

A novel method of airway management in a case of penetrating neck injury

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ABSTRACT

Direct injury to airway is a rare event and also a challenge to anaesthesiologist and surgeon. We present a case report of open tracheal injury with right pneumothorax in a young male following assault with a sharp weapon. In spite of a chest tube *in situ*, the patient came with collapse of one lung and tachypnoea which required surgical exploration. Lower airway was evaluated by fibre-optic bronchoscopy through the open tracheal wound while he was awake and tracheal tube was passed over the bronchoscope. There was no vascular or oesophageal injury detected. Although there was a pleural tear, there were no signs of injury to lung parenchyma. After evaluation, end to end anastomosis of the trachea was planned, for which orotracheal tube was passed with surgical assistance. Patient was shifted to post-operative high dependency unit and was electively ventilated for 7 days and was later successfully extubated under fibre-optic bronchoscope guidance.

Key words: Airway management, novel method, penetrating neck injury

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INTRODUCTION

Penetrating neck injury (PNI) is a life-threatening emergency because of potential injury to vital structures of the neck and thorax.^[1] Successful management depends on prompt recognition of injury, appropriate diagnostic evaluation and proper surgical intervention.^[2] The mortality rate due to PNI ranges between 3% and 6% mainly due to vascular injury.^[1,3]

CASE REPORT

We report a case of a 22-year-old male brought to emergency department with a history of sickle injury on the left side of the neck following which the patient developed dyspnoea and aphonia. On examination, the patient was alert, restless and unable to lie supine. Heart rate (HR) was 120/min, blood pressure (BP) 138/84 mmHg, respiratory rate 38/min and saturation (SpO₂) 86% on room air. The patient was not able to vocalise, with persistent air leak from the neck wound [Figure 1a]. There was no active bleeding and his BP was stable although he had tachycardia. In view of respiratory distress and suspected airway injury, immediate chest and cervical spine X-ray was obtained. Chest X-ray showed gross right-sided pneumothorax and

pneumomediastinum, causing collapse of the right lung [Figure 2c]. Computerised tomography (CT) revealed large anterior tracheal wall injury with right-sided gross pneumothorax and pneumomediastinum, with no vascular injury [Figure 2b]. A right-sided intercostal drain (ICD) was inserted with little improvement in patient's respiratory status. As there was no acute respiratory distress, he was shifted to the operating room (OR) for surgical evaluation and repair without attempting any artificial airway.

In the OR, patient was connected to standard monitors and noted to have HR of 114/min, BP 132/84 mmHg and SpO₂ of 88%. Large bore intravenous (IV) cannulae and left radial arterial line were secured. Local examination of the wound in OR revealed an 8 cm × 5 cm obliquely incised wound on the left lower aspect

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Figure 1: (a) The penetrating neck injury before intervention, (b) endotracheal tube through the open tracheal wound site

of anterior triangle of the neck about 1.5 cm above clavicle. The sternal head of sternocleidomastoid muscle was partially cut, and tracheal rings were seen through the wound. To assess the location and to rule out intrathoracic tracheal injury, we decided to perform awake fibre-optic bronchoscopic evaluation using a 5 mm diameter adult intubating fibroscope through the open neck wound under local anaesthesia.

The fibre-optic bronchoscope was guided through the open neck wound into distal part of trachea. After assessing the trachea till carina and the bronchi, intrathoracic tracheal injury was ruled out. A 7.5 mm internal diameter, reinforced endotracheal tube (ETT) was advanced over the bronchoscope into the trachea until the tip of the tube was just above the carina and the cuff was inflated [Figure 1b]. Placement of the tube was confirmed with capnograph trace and chest auscultation. Right side air entry was diminished and there was a harsh sound coming from the open chest wound site. After confirming the tracheal tube cuff inflation, it was suspected to be arising due to negative pressure generated by the respiratory efforts of the patient with open chest wound on the right side. Anaesthesia was induced with propofol 120 mg, IV; atracurium 30 mg IV was used for neuromuscular blockade. Anaesthesia was maintained with 1.5% isoflurane, in 1:1 air and oxygen with IV morphine bolus of 6 mg for analgesia. Following the institution of positive pressure, ventilation, right lung air entry improved significantly. On surgical assessment, there was a clean cut in the anterior wall at the 3rd and 4th tracheal ring. One stage surgical end to end anastomosis was planned for the tracheal injury, which required an orotracheal intubation. Therefore, direct

