Original Article

Prophylactic fiberoptic bronchoscopy after sleeve lobectomy can reduce the incidence of postoperative pneumonia: a propensity score matching study

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Background: Postoperative pneumonia (POP) predicts poor outcomes after lung surgery, especially for patients undergoing sleeve lobectomy. Fiberoptic bronchoscopy (FOB) is frequently used in the treatment of POP for patients receiving sleeve lobectomy. This study aimed to assess the effect of prophylactic FOB on the incidence of POP in these patients.

Methods: This is a single-center retrospective cohort study. Postoperative outcomes of patients who underwent sleeve lobectomy for central lung cancer from August 2005 to August 2020 in the West China Hospital were collected. The included patients were divided into two groups based on whether prophylactic FOB was performed, and the two groups were compared using propensity score matching (PSM).

Results: A total of 314 patients were included in this study. There were 166 patients in the aspirated group and 148 patients in the non-aspirated group. PSM resulted in 133 patients in each group. The aspirated group was associated with a lower incidence of POP (7.5% *vs.* 17.3%; P=0.03), shorter duration of antibiotic use (5.6±3.3 *vs.* 6.9±3.9 days; P=0.003), and shorter postoperative hospital stay (9.3±4.8 *vs.* 10.7±5.5 days; P=0.04).

Conclusions: Prophylactic FOB after sleeve lobectomy was associated with improved postoperative outcomes and might be recommended for patients undergoing sleeve lobectomy.

Keywords: Prophylactic fiberoptic bronchoscopy (prophylactic FOB); sleeve lobectomy; postoperative pneumonia (POP)

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Introduction

Postoperative pneumonia (POP), primarily caused by sputum retention due to cough weakness and increased airway secretions, is a common and dangerous complication after lung surgery (1-3). In central lung cancer, sleeve lobectomy has been shown to be an effective alternative to pneumonectomy, with improved postoperative lung function and quality of life, and achieving comparable oncological outcomes (4-6). However, compared to lobectomy or pneumonectomy, disruption of bronchial

blood supply and ciliary continuity during sleeve lobectomy may further inhibit airway clearance, leading to a higher risk of sputum retention and POP (7-9). These complications can progress to empyema, bronchopleural fistula (BPF), and acute respiratory distress syndrome (ARDS), ultimately leading to catastrophic outcomes (10).

Fiberoptic bronchoscopy (FOB), widely used in intensive care unit, can effectively promote the discharge of airway secretions in patients with severe pneumonia, helping to maintain airway opening and reduce respiratory distress symptoms (11,12). However, in patients following sleeve lobectomy, FOB is usually performed as a treatment for sputum retention after the onset of pneumonia. Therefore, we hypothesized that prophylactic FOB in patients after sleeve lobectomy may prevent sputum retention and POP. In this study, we aimed to collect, analyze, and compare data from patients who underwent sleeve lobectomy at our institution over 15 years. We will focus on postoperative complications, duration of antibiotic use, and postoperative hospital stay. We present this article in accordance with the STROBE reporting checklist (available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-1326/rc).

Methods

Ethical statement

Ethical approval for this study (No. 2022-175) was provided by the Ethics Committee on Biomedical Research, West China Hospital of Sichuan University, Chengdu, China on 29 January 2022. Informed consent was waived by our ethics committee because of the retrospective nature of this study. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The data were retrieved from the Western China Lung Cancer Database, which collected data of lung cancer patients who underwent surgery at the Department of Thoracic Surgery, West China Hospital, Sichuan University since August 2005.

Highlight box

Key findings

- Prophylactic fiberoptic bronchoscopy (FOB) after sleeve lobectomy is associated with a lower incidence of postoperative pneumonia (POP), shorter duration of antibiotic use, and shorter postoperative hospital stay.

What is known and what is new?

- FOB is frequently used in the treatment of POP for patients receiving sleeve lobectomy.
- Prophylactic FOB after sleeve lobectomy improves postoperative outcomes.

What is the implication, and what should change now?

- Prophylactic FOB may be recommended for patients undergoing sleeve lobectomy rather than when the patients develop pneumonia.

