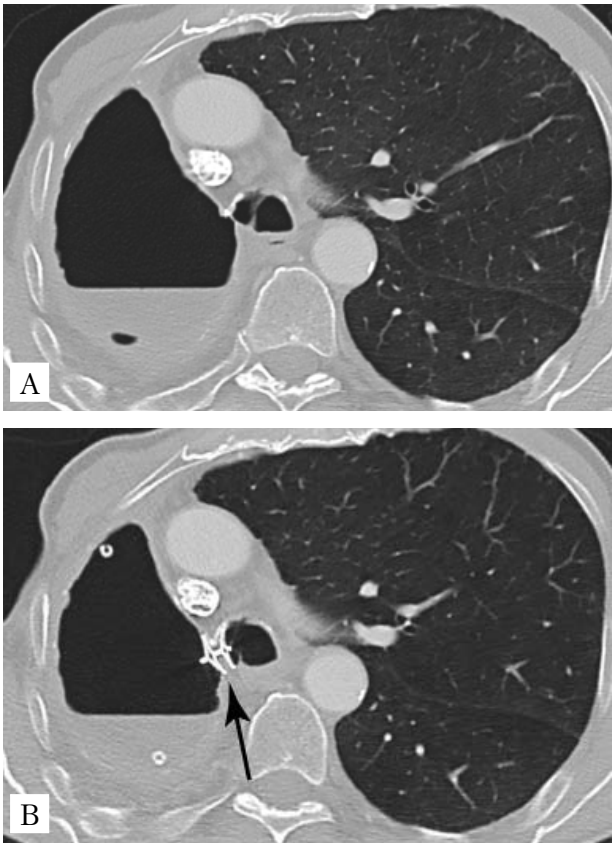

Figure 9. **Pre-interventional CT scan demonstrating a predominantly air-filled right post-pneumonectomy cavity with visible lateral bronchial stump insufficiency (A). Follow-up CT scan six weeks after Amplatzer occluder implantation demonstrating stable device positioning at the bronchopleural fistula with pleural drainage still in situ (B) (Case 3)**

Figure 10. **Radiographic follow-up after removal of the PleurX® catheter demonstrating stable positioning of the Amplatzer occluder (Case 3)**

with pleural drainage still *in situ* (Fig. 9). After four months, the PleurX® catheter was removed at the patient's request due to minimal drainage and after exclusion of a parenchymal fistula. Imaging follow-up with chest x-ray showed stable findings (Fig. 10).

Discussion

This three-case series underscores several clinically relevant aspects of postoperative BPF management. First, BPF is not a uniform entity. It encompasses a spectrum ranging from early catastrophic stump dehiscence after lung resection to late chronic fistulas associated with empyema and altered postoperative anatomy. Second, successful occluder therapy depends on more than the nominal diameter of the fistulous orifice. The geometry of the tract, the orientation of the stump, tissue quality, pleural infection control, prior interventions, and the patient's global condition all appear to influence outcome. Third, the present experience suggests that hybridization of techniques may be crucial when straightforward bronchoscopic access is prevented by anatomy.

The rationale for using an Amplatzer device in airway fistulas is conceptually strong. The occluder is made of self-expanding nitinol mesh and was originally designed for transcatheter closure of intracardiac defects such as atrial septal defects, ventricular septal defects, and patent ductus arteriosus. In the airway, this structure can provide immediate mechanical obstruction, create a scaffold for tissue ingrowth, and maintain its position by disc-to-disc anchoring across the fistula [2, 3, 5]. Compared with liquid sealants alone, the device offers more robust structural closure, particularly for central fistulas with a discrete opening and a rim that permits anchoring.

This principle is especially relevant in chronic postoperative BPF, where inflamed, fibrotic, or ischemic stump tissue may not respond predictably to glue alone. In such settings, the device may function as both a plug and a framework for subsequent biological sealing. The favorable result in Case 1 is consistent with this mechanism: despite the presence of chronic pleural pathology, once the occluder was stably positioned, durable short-term closure was achieved.

The available literature strongly suggests that endoscopic BPF treatment works best in selected patients [2, 3, 5, 8]. Smaller central fistulas with well-defined margins and controlled pleural contamination are the most suitable candidates. By contrast, large defects, extensive stump necrosis, uncontrolled empyema, and severe systemic illness reduce the probability of durable closure. Our cases reflect this gradient clearly.

Case 1 represented a relatively favorable technical substrate: the fistula could be accessed bronchoscopically, the device could be positioned stably, and follow-up confirmed persistence of closure. Case 2, in contrast, illustrates a scenario in which repeated local interventions were outpaced by the complexity of the underlying clinical situation. This patient had malignancy, multiple prior procedures, recurrent leakage, and severe comorbidity. Even though transient endoscopic control was possible at several stages, durable success was not obtained. This pattern is important because it reminds clinicians that technical feasibility does not necessarily translate into meaningful long-term clinical success.

