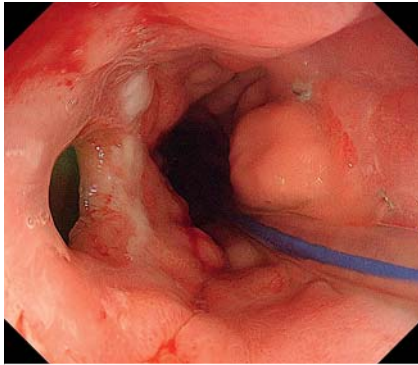


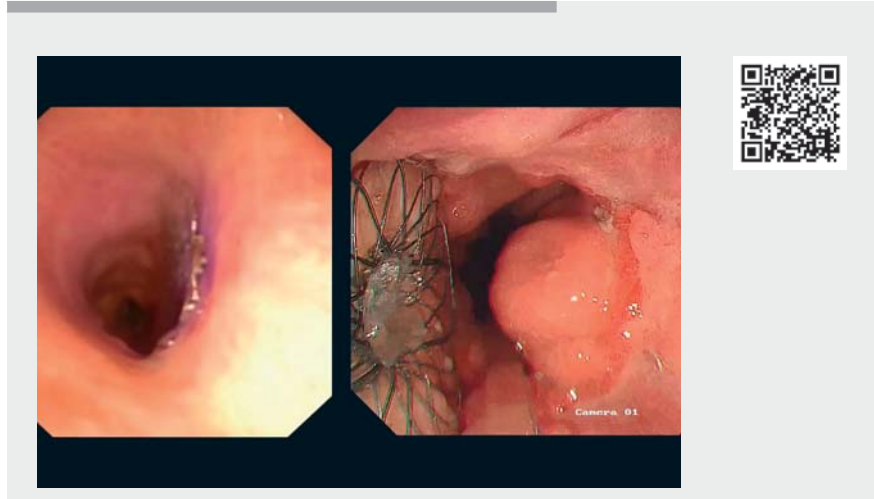
## Endoscopic closure of tracheoesophageal fistula with a novel dumbbell-shaped occluder



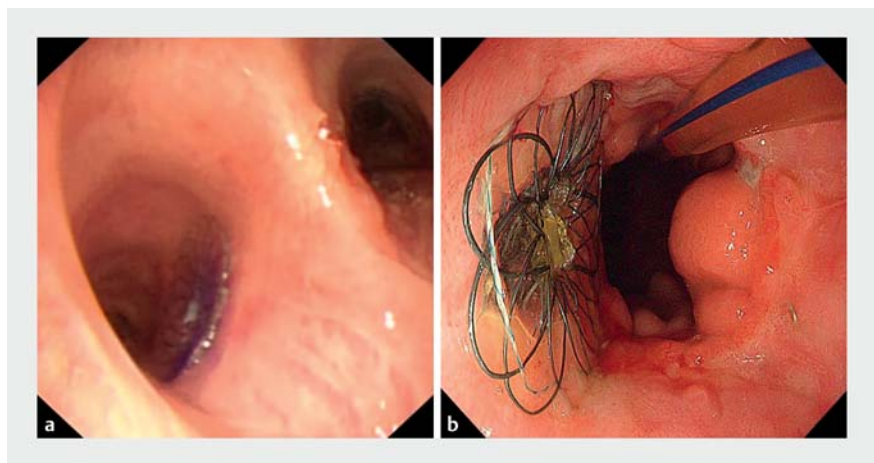
► **Fig. 1** View during gastroscopy showing a fistula between the esophagus and the tracheal wall, with a nasogastric tube seen inside the esophageal lumen.

Tracheoesophageal fistula (TEF) is a challenging condition that is difficult to treat. Several reports have described successful TEF treatment with an Amplatzer occluder (AGA Medical Corporation, Plymouth, Minnesota, USA) [1, 2]. However, Daniel et al. reported the case of a benign gastrobronchial fistula patient who underwent treatment with the Amplatzer device and died of fatal hemoptysis [3]. Inspired by this case, we developed a new dumbbell-shaped occluder device [4]. Compared with the Amplatzer occluder, this device has no protrusions, which reduces the risk of bleeding; even if the patient coughs, it will not increase airway damage.

