

Carinal Resection and Reconstruction Following Bronchogenic Carcinoma Resection: A Case Report

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ABSTRACT

Despite improvements in surgical and anesthetic techniques, resection of tracheobronchial tumors involving the carina remains challenging due to technical difficulties and perioperative complications. Carinal resection involves removing and reconstructing the airway. A thorough preoperative workup is essential. Meticulous surgical technique and aggressive postoperative management are required for optimal outcomes. Complete tumor resection is the cornerstone of management. Radiotherapy and adjuvant chemotherapy have been used in select patients with debatable results. We present a case of a patient with primary pulmonary squamous cell carcinoma invading the carina, treated with carinal resection without lung resection, followed by chemotherapy and radiotherapy. The patient had a complete follow-up over an average of 13 years.

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INTRODUCTION

Carinal tumors have historically been considered a challenge for surgical resection due to the associated risks. However, advancements in surgical techniques have led to acceptable morbidity and mortality rates. Recent successes in this procedure are largely attributable to advancements in anesthetic techniques, enhanced postoperative care, and more stringent patient selection criteria.

CASE REPORT

A 43-year-old male, non-smoker, had been followed for asthma for two years and treated with bronchodilators and inhaled corticosteroids without improvement. Physical examination revealed mild dyspnea and wheezing, with no other remarkable findings. Computed tomography (CT) scan of the chest demonstrated an endobronchial mass located 5 mm from the carina, causing almost complete obstruction of the mainstem bronchi. Additionally, mediastinal adenomegalies were noted in Baret's compartment (4R) and subcarinal regions, along with a 7 mm nodule in the left upper lobe.

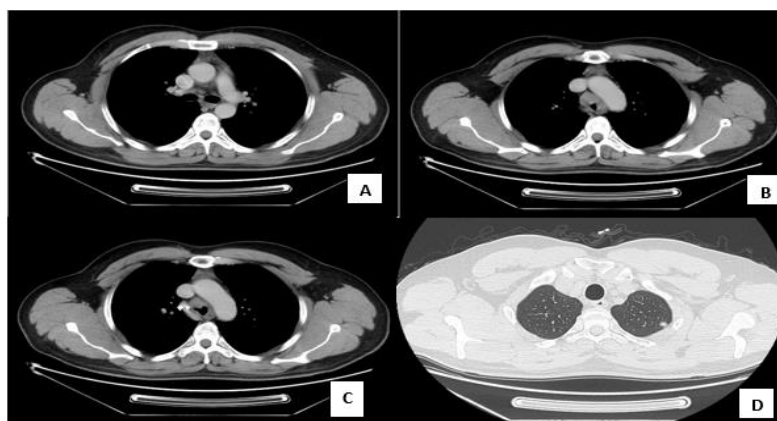


Fig. 1. A, B, C. Chest scans showing an endobronchial mass, causing almost complete obstruction of the mainstem bronchi. D. a 7 mm nodule in the left upper lobe.

Bronchoscopy revealed an ulcerated mucosal tumor in the lower third of the trachea, extending to the base of the carina, blocking approximately 60% of the tracheal lumen. The abdominal-pelvic and brain CT scans were normal. The pathological examination of the fibroscopy biopsy confirmed the tumor as squamous cell carcinoma. The patient's past medical history, family history, and physical examinations were unremarkable. Preoperative arterial blood gas was also within normal limits. The patient was scheduled for elective carinal resection and reconstruction under general anesthesia. The patient was intubated, and a sternotomy was performed. The carina and mainstem bronchi were dissected. The tumor was observed to extend through the tracheal wall. The tumor was removed en bloc. Multiple paratracheal and carinal lymph nodes were excised. A "neocarina" was constructed from the right and left mainstem bronchi, with subsequent implantation to the distal trachea. Anatomopathology reported a moderately differentiated non-keratinizing squamous cell carcinoma infiltrating the trachea and carina, with the 4R lymph node involved by contiguity, and the remaining lymph nodes negative. The patient received concurrent chemotherapy and radiation therapy. Post-chemoradiotherapy follow-up CT scan was performed, revealing the resolution of the LSG nodule. Twelve years later, the patient underwent cerebral metastasectomy followed by radiotherapy and chemotherapy. The patient is currently stable.

