

## Tracheoesophageal fistula: diagnosis with CT

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**Abstract.** A baby with two lower cervical tracheoesophageal fistulas was evaluated with a barium esophagram and computerized tomography (CT). The esophagram identified both fistulas. Axial CT demonstrated the esophageal attachment of the upper fistula and completely displayed the lower fistula. A change in caliber of the esophagus from a collapsed to a distended state marked the site of the fistulas.

communication between the trachea and esophagus (Fig. 2b). Below the lower fistula, the esophagus remained distended but the interfacing contours of the trachea and esophagus were normal. The laryngotracheoesophageal cleft was not demonstrated, presumably because of collapse of surrounding soft tissue into the fissure. No additional tracheoesophageal fistulas were seen.

The initial postoperative period was complicated by tracheomalacia, gastroesophageal reflux, breakdown of a gastrostomy site and sepsis with staphylococcus aureus, E coli and candida albicans. The baby underwent a fundoplication for gastroesoph-

The barium esophagram is the principal radiographic means of identifying a tracheoesophageal fistula [1–4]. Unfortunately, associated medical problems and dependence on life support devices may make some babies poor candidates for an esophagram. Computerized tomography is an alternative means of imaging a tracheoesophageal fistula when an esophagram cannot be performed because of the baby's medical condition.

### Case history

A 3350-g female born at Clarke Air Force Base, Philippines, developed cyanosis with feedings. Barium swallow on Day 13 of life showed contrast entering the trachea immediately after passing through the hypopharynx. Because of the possibility of a tracheoesophageal fistula, the baby was transferred to Tripler Army Medical Center (TAMC) at 21 days of age for further investigation.

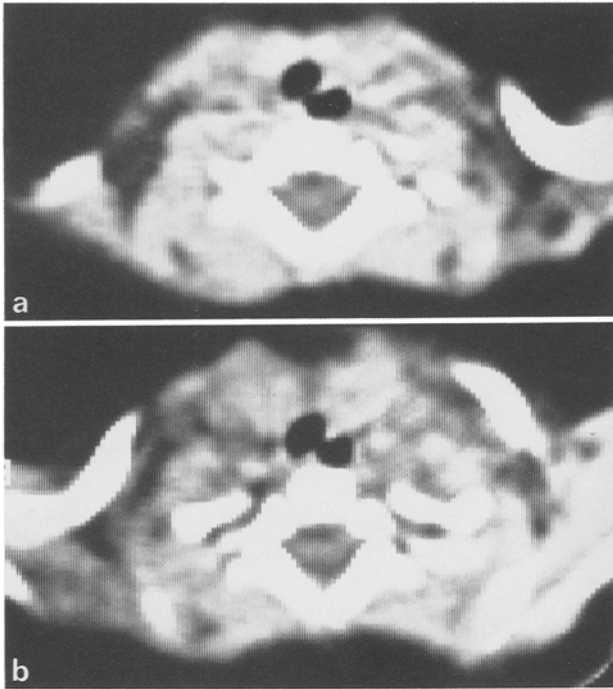
Repeat esophagram at TAMC demonstrated minimal aspiration into the trachea and two lower cervical tracheoesophageal fistulas (Fig. 1). Esophagoscopy confirmed two tracheoesophageal fistulas located 5 mm apart in the lower cervical area and laryngoscopy also demonstrated a 6 mm laryngotracheoesophageal cleft extending between the arytenoids and true cords.

In order to pursue the possibility of additional fistulas not visualized at fluoroscopy and to further investigate the functional patency of the laryngotracheoesophageal cleft, contiguous 5 mm computed tomographic transverse sections were taken of the trachea and esophagus using a Searle PHO/TRAX 4000. Technical factors included a five second scan time, a window level of +50, a window width of 300, and a kV and mA of 130 and 30 respectively.

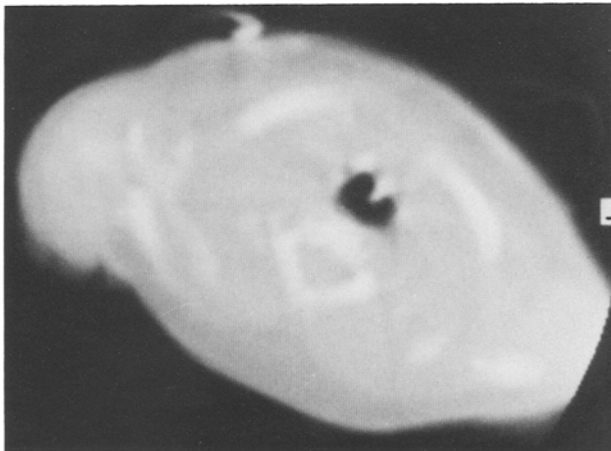
Above the upper fistula, the CT demonstrated a collapsed esophagus separated from the trachea by soft tissue. At the site of the upper fistula, the esophagus distended with air and the margin of the esophagus adjacent to the trachea was pulled into a beak-like protrusion extending through the soft tissue toward the trachea (Fig. 2a). The lower fistula was clearly seen as a direct com-



**Fig. 1.** Esophagram shows two lower cervical tracheoesophageal fistulas



**Fig. 2.** **a** Esophageal attachment of the upper fistula: the esophagus distends with air and the margin of the esophagus adjacent to the trachea is pulled into a beak-like protrusion that extends through the soft tissue towards the trachea. **b** 5 mm below the upper fistula, the lower fistula is clearly seen as a direct communication between the trachea and esophagus



**Fig. 3.** The lower cervical trachea and esophagus have coalesced into a single chamber

ageal reflux and an enterostomy and required hyperalimentation, and nasotracheal intubation.

At age 7 months, increasing clinical and radiographic signs of aspiration indicated the possibility of recurrence and enlargement of the tracheoesophageal fistulas. Because of the difficulty in controlling aspiration of contrast material [5] in an intubated baby with an enlarging tracheoesophageal fistula, the anatomy was

studied with CT. During the examination, the endotracheal tube was removed and the baby was ventilated with an ambu bag. Exposures were timed to coincide with inspiration in order to distend the fistula with air. A lung window was selected to enhance soft tissue air interfaces.

The CT revealed almost complete obliteration of the wall between the trachea and the lower cervical esophagus (Fig. 3). Endoscopy confirmed a 16 mm excavation of the lower cervical trachea into the esophagus.

Currently, the baby has just undergone an enterostomy closure. Repair of the recurrent tracheoesophageal fistula is anticipated as soon as the baby recovers from this laparotomy.

## Comment

Visualization of a tracheoesophageal fistula with CT is facilitated by the tendency for a tracheoesophageal fistula and the esophagus distal to the insertion of the fistula to distend with air during normal breathing. Although the site of a tracheoesophageal fistula cannot be precisely anticipated at CT, highly collimated thin and overlapping scans in the zone of increasing esophageal caliber may improve the odds of demonstrating the fistula.

Since a tracheoesophageal fistula usually ascends cranially between the esophagus and trachea, sometimes a single axial CT section will only partially demonstrate the fistula (Fig. 2a). However, we suspect that tilting such a baby into a reverse Trendelenburg position with a foam wedge might improve the CT visualization of a more oblique fistula.

Axial CT imaging is a diagnostic alternative when the fluoroscopic evaluation of tracheoesophageal fistula is contraindicated. If available, axial magnetic resonance imaging could probably fulfill the same objectives as CT without the use of ionizing radiation.

## References

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