

## Palliation of intrathoracic tracheal compression with a silastic tracheobronchial stent

S WESTABY, MP SHEPHERD

*From Harefield Hospital, Uxbridge, Middlesex*

Asphyxia due to extrinsic tracheal compression by non-resectable tumour in the mediastinum is a particularly distressing problem, hitherto not amenable to relief by surgical means. Tracheostomy may be inappropriate, either because the tube falls short of the area of compression or because the segment of trachea at the tracheostomy site is affected by the pathological process; and endotracheal intubation is unacceptable in a spontaneously breathing and fully conscious patient. Radiotherapy is logistically difficult in patients undergoing positive-pressure ventilation and for those who are on the verge of critical major airways obstruction, and it may initially exacerbate dyspnoea by causing oedema and swelling of the tumour and surrounding tissues.

In 1982 Westaby<sup>1</sup> described a silastic tracheobronchial stent for intubation of the diseased or injured supracarinal trachea and main bronchi (fig 1). This is usually inserted via a tracheostomy and it has a tracheostomy side limb, which when occluded allows the patient to breath normally through the cords. We report the use of the stent without tracheostomy in a patient with a highly vascular thyroid tumour with intrathoracic extension, in whom conventional tracheostomy was impossible. We describe the method of insertion and discuss the therapeutic applications of this device.

### Case report

A 19-year-old man presented with a goitre and stridor at rest. On examination his thyroid was greatly enlarged with an intrathoracic extension on the right and cervical lymphadenopathy. A chest radiograph clearly showed the mediastinal mass (fig 2). The gland was explored with a view to providing direct relief of his tracheal compression, but biopsy showed a poorly differentiated carcinoma and there was profuse bleeding at the biopsy site. When the bleeding had stopped the wound was closed and a trial extubation attempted. This failed and the endotracheal tube was left in place with the patient breathing spontaneously. In order to transfer him for radiotherapy we proposed to use a tracheobronchial stent which had previously been inserted only by tracheostomy. In this case access to the cervical trachea was prohibited by the tumour and therefore we decided to insert the stent directly through the cords without its tracheostomy limb.

Bronchoscopic (Negus) assessment was first carried out to measure the area of compression, which was severe and slit-like. It began at the level of the thoracic inlet and

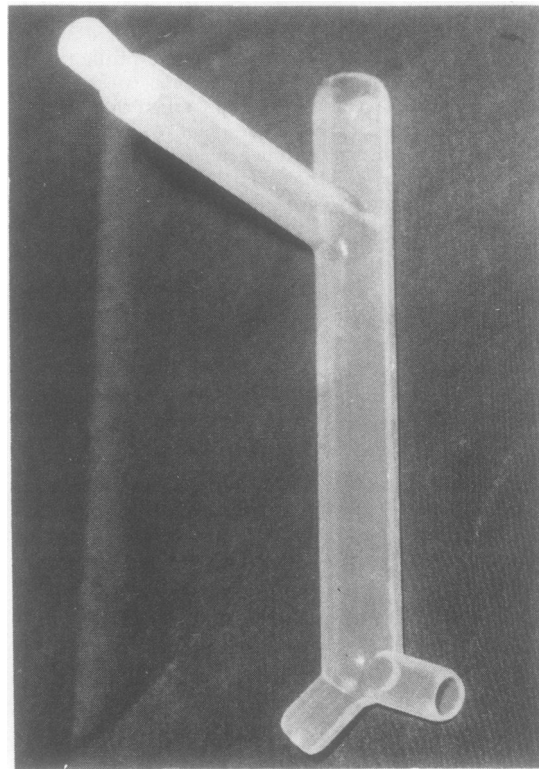


Fig 1 The silicone rubber tracheobronchial stent.

extended to within 3 cm of the carina. The stent was then prepared by removal of its side limb and guide bougies were passed into the right and left main bronchi through the bronchoscope. A wide-bore suction catheter was then inserted into the distal trachea to ensure a route for ventilation by the Venturi apparatus in case insertion of the stent proved difficult. The stent was then placed over the guide bougies and the bronchial limbs were guided through the vocal cords and larynx with a laryngoscope and Magill's forceps. Once in the trachea the whole stent was railroaded past the area of obstruction and into place with bronchial limbs astride the carina. The guide bougies and suction catheter were removed with the Negus bronchoscope reinserted through the cords to maintain the position of the stent and ventilation. The fiberoptic bronchoscope was then passed through the stent to check the position of the bronchial limbs and aspirate any secretions in the distal

Address for reprint requests: Mr S Westaby, Harefield Hospital, Harefield, Uxbridge, Middx UB9 6JH.

Accepted 7 September 1982

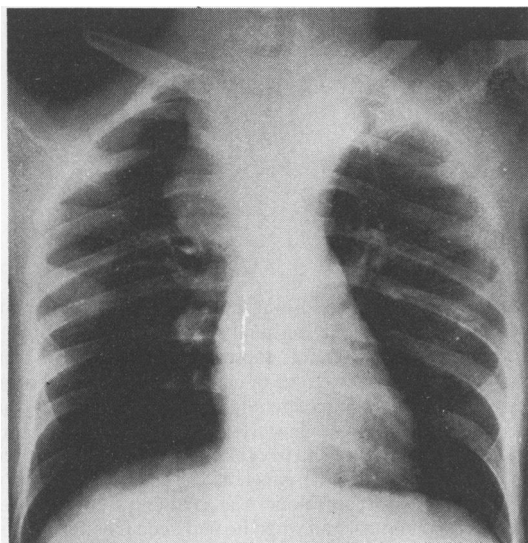


Fig 2 Chest radiograph showing the intrathoracic extension of the thyroid tumour.

bronchial tree. As the patient recovered from the anaesthetic he began to cough and it was apparent under direct vision that far from displacing the tube the trachea elongated and gripped it.