In Case 3, the key limitation was not systemic fragility but anatomy. The marked lateral angulation of the fistula prevented an appropriate trajectory for standard bronchoscopic deployment. Once the procedural strategy was adapted and thoracoscopic guidance was added, device placement became feasible. This case therefore broadens the conceptual framework of «patient selection» to include «approach selection»: some patients may be acceptable candidates for occluder therapy, but only if the route of implantation is modified.

Several reviews and case series suggest that endoscopic BPF treatment should be tailored not only to fistula size, but also to localization, morphology, local infectious conditions, and the patient's clinical status [2, 3, 5, 7, 8, 11, 13, 21]. While fistula diameter remains an important determinant of device selection, our experience suggests that morphology may be equally relevant. A small but sharply angulated stump can be harder to treat than a somewhat larger but coaxial lesion. Similarly, a short irregular tract without a secure rim may predispose to device instability or incomplete apposition.

Our third case is particularly instructive in this regard. The initial bronchoscopic failure was not simply a failure of the device but a failure of procedural geometry. Once an alternative trajectory and direct thoracoscopic assistance were introduced, the same general device concept became viable. This observation suggests that reports focusing only on fistula diameter may underappreciate other determinants of success, such as axis alignment, bronchial stump mobility, pleural cavity access, and the ability to verify apposition from both luminal and pleural perspectives.

Several endoscopic modalities are available for BPF, each with specific advantages and limitations. Tissue glues and sealants are readily accessible and may be useful in very small fistulas, but durability can be limited in larger or high-flow defects. Endobronchial valves are particularly attractive when

the source of air leak can be localized to a segmental or subsegmental airway and when temporary reduction in airflow allows healing. Covered stents may be more suitable for selected central airway defects, especially if there is associated airway deformity, but they carry risks of migration, secretion retention, granulation, and patient intolerance.

Case 2 demonstrates that endobronchial valve therapy can produce immediate improvement when a leaking segment is clearly identified. However, it also illustrates the limitations of valve-based approaches in the context of evolving stump pathology. When the pathological anatomy shifted from a segmental leak to a stump fistula, a different strategy was required. This sequence reflects a practical principle: endoscopic BPF management is often dynamic, and the optimal device at one stage of the disease may not be optimal later.

The Amplatzer occluder occupies an important niche within this therapeutic spectrum. It may be particularly useful for central postoperative fistulas that are too large or too structurally defined for glue alone, but not amenable to or not desirable for major redo surgery. At the same time, occluder therapy should not be viewed as universally superior; rather, it is one element in a tailored interventional algorithm.

The unsuccessful course in Case 2 deserves special attention because negative outcomes often provide the most instructive lessons. Several factors may explain the limited durability of closure. First, repeated interventions suggest that the local tissue environment was biologically unstable, with ongoing inflammation, possible impaired vascularity, and mechanical stress on the stump. Second, the patient's multimorbidity likely reduced the capacity for tissue healing and recovery from recurrent septic and cardiopulmonary insults. Third, prior procedures may have altered anatomy in a way that limited ideal device seating or promoted recurrent dehiscence at adjacent sites.

Perhaps the most novel practical message of this series is the successful use of a combined VATS-guided and bronchoscopic-assisted technique in Case 3. Hybrid approaches are well established elsewhere in thoracic surgery and interventional pulmonology, but they are still infrequently described specifically for occluder placement in BPF. In anatomically difficult fistulas, thoracoscopic access can offer several advantages: direct visualization of the pleural side of the defect, assistance in orienting guidewires or delivery systems, confirmation of external disc deployment, management of the pleural cavity, and immediate adjunctive sealant application.

This approach may be especially valuable in post-pneumonectomy spaces, where distorted anatomy and large residual cavities can complicate purely endoluminal maneuvers. The hybrid strategy can therefore be seen not as a failure of bronchoscopy, but as an escalation within minimally invasive therapy designed to preserve the advantages of endoscopic closure while overcoming anatomical constraints.

Taken together, these cases suggest several practical lessons. First, Amplatzer occluder treatment should be considered early in selected patients with postoperative central BPF who are poor candidates for extensive surgical revision. Second, pre-procedural planning should include careful analysis of fistula morphology, not only size. Third, infection control and pleural drainage remain indispensable preconditions for durable success. Fourth, multimodal therapy is often necessary; valves, fibrin glue, thoracoscopy, and repeated bronchoscopic reassessment may all play complementary roles. Finally, outcome expectations should be individualized: in some patients, occluder implantation can achieve durable closure; in others, it may function as a bridge, a partial solution, or a palliative measure.

Limitations

This report has the limitations inherent to a retrospective case series. The number of patients is small, follow-up duration is heterogeneous, and treatment decisions were individualized rather than protocolized. Objective measurements such as exact fistula diameter, standardized symptom scores, microbiological outcomes, and long-term imaging data were not uniformly available in the abstract-based dataset. In addition, the series includes both successful and unsuccessful outcomes across markedly different clinical contexts, which limits generalizability but also reflects real-world practice. Nevertheless, the heterogeneity itself is informative because it highlights the need for patient-specific procedural planning rather than a one-size-fits-all algorithm.

