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Case Report

Bilateral first rib fractures – case report and review

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From the time that they were originally described in 1869, first rib fractures have been a source of anxiety to attendant doctors.[1] First rib fractures are associated with major thoracic trauma and predispose to injury of the subclavian vessels, brachial plexus and mediastinal structures. These complications invariably follow unilateral first rib fractures. In contrast, bilateral first rib fractures (BFRFs) may follow less significant thoracic trauma, suggesting that the mechanism of injury may be different. Furthermore, these injuries have rarely been reported to cause serious complications. The following report illustrates this point.

Case report

A 28-year-old man presented to Stanger Hospital after being run over by a motor vehicle. The injuries were confined to the thorax, with abrasions along the upper thorax posteriorly. Surgical emphysema was present over the left chest with marked tenderness along the lower ribs suggesting fractures.

The patient was fully conscious and normotensive; breath sounds were decreased on the left. Abdominal examination was normal. Examination of the limbs revealed no neurovascular deficits. Baseline blood investigations were normal. The chest radiograph showed BFRFs, fractures of the 5th - 9th ribs on the left side, and bilateral surgical emphysema.

Management entailed analgesia (including rib blocks) and close observation of respiratory function. The patient was discharged 5 days later. On review a month later he was found to be in good health; specifically, there were no upper-limb neurovascular deficits or neuropathies.

Discussion

The mechanism of injury in BFRF remains unclear. Some authors suggest that it is a relatively benign condition and emphasise that clinical endeavours should be directed at associated injuries, especially of the spinal cord; others suggest that BFRF is a harbinger of major thoracic trauma and mandate urgent investigation to exclude the possibility of injury to the great vessels.[2-4]

The rarity of BFRF leads one to the conclusion that there can be no rules regarding the investigation of this injury; investigations are based on knowledge of the anatomical structures at risk of injury.

Extrapolating management guidelines for BFRF from experience with unilateral first rib fractures seems to be logical and is based on the premise that unilateral fractures, while not common, occur more often than BFRFs. Confounding this comparison is the notable rarity of significant intrathoracic (especially great-vessel) injury in the documented reports of BFRF. Perhaps this is because of a more even distribution of the chest violence along the components of the thoracic inlet.

Regardless of the hypothesis, documented cases of BFRF fall into one of three categories:[3,5-9] (*i*) as a result of direct chest trauma, usually related to motor vehicle accidents; (*ii*) in the setting of sporting activities, particularly related to activities that prompt excessive neck muscle contraction such as weight lifting and rowing; and (*iii*) medical cases of respiratory compromise that require the excessive use of accessory breathing muscles to assist with coughing and ventilation – status asthmaticus, and pertussis in childhood are well-documented causes.

Blunt trauma to the chest (category (*i*)) usually results in fracture of these ribs at their weakest point, i.e. along the subclavian groove. 'Traction'-type forces (categories (*ii*) and (*iii*) above) cause fractures close to the scalene tubercule, the point of insertion of the scalene muscles. It would seem prudent to classify cases of isolated BFRF into their mechanism of injury and site of fracture.

Currently, it is recommended that investigations to define subclavian arterial or other vascular injury should be selective. The presence of a widened mediastinum on chest radiograph, upper-extremity pulse deficits, displaced first rib fractures, subclavian groove fractures, brachial plexus injury and an expanding haematoma are situations where such investigations are warranted.[4,10]

When there is clinical suspicion of a vascular injury, duplex scan of these vessels with progression to subclavian and axillary angiography is recommended.

After excluding the possibility of neurovascular injury, treatment of BFRF should involve no more than analgesia and hot packs; cervical stabilisation with a collar is considered unnecessary.

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Case Report

Emergency percutaneous tracheostomy

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Summary

We present a case of acute upper airway obstruction secondary to angio-oedema. The patient underwent emergency percutaneous tracheotomy. Other options available for emergency surgical airway are discussed.

Complete upper airway obstruction that cannot be alleviated by supraglottic intubation devices is a rare situation in emergency medicine. The primary aim in the management of such patients is to provide rapid oxygenation. The options available to the physician include temporary (needle transtracheal jet ventilation, cricothyroidotomy) or definitive airway procedures (tracheostomy). The fastest method available to provide oxygenation is an emergency cricothyroidotomy,[1,2] which can be performed within 10 seconds.[3] Percutaneous tracheostomy (PCT) is becoming more popular in intensive care units (ICUs), and the guidewire dilator forceps technique described by Giggs *et al.*[4,5] is well documented in non-emergency situations. PCT has the advantage of being feasible under local anaesthesia, at the bedside and without first requiring airway access. It has been performed within 3 minutes in the emergency situation[6] and the average time was 5½ minutes in a study done by Ben-Nun *et al.*[7] on trauma patients.