Study population

The flow diagram of patient selection is presented in *Figure 1*. Sleeve lobectomy was defined as cases where the bronchus invaded by the tumor was resected circumferentially, followed by end-to-end anastomosis. Consequently, cases of wedge bronchoplasty, in which only partial reconstruction of the bronchus was performed without circumferential dissection, were excluded. Furthermore, patients who underwent bronchoplasty without lobectomy, carinal pneumonectomy, bilobectomy, or sleeve lobectomy with extended resections of pericardiectomy, atrial resection, or chest wall resection were excluded. Cases with non-R0 resection or missing data were also excluded. All patients underwent preoperative pulmonary function test, bronchoscopy, bone scanning, and contrast-enhanced computed tomography scans of the chest, abdomen, and brain. Positron emission tomography or endobronchial ultrasound-guided transbronchial needle aspiration was carried out in patients with suspected mediastinal lymph node metastasis.

The detailed surgical technique for sleeve lobectomy has been described in our previous publications (13,14). Briefly, the pulmonary vessels and fissures were initially handled similarly to conventional thoracoscopic lobectomy, with the bronchus being treated finally. During the bronchus handling process, it was transected first with at least 0.5 centimeters proximal and distal margins confirmed to be tumor-free by the frozen section. Systematic dissection of mediastinal lymph nodes was usually completed before bronchial reconstruction to avoid unnecessary traction on the anastomosis. The inferior pulmonary ligament was released before the bronchial anastomosis to reduce anastomotic tension. End-to-end bronchial anastomoses were usually performed using a 3-0 Prolene running suture. The suture started at the deepest point of the posterior bronchial wall and ended at the midpoint of the anterior wall.

Prophylactic FOB was defined as the first postoperative

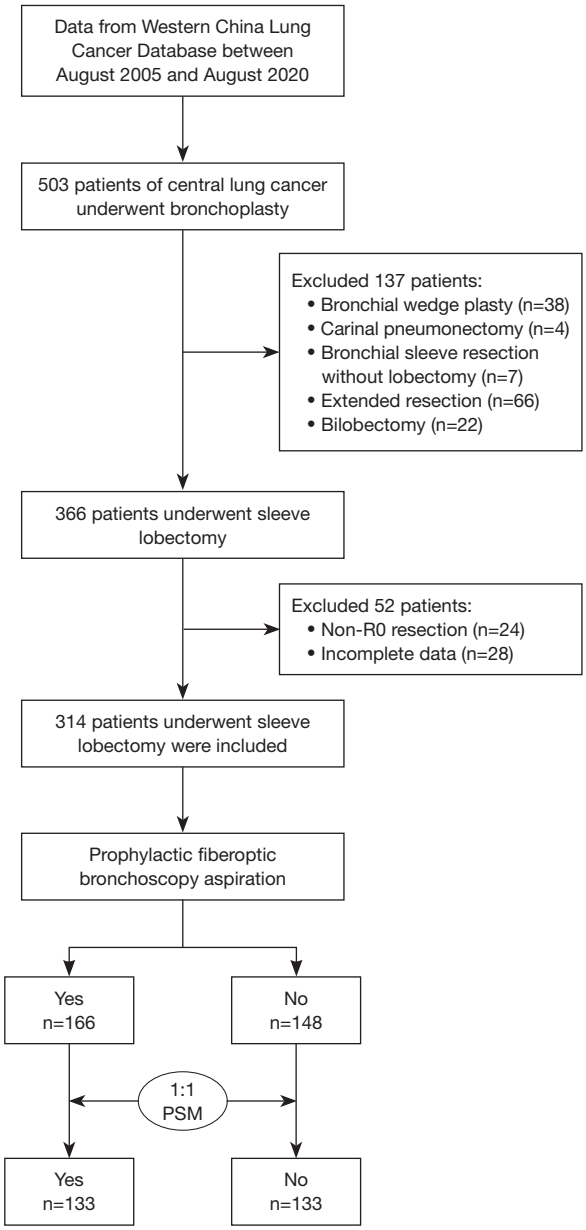

Figure 1 Flow diagram for the study cohort. PSM, propensity score matching.

