

# Tracheal tear during laryngopharyngectomy and transhiatal oesophagectomy: a case report

Henry M.H. Sung MD FRCPC, Bill Nelems MD FRCSC

*A case is reported of a tracheal tear developing during laryngopharyngectomy and transhiatal oesophagectomy. Ventilation and oxygenation were managed by removing the tracheostomy tube and advancing a straight cuffed armoured tube via the tracheostomy into one main stem bronchus and applying CPAP to the other bronchus via a Foley catheter. Following gastrointestinal reconstruction, the membranous tracheal tear was repaired via a right lateral thoracotomy.*

Among the intraoperative complications of transhiatal oesophagectomy are pneumothorax, tracheobronchial disruption, life-threatening haemorrhage, and hypotension and dysrhythmias during the intrathoracic oesophageal dissection and gastric pull-up. We report a case of a posterior membranous tracheal tear involving nearly the entire length of the trachea which occurred during laryngopharyngoesophagectomy.

## Case report

A 54-year-old woman presented for one-stage laryngopharyngectomy and transhiatal oesophagectomy with stomach pull-up for treatment of carcinoma of the posterior wall of the mid oral pharynx. She was a heavy cigarette smoker, regular ethanol user, and malnourished. Preoperative arterial blood gas analysis whilst breathing room air

showed pH 7.49,  $\text{PCO}_2$  41 mmHg,  $\text{PO}_2$  79 mmHg, and  $\text{HCO}_3^-$  32  $\text{mmol} \cdot \text{L}^{-1}$ .

Anaesthesia was induced with thiopentone and with the aid of succinylcholine the trachea was intubated with a cuffed 6.5 mm oral tracheal tube. Anaesthesia was maintained with nitrous oxide (60 per cent) in oxygen, isoflurane, morphine, and pancuronium. Ventilation was controlled using the Drager AV-E anaesthesia ventilator. Monitors included ECG, arterial line, CVP line, urethral catheter, and shared mass spectrometer system. A pulse oximeter was not available initially.

A tracheostomy was performed first and the oral tracheal tube was changed to a cuffed armoured 7.0 mm ID Rusch Laryngoflex tube. The otorhinolaryngology team proceeded to laryngopharyngectomy.

Then, the thoracic surgery team mobilized the stomach and oesophagus. As the oesophageal stripping was completed a large leak developed in the breathing system which precluded ventilation of the lungs. A diagnosis of tracheal rupture was made and the leak was controlled by packing the posterior mediastinum with sponges. The Laryngoflex tube was changed to a straight cuffed armoured tube and this was advanced distally until effective ventilation could be established. It could be seen that only the right lung was being ventilated. Nitrous oxide was discontinued.

It was elected to complete the gastric tube construction and pull-up and then to repair the tracheal tear. Repeated blood gas determinations showed a progressive decline in the  $\text{PO}_2$  to 44 mmHg, despite 100 per cent inspired oxygen and PEEP 7  $\text{cmH}_2\text{O}$  to the ventilated right lung. Thus a number 14 Foley catheter, with its tip immediately beyond the cuff cut-off, was passed through the posterior tracheal tear via the cervical incision and manipulated into the left main stem bronchus. The 5 ml capacity balloon was gradually inflated to effect a seal and CPAP was applied to the left lung via the Foley catheter. The CPAP apparatus used was a modification of the Jackson-Rees circuit with a bag fitted with an adjustable tap. A pressure gauge was also incorporated into the CPAP set-up. By

## Key words

ANAESTHESIA: thoracic, one-lung ventilation;  
COMPLICATIONS: tracheal tear; EQUIPMENT: tubes, endobronchial.

From the Department of Anaesthesia and the Division of Thoracic Surgery, Vancouver General Hospital, Vancouver, British Columbia.

Address correspondence to: Dr. Henry M.H. Sung, Department of Anaesthesia, Vancouver General Hospital, 910 West 10th Avenue, Vancouver, British Columbia, V5Z 4E3.

adjustment of the oxygen flow rate and the adjustable tap the level of CPAP could be altered. A pulse oximeter was applied to the patient and a SaO<sub>2</sub> of 97 per cent was observed with CPAP of 6 cmH<sub>2</sub>O. Subsequent arterial blood gas analysis showed PCO<sub>2</sub> 37 mmHg and PO<sub>2</sub> 76 mmHg and the SaO<sub>2</sub> was consistently above 95 per cent.

When the gastrointestinal reconstruction was completed and the abdominal and cervical incisions were closed, the chest was entered via a right thoracotomy to repair the tracheal tear. The posterior membranous trachea had sustained a 5 cm longitudinal tear extending down to the carina. During the tracheal repair the Foley catheter being used to deliver CPAP was left in place for as long as possible before being removed through the cervical incision. With the repair effected the straight cuffed armoured tube was pulled back so that its tip was in the trachea. We believed that pressure from the tube cuff would pose the most hazard to the repaired trachea. Therefore the cuff was left deflated and the resulting leak in the breathing system was accepted. This proved to be satisfactory on blood gas analyses.

Postoperatively the patient's lungs were ventilated in the ICU for 14 hours. The patient was transferred to the ward on postoperative day two and discharged from hospital on postoperative day 50.

### Discussion

The incidence of tracheal tear during transhiatal oesophagectomy varies from 0–10 per cent.<sup>1–9</sup> This complication may occur during the dissection of the upper thoracic oesophagus from the posterior membranous trachea. This is especially so if the oesophageal lesion is adherent to or invading the trachea. Baker and Schechter<sup>8</sup> also suggested that aggressive dissection against a large tracheal tube cuff may account for this complication.

