

Bronchial Stump Reinforcement in Right Pneumonectomy with Fascia Lata and Gelatin Resorcin Formalin (GRF) Glue: Case Report

Tohru Mawatari, MD,¹ Toshiaki Watanabe, MD,¹ Noriyuki Takahashi, MD,¹
Katsuyuki Kusajima, MD,¹ Masanori Nakamura, MD,² Tokuo Koshio, MD,¹
and Tomio Abe, MD¹

We reinforced the bronchial stump with fascia lata and gelatin resorcin formalin (GRF) glue in a right pneumonectomy. This method was found to be simple and useful. We describe our case and the method herein. A 62-year-old woman had a malignant polypoid lesion which completely occluded the introitus of the right main bronchus and deviated to the introitus of the left main bronchus. Right pneumonectomy was done but materials (pleura, pericardium, intercostal muscle, etc) obtained from the thoracic cavity were insufficient for bronchial stump reinforcement due to severe adhesion caused by prior tuberculosis. Therefore, we reinforced the bronchial stump using the fascia lata and GRF glue. Fascia lata is a superior material for reinforcement in terms of strength and ease of molding, as well as harvesting. GRF glue is a superior adhesive with rapid and strong fixation. We consider this method of reinforcing the bronchial stump with fascia lata and GRF glue to be feasible, in particular, for pneumonectomy or lobectomy without adequate material in the thoracic cavity because of severe adhesion or lesions. (Ann Thorac Cardiovasc Surg 2001; 7: 159–61)

Key words: bronchial stump reinforcement, fascia lata, GRF glue

Introduction

The fascia lata has been used as an autologous material for reinforcement and restoration, since being used for inguinal hernia repair in 1901.¹⁾ Gelatin resorcin formalin (GRF) is a strong glue with which fixation is achieved by cross-linking polymers between the gelatin-resorcin mixture and formalin. It has been widely used in vascular surgery because of the rapid strong adhesion achieved with this glue. The reinforcement method using both of these materials, which we performed in this case, is very simple. As this method has not been described in a pre-

From the ¹Department of Thoracic and Cardiovascular Surgery, Sapporo Medical University School of Medicine, Sapporo, and ²Division of Thoracic Surgery, Tomakomai Prefectural Hospital, Tomakomai 053-0045, Japan

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Address for correspondence and reprints request: Tohru Mawatari, MD: Department of Thoracic and Cardiovascular Surgery, Sapporo Medical University School of Medicine, South 1 West 16, Chuo-ku, Sapporo 060-8556, Japan.

vious report, we present our case and details of the application of this method.

Case Report

A 62-year-old woman first visited a neighborhood hospital complaining of dyspnea. A chest roentgenogram and chest computed tomography (CT) revealed atelectasis of almost the entire right lung (Fig. 1). Bronchofiberscopic examination revealed a polypoid lesion which completely occluded the right main bronchus, and the lesion was shifted to the inlet of the left main bronchus in the left lateral position (Fig. 2). She was transferred to our hospital for further evaluation and therapy. On admission, no respiratory sounds were heard over the right lung. In the left lateral position, she complained of severe dyspnea and expiratory stridor was remarkable. She had been treated for right lung tuberculosis 40 years previously. Tumor marker data (carbohydrate antigen 125: CA125 44 U/ml, squamous cell carcinoma antigen: SCC 9.8 Cng/ml) and inflammatory findings (C-reactive protein: CRP



Fig. 1. Chest CT shows atelectasis of the right lung and inflation of the left lung. Arrowheads indicate the polypoid lesion at the tracheal bifurcation.

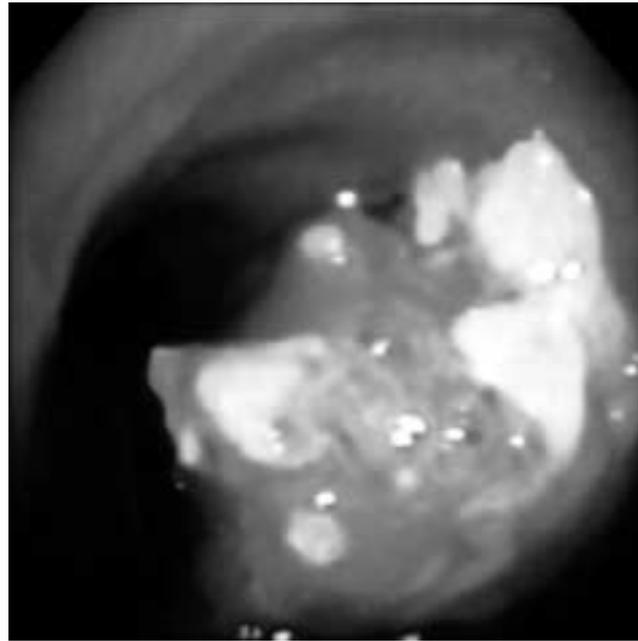


Fig. 2. Bronchofiberscopic findings revealed a polypoid lesion completely occluding the right main bronchus, and the lesion had shifted to the inlet of the left main bronchus.