day of FOB aspiration. Based on whether prophylactic FOB was performed, patients were divided into the aspirated group and the non-aspirated group. The medical data of patients were collected and reviewed, including demographics [age, sex, body mass index (BMI), smoking history, comorbidities, history of induction therapy], preoperative investigations (pulmonary function, laboratory examination), perioperative variables [surgical approach, angioplasty, additional pulmonary resection, blood loss, duration of surgery, pleural adhesion, residual tumor in the bronchial margin, histology, and pathological tumor-node-metastasis (pTNM) stage], and postoperative outcomes (mortality, reoperation, postoperative hospital stay, drainage duration, duration of antibiotic use and postoperative complications included pneumonia, BPF, empyema, prolonged air leakage, ARDS, postoperative bleeding, embolism, chylothorax, and arrhythmia). All tumors were restaged according to the 8th edition of the TNM system (15). Prolonged air leakage was defined as lasting more than seven days after surgery. Perioperative mortality was defined as death within 30 days of the operation. In this study, POP was defined using the Center for Disease Control guidelines (16,17). Patients who met the following criteria within 30 days after surgery were considered to have POP: (I) at least one sign of progressive infiltration, consolidation, or cavitation on chest radiograph, (II) at least one sign or symptom of fever, leukocytosis, or delirium, (III) at least two of these signs and symptoms, including sputum changes suggesting infection, worsening cough or dyspnea, bronchial breath sounds, or worsening gas exchange. For patients with suspected or confirmed POP, empirical antibiotics were initially used, and samples of sputum, blood, and pleural fluid were tested for pathogens and drug susceptibility, followed by the use of sensitive antibiotics based on these test results. In patients with POP, the frequency of FOB aspiration was increased. In cases of respiratory failure, non-invasive or invasive ventilator support was administered as needed. For patients with pneumonia progressing to empyema or BPF, reoperation was performed if necessary.

PSM

PSM was conducted to balance the baseline characteristics between the two groups. Cases were matched at a 1:1 ratio with a caliper size of 0.1 using SPSS. The variables used for matching included age, sex, BMI, forced expiratory volume in one second as a percentage of predicted, smoking history, Charlson comorbidity index (CCI), neoadjuvant therapy, T stage, N stage, pTNM stage, pathology, surgical approach, pulmonary angioplasty, tumor location, operation time, and blood loss.

Statistical analysis

Continuous variables were presented as mean ± standard

deviation or median (interquartile range). Categorical variables were shown as percentages. Categorical variables were compared by Chi-square test or Fisher's exact test. Continuous variables were compared by Student's *t*-test or Mann-Whitney *U* test. All analyses were performed using SPSS (IBM SPSS 27.0, SPSS Inc.) and R software (version 4.4.1). A P value <0.05 (two-tailed) was considered statistically significant.

Results

Study cohort

Between August 2005 and August 2020, 503 patients underwent bronchoplasty for central lung cancer in our institution. After excluding 137 cases without sleeve lobectomy, 24 cases with non-R0 resection, and 28 cases with incomplete data, 314 patients were finally included. There were 166 (52.9%) patients in the aspirated group and 148 (47.1%) patients in the non-aspirated group. The study patients consisted of 281 (89.5%) males and 33 (10.5%) females with a median age of 59 years. Fifty-five (17.5%) patients were never smokers, and 259 (82.5%) were former or current smokers. Before surgery, 20 (6.4%) patients underwent neoadjuvant therapy. Video-assisted thoracoscopic surgery was performed in 59 (18.8%) patients, and thoracotomy was performed in 255 (81.2%) patients. There were 117 (37.3%), 45 (14.3%), 145 (46.2%), 4 (1.3%), and 3 (1.0%) patients who underwent left upper lobectomy, left lower lobectomy, right upper lobectomy, right middle lobectomy, and right lower lobectomy, respectively. Pulmonary angioplasty was performed in 80 (25.5%) patients. The median duration of surgery was 200 minutes. The median blood loss was 120 mL. According to the 8th edition of TNM classification for lung cancer, there were 108 (34.4%), 109 (34.7%), and 97 (30.9%) patients in pTNM stage I, stage II, and stage III, respectively. Postoperative pathological results revealed 246 (78.3%) cases of squamous cell carcinoma, 65 (20.7%) cases of adenocarcinoma, and 3 (1.0%) cases of other types of tumors.

