Case report

Left upper lobe double sleeve lobectomy with double barrel anastomosis for lung adenocarcinoma

Hidetaka Uramotoa, b, *, Yuki Nakajima a, Hiroyasu Kinoshitaa

a Division of Thoracic Surgery, Saitama Cancer Center, 780 Komuro, Ina, Kita-adachi-gun, Saitama 362-0806, Japan
b Division of Thoracic Surgery, Kanazawa Medical University, 1-1 Daigaku, Uchinada, 920-0293, Japan

A B S T R A C T

Introduction: Bronchoplasty is performed for both curability and preservation of the pulmonary function.
Case presentation: We herein report the findings of a 65-year old female patient who was admitted to our hospital to undergo surgical treatment for lung cancer. We successfully performed left upper lobe double sleeve lobectomy and reconstructed the site through bronchoplasty with double barrel (B6 + basal bronchus) anastomosis using inner ligation in a given location.
Discussion: The postoperative course was uneventful, and full-dose adjuvant chemotherapy was performed. No stenosis or narrowing of the airways was recognized. Chest CT also showed a good expansion of the residual lung, and the pulmonary function was also reserved.
Conclusion: We propose the use of inner ligation in double barrel bronchoplasty at a particular site.

© 2016 The Author(s). Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

Bronchoplasty is a widely accepted technique for the management of select patients [1,2]. However, there are few reports concerning peripheral double barrel bronchoplasty in contrast to central trachea and carina reconstruction [2,3]. We experienced a case of left upper lobe double sleeve lobectomy with double barrel (B6 + basal bronchus) anastomosis using inner ligation as a particular site for lung adenocarcinoma. We additionally provide a few words of caution with bibliographic consideration, with a particular focus on the suturing methods.

1.1. Case report

A 65-year-old Japanese female presented with a left lung tumor and was referred to our hospital for an evaluation of an abnormal shadow observed on a chest X-ray film. Chest computed tomography (CT) showed a 22 mm tumor, which was located in the left superior lingular segment, and a swollen lymph node in the immediate vicinity of the left superior lingular segment bronchus, suggesting lymph node metastasis (Fig. 1A). Bronchscopy showed a slightly obtuse second spur of the left bronchus and stenosis of B5 (Fig. 1B). She was diagnosed with lung adenocarcinoma by a transbronchial lung biopsy. The L858R mutation in exon 21 of the EGFR gene was identified in the primary lung tumor by a genetic analysis of the biopsy of specimen. Preoperative 3D CT showed a swollen lymph node in the immediate vicinity of the left superior lingular segment bronchus (Fig. 1C). Therefore, the lesion was clinically diagnosed to be at stage IIA (cT1bN1M0). We performed left upper lobe double (extended broncho-angioplastic) sleeve
lobectomy and combined resection of S8, which was involved by the tumor, and systematic lymphadenectomy with the best oncological margins possible to avoid pneumonectomy, which may cause massive parenchymal extirpation and a poor quality of life. The surgical technique for PA resection includes the following steps: the left main pulmonary artery (PA) was then dissected. Proximal control of the main PA is obtained usually extrapericardially by a Satinsky clamp. Distal control of the PA is obtained usually in the pulmonary fissure with a bulldog vascular clamp. Resection of the PA was dissected sharply with scissors performed en bloc with the invaded lymph node of the PA. A continuous simple closure of the lateral wall of the PA using Prolene sutures was done because the residual arterial caliber was 50% or greater. Describe above, we prefer to perform PA resection and reconstruction as the first step to decrease the artery clamp time. Next we reconstructed the site through bronchoplasty with double barrel (B6 + basal bronchus) anastomosis because the initially swollen lymph nodes had invaded to the left main and left lower bronchus and the main pulmonary artery (PA). Reconstruction of the bronchial tree was accomplished by suturing together the distal segment bronchi and then anastomosing the double-barrel suture to the proximal residual left main bronchus. We performed inner ligation (five sutures) in the anastomotic region between B6 and the basal bronchus, and one suture required a U-type suture between the main bronchus and inosculated among B6 with the basal bronchus. Bronchial anastomosis was performed employing an interrupted 4/0 polydioxanone suture (PDS, Ethicon, Somerville, NJ, USA). The remaining knots were tied outside (Supplementary video). Bronchial anastomosis was covered with pericardial fat tissue and an intercostal muscle pedicle to separate bronchial anastomosis and the PA to prevent flexion of the PA and broncho-pleural fistula (BPF) [4,5]. The total operation time was 4 hours and 13 minutes with 147 ml of intraoperative bleeding. Finally, complete resection was achieved. The pathological examination revealed adenocarcinoma in the primary site, a hilar lymph node (#10 and 11) and a mediastinal lymph node (#4, 5, 6, and 7). The tumor size was $25 \times 21 \times 15$ mm. Therefore, the lesion was pathologically diagnosed to be at stage IIIA (T1bN2M0). The postoperative course was uneventful and the patient was discharged on day 8 after surgery. Adjuvant chemotherapy with 4 cycles of cisplatin and pemetrexed was performed. Postoperative bronchoscopy showed a good anastomotic region between the main bronchus and double barrel (B6 + basal bronchus) anastomotic region (Fig. 2A). No stenosis or narrowing of the airways was recognized (Fig. 2B). Chest CT also showed a good expansion of the residual lung (Fig. 2C). The postoperative pulmonary function was preserved under good conditions (preoperative: vital capacity (VC): 3380 ml, forced vital capacity (FVC): 3450 ml, forced expiratory volume in the first seconds (FEV1): 2630 ml, percentage of predicted FEV (FEV1%): 76.2%; 6 months after surgery: VC: 2680 ml, FVC: 2600 ml, FEV1: 2110 ml, FEV1%: 81%). She currently remains alive without disease progression seven months after therapy. Supplementary video related to this article can be found at http://dx.doi.org/10.1016/j.amssu.2016.05.013.