Careful patient selection coupled with transhiatal palpation during laparotomy to determine suitability of the transhiatal approach will minimize this complication.<sup>9</sup> Smith and Hopkinson<sup>10</sup> recommended adjusting the cuff pressure to the minimum necessary to prevent gas leakage and not using air. Condon<sup>11</sup> suggested releasing the cuff during mediastinal manipulations. Bains and Spiro<sup>12</sup> believed that injury to the trachea could be minimized by using the largest tube which would fit into it and avoiding inflating the cuff.

In managing this complication if the tracheal tube is long enough ventilation can be re-established by advancing the tube beyond the tear.<sup>3,8,13</sup> In retrospect we realized that a tube that has to be advanced beyond the carina is better advanced into the left main stem bronchus. A tube in the right main stem bronchus is likely to prevent ventilation of the right upper lobe. Also a tube into the left side is preferable for the right thoracotomy for repair of

the tracheal tear because of better ventilation-perfusion matching and better surgical exposure. In patients undergoing transhiatal oesophagectomy (without laryngectomy) the airway should be managed with a left double lumen bronchial tube or at least an uncut tracheal tube to deal with the possibility of tracheobronchial disruption or haemorrhage requiring thoracotomy.

The development of severe hypoxaemia necessitated finding a method to improve oxygenation. During one-lung ventilation with double lumen bronchial tubes, the application of CPAP to the nonventilated lung is a recognized method to improve oxygenation. Abou-Madi *et al.*<sup>14</sup> described the use of a number 28 Foley catheter to ventilate the lungs through a short distal tracheal stump during resection of a lower tracheal tumour. We used a number 14 Foley catheter to apply CPAP to the nonventilated left lung to improve oxygenation.

In most of the reports on this complication the tracheal tears were surgically repaired.<sup>3,6–9</sup> If the airway disruption involves the upper half of the trachea, a partial upper sternal split provides access to the trachea for repair.<sup>13</sup> If the tear involves the distal trachea or carina a right thoracotomy is performed for closure of the tracheal injury.<sup>13</sup>

In summary we report a case of a posterior membranous tracheal tear involving nearly the entire length of the trachea which occurred during laryngopharyngectomy and transhiatal oesophagectomy. Ventilation was re-established by advancing a straight cuffed armoured tube via the tracheostomy into the right main stem bronchus. This led to severe hypoxaemia. Applying CPAP to the left lung using a number 14 Foley catheter improved oxygenation to allow completion of the planned surgical procedure and the tracheal repair.

### References

- 1 Steiger Z, Wilson RF. Comparison of the results of esophagectomy with and without thoracotomy. *Surg Gynecol Obstet* 1981; 153:653-6.
- 2 Plant M. Anaesthesia for pharyngolaryngectomy with extrathoracic oesophagectomy and gastric transposition. *Anaesthesia* 1982; 37: 1211–3.
- 3 Orringer MB, Orringer JS. Esophagectomy without thoracotomy: a dangerous operation? *J Thorac Cardiovasc Surg* 1983; 85: 72–80.
- 4 Yonezawa T, Tsuchiya S, Ogoshi S, Tamiya T. Resection of cancer of the thoracic esophagus without thoracotomy. *J Thorac Cardiovasc Surg* 1984; 88: 146–9.
- 5 Stewart JR, Sarr MG, Sharp KW, Efron G, Juanteguy J, Gadacz TR. Transhiatal (blunt) esophagectomy for malignant and benign esophageal disease: clinical experience and technique. *Ann Thorac Surg* 1985; 40: 343–8.

- 6 Kron IL, Joob AW, Levine PA, Cantrell RW. Blunt esophagectomy and gastric interposition for tumors of the cervical esophagus and hypopharynx. *Am Surg* 1986; 52: 140-1.
- 7 Shahian DM, Neptune WB, Ellis FH, Watkins E. Trans-thoracic versus extrathoracic esophagectomy: mortality, morbidity, and long term survival. *Ann Thorac Surg* 1986; 41: 237-46.
- 8 Baker JW, Schechter GL. Management of panesophageal cancer by blunt resection without thoracotomy and reconstruction with stomach. *Ann Surg* 1986; 203: 491-9.
- 9 Hankins JR, Miller JE, Attar S, McLaughlin JS. Transhiatal esophagectomy for carcinoma of the esophagus: experience with 26 patients. *Ann Thorac Surg* 1987; 44: 123-7.
- 10 Smith BAC, Hopkinson RB. Tracheal rupture during anaesthesia. *Anaesthesia* 1984; 39: 894-8.
- 11 Condon HA. Anaesthesia for pharyngo-laryngo-oesophagectomy with pharyngo-gastrostomy. *Br J Anaesth* 1971; 43: 1061-5.
- 12 Bains MS, Spiro RH. Pharyngolaryngectomy, total extrathoracic esophagectomy and gastric transposition. *Surg Gynecol Obstet* 1979; 149: 693-6.
- 13 Orringer MB. Transhiatal esophagectomy without thoracotomy for carcinoma of the esophagus. *Adv Surg* 1986; 19: 1-49.
- 14 Abou-Madi MN, Cuadrado L, Domb B, Barnes J, Trop D. Anaesthesia for tracheal resection: a new way to manage the airway. *Can Anaesth Soc J* 1979; 26: 26-8.

#### Résumé

*Nous présentons un cas de rupture trachéale survenu lors d'une laryngopharyngectomie avec oesophagectomie par voie hiatale. Nous avons alors glissé un tube renforcé avec ballonnet par la trachéotomie jusque dans la bronche souche droite et un cathéter de Foley branché sur un système de CPAP dans la bronche gauche, assurant ainsi ventilation et oxygénation. Après l'anastomose gastropharyngée, les chirurgiens firent une thoracotomie droite pour réparer la déchirure trachéale.*