A 69-year-old man with a chronic TEF was the first patient to be successfully treated with our novel occluder (► **Video 1**). He had been diagnosed 7 years previously with esophageal cancer and underwent surgery. He presented 1 year prior to treatment with cough, aspiration, and weight loss. An endoscopic examination revealed a tracheoesophageal fistula 27 cm from the incisors (► **Fig. 1**), with a diameter of 0.8 cm. After several esophageal stent placements and replacements and anastomotic sutures, there was still evidence of difficulty in healing of the



► **Video 1** Treatment of a tracheoesophageal fistula (TEF) by gastroscopy and bronchoscopy, using a newly developed dumbbell-shaped occluder.

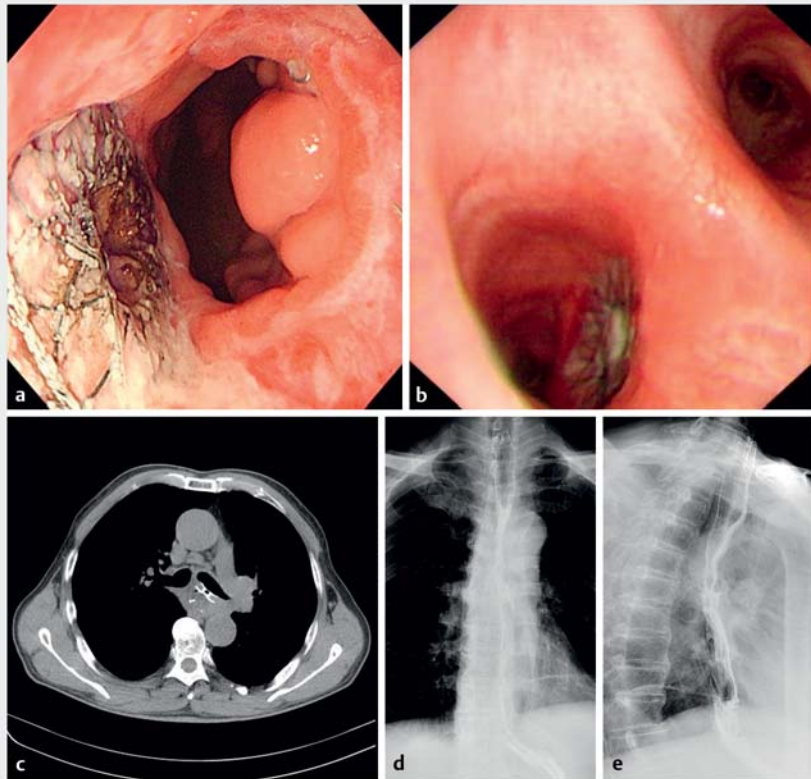


► **Fig. 2** Endoscopic images showing the orifices of the fistula occluded by the occluder device on: **a** bronchoscopic view; **b** gastroscopic view.

fistula. We therefore decided that application of this new instrument was an appropriate treatment strategy. We inserted a 9-Fr catheter through the endoscope, so that the device could be introduced into the airway. After releasing the distal dilation disc under direct vision with a bronchoscope, we gently pulled the device until it was fixed against

the airway wall (► **Fig. 2 a**). As the flexible catheter was removed, we observed that the side of the gastroscope slowly pulled the device to release the proximal expansion disc (► **Fig. 2 b**).

The patient tolerated a normal diet after 2 days. By the 4-month follow-up, all of his clinical symptoms had been relieved, and his body mass index had increased



► **Fig. 3** Follow-up at 4 months showing: **a** the appearance of the occluder device on gastroscopy; **b** the bronchoscopic appearance; **c** the occluder placed between the esophageal and tracheal walls on axial computed tomography (CT) scanning; **d, e** no contrast extravasation after blocking contrast examination of the tracheoesophageal fistula.

from 18.5 kg/m<sup>2</sup> to 23.6 kg/m<sup>2</sup>. Gastroscopy and tracheoscopy evaluations showed that the fistula was completely blocked, and no leakage was found on gastrointestinal radiography and computed tomography (► **Fig. 3**).

The findings of the present case demonstrate that our newly developed dumbbell-shaped occluder can effectively block a TEF, thereby providing a new method for mechanical TEF closure.

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## Competing interests

The authors declare that they have no conflict of interest.

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