The baseline characteristics of patients before and after PSM are presented in *Table 1*. Compared to the non-aspirated group, the aspirated group had more comorbidities (CCI ≥1, 48.8% *vs.* 29.8%; P=0.006). The aspirated group also had more patients who underwent pulmonary arterioplasty (31.3% *vs.* 18.9%; P=0.02) and a longer operation time {205 [175, 245] *vs.* 192.5 [160, 225] minutes; P=0.01}. Squamous cell carcinoma and adenocarcinoma pathology were evenly distributed between the two groups. PSM resulted in 133 patients in each group, which were well-matched based on 16 potential prognostic factors.

Postoperative complications

Postoperative outcomes in patients with and without prophylactic FOB were compared, and the results are summarized in *Table 2*. The incidence of pneumonia was lower in the aspirated group (7.5% *vs.* 17.3%; P=0.03). Rates of BPF, empyema, ARDS, prolonged air leakage, postoperative bleeding, embolism, chylothorax, and arrhythmia were similar between the two groups. The higher incidence of pneumonia in the non-aspirated group was reflected in the significantly longer duration of antibiotic use (6.9±3.9 *vs.* 5.6±3.3 days; P=0.003) and longer postoperative hospital stay (10.7±5.5 *vs.* 9.3±4.8 days; P=0.04).

Discussion

In this retrospective study, we enrolled patients who underwent sleeve lobectomy for central lung cancer in our institution over 15 years. Then we divided them into two groups based on whether prophylactic FOB was performed on the first postoperative day and matched them on a propensity score. Our results demonstrated that prophylactic FOB on the first postoperative day was associated with a lower incidence of POP, shorter duration of antibiotic use, and shorter postoperative hospital stay. Early postoperative FOB can improve patient outcomes after sleeve lobectomy.

A comprehensive search of the existing literature did not yield similar studies on the effect of prophylactic FOB on postoperative complications of lung surgery. Our study explored the potential clinical value of prophylactic FOB after sleeve lobectomy. Wang *et al.* (18) conducted a prospective randomized clinical trial to explore the effect of early use of FOB aspiration and lavage after thoracoscopic laparoscopic esophageal cancer surgery. The results indicated that early FOB aspiration and lavage may help shorten patients' hospital stay and reduce medical expenses and the incidence of POP. These findings are consistent with our results. Despite the differences in surgical procedures between sleeve lobectomy and esophagectomy, there may be similarities in the

Table 1 Baseline characteristics of patients with and without prophylactic fiberoptic bronchoscopy

