The Journal of Laryngology and Otology
July 1997, Vol. **111,** pp. 663–665

Posterior tracheal wall diverticula-an unexpected finding

MELANIE M. COLLINS, B.SC., F.R.C.S., RICHARD G. WIGHT, F.R.C.S.

Abstract
Two cases of asymptomatic posterior tracheal wall diverticula, one single and one multiple, found unexpectedly at laryngectomy are described. The embryonal development and pathogenesis of tracheal abnormalities are discussed, and possible clinical implications speculated upon.

Key words: Laryngectomy; Trachea; Embryonal development

Introduction

Posterior tracheal wall diverticula were found unexpectedly in two patients with squamous cell carcinoma of the head and neck, at the time they underwent laryngectomy. Both had undergone primary radiotherapy but the abnormalities lay outside the field of treatment and so were felt to pre-exist their disease and likely to be congenital in origin. Congenital lower respiratory tract diverticula and pouches have been described that were symptomatic and required surgical excision (Adham *et al.*, 1992; Dabbs *et al.*, 1994). Asymptomatic shallow diverticula in this particular site have not been described elsewhere.

Case reports

Patient A, a 67-year-old woman with a T_2 N_0 supraglottic squamous cell carcinoma underwent radical primary radiotherapy, and developed recurrent disease 12 months later. A total laryngectomy was performed. In the postoperative period a 2–3 mm shallow defect in the posterior tracheal wall, 2 cm from the stomal edge was noted. A contrast swallow showed no evidence of a fistulous tract and she ultimately communicated well with an artificial electrolarynx.

Patient B, a 50-year-old man with a T_3N_0 transglottic squamous cell carcinoma refused primary surgery and underwent radical primary radiotherapy. Four years later he developed recurrent disease and a total laryngectomy and bilateral functional neck dissections were performed. At the time of surgery he was noted to have a series of four 3–4 mm shallow defects in the posterior tracheal wall at a level equivalent to successive tracheal rings (Figure 1). A contrast swallow showed no fistulous tracts. The tracheal diverticula remained unchanged at subsequent follow-up and he developed reasonable oesophageal speech. Both patients had undergone bronchoscopy as part of their work up at original diagnosis and no posterior tracheal wall abnormalities had been recorded.

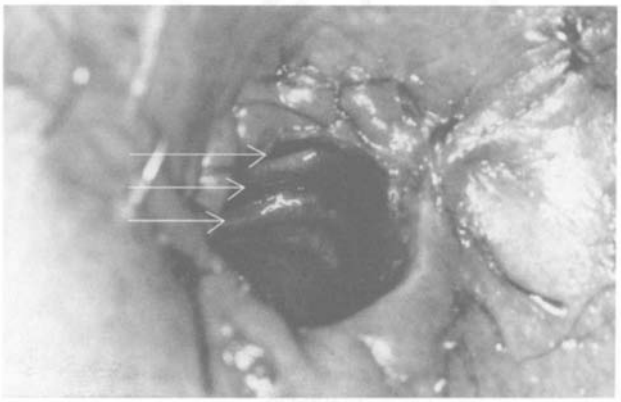

FIG. 1
Patient B. Trachea through stoma demonstrating four tracheal diverticula: midline and symmetrically spaced.

Discussion

In the fourth week of foetal life the lung bud appears as a median laryngotracheal groove in the ventral wall of the pharynx. A further groove, the longitudinal sulcus appears along the outside lateral wall, and two ridges of endodermal cells on the inside lateral wall join in the midline and take the form of a saddle-shape fold, the tracheo-oesophageal sulcus. The mesenchyme that comes to lie between the developing respiratory and digestive tubes constitutes the tracheo-oesophageal septum (Figures 2 and 3). The superior margin of the septum is at the level of the fifth and sixth somites and remains constant relative to the vertebral structures as the lung bud grows caudally.

