Laryngotracheal separation with pneumopericardium after a blunt trauma to the neck

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Case report

On the 14 April 1998 a 27 year old male motorcyclist was involved in a road traffic accident in the early hours of the morning, when he hit a bus and went underneath it. He was found to be slightly confused at the scene of the accident and was complaining of pain in the front of his neck. He was breathing spontaneously. On arrival to the accident and emergency (A&E) department in Grimsby at 0600 he was fully conscious and orientated and had a Glasgow Coma Score of 15/15. He was breathing spontaneously with tachypnoea (45 per minute). The airway was clear. His pulse rate was 92 per minute and blood pressure was 160\104 mm Hg. He had a 3 cm long laceration over his chin. There was normal air entry on both sides on his chest. There were no signs of head injury or any other associated injuries. He arrived with a hard collar around his neck and was given oxygen 10 litres per minute and using a facemask and intravenous fluids were given. His oxygen saturation remained at 80% despite giving oxygen. After arrival to A&E the patient became more agitated and oxygen saturation had decreased to 79% and he developed obvious surgical emphysema in the neck. Endotracheal intubation with rapid sequence induction was considered, however, pre-oxygenation has failed to improve his oxygen saturation; in fact it deteriorated to 75%. It was impossible to visualise the laryngeal opening with failure to intubate the patient; the airway was almost completely obstructed. Cricothyroidotomy and mini-tracheostomy were attempted but failed to establish any airway. A tracheostomy incision was performed but the trachea was not identified and there was gross swelling and surgical emphysema in the soft tissue of the neck. The patient's condition deteriorated and he soon arrested. Cardiopulmonary resuscitation was started immediately. Radiological examination of the neck revealed the presence of air in the soft tissue planes with an increased prevertebral soft tissue space over the maximum normal of 5 mm opposite the third cervical vertebral body (figs 1 and 2). The chest radiograph showed air in the mediastinum (pneumomediastinum) and in the pericardial sac (pneumopercardium) (fig 3). Pericardiocentesis was performed: 50 ml of blood and 300 ml

Figure 1 Lateral view of the cervical spine: showing a wide prevertebral space (over 5 mm opposite the third cervical vertebra), with air in soft tissue planes.

Figure 2 AP view of the neck: showing air in the soft tissue planes (surgical emphysema).

Figure 3 Chest radiograph showing air in the mediastinum (pneumomediastinum) and in the pericardium (pneumopericardium).

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of air were aspirated with some improvement in the vital signs. A second attempt to intubate the patient also failed and a bougie was introduced. However, the anaesthetist felt an obstruction to free passage of the bougie. At this stage further dissection in the neck located the completely divided trachea, which had retracted inferiorly in the neck. An endotracheal tube (with a bougie) was guided by hand, through the tracheostomy incision, into the distal trachea and the airway was established and ventilation resumed. However, the patient remained unconscious with fixed dilated pupils. Magnetic resonance imaging of the brain and neck was carried out that showed brain oedema with multiple areas of abnormal signs, suggesting anoxic damage but no signs of any bleeding. There was also pre-vertebral gas shadow in the neck but no damage to the cervical spine. Two sets of brainstem tests were carried out on two consecutive days after admission, which confirmed brain death. Postmortem examination of the body showed the presence of fractures of the laryngeal cartilages with almost complete transection of the upper airway just below the larynx.

Discussion

Laryngotracheal injuries are rare and about 80% of these injuries occur within 2.5 cm of the carina.[1] Men are more affected than women in a ratio of five to one with a mean age of late 20s to mid-30s. Over 75% of non-penetrating injuries die at the scene of the accident or are dead on arrival at A&E and after operative repair of those who have survived, there is a 14%–25% mortality mainly because of the associated injuries.[2] Those patients who reach the hospital alive after tracheal injuries have established an airway through the ruptured segment and the diagnosis may be missed initially. In complete tracheal transection the mediasternal tissues may provide a "neo-trachea" maintaining an airway provided that the intratracheal pressure is not abnormally high. In these cases intubation is hazardous because the lower end of the endotracheal tube may perforate the mediasternal tissue at the site of tracheal separation, passing into a false track and hence not only obstructing the airway completely but also exacerbating any mediastinal or pleural air leak.[3] Connecting the endotracheal tube to positive pressure ventilation can produce major air leakage causing severe medisternal emphysema. An air leak from the damaged trachea into the plane between the trachea and pretracheal fascia can track down into the pericardium causing a pneumopericardium[4] that reduces venous return and cardiac output (cardiac tempanade). In the initial stages of treatment of these patients the diagnosis of TB injury may be missed and become apparent only on attempting endotracheal intubation for poor spontaneous ventilation, head injury management requirements or for general anaesthesia. A high index of suspicion should exist in any injury that may be associated with airway trauma. Signs and symptoms may be subtle in tracheal injuries and also relatively non-specific correlating poorly with the severity of the underlying injuries.[5] The clinical picture initially may not be greatly different from that of pneumothorax and subcutaneous air leak caused by rib fractures. However, isolated laryngotracheal separation can present with airway distress, hoarseness of voice (because of bilateral vocal fold paralysis), external indication of trauma to the skin overlying the trachea and surgical emphysema caused by the extravasation of air into the soft tissue of the neck with its characteristic radiological findings.[6]

The case we are reporting is an example of a high energy blunt trauma to the neck that can be rapidly lethal if the damaged airway is not diagnosed early. Therefore, the most experienced member of the trauma team must take responsibility for airway management—with inline stabilisation of the neck. Endotracheal intubation should be attempted in cases with tracheal injuries except in massive maxillofacial injuries and will be successful in the vast majority of cases. Even when there is a complete disruption of the trachea with distraction of the distal end of the trachea into the superior mediastinum, endotracheal intubation can be achieved using a flexible bronchoscope to guide the endotracheal tube along the bronchoscope into the distal end of the trachea to establish the airway.[2] Tracheostomy should be performed only after failure of endotracheal intubation. The damaged trachea should be repaired in theatre with appropriate antibiotic and tetanus prophylaxis after stabilising the patient in the resuscitation room.

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