After operation he breathed spontaneously, with complete relief of his major airways obstruction. The cough reflex, which was active for about six hours, was suppressed with codeine linctus and small doses of morphine. The inspired air was initially humidified. He was then transferred for radiotherapy and currently remains well. Initially he required intermittent nasotracheal aspiration to clear secretions, and at 10 days bronchoscopy was performed to check the position of the stent. It will be removed when the tracheal compression recedes.

## Discussion

The prospect for rapid, effective relief from asphyxia in patients with tracheal compression or occlusion not treatable by resection has previously been poor. Patients with tracheal narrowing tend to present at a very late stage so that further manipulation of the lesion for biopsy, or the initial oedema caused by radiotherapy, results in critical obstruction and the need for urgent intervention.

Intrabronchial stents designed for the relief of benign tracheal stenosis were described by Hankins,<sup>2</sup> who used a metal alloy tube, and Pagliero and Shepherd,<sup>3</sup> who used a stainless steel wire coil to support a fibrous collapsing segment resulting from dehiscence of a tracheal anastomosis. Clarke<sup>4</sup> improvised a method for relief of major airways obstruction due to tumour using the Souttar tube, though this may easily be displaced if the lesion is successfully treated by radiotherapy. Montgomery<sup>5</sup> designed a silicone rubber T-tube for treatment of subglottic stenoses and it was the use of this tube by Pearson and colleagues<sup>6</sup> that led Westaby and Jackson to design the silastic tracheobronchial stent for a patient with severe widespread tracheal and bronchial burns. This first patient has had his tube in place for two-and-a-half years.

Since that time the stent has been employed for various

problems and suggested indications for its use are: (a) extrinsic compression of the intrathoracic trachea and main bronchi by tumour, pending treatment by radiotherapy or cytotoxic drugs; (b) primary or secondary tracheal tumours when their extent precludes resection; (c) asphyxiating thyroid tumours where tracheostomy is impossible (stent used without side limb); (d) benign tracheal stenoses pending resection or if their extent precludes resection; (e) as an adjunct to tracheal resection if complications occur or are expected; (f) diffuse occlusive endotracheal disease such as Wegener's granuloma or burns; (g) tracheal trauma or ruptured main bronchus if major surgery is contraindicated by the overall condition or delay in its recognition. It has been suggested that, since the stent can be left within the trachea and main bronchi indefinitely, a further use might be the support of collapsing major airways in severe emphysema; but as yet there has been no experience with this. The stent should not be used as a long-term substitute for resection if this is feasible, or when use of the laser proves beneficial in otherwise inoperable cases.<sup>7</sup>

The stent has proved to be a safe and highly effective means of maintaining an airway even with very severe tracheal tumours, which might be expected to compress the pliable silicone rubber cylinder. Its presence in the trachea is well tolerated since the cough reflex disappears and the tendency to produce secretions subsides over 24–48 hours. The patient breathes normally through the larynx and when it is used without the side arm is unaware of its presence. Presumably the fact that inspired air is humidified by the upper respiratory tract accounts for the absence of secretions and crusting that occur with conventional endotracheal and tracheostomy tubes. The possibility of inserting the stent through the vocal cords without tracheostomy extends the scope of the device to include patients in whom tracheostomy through malignant tissue is inadvisable and provides a considerably more acceptable approach than anterior mediastinal tracheostomy.<sup>8</sup> Most patients with endotracheal disease, however, are better served by the conventional stent, as the tracheostomy limb provides direct access for aspiration of secretions and serves as a fixed point to prevent dislocation of the bifurcation into the trachea.

## References

- Westaby S, Jackson JW, Pearson FG. A bifurcated silicone rubber stent for relief of tracheobronchial obstruction. *J Thorac Cardiovasc Surg* 1982;**83**:414–7.
- Hankins WB. An endotracheal metallic prosthesis in the treatment of stenosis of the trachea. *Ann Otol Rhinol Laryngol* 1952;**61**:663–75.
- Pagliero KM, Shepherd MP. Use of stainless steel wire coil prosthesis in treatment of anastomotic dehiscence after cervical tracheal resection. *J Thorac Cardiovasc Surg* 1974;**67**:932–5.
- Clarke DB. Palliative intubation of the trachea and main bronchi. *J Thorac Cardiovasc Surg* 1980;**80**:736–41.
- Montgomery WW. Silicone tracheal T-tube. *Ann Otol Rhinol Laryngol* 1974;**83**:71–5.
- Cooper JD, Todd TRJ, Ilves R, Pearson FG. Use of the silicone tracheal T-tube for the management of complex tracheal injuries. *J Thorac Cardiovasc Surg* 1981;**82**:559–68.
- Laforet EG, Berger RL, Vaughan CW. Carcinoma obstructing the trachea: treatment by laser resection. *N Engl J Med* 1976;**294**:941–3.
- Oringer MB, Sloane H. Anterior mediastinal tracheostomy. *J Thorac Cardiovasc Surg* 1979;**78**:850–9.