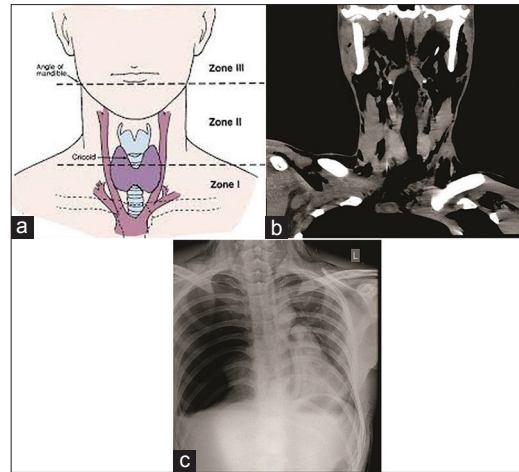


Figure 2: (a) Zones in the neck, (b) computerised tomography scan showing left-sided penetrating neck injury extending into the anterior wall of trachea with surgical emphysema, (c) chest X-ray of the patient showing right pneumothorax

laryngoscopy was performed and a gum elastic bougie was passed; the tip of the bougie protruded through the proximal cut end of tracheal wound and was guided by the surgeon into distal trachea. The existing ETT was replaced by a cuffed 7.5 mm orotracheal tube over the bougie. Position was again confirmed with bronchoscope and capnogram. A primary repair of the tracheal wound and injured right pleura was done. Rest of the perioperative period was uneventful.

DISCUSSION

PNI is a life-threatening emergency and demands immediate management due to proximity of vital structures in the neck such as major blood vessels, trachea, oesophagus and nerves.

The anatomical region of the neck can be divided into three zones for the purpose of evaluating and treating penetrating injuries [Figure 2a]. Zone I extends from the clavicle to the cricoid cartilage, Zone II extends from the inferior margin of the cricoid cartilage to the angle of the mandible and Zone III is located from the angle of the mandible to the base of the skull. Zone II injuries are the most common (50–80%).^[4-6] If the patient is haemodynamically stable, investigations have to be carried out to know the extent of injury, such as X-ray neck, ultrasonography and CT scan. Haemodynamically, unstable patients require immediate surgical exploration. If the patient has tracheal injury, conventional endotracheal intubation with direct laryngoscopy can aggravate the injury and this may even lead to complete disruption of the trachea, so awake fibre-optic intubation is the safest method to secure the airway.^[7]

Our patient had Zone I injury and was stable haemodynamically. He had respiratory distress with right lung collapse. An ICD was inserted after initial investigations and was followed by CT scan which showed tracheal injury in continuity with right hemi-thorax, but the extent of injury was known only on direct examination of the wound and airway by fibre-optic bronchoscopy. Awake fibre-optic bronchoscopy could not be performed either by nasotracheal or by orotracheal route as the patient was not cooperative and could not lie supine. Hence, fibre-optic bronchoscopy was performed through the neck wound to know the extent of airway injury. Distal part of the trachea was found intact without any injury; hence, reinforced ETT was passed over the fibre-optic bronchoscope after which the ICD leak disappeared after a few breaths. The open pneumothorax hidden in the deeper part was constantly sucking air during spontaneous inspiratory effort, not allowing the right lung expansion despite ICD placement. A persistent air leak despite the chest tube drainage should alert the clinician on the possibility of airway injury.^[6] The entrapped air in the pleural cavity was pushed out once positive pressure ventilation was initiated with no further leak from the ICD.

CONCLUSION

Securing airway is always a priority in cases of PNI involving airway injury. Airway control and management of the patient will not only depend on the site of injury but also depend on the nature of the injury.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the

patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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