4.8 mg/dl) revealed abnormalities. Other laboratory data showed essentially normal values. The pathological diagnosis of the lesion was squamous cell carcinoma. There were no metastatic findings or swelling of mediastinal lymph nodes, indicating the patient to be a good candidate for surgery. We excised the projecting portion of the tumor at the bifurcation of the trachea with a laser, under bronchofiberscopic guidance, before the operation, as we had concerns that endotracheal intubation and ventilation would be difficult intraoperatively. Preoperatively, we were unable to determine where the root of the tumor existed or the degree of invasion, but we planned a right pneumonectomy because the tumor was presumed to have originated from the right main bronchus and left lung inflation obscured the mediastinum on CT. The operation was performed in the left lateral position under left separated intubation. A post-lateral thoracotomy was made via the 5th intercostal space, but the entire surface of the right lung showed severe adherence to the chest wall with partial calcification. We therefore also performed thoracotomy via the 3rd intercostal space. The adhesion was partially dissected through the extrapleurae layer. Vessels were routinely ligated and severed, a deep wedge-shaped cut was made at the bifurcation at the right main bronchus which was then sutured after confirming the absence of malignant findings at the bronchial stump by rapid pathological examination. A 10 cm longitudinal skin incision was made in the right lateral thigh, and

the fascia lata under the fat layer was harvested (Fig. 3). The bronchial stump was reinforced by being wrapped in the fascia lata using GRF glue. There was no air leakage on the water sealing test at 30 cmH₂O pressure. The operation was completed uneventfully.

The surgical specimen revealed the tumor to have originated from the trunchus intermedius and to have reached the bifurcation, via the right main bronchus, as a polypoid formation. The lesion had not invaded the membrane of the main bronchus or the bifurcation. Histopathological examination findings were consistent with a well differentiated squamous cell carcinoma and malignant metastatic findings were negative in mediastinal lymph nodes. The pathological stage was T2N1M0.²⁾ The post-operative course was uneventful. The patient was discharged 4 weeks after surgery. Afterwards, she had been followed up at neighborhood hospital for about four years, and no signs of relapse of the lesion have been detected as yet.

Discussion

In pneumonectomy, the bronchial stump is exposed to free space such that stump reinforcement is often performed to avoid the formation of a bronchopleural fistula (BPF). This reinforcement is a preventive measure. Therefore, autologous material, which can easily be har-

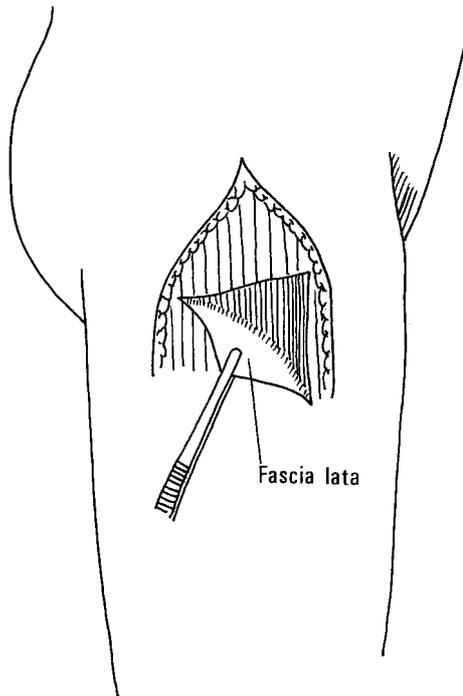


Fig. 3. Harvest of fascia lata existing just under the fat layer at the right lateral thigh.

vested with a minimal burden on the patient, is required for this treatment. Intercostal muscle, pericardium, fat tissue around the pericardium, and so on, can be used as materials for the standard procedure. These materials are feasible in the pediculate condition, and are most often utilized. Meanwhile, the fascia lata can easily be harvested in the postero-lateral position which is the standard position for lung operations. The fascia lata cannot be used for lung surgery in the pediculate condition, but is superior in strength and malleability. The fascia lata has long been utilized for various regions of the human body (pericardium,^{3,4} cardiac wall,⁵ heart valves⁶) in the areas of thoracic and cardiovascular surgery). According to Dubiel,⁷ dysfunction of the lower extremity is minimal after fascia lata harvest.

GRF glue allows tissue adhesion via polymerization involving a mixture of gelatin and resorcin with formaldehyde. GRF glue has been used experimentally since 1960,⁸ but has recently been used in clinical situations. Reports in which this glue was utilized particularly in the area of vascular surgery stand out, while those on pulmonary resection are less numerous. There have been no reports describing fascia lata and GRF glue being used for bronchial stump reinforcement, according to a thorough search of the English literature. Takahashi, from our department, reported an animal experiment in

which autologous fascia lata and GRF glue were used. The strength of GRF glue was superior to that of fibrin glue in both the acute and the chronic phase.⁹

In our present case, there was severe adhesion with calcification due to a previous history of tuberculosis between the lung and the chest wall, as well as the mediastinum. Consequently, it was difficult to use either the pericardium, or the pleura, or fat tissue around the pericardium, to reinforce the bronchial stump during the process of exposing the lung. Furthermore, we could not use the intercostal muscle for reinforcement because of the partial dissection of adhesions via the extrapleural layer and thoracotomy via the 3rd and 5th intercostal spaces. Ultimately, we opted for reinforcement using fascia lata and GRF glue. With regard to bronchial stump reinforcement, various materials and modes of anchorage are available, and reinforcement with fascia lata is useful when suitable materials for an intrathoracic lesion cannot be obtained. Furthermore, GRF glue is an appropriate adhesive for pneumonectomy because strong adhesion is achieved immediately after application.

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