

Tracheobronchial Stenting for Management of Bronchopleural Fistula

A Novel Solution to an Old Problem

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INTRODUCTION

Tracheobronchial stenting *via* flexible bronchoscopy has been performed at the National Chest Hospital, Kingston, Jamaica, for just over a year. Whereas stents have been used in the management of tracheo-oesophageal fistulae, this is the first case of a tracheobronchial stent being deployed for management of a bronchopleural fistula at this institution.

CASE REPORT

The patient was a 60-year-old male, a chronic smoker of more than 80 pack years, transferred from an outlying hospital with a one-month history of shortness of breath and intermittent haemoptysis. Chest Computed Tomography (CT) scan was strongly suggestive of bronchogenic carcinoma. Findings were of a right hilar mass and right upper lobe collapse.

Videobronchoscopy demonstrated a tumour mass occluding the right upper lobe bronchus and infiltrating the bronchus intermedius and superior segment of the right lower lobe (Fig. 1).

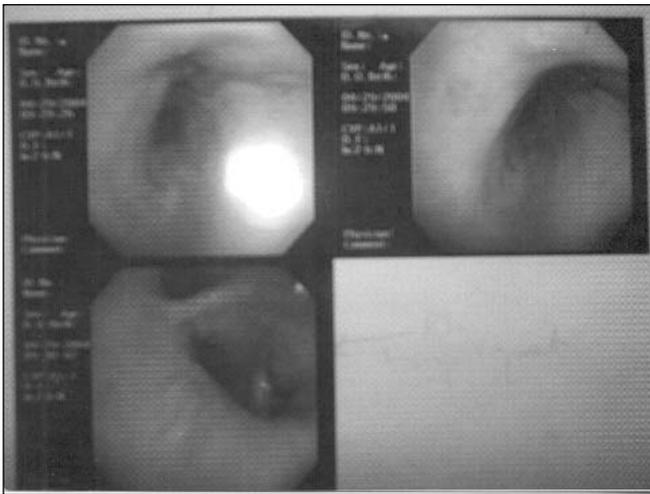


Fig. 1: Tumour mass occluding the right upper lobe bronchus and infiltrating the bronchus intermedius.

An endobronchial biopsy of the right upper lobe tumour mass was obtained *via* flexible bronchoscopy and reported as showing squamous cell carcinoma, moderately differentiated. Rigid bronchoscopy and mediastinoscopy were then performed for clinical staging. Small right

paratracheal nodes and right tracheobronchial nodes were identified and biopsied. Lung function testing done as part of the preoperative assessment, demonstrated an FEV1 > 1.2 L.

An uncomplicated right pneumonectomy was performed the following day. A large tumour mass was found in the right upper lobe extending to the right mainstem bronchus which was identified and stapled and the right lung removed along with the ipsilateral hilar nodes.

Findings were consistent with a stage IIB lung carcinoma (T2 N1 MO). Histology findings were reported as follows:

Margins: *Bronchial resection margin was free of tumour. Tumour was within one cm of visceral pleural margin.* Lymph nodes: *intrapulmonary – one of four hilar nodes contains metastatic deposits. The remainder of the submitted nodes shows reactive changes.* Tumour: *type – primary squamous cell carcinoma. Tumour size – 5.6 cm. Grade – range of differentiation from low grade with definite keratinization to focal high grade, poorly differentiated foci. Lymphatic and blood vessel invasion were absent.*

On postoperative day one, the patient was afebrile with stable vital signs. He did well and was discharged home on day six for follow-up in the surgical out-patient department. Chest X-ray at the time of discharge demonstrated filling of the right hemithorax.

Two weeks post pneumonectomy, the patient was transferred to the National Chest Hospital from an outlying hospital where he had been admitted with a three-day history of progressive shortness of breath and right-sided chest pain. There, he had been treated with antibiotics for a presumed lower respiratory tract infection. The day prior to transfer, he reported cough with mild haemoptysis (approximately one teaspoon of blood-tinged sputum).

Day one post readmission, the patient spiked a fever of 38.33°C, which resolved the following day. He remained stable but spiked intermittent fevers on days three and four, in spite of broad spectrum antibiotic coverage started on day 1. There was recurrence of haemoptysis on day three with serial chest X-rays demonstrating a significant decline in fluid level in the right hemithorax.

On day five post readmission, videobronchoscopy was repeated. This revealed an intact right mainstem stump but with fluid and air escaping from a small defect in the medial border. There was otherwise good approximation of stump edges (Fig. 2).

The proposal was made by the thoracic surgeon for placement of a covered metallic stent with the intention of bridging the distal trachea and left mainstem bronchus, effectively creating an airway conduit that would exclude the right

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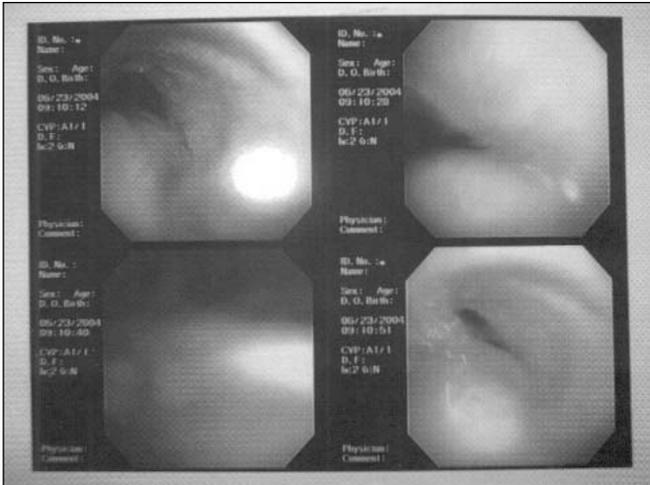


Fig. 2: Intact right mainstem stump but with fluid and air escaping from a small defect in the medial border.

mainstem stump. Boston Scientific Ultraflex distal release, covered metallic stent was chosen. The stent was six cm in length, with a mid-body covering of 4.5 cm. and a maximal internal diameter of 3 cm when fully deployed.