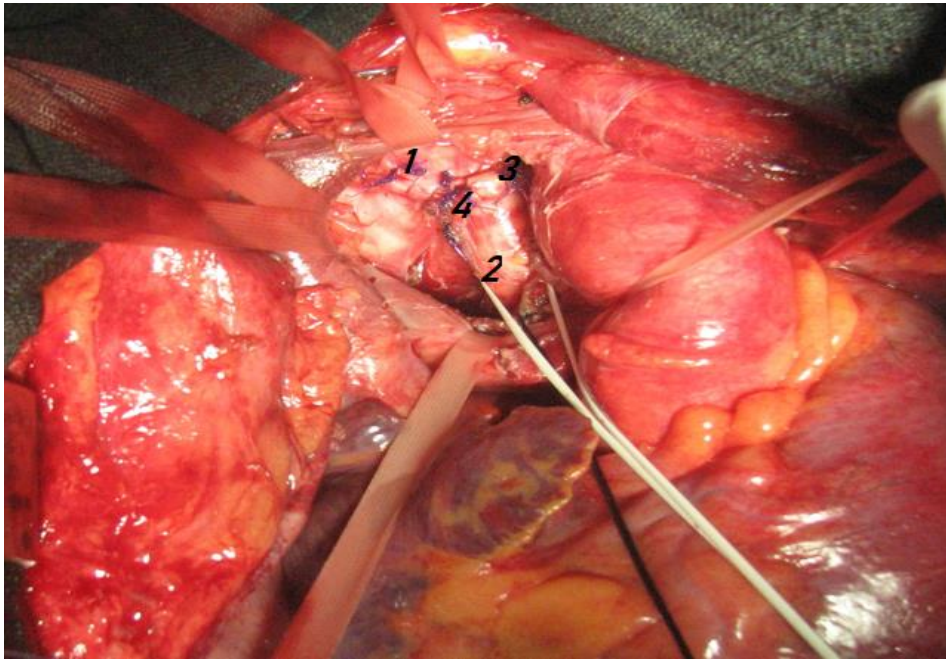


Fig. 2. Trachea in the upper part, right bronchus to the right, and left bronchus to the left. Trachea (1), right bronchus (2), left bronchus (3), tracheo-bronchial anastomosis (4).



Fig. 3. Resection with formation of a "neocarina." This technique applies to small, centrally placed tumors where only a limited resection is required.



Fig. 4 Surgical Piece of the Trachea with Tumor Resected En Bloc.

DISCUSSION

Malignant tumors involving the carina and/or distal trachea are uncommon but not rare. Squamous cell carcinoma and adenoid cystic carcinoma constitute the majority of primary tracheal tumors, comprising 60–80% of cases [1]. Carinal resection remains a formidable challenge for thoracic surgeons due to the complexities of intraoperative airway management, the technical aspects of anatomic reconstruction, and the potential for significant postoperative morbidity. Initial large series studies on carinal resection and reconstruction reported high postoperative mortality rates, ranging from 29% to 40% [2-3]. However, significant improvement in operative mortality has been reported by Roviario and associates (4%) and Dartevelle and colleagues (6.6%), attributed to advancements in patient selection, anesthetic and surgical techniques, and postoperative management [4-5-6].

In the preoperative evaluation of central tumors involving the carina, the medical team must ascertain the precise extent of the tumor within the airway, evaluate the disease spread within mediastinal lymph nodes, and confirm the absence of metastatic disease. Essential diagnostic modalities include chest CT scans, PET-CT, and endoscopic procedures such as bronchoscopy and endobronchial ultrasound-guided fine-needle aspiration (EBUS-TBNA), to ensure an adequate analysis of tumor extension [7].

Complete tumor resection is the cornerstone of management, aiming to achieve tension-free anastomosis with negative resection margins. To accomplish this, we used techniques to reduce anastomotic tension, including neck flexion, paratracheal plane dissection, hilar release, and a postoperative chin stitch, with a recommended airway resection limit of less than 4 cm to reduce anastomotic complications [6-8]. Various techniques for carinal reconstruction have been proposed, largely determined by the tumor's extent. For limited resections of the carina, the right and left mainstem bronchi can be reapproximated to form a "neocarina," which is then attached to the distal trachea. When more than 4 cm of the trachea must be removed, an end-to-end anastomosis between the trachea and the right main bronchus, with reimplantation of the left main bronchus into the side of the bronchus intermedius, is recommended [9]. Non-small cell lung cancer (NSCLC) involving the carina is classified as advanced T4 disease (Stage IIIA or IIIB). According to the American College of Chest Physicians (ACCP), for patients with resected NSCLC (R0) who were found to have incidental (occult) N2 disease (IIIA) despite thorough preoperative staging and who have good performance status, adjuvant platinum-based chemotherapy is recommended. Additionally, in such patients, sequential adjuvant radiotherapy is suggested when there is a high concern for local recurrence [12]. Recent studies have shown favorable long-term outcomes after surgery in patients with thoracic malignancies. Complication rates range from 10% to 50%, and mortality rates range from 7% to 29%. In oncologic cases, long-term survival after carinal resection depends on lymph node status. Mitchell et al. reported an overall actuarial 5-year survival rate of 42% in 60 patients after carinal resection (N0 = 51%, N1 = 32%, and N2/N3 = 12%). Porhanov et al. recently described a series of 151 patients, where nodal status significantly impacted long-term survival (N0–N1 = 32%, N2 = 7.5%) [10-11].

SUMMARY

Malignant tumors involving the carina can be managed with carinal resection and reconstruction. Careful patient selection, understanding safe resection limits, technical nuances of airway reconstruction, and reducing anastomotic tension are crucial to minimizing anastomotic morbidity. The role of neoadjuvant therapy in these cases requires further investigation due to potential negative effects on anastomotic healing.

DECLARATION OF INTERESTS: The authors declare that they have no conflicts of interest related to this article.

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