It is suggested that abnormal septation during separation of the respiratory and digestive tracts leads to recognized malformations such as a tracheo-oesophageal fistula. The fistulous canal can be replaced by a ligamentous cord and possibly a tracheal diverticulum at certain sites is part of a spectrum of developmental tracheal malformation. The tracheo-oesophageal sulcus appears crucial to the formation of the septum and its catenoidal or

From the Department of Otolaryngology, North Riding Infirmary, Newport Road, Middlesbrough, UK.
Accepted for publication: 2 May 1997.

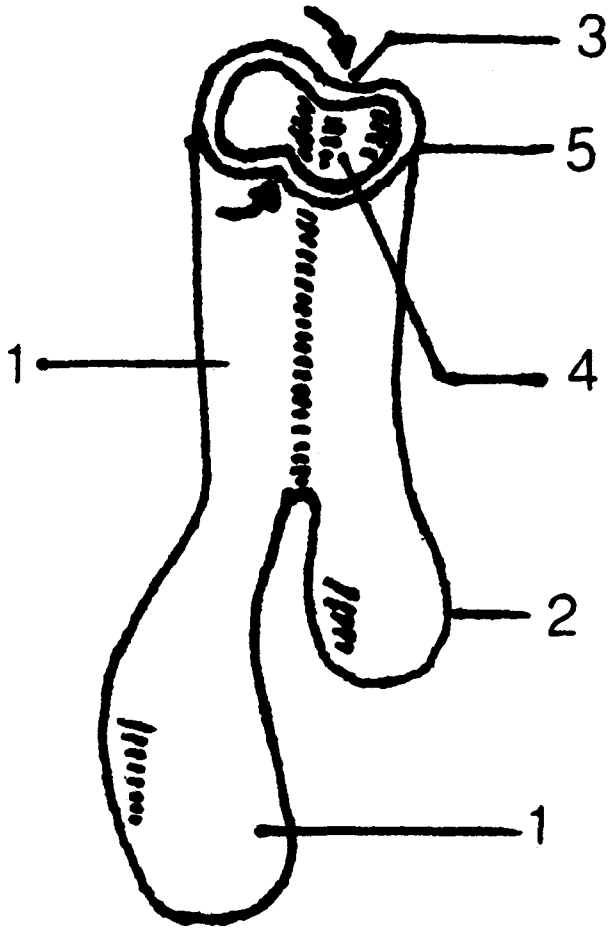

FIG. 2
Tracheo-oesophageal septation:
1. foregut
2. lung bud
3. longitudinal sulcus or laryngotracheal groove
4. tracheo-oesophageal septum
5. trachea

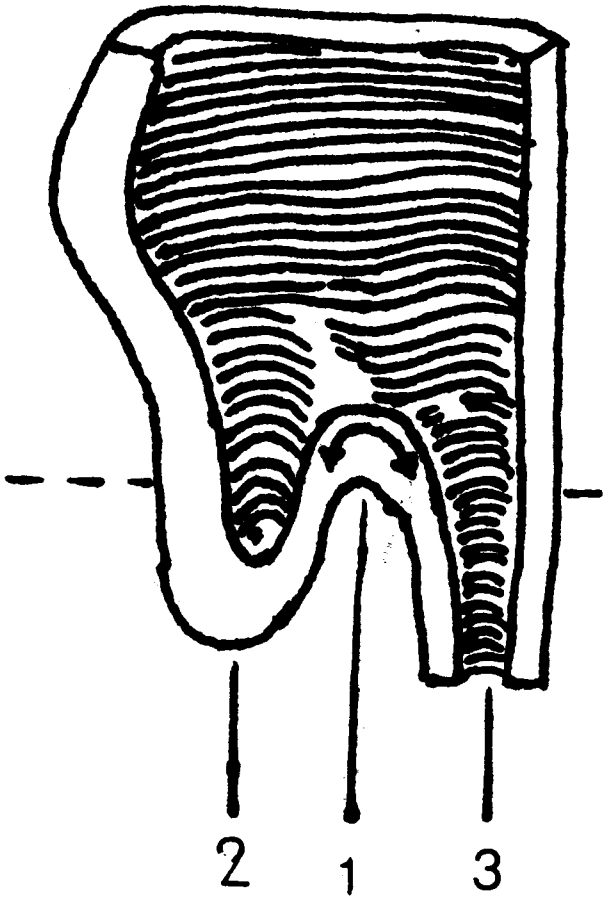

FIG. 3
Tracheo-oesophageal septation: longitudinal cross-section:
1. saddle shaped tracheo-oesophageal sulcus
2. lung bud
3. foregut
– – – – dotted line represents level of 5th and 6th somites