Variables	All patients (n=314)	Before PSM (n=314)			After PSM (n=266)		
		Aspirated group (n=166)	Non-aspirated group (n=148)	P	Aspirated group (n=133)	Non-aspirated group (n=133)	P
Age (years)	58.1±11.2	58.6±11.5	57.5±11.0	0.38	58.2±11.8	57.8±10.1	0.74
Sex				0.28			>0.99
Male	281 (89.5)	152 (91.6)	129 (87.2)		119 (89.5)	119 (89.5)	
Female	33 (10.5)	14 (8.4)	19 (12.8)		14 (10.5)	14 (10.5)	
BMI (kg/m^2)	23.4±3.6	23.5±3.5	23.3±3.7	0.68	23.3±3.5	23.3±3.6	0.81
FEV1% predicted	86.9±16.1	87.8±16.7	85.9±15.5	0.29	88.1±17.0	86.8±15.3	0.52
Smoking history				0.10			0.52
Never	55 (17.5)	23 (14.9)	32 (21.6)		21 (15.8)	26 (19.5)	
Ever	259 (82.5)	143 (86.1)	116 (78.4)		112 (84.2)	107 (80.5)	
CCI				0.006			0.55
0	189 (60.2)	85 (51.2)	104 (70.3)		78 (58.6)	89 (66.9)	
1	105 (33.4)	67 (40.4)	38 (25.7)		49 (36.8)	38 (28.6)	
2	15 (4.8)	10 (6.0)	5 (3.4)		5 (3.8)	5 (3.8)	
≥3	5 (1.6)	4 (2.4)	1 (0.7)		1 (0.8)	1 (0.8)	
Neoadjuvant therapy				0.07			0.41
Yes	20 (6.4)	15 (9.0)	5 (3.4)		9 (6.8)	5 (3.8)	
No	294 (93.6)	151 (91.0)	143 (96.6)		124 (93.2)	128 (96.2)	
T stage				0.11			0.82
1	42 (13.4)	17 (10.2)	25 (16.9)		17 (12.8)	19 (14.3)	
2	205 (65.3)	106 (63.9)	99 (66.9)		86 (64.7)	90 (67.7)	
3	34 (10.8)	22 (13.3)	12 (8.1)		16 (12.0)	12 (9.0)	
4	33 (10.5)	21 (12.7)	12 (8.1)		14 (10.5)	12 (9.0)	
N stage				0.33			0.89
0	151 (48.1)	76 (45.8)	75 (50.7)		66 (49.6)	67 (50.4)	
1	101 (32.2)	52 (31.3)	49 (33.1)		41 (30.8)	43 (32.3)	
2	62 (19.7)	38 (22.9)	24 (16.2)		26 (19.5)	23 (17.3)	
pTNM stage				0.31			0.97
I	108 (34.4)	52 (31.3)	56 (37.8)		46 (34.6)	48 (36.1)	
II	109 (34.7)	57 (34.3)	52 (35.1)		47 (35.3)	46 (34.6)	
III	97 (30.9)	57 (34.3)	40 (27.0)		40 (30.1)	39 (29.3)	
Pathology				0.44			0.71
Squamous cell carcinoma	246 (78.3)	134 (80.7)	112 (75.7)		107 (80.5)	104 (78.2)	
Adenocarcinoma	65 (20.7)	30 (18.1)	35 (23.6)		24 (18.0)	28 (21.1)	
Other	3 (1.0)	2 (1.2)	1 (0.7)		2 (1.5)	1 (0.8)	

Table 1 (*continued*)

Table 1 (*continued*)

Variables	All patients (n=314)	Before PSM (n=314)			After PSM (n=266)		
		Aspirated group (n=166)	Non-aspirated group (n=148)	P	Aspirated group (n=133)	Non-aspirated group (n=133)	P
Surgical approach				0.12			0.63
VATS	59 (18.8)	37 (22.3)	22 (14.9)		25 (18.8)	21 (15.8)	
Thoracotomy	255 (81.2)	129 (77.7)	126 (85.1)		108 (81.2)	112 (84.2)	
Pulmonary angioplasty				0.02			0.39
Yes	80 (25.5)	52 (31.3)	28 (18.9)		35 (26.3)	28 (21.1)	
No	234 (74.5)	114 (68.7)	120 (81.1)		98 (73.7)	105 (78.9)	
Tumor location				0.15			0.21
Left upper lobe	117 (37.3)	71 (42.8)	46 (31.1)		54 (40.6)	43 (32.3)	
Left lower lobe	45 (14.3)	19 (11.4)	26 (17.6)		16 (12.0)	24 (18.0)	
Right upper lobe	145 (46.2)	73 (44.0)	72 (48.6)		60 (45.1)	63 (47.4)	
Right middle lobe	4 (1.3)	1 (0.6)	3 (2.0)		1 (0.8)	3 (2.3)	
Right lower lobe	3 (1.0)	2 (1.2)	1 (0.7)		2 (1.5)	0 (0.0)	
Operation time (min)	200 [165, 240]	205 [175, 245]	192.5 [160, 225]	0.01	200 [170, 235]	200 [165, 230]	0.58
Blood loss (mL)	120 [100, 200]	130 [100, 200]	112.5 [95, 200]	0.41	120 [100, 200]	120 [100, 200]	0.74

Data are presented as n (%), mean ± SD or median [IQR]. PSM, propensity score matching; BMI, body mass index; FEV1, forced expiratory volume in 1 second; CCI, Charlson comorbidity index; pTNM, pathological tumor-node-metastasis; VATS, video-assisted thoracoscopic surgery; SD, standard deviation; IQR, interquartile range.

mechanism of postoperative sputum retention in patients undergoing both surgeries. This similarity partially supports the clinical application value of prophylactic FOB in patients undergoing sleeve lobectomy. However, the specific effects and indications of different surgical types may be different, and more studies are needed to further verify this conclusion.