2. Discussion

This report describes a very rare case concerning peripheral double barrel bronchoplasty [2,3]. Double-barrel reconstruction is sometimes adopted for cases of carina resections for tracheal tumors. This technique is seldom applied for the reconstruction of the segmental bronchus [3], and thus there is little technical description regarding this procedure. We reviewed the previously reported twelve cases in which peripheral double barrel bronchoplasty was performed. A low-grade malignant tumor, such as carcinoid or

Fig. 1. A: Chest CT shows a tumor with swollen lymph node in the immediate vicinity of the left superior lingular segment bronchus. B: Bronchoscopy shows a slightly obtuse second spur of the left bronchus (left side) and stenosis of B5 (right side). C: The preoperative 3D CT image shows a swollen lymph node (pink) in the immediate vicinity of the left superior lingular segment bronchus. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)
mucoepidermoid carcinoma, accounted for many of these cases, while the remaining cases were due to thoracic trauma and arteriovenous fistula. We could find only three cases in which peripheral double barrel (left upper + basal bronchus) bronchoplasty for lung tumor was performed (2 cases: left upper + lower bronchus, 1 case: right middle + lower bronchus) [2] in the English literature. To the best of our knowledge, this is the first reported case in which reconstruction was performed through bronchoplasty with left B6 and the basal bronchus and double barrel reconstruction anastomosed to the left main bronchus.

Outer ligation has been recently shown to be applicable for anastomosis of the bronchus. However, we performed inner ligation in the limited anastomotic region between B6 and the basal bronchus for a steady view of the ligation points, especially for anastomosis between the main bronchus and inosculation among B6 with the basal bronchus (referred to as a 3-point joint portion). A good view might make ligation points for creating a new bifurcation of the segmental bronchus, which could prevent micro-abscesses and unnecessary growth of granulation tissue. Additionally, bifurcation of B6 and the basal bronchus are very sharp by rights; therefore, inner ligation might maintain the natural structure as opposed to outer ligation. In fact, postoperative bronchoscopy showed a good anastomotic region. We propose inner ligation in double barrel bronchoplasty, which is suitable for respiratory impairment.

**Conflict of interests**

None declared.

**Funding**

None declared.

**Ethical approval**

Informed and written consent has been given by patient.

**Author contribution**

HU contributed to the conception and design. YN, HK, and HU did the data collection. HU did the writing of the article and the critical revisions. YN and HK did the analysis and interpretation.

**Guarantor**

Not available.

**Consent**

Informed and written consent has been given by patient.

**Registration of research studies**

Not available.

**References**

[1] A. Gómez-Caro, S. Garcia, N. Reguart, E. Cladellas, P. Arguis, M. Sanchez, J.M. Gimferrer, Determining the appropriate sleeve lobectomy versus pneumonectomy ratio in central non-small cell lung cancer patients: an audit of an aggressive policy of pneumonectomy avoidance, Eur. J. Cardiothorac. Surg. 39 (2011) 352–359.

[2] A. Oliaro, C. Casadio, E. Ruffini, R. Gobbe, F. Pischedda, G. Maggi, Bronchial sleeve resection distal to the main bronchi with complete pulmonary preservation. Report on three successful cases, J. Cardiovasc Surg. (Torino) 35 (1994) 157–160.

[3] M. Tamura, M. Oda, I. Matsumoto, H. Fujimori, Y. Shimizu, G. Watanabe, Double-barrel reconstruction for complex bronchial disruption due to blunt thoracic trauma, Ann. Thorac. Surg. 88 (2009) 2008–2010.

[4] Akiyama H. Uramoto, Y. Nakajima, H. Kinoshita, T. Inoue, F. Kurimoto, et al., The long term outcome of induction chemoradiotherapy followed by surgery for locally advanced non-small cell lung cancer, Case Rep. Oncol. 7 (2014) 700–710.

[5] H. Uramoto, T. Hanagiri, The development of bronchopleural fistula in lung cancer patients after major surgery: 31 years of experience with 19 cases, Anticancer Res. 31 (2011) 619–624.

**Fig. 2.** A: Bronchoscopy shows an anastomotic region between the main bronchus and double barrel anastomotic region (postoperative day 68). B: The postoperative 3D CT image shows an anastomotic region (postoperative day 3). C: Chest CT shows a good expansion of the residual lung (postoperative day 86).