Case report

A 76-year-old man presented to our emergency department with sudden onset of difficulty in breathing and swelling of his face, lips and tongue. He was a known hypertensive on hydrochlorothiazide and used doxazosin for benign prostate hypertrophy. On clinical examination he had swelling of his face, lips and tongue with marked respiratory difficulty.

The patient's breathing rapidly became more laboured and he subsequently developed acute upper airway obstruction. He required airway support, and endotracheal intubation was attempted by the anaesthetist using 10 mg intravenous midazolam. Endotracheal intubation was unsuccessful and the ENT specialist was consulted. After injecting a local anaesthetic, a small skin incision was made over the upper part of the trachea. A large-bore cannula was inserted into the trachea and the position was confirmed by aspirating air. The guidewire was inserted via the cannula into the trachea. A percutaneous dilator was inserted over the guidewire. After dilating the subcutaneous soft tissue a tracheotomy tube was inserted over the guide wire. This procedure was performed within 2 minutes with no complications.

A diagnosis of acute upper airway obstruction secondary to angio-oedema was entertained. Further enquiry revealed that the patient used aspirin regularly and this was the presumed cause of the angio-oedema. The patient developed acute renal failure and nosocomial pneumonia over the next week. He died 12 days after admission in the ICU.

Discussion

Of the emergency surgical airway interventions, cricothyroidotomy is well recognised. There are two potential problems in performing a cricothyroidotomy. Firstly, it might be difficult to identify the cricothyroid membrane correctly, especially in patients who have sustained trauma to their larynx. Secondly, it might be potentially difficult to maintain the airway once a needle cricothyroidotomy has been performed. The plastic cannula described in textbooks is often very soft and can kink easily. It is also difficult to secure this tube after insertion and it can become displaced. Apart from these potential problems a needle cricothyroidotomy is only a temporary solution until a definitive airway can be provided, for example by means of a tracheotomy.

Conventional breathing systems deliver low flow because of the small internal diameter of the cannula, and jet ventilation can cause barotrauma in complete upper airway obstruction.[1] Surgical cricothyroidotomy is a more definitive option. The

danger of a surgical cricothyroidotomy is the risk of injuring the cricoid cartilage, which is the only complete ring in the upper airway. Injury to the cricoid cartilage can cause scarring, with subsequent subglottic stenosis. Indications for performing a cricothyroidotomy (surgical or needle) are very limited. It is therefore extremely difficult to gain experience and become confident in performing this procedure.

A surgical open tracheotomy takes much longer than a cricothyroidotomy and is not indicated in patients where respiratory support cannot be provided during the procedure. The anaesthetic options when performing a surgical tracheotomy include general or local anaesthesia. General anaesthesia may be achieved by gaseous induction while the patient is breathing spontaneously and attempted intubation as the patient is anaesthetised, or by fibreoptic intubation using local anaesthesia.[8,9] Both these procedures are hazardous and may take up to 10 minutes or longer before airway control is achieved.

When using local anaesthetic skin infiltration to perform an open tracheotomy the patient needs to be very co-operative for the duration of the procedure, which is often difficult for distressed and hypoxic patients.

In the early publications most authors considered obesity and a short neck as relative contraindications for percutaneous tracheostomy, whereas cervical injury, paediatric age and emergency were regarded as absolute contraindications. Since then PCT has been performed safely in obese patients with short or fat necks and in trauma patients without cervical spine clearance.[10-12] The study performed by Ben-Nun *et al.*[7] concluded that in experienced hands emergency PCT in trauma patients is feasible and safe.

It is important to stress that there are potential complications with this technique, especially when performed in the emergency setting. It is therefore important that only staff already trained in performing this procedure should consider doing it in the emergency setting. The advantage of the PCT method is that the same technique is utilised in both elective and emergency situations, therefore the surgeon can easily acquire considerable experience, which will make it safer to use in the emergency setting. A number of comparative studies[13-16] between PCT and open tracheotomy demonstrated either a lower complications rate with PCT or no statistical difference between the two methods.

Conclusion

In experienced hands, PCT may be considered an option when definitive emergency access is required within 10 minutes.

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