After lung surgery, surgical pain and trauma to the chest wall inhibit coughing, while intraoperative blockade of the bronchial wound reduces the ciliary movement of the bronchial mucosa, both of which could lead to sputum retention (1,19). Sputum retention can result in pulmonary atelectasis, pneumonia, hypoxemia, and even respiratory failure. Previous literature has indicated that smoking, comorbid chronic obstructive pulmonary disease, and inadequate postoperative pain control are associated with sputum retention (1). In the early stage of sputum retention and airway obstruction, patients compensate by increasing the respiratory rate and receiving oxygen therapy, which may mask underlying changes in their condition. As small amounts of sputum retention are not radiographically significant, by the time they become apparent, most cases have progressed to pneumonia. There is limited literature on sputum retention after lung surgery, particularly after sleeve lobectomy. Although this condition is recognized, it is often regarded as insignificant, leading to the impression that it is easily treatable. However, in reality, the incidence of pneumonia after sleeve lobectomy can be as high as 7.7% to 18.6%, often attributable to poor sputum clearance (9,20,21). Therefore, prevention of sputum retention following sleeve lobectomy is essential. FOB has increasingly emerged as a valuable tool in clinical diagnostics and therapeutics. FOB can enter the lumen of fine bronchial tubes of 3–4 degrees, purposefully reach into the bronchial tubes with lesions, and aspirate foreign bodies and secretions. In cases of pulmonary atelectasis caused by sputum or blood crusts blocking bronchial tubes, FOB can quickly flush and aspirate to relieve airway obstruction (22). Previous studies on FOB have primarily focused on treating patients with severe pneumonia, demonstrating that

Table 2 Comparison of postoperative outcomes in patients with and without prophylactic fiberoptic bronchoscopy

Variables	All patients (n=314)	Before PSM (n=314)			After PSM (n=266)		
		Aspirated group (n=166)	Non-aspirated group (n=148)	P	Aspirated group (n=133)	Non-aspirated group (n=133)	P
Mortality within 30 days	5 (1.6)	3 (1.8)	2 (1.4)	>0.99	2 (1.5)	2 (1.5)	>0.99
Reoperation	10 (3.2)	5 (3.0)	5 (3.4)	>0.99	2 (1.5)	5 (3.8)	0.44
Postoperative hospital stay (days)	10.3±5.8	9.9±5.7	10.7±5.8	0.25	9.3±4.8	10.7±5.5	0.04
Drainage duration (days)	6.2±4.2	6.1±4.0	6.4±4.4	0.49	5.9±4.0	6.2±4.2	0.51
Duration of antibiotic use (days)	6.6±4.5	6.0±4.6	7.2±4.4	0.03	5.6±3.3	6.9±3.9	0.003
Complications							
BPF	7 (2.2)	3 (1.8)	4 (2.7)	0.71	2 (1.5)	3 (2.3)	>0.99
Pneumonia	44 (14.0)	15 (9.0)	29 (19.6)	0.006	10 (7.5)	23 (17.3)	0.03
Prolonged air leakage	47 (15.0)	28 (16.9)	19 (12.8)	0.40	20 (15.0)	18 (13.5)	0.86
Empyema	4 (1.3)	2 (1.2)	2 (1.4)	>0.99	1 (0.8)	2 (1.5)	>0.99
ARDS	6 (1.9)	3 (1.8)	3 (2.0)	>0.99	2 (1.5)	3 (2.3)	>0.99
Postoperative bleeding	2 (0.6)	1 (0.6)	1 (0.7)	>0.99	1 (0.8)	1 (0.8)	>0.99
Embolism	3 (1.6)	2 (1.2)	1 (0.7)	>0.99	1 (0.8)	1 (0.8)	>0.99
Chylothorax	4 (1.3)	2 (1.2)	2 (1.4)	>0.99	2 (1.5)	2 (1.5)	>0.99
Arrhythmia	2 (0.6)	1 (0.6)	1 (0.7)	>0.99	1 (0.8)	1 (0.8)	>0.99