saddle shape determines the constant, static position of the top of the septum. Saddle-shaped sulci have been shown to have regional growth limited properties in other sites such as the embryonic heart (Sutliff and Hutchins, 1994).

The epithelium of the respiratory tract develops from the endoderm lining the sulcus. Ultimately, the posterior tracheal wall consists of a mucosal layer, submucosa, perichondrium and an outer fibrous layer continuous with the fibrous layer of external adventitia that constitutes the outermost oesophageal wall (Beasley, 1987; Weir, 1987; Sutliff and Hutchins, 1994). It is possible that the diverticula arose from a defect in endodermal differentiation during development of the membranous posterior tracheal wall. It has not been possible to establish absolutely which layers are deficient in the two cases presented here.

The tracheal cartilages develop from the sixth branchial arch during the sixth week of foetal life, and possibly a defect in this process of development could produce diverticula. A number of congenital tracheal abnormalities have been described (Adham et al., 1992; Chen and Holinger, 1994) and congenital diverticula or pouches have been found in the lower trachea giving rise to respiratory distress or recurrent respiratory tract infections (Adham *et al.*, 1992) and necessitating surgical excision. Shallow diverticula, in particular multiple defects at the level of several tracheal rings, have not previously been described. These had been asymptomatic in our patients and were only discovered at laryngectomy.

All our patients have a speech and language therapy assessment prior to undergoing a laryngectomy, and if appropriate a primary tracheo-oesophageal puncture is fashioned. Neither of these two cases had been felt to be suitable, the first because of poor understanding and the second because of his farming work and potential difficulties with hygiene. However if a primary puncture had been planned, its potential site would have presented a dilemma. Could one have safely used one of the diverticula as the puncture site, would the lumen be of appropriate calibre, would the integrity of the rest of the posterior wall of the trachea be normal, and in the second case in particular, where else could it have been sited? A previous bronchoscopy in both these cases had not noted the presence of any tracheal abnormalities. Currently there is no published literature to indicate what the appropriate course of action should be. The head and neck surgeon needs to be aware of the range of possible tracheal abnormalities that might influence the surgical options with respect to voice restoration.

References

Adham, M., Chappuis, J. P., Floret, D., Bouvier, R., Cottin, X. (1992) Congenital diverticulum of the tracheal carina in neonates. A case report. *Pediatrie* **47:** 41–44.

Beasley, P. (1987) Anatomy of the pharynx and oesophagus. In: *Scott-Brown's Otolaryngology: Basic Sciences*, 5th Edition. (Wright, D., ed.) Butterworths, London. pp 245–283.

Chen, J. C., Holinger, L. D. (1994) Congenital tracheal abnormalities: pathology study using serial macrosections and review of the literature. *Pediatric Pathology* **14:** 513–537.

Dabbs, D. J., Duhaylongsod, F., Schour, L. (1994) Fine needle aspiration cytology of congenital tracheal diverticulum. A case report. *Acta Cytologica* **38:** 98–100.

Sutliff, K. S., Hutchins, G. M. (1994) Septation of the respiratory and digestive tracts in human embryos: crucial role of the tracheosophageal sulcus. *Anatomical Record* **238:** 237–247.

Weir, N. (1987) Anatomy of the larynx and the tracheobronchial tree. In *Scott-Brown's Otolaryngology: Basic Sciences* 5th Edition. (Wright, D., ed.) Butterworth's, London, pp 296–321.

Address for correspondence:
Melanie M. Collins, F.R.C.S.,
Dept of Otolaryngology,
Freeman Hospital,
High Heaton,
Newcastle-upon-Tyne NE7 7DN.