Bronchoplastic closure as an alternative approach for tracheal reconstruction following resection of a massive tracheal tumour

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Abstract

A 47-year old woman presented with large cell carcinoma with extensive lengthwise and circumferential invasion of the lower trachea. End-to-end anastomosis by suture lines alone may be impossible and even harmful, following tumour resection with such extensive tracheal involvement. Thus, we performed a successful tracheal reconstruction with bronchoplastic closure without complications or recurrence at 12-month follow-up. This case highlights the use of this technique for the closure of massive airway defects.

Keywords: Tracheal tumour • Tracheal surgery • Bronchus flap

Primary closure of airways by direct suture anastomosis may be hazardous or impossible after an extended lengthy resection [1]. We report an innovative technique of tracheal reconstruction with upper lobe bronchoplastic closure for massive tracheal defect after resection of lengthy tracheal tumour.

A 47-year-old woman with no smoking history presented with 6 months of progressive dyspnoea. She denied any chest pain, fever or weight loss. A family history was negative for cancer. Physical examination was unremarkable aside from wheezing in the posterior lung field. A computed tomography (CT) scan revealed a tumour invading the right lateral wall, extending 4.5 cm along her lower trachea (Fig. 1A and B). Bronchoscopy demonstrated an intra-tracheal lesion, occupying two-thirds of the airway circumference (Fig. 1D). Distant metastases were excluded with an abdominal ultrasound scan, brain magnetic resonance imaging and bone emission CT.

The patient underwent a standard right posterior lateral thoracotomy at the fifth intercostal space. The azygos vein and level 4 lymph nodes were mobilized and excised to expose the right lower trachea and tracheobronchial angle. A right upper lobectomy was performed, and the distal end of the right upper bronchus was cut, with the free edge left intact for later closure (Fig. 2). To reduce airway anastomotic tension, the inferior pulmonary ligament was divided. Before the involved airway was opened, the endotracheal tube was retracted into the midportion of the trachea. The invaded lateral wall of the trachea was opened above the carina, and the incision was extended superiorly along the anterior and posterior walls of the trachea and inferiorly along the right main and upper lobe bronchi. The tumour was visualized to invade >50% of the airway circumferentially, spanning 2.0 cm lengthwise, and was resected segmentally (Fig. 2). Frozen sections of resection margins were negative. Primary closure of the segmental airway defect was achieved by end-to-end anastomosis with interrupted 4-0 Vicryl absorbable sutures (Ethicon, Inc., Somerville, NJ, USA). The 3-cm long non-circumferential airway defect was patched, using an autologous upper lobe bronchial flap (Fig. 2) [2]. Transient periods of apnoea were used to facilitate the resection and reconstruction. No air leakage was noted at the airway anastomosis with a sustained airway pressure of 30 cmH2O. The bronchial anastomosis line was then reinforced with a pedicle anterior serratus muscle flap. Radical dissections of mediastinal and hilar lymph nodes were performed. Pathology confirmed large cell carcinoma, stage T4N0M0.

Recovery was uneventful, and the patient was discharged on postoperative day 12. Four weeks later, the patient received a total of 6000 cGy of radiotherapy in 30 fractions over 6 weeks, covering the tumour bed, right hilum, mediastinum and supraclavicular areas.

Upon completion of her treatment, the patient was followed up at 3, 6, 9 and 12 months, respectively. One year postoperatively, chest CT scan and bronchoscopy revealed airtight, stable and epithelialized airways, and no angulation and stenosis in airways, and the patient remained clinically and radiologically free of cancer (Fig. 1C and E).

DISCUSSION

Closure of massive airway defects has been reported, using vascularized autogenous tissue flaps [3, 4]. However, these techniques have been met with technical difficulties and various complications such as dehiscence, stenosis, infection and rejection. Tracheobronchoplastic procedures using bronchoplastic closure could ensure not only the rigidity, but also the normal respiratory
epithelial lining of the reconstructive wall. Nohl-Oser et al. [5] first reported a tracheobronchoplastis procedure with bronchoplastic closure as a surgical alternative to sleeve pneumonectomy. They argued that this technique was feasible only in cases where the tracheal involvement is less than the length of the remaining healthy bronchus flap. We previously reported a technique involving transverse V-shaped trimming of the healthy lateral trachea, but this type of procedure might be safely achieved in cases with <3.0 cm lengthwise and <50% circumferential involvement of the right lower trachea [2].

In our currently reported case, however, the invaded wall was >3.0 cm and >50% of airway circumference. Fortunately, the region of the trachea with >50% circumferential involvement was only 2 cm and could be safely resected segmentally with subsequent end-to-end anastomosis. After anastomosis, it became feasible to patch-repair the airway defect with an upper bronchial flap. This case demonstrates that bronchoplastic closure may be a feasible alternative technique for selected massive lower trachea tumours involving >50% airway circumference with limited wall invasion.

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REFERENCES


