

## Successful conservative management in post-intubation tracheal rupture

### INTRODUCTION

Post-intubation tracheal rupture (PiTR) is a rare condition but it carries a high morbidity and mortality. Diagnostic suspicion is essential, with subsequent confirmation by bronchoscopy. Both conservative and surgical management apply depending on the patient profile (co-morbidities, respiratory stability) and characteristics of the lesion (size and location).

A 43-year-old female patient (155 cm, 48 kg), known asthmatic, was posted for stabilization of the C<sub>4</sub>-C<sub>5</sub> spine. After induction of anaesthesia, intubation was attempted with stylet loaded 7.5 cuffed flexometallic tube (Rusch). When moderate resistance was encountered to insertion beyond 17 cm (Cormack 4), another 7.0 sized tube was inserted without difficulty. The tracheal tube cuff was inflated and maintained at a pressure of 20 mmHg. After few minutes of positive pressure ventilation, peak airway pressures rose to 36-42 cm H<sub>2</sub>O and auscultation revealed severe bronchospasm. After 30 minutes, the bronchospasm subsided, surgery was deferred and the patient reversed of the neuromuscular block. Physical examination revealed subcutaneous emphysema in the neck and upper thorax confirmed by thoracic computed tomography (CT), which showed severe and diffuse soft tissues emphysema from the anterior thoracic region to the neck, pneumo-mediastinum, slightly irregular right lateral outline of the trachea at its medial-distal third with impinging tip of tracheal tube without any pneumothorax or oesophagus tear [Figure 1]. Traumatic PiTR was suspected and confirmed

by fiberoptic bronchoscopy (FOB) which showed a clean, sharp-edged and longitudinal tear (2.5 cm) in the posterior membranous part of the trachea located approximately 2.5 cm above the carina which moved dynamically in with inspiration. There was no apparent active bleeding, clots or mediastinal herniation. Patient was comfortable on minimal pressure support spontaneous ventilation, maintaining 99% oxygen saturation with stable respiratory and haemodynamic values. After consultation with the thoracic surgical team, a non-operative management was decided upon and the tracheal tube “bridged” endoscopically with its minimally inflated cuff positioned as distal to the lesion as possible nearing the carina. Patient was kept on humidified oxygen with broad spectrum antibiotic therapy, steroids, cough suppressants, anti-inflammatory aerosol therapy and parenteral nutrition for the next 48 hours. Repeat FOB and chest CT [Figure 2] performed on day 3 revealed healing and opposed margins of the PiTR and no mediastinal collection respectively. The trachea was extubated under FOB guidance uneventfully the same day and the patient shifted to the ward on seventh day after visualising healed tracheal mucosa on repeat FOB. Follow-up FOB on first and third month showed completely healed mucosal scar without any stenosis or fistula.

## DISCUSSION

PiTR is a rare, but potentially life threatening complication. Its incidence estimation ranges from 0.05% to 0.37% of single-lumen tube intubations.<sup>[1]</sup> The mechanical risk factors include multiple forced intubation attempts, inexperienced hands, tracheal tube guides protruding beyond the tube tip, incorrect

tube tip position, inappropriate tube size, over or eccentric inflation of cuff, movement of head and neck in intubated trachea, repositioning of tube with inflated cuff and significant cough.<sup>[1,2]</sup> The anatomical factors include tracheal anomalies, chronic obstructive pulmonary disease, advanced age, chronic steroid use, short stature and female sex.<sup>[1-3]</sup> In our patient, the primary insult was probably by direct tracheal tube trauma during the first vigorous intubation attempt. The cuff inflation might have opened up the tracheal tear and high airway pressure might have increased it further. The most common clinical manifestations of PiTR are subcutaneous emphysema in the chest and neck, pneumomediastinum, pneumothorax and respiratory failure. Radiological findings, such as subcutaneous or mediastinal emphysema, extension of the tip of the endotracheal tube to the right and cuff over inflation or herniation, are usually indirect signs of injury.<sup>[1,2]</sup> Clinical suspicion must be followed by diagnostic FOB for visualisation of the length, morphology, exact site and extension of tracheal laceration, depth of transmural involvement and any mediastinal herniation.<sup>[4]</sup> PiTR is usually longitudinal and most frequently located in the pars membranosa, the posterior part of trachea that lacks cartilaginous support. Consensus has not yet been reached on the management strategy for PiTR as all the published recommendations are based on personal experiences with small group of patients. Conservative treatment consists of positioning the tracheal tube cuff distal to the lesion i.e., bridging manoeuvre<sup>[4]</sup> (in order to keep the lesion under zero pressure and prevent widening of the injury during inspiration), chest drain if required, continuous airway humidification, broad-spectrum antibiotics, cough suppression,



**Figure 1:** Axial CT image reveals the endotracheal tube (white arrow) protruding posterior to the posterior tracheal wall (open arrow). Pneumo mediastinum and chest wall emphysema (black arrow)



**Figure 2:** Follow-up axial CT on the third day shows healed margins of the posterior tracheal wall (white arrow)

enteral (post-pyloric) or parenteral nutrition and chest physiotherapy.<sup>[1-3]</sup> It is advocated in patients who are clinically stable, with no respiratory embarrassment or air leakage, non progressive pneumo-mediastinum, no signs of mediastinitis, no oesophageal injury, short ruptures and easy achievement of adequate functional respiratory status under mechanical or spontaneous ventilation.<sup>[5]</sup> Other modalities of non-surgical approach include endoscopic application of fibrin sealant<sup>[5]</sup> onto the lesion and pressure controlled non-invasive ventilation especially in PiTRs with oesophageal herniation and mild respiratory distress.

In summary, clinical suspicion with subsequent FOB confirmation are essential for diagnosing PiTR. Treatment is controversial, although it appears that conservative management is associated with a favourable outcome, but the group of patients benefiting from operative management has not been fully defined.

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