Using a flexible videobronchoscope and under fluoroscopy, a 0.038-inch diameter guide wire was placed in the left airway and the stent delivery system guided into the distal trachea and left mainstem. The stent was deployed under fluoroscopy and its position adjusted by forceps, ensuring that the convexity of the covered stent was centred over the right mainstem orifice, effectively isolating the right mainstem stump (Fig. 3). The entire procedure took less than an hour and was performed under conscious sedation.

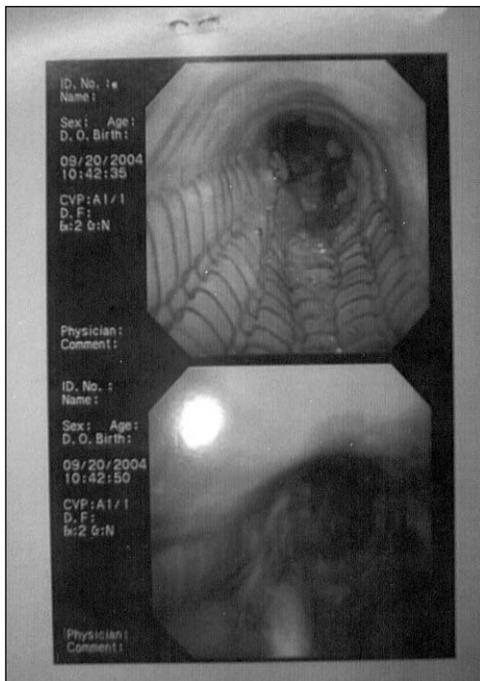


Fig. 3: Placement of a covered metallic stent with the intention of bridging the distal trachea and left mainstem.

By day two post-procedure, the patient's fever had defervesced and he was asymptomatic. Over the following week, he demonstrated appropriate filling of the right hemithorax and remained asymptomatic. At follow-up one month later, the patient was fully ambulant and had no complaints. Repeat chest X-rays showed that the stent had remained in position (Fig. 4).

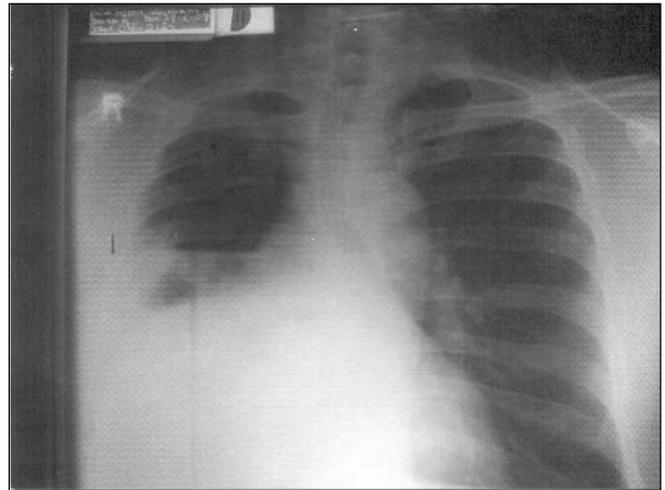


Fig. 4: Chest X-ray post placement of stent.

Three months post stent placement, the device was painstakingly removed *via* rigid bronchoscopy and flexible bronchoscopy (Fig. 5). Chest X-ray repeated nine months



Fig. 5: Airway post removal of metallic stent.

after initial diagnosis of the bronchopleural fistula revealed complete filling of the right hemithorax (Fig. 6). The patient



Fig. 6: Chest X-ray at follow-up showing complete filling of right hemithorax.

continues to be asymptomatic and active. He has not required subsequent admission to hospital.

DISCUSSION

Whereas airway stenting is a well-recognized tool for conservative management of bronchoesophageal and tracheoesophageal fistulae (1), there are few case reports of the use of tracheobronchial stents for conservative management of

bronchopleural fistulae (2–4). Of these reports, most pertain to the use of silastic (unexpandable, non-metallic) devices for this procedure *eg* use of the Dumon stent (2–4). A recent report however detailed use of an expandable Ultraflex metallic stent for treatment of a bronchopleural fistula after pneumonectomy (5).

The rationale for placement of a covered stent was to create and then divert air through a tracheal-left mainstem conduit, effectively eliminating flow across the fistula and thus facilitating closure.

Woven from threads of nitinol, the Ultraflex covered stent is self-expanding and conforms to the contours of the airway. This enabled anchorage across the trachea and left mainstem bronchus without migration.

CONCLUSION

Whereas more documented case reports are needed, this procedure appears to be a viable alternative for treatment of a not uncommon complication that would otherwise require complex, corrective surgery.

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