The left thoracotomy approach for excision of distal tracheal carcinoma in the presence of right-sided aorta†

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Abstract

Tracheal primary carcinoma is a rare malignancy, and we believe that its presence in a patient with a right-sided aorta has not been described before. We report a case of a primary tracheal squamous carcinoma in a patient with a four-branched right-sided aortic arch. The patient underwent a tracheal resection approached by a left thoracotomy. The surgical exposure was excellent once the ligamentum arteriosum had been divided. All the aortic arch branches and the phrenic, vagus and recurrent laryngeal nerves were identified and preserved.

Keywords: Trachea • Aorta • Surgery

INTRODUCTION

Primary tracheal tumours have an annual incidence of only 2.7 cases per million people. The two most common primary malignancies are squamous cell carcinoma (mostly found in smokers) and adenoid cystic carcinoma [1].

CASE REPORT

A 67-year-old man was presented for our attention in August 2011, after having been admitted into the Intensive Care Unit at one of our referring hospitals for acute respiratory failure caused by tracheal stenosis complicated by right pneumonia.

The computed tomography scan of the chest showed a tracheal tumour 3 cm above the carina and a right-sided aorta. (Fig. 1A). The patient was transferred to our Unit for diagnosis and treatment of the tracheal stenosis. A rigid bronchoscopy performed under general anaesthesia revealed a luminal tumour in the distal third of the trachea, diagnosed as squamous cell carcinoma of the trachea. Argon electrocautery was employed to open up the tracheal lumen. The patient improved on antibiotics and was extubated 24 h later. Staging with a positron emission tomography scan was negative for evidence of metastatic disease, and the patient elected to undergo a tracheal resection 4 weeks later.

The trachea was approached through a left posterolateral thoracotomy. We identified and preserved the left phrenic nerve and the left vagus nerve with its recurrent branch (Fig. 2), as well as the left subclavian and carotid arteries. The ligamentum arteriosum was divided with a stapler, which provided satisfactory exposure of the lower trachea (supplementary Video 1). The tumour was identified intraoperatively using a transillumination control by flexible bronchoscopy, and a circumferential tracheal resection of 2 cm was performed to excise the main specimen. Further proximal and distal specimen were resected in addition to the main specimen, resulting in a total resection length of approximately 4 cm. Using cross-field ventilation, a tracheal end-to-end anastomosis was performed with interrupted 4-0 Vicryl sutures (supplementary Video 2). An intercostal muscle flap was used to separate the trachea from the oesophagus after a lymphadenectomy of stations 2L, 4L, 5, 6 and 7 had been performed. The inferior pulmonary ligament was divided, and an intercostal drain was inserted, which was removed 24 h later. Two chin-to-sternum stitches in the neutral position were inserted at the end of the procedure and left for 6 days in order to avoid hyperextension of the neck. The patient was successfully extubated without airway compromise in the operative room and transferred to the High Dependency Unit of our Thoracic Surgical Ward.

The postoperative course was complicated only by actelectasis of the lower lung lobes, which was treated with physiotherapy and mucolytics. The patient was discharged home in the 10th postoperative day once deemed safe.

Histopathological examination of the resected specimen confirmed a squamous cell carcinoma and demonstrated both proximal and distal resection tumour-free margins and the absence of lymph node metastases. Clinical follow-up, computed tomography scan and bronchoscopy showed no evidence of recurrence at 6 months.

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Tracheal primary carcinoma is a rare malignancy, and we present a unique case of primary tracheal carcinoma in a patient with a right-sided aorta, treated successfully with surgery.

The incidence of right-sided aortic arch in both radiology and autopsy series is approximately 0.1% [2–4]. There are three major types of right-sided aortic arch: type 1, with mirror-image branching of the major arteries; type 2, with an aberrant left subclavian artery, as seen in our case, which is the most common form (Fig. 1); and type 3, with isolation of the left subclavian artery (where the subclavian artery is connected to the pulmonary artery through the ductus arteriosus).

**DISCUSSION**

Tracheal primary carcinoma is a rare malignancy, and we present a unique case of primary tracheal carcinoma in a patient with a right-sided aorta, treated successfully with surgery.

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**Figure 1:** (A) Tracheal tumour and the right-sided aorta on computed tomographic (CT) image. (B) Three-dimensional volume rendered CT angiogram in oblique coronal plane shows four branches originating separately from right-sided aortic arch, including the left common carotid artery (green arrow) and left subclavian artery (white arrow).

**Figure 2:** (A) Phrenic nerve (yellow arrow) and vagus nerve (blue arrow). (B) Recurrent laryngeal nerve (grey arrow) originating from the left vagus nerve (blue arrow). (C) Left common carotid artery (green arrow) and left subclavian artery (white arrow), with recurrent laryngeal nerve (grey arrow) originating from the left vagus nerve (blue arrow). (D) Ligamentum arteriosum (green arrow) over the distal trachea (purple arrow).

**Video 1:** Division of ligamentum arteriosum with an endostapler Echelon 60 TM vascular reload. Once the ligamentum was divided, we confirmed the excellent exposure of the distal trachea (between left subclavian and carotid arteries).
In cases of right aortic arch without a retro-oesophageal aortic segment and with an aberrant left subclavian artery, the arch passes over the right main stem bronchus and joins a right-sided proximal descending aorta. In our case, the left subclavian artery arose from the left anterior aspect of the upper descending aorta, and the ligamentum arteriosum was left-sided, running between the left pulmonary artery, below, and the left subclavian artery near its aortic origin, above (Fig. 2D).

We had concerns about how adequate the exposure would be via a left thoracotomy. As described in Fig. 2, the view of all structures was excellent, including the distal trachea once the ligamentum arteriosum had been divided (supplementary Video 1).

SUPPLEMENTARY MATERIAL

Supplementary material is available at ICVTS online.

Conflict of interest: none declared.

REFERENCES