Data are presented as n (%) or mean ± SD. PSM, propensity score matching; BPF, bronchopleural fistula; ARDS, acute respiratory distress syndrome; SD, standard deviation.

FOB aspiration and lavage can significantly control the inflammatory response, improve blood oxygenation level, and promote the therapeutic effect (11,12,22). A study has shown that prophylactic and routine FOB in intensive care unit can prevent the development of ventilator-associated pneumonia (22). Our study explored and confirmed the role of prophylactic FOB in preventing POP. Additionally, FOB can obtain deep sputum samples for bacterial culture and antibiotic sensitivity testing, aiding in the selection of appropriate antibiotics and informing precise treatment decisions (23).

Conventional chest physiotherapy and suction catheters are routine measures used to remove sputum after lung surgery, which have been shown to have a modest but limited effect on pulmonary sputum evacuation. Conventional chest physiotherapy typically involves respiratory muscle training and vibratory expectoration, requiring the patients' active participation in coughing. However, this approach may be challenging for patients with cough weakness due to pain or other reasons after lung surgery (24,25). As for catheter aspiration, Li *et al.* (11) found that FOB is more effective in sputum removal and improving lung ventilation in patients with pneumonia. This is because traditional sputum catheters are unable to reach deeper layers and can only aspirate sputum blindly. In addition, ordinary suction catheters can potentially harm the airway due to the blind nature. FOB allows direct observation of lesions, preventing blind suction and minimizing the risk of airway damage, particularly in patients following sleeve lobectomy. Furthermore, FOB can assist in monitoring the status of bronchial anastomosis postoperatively, reducing the risk of damage caused by blind aspiration. Some studies have also indicated that in patients in the inflammatory stage of infection, FOB can help control systemic inflammation and shorten antibiotic therapy duration (11,22,26,27). Han *et al.* (22) demonstrated that patients treated with FOB had significantly lower levels of inflammatory markers such as C-reactive protein (CRP), procalcitonin (PCT), interleukin (IL)-6, and tumor necrosis factor-α (TNF-α), compared to those treated with conventional suction catheterization. These findings suggest that FOB may be

beneficial in reducing the systemic inflammatory response and lung infection.

Despite the relatively large size of our cohort and the small number of cases excluded due to insufficient data, this study carries all the inherent limitations of a retrospective study. The main limitations include selection bias, completeness, and exhaustiveness of data. Patients with risk factors for sputum retention and POP are often chosen for early FOB aspiration, leading to selection bias. From a chronological perspective, patients are more likely to undergo prophylactic FOB due to the accumulation of experience, which may result in a decrease in the number of complications. Differences in comorbidities, procedural difficulty, and operation duration were observed between the groups in this study. We attempted 1:1 matching based on propensity scores to balance the selection bias. However, the effectiveness of propensity matching in creating a homogeneous cohort relied on the variables considered, and some inadequately documented or unmeasurable variables were not included. In addition, some unmatched cases were excluded during the propensity matching process, which may potentially affect the results.

Conclusions

Based on the results of this study, we have concluded that prophylactic FOB on the first day after sleeve lobectomy was associated with a lower incidence of POP, shorter duration of antibiotic use, and shorter postoperative hospitalization. Consequently, prophylactic FOB in the early postoperative period is recommended for patients undergoing sleeve lobectomy.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-1326/rc

Data Sharing Statement: Available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-1326/dss

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-1326/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethics Committee on Biomedical Research, West China Hospital of Sichuan University, Chengdu, China on 29 January 2022 (No. 2022-175) and individual consent for this retrospective analysis was waived due to the retrospective nature of this study.

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