Simplified Carinal Wedge Resection and Reconstruction

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Carinal resection remains a technical challenge to thoracic surgeons. There is no single, ideal technique for reconstruction. Reduction of anastomotic tension is the principal concern for carinal resection and reconstruction. We report a case of carinal wedge resection for a carinal tumor; the medial walls of left and right main bronchus were sutured together to create a “neocarina.” Thus, maintaining the continuity between the trachea and bronchus has no longitudinal tension. This procedure is feasible for carinal reconstruction with a limited wedge resection.


Carinal resection remains a technical challenge to thoracic surgeons [1, 2]. There is no single ideal technique for reconstruction. Modifications of the technique were reported sporadically in the literature [3, 4]. High morbidity and mortality hinder sick or older patients from receiving conventional carinal resection. We describe a simplified technique used for resection of a limited carinal tumor with no longitudinal tension.

Technique

A 73-year-old man was admitted with bloody sputum. Chest computed tomography (CT) showed a nodule measuring 1.0 × 1.0 × 0.8 cm at the spur of the carina (Fig 1A), with no extension along the bilateral main bronchus. A flexible bronchoscopy showed a neoplasm at the carina (Fig 1B). Bronchoscopic biopsy demonstrated squamous cell carcinoma. There was no evidence of mediastinal lymphadenopathy or distant metastasis. His lung ventilation indicated that forced expiratory volume in 1 second (FEV1) was 1.42 L. Because of the patient’s poor ventilation function and general condition, a carinal wedge resection and reconstruction was used.

Procedure

The patient received total intravenous anesthesia with a double-lumen endobronchial tube. A right posterolateral thoracotomy incision was made. After the division of the inferior pulmonary ligament, hilar release was performed to minimize anastomotic tension. After ligation and cutting of the azygos vein, the subcarinal space was dissected and lymph nodes were removed. There was no extra-luminal spread of the carinal tumor. After mobilization, the tapes were placed around the trachea, left main bronchus, and right main bronchus. Upon inspection of the flexible bronchoscopy procedure, a carinal wedge resection was performed (Fig 2A). After the resection, the left main bronchus was intubated across the operative

Fig 1. Preoperative radiology and bronchoscopy. (A) A chest computed tomography scan demonstrated a cranial nodule (arrow) at the tip of the carina. (B) A flexible bronchoscopy showed a neoplasm at the carina.

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field with a spiral tube, and the double-lumen tube was removed. When a clear margin was confirmed from the frozen section of removed tissue, the reconstruction was commenced by suturing the anterior part of the carinal defect with interrupted 4-0 Vicryl absorbable sutures (Ethicon, Somerville, NJ). The sutures were positioned approximately 3 mm apart and at a depth of 3 mm. Medial walls of left and right main bronchus were sutured together to reconstruct a “neocarina” at a lower position (Fig 2). The posterior part of the carinal defect was closed at last. All interrupted sutures were knotted extraluminally. When the anastomosis was brought together and the sutures were tied, the double-lumen endotracheal tube was advanced into the left bronchus. After testing for air leaks, the anastomosis was wrapped with a pleural flap. At the end of the operation, before extubation, the anastomosis was inspected using a flexible bronchoscopy.

Pathologic examination confirmed no lymph node involvement. Concerning the relatively short distance from the resection margin and the potential risk of local recurrence, the patient received a combination of radiotherapy and chemotherapy. He was followed-up for 2 years with no evidence of recurrence (Fig 3).

Comment
Barclay and colleagues [5] first reported carinal reconstruction creating “neocarina” in 1957. Since then, modifications of the technique have been reported sporadically in the literature. Operative mortality of carinal resection ranges from 6.6% to 29% [1, 2]. Our carinal wedge resection and reconstruction is less invasive than the double-barrel carinal reconstruction method [6], which is used only after resection of a small segment of the airway. Our technique is applicable for a more limited carinal lesion, with no involvement of the bilateral main bronchus. The novelty of our technique is that it allows for reserve of whole lung function, avoiding end-to-end anastomosis or end-to-side anastomosis. In double-barrel carinal reconstruction, end-to-end anastomosis of the trachea with side-to-side anastomosis of the right and left main bronchi can cause severe tension at the anastomotic site, and there is a caliber disparity between the trachea and main bronchi. In contrast, there is no detachment between the trachea and main bronchus in our case study. Maintaining the continuity between the trachea and bronchus makes no longitudinal tension.

One advantage of our technique is that it allows recruitment of older and sicker patients who would otherwise not be candidates for resection through a conventional carinal reconstruction. Our procedure involves less dissection of the surrounding structure than the double-barrel carinal reconstruction method, and conserves more blood supply for healing. The limited invasiveness of the procedure facilitates a quick recovery and makes it possible for elderly or sick patients to receive the procedure. Considering central tracheal tumors, it has been shown that limited resections are oncologically acceptable options for selected patients [7]. Postoperative radiotherapy and chemotherapy may improve regional control and disease-free survival.

Carinal reconstruction must be personalized according to the location of the lesions. No single ideal technique is suitable for all patients. Based on less anastomotic tension and less invasiveness of our procedure, it is a feasible technical procedure for carinal resection and reconstruction in selected patients.
References