Conclusions

Amplatzer occluder implantation is a valuable minimally invasive option for selected postoperative BPF. Durable success is most likely when there is a well-defined central defect, adequate device anchoring, and controlled pleural infection. Failure is more likely in the presence of hostile tissue biology, recurrent stump breakdown, or profound systemic frailty. In anatomically challenging fistulas, especially those with marked angulation after pneumonectomy, a hybrid VATS-guided and bronchoscopic-assisted strategy may permit successful implantation when a purely bronchoscopic approach is not feasible.

Declaration of interests

OP received educational and travel support (CME-related) from CSL Behring and Boehringer Ingelheim, as well as speaker honoraria and travel expenses from Sanofi-Aventis Deutschland GmbH.

JB reports consulting activity for Boehringer Ingelheim, Intuitive Surgical and Erbe. She has received honoraria for lectures from Boehringer Ingelheim, streamed up!, Berlin Chemie, Pulmonx, Olympus, Astra zeneca. She receives support for research from Thoraxstiftung Heidelberg, Beatrice von Hardenberg Stiftung, Günther-Labes and Helene-Heim-Stiftung. All activities are outside the submitted work.

KK reports honoraria for lectures from Astra Zeneca, BRONCUS, ERBE, Olympus medical, Pulmonx and consulting activity for COOK Medical.

The results of this work were partially presented at ECBIP (European Congress for Bronchology and Interventional Pulmonology) 8–10 May 2025.

Ethics approval and written informed consent statements

The study was conducted in accordance with institutional standards and the Declaration of Helsinki.

Authors contributions

Conception and design: O. Prokopchuk, K. Kontogianni; acquisition of data: O. Prokopchuk, P. Wolf, S. Weinert, F. Eichhorn, H. Winter, K. Kontogianni; drafting of the article: O. Prokopchuk; critical revision of the article: F. Eichhorn, H. Winter, J. Brock, F. Herth, K. Kontogianni.

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Закриття післяопераційної бронхоплевральної нориці оклюдером Amplatzer: серія із трьох клінічних випадків

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Бронхоплевральна нориця (БПН) залишається одним із найнебезпечніших ускладнень після великих торакальних операцій, оскільки вона асоціюється з тривалою госпіталізацією, емпіємою, дихальною недостатністю та високим рівнем смертності. У вибраних пацієнтів бронхоскопічне закриття нориці за допомогою пристроїв для оклюзії серця, розроблених для закриття дефектів міжпередсердної перегородки, може бути малоінвазивною альтернативою повторному хірургічному втручанню.

Опис випадків. Представлено три випадки пацієнтів із післяопераційною БПН, яким було проведено лікування за допомогою оклюдера Amplatzer. У першого пацієнта розвинулася недостатність бронхіальної кукси на тлі хронічної плевральної емпієми через роки після правобічної верхньої лобектомії. Установлення бронхоскопічного оклюдера забезпечило адекватну оклюзію БПН протягом 3 міс після процедури. Другий пацієнт, мультиморбідний хворий із плоскоклітинною карциномою, переніс ранню післялобектомічну БПН. Численні попередні втручання, зокрема реторакотомія та сегментарна ендобронхіальна клапанна терапія, дали змогу лише тимчасово контролювати стан. Установлення оклюдера в ділянці нориці кукси, виявленої повторно, забезпечило лише тимчасове закриття. Згодом пацієнт помер від кардіоренальної поліорганної недостатності в умовах надання паліативної допомоги. У третього пацієнта розвинулася рецидивна емпієма внаслідок недостатності кукси бронха після правобічної пневмонектомії. Первинне бронхоскопічне встановлення оклюдера було технічно невдалим через виразну латеральну ангуляцію (вигин) нориці. Остаточного закриття вдалося досягти за допомогою комбінованого підходу: імплантації оклюдера під відеоторакоскопічним і бронхоскопічним контролем із додатковим введенням фібринового клею.

Висновки. Установлення оклюдера Amplatzer є перспективним малоінвазійним варіантом лікування в деяких випадках післяопераційних БПН. Успішність лікування залежить не лише від розміру нориці, а й від анатомічних особливостей, ангуляції, локального контролю інфекції та загального фізіологічного резерву пацієнта. При анатомічно складних норицях із виразним вигином гібридний підхід під відеоторакоскопічним і бронхоскопічним контролем може забезпечити успішну імплантацію оклюдера, коли бронхоскопічне введення є неможливим.

Ключові слова: бронхоплевральна нориця, оклюдер Amplatzer, бронхоскопія, пневмонектомія, емпієма, торакальна хірургія.

FOR CITATION

Prokopchuk OL, Dittrich S, Wolf P, Weinert S, Eichhorn F, Winter H, Brock J, Herth F, Kontogianni K. Amplatzer occluder closure of postoperative bronchopleural fistula: a three-case series. General Surgery (Ukraine). 2026;(2):46-55. http://doi.org/10.30978/GS-2026-2-46.