



Case report

Bilateral pneumothorax following a blunt trachea trauma

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ARTICLE INFO

Article history:

Received 4 March 2013

Accepted 23 August 2013

Keywords:

Bilateral pneumothorax

Tracheal rupture

Chest trauma

ABSTRACT

A 13 year old boy had an accident with his bike with a blunt thorax trauma and presented shortly after with facial swelling. Due to respiratory insufficiency, intubation was done during the transport to the clinic. First, a chest radiograph was performed, which showed a unilateral pneumothorax. Later a CT scan revealed bilateral pneumothorax and pneumomediastinum. Bilateral chest tube insertions improved the respiratory situation. Bronchoscopy showed a tracheal lesion two cm posterior to the main carina. After good wound healing, the patient was dismissed after 21 days in good health. Conservative treatment can be recommended in selected patients with a tracheal lesion when having a stable respiratory situation. If the patient does not improve after 48 h or if the clinical condition worsens, surgical management should be considered.

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1. Background

Tracheal rupture or lesion with consecutive pneumomediastinum and bilateral pneumothorax is a rare clinical condition which can be caused by infections, neoplasms or, as in our case report, be traumatic. This clinical condition is exceedingly rare, and no consensus has been found whether to manage a tracheal lesion conservatively or by surgery. This case report provides a brief overview about conservative and surgical management of rupture of the trachea. Due to a good clinical outcome, conservative treatment is increasingly favoured over surgical management in selected cases. In our case, conservative treatment had a good clinical outcome in a patient after a blunt trachea trauma.

2. Case report

This is an unusual report of a 13-year old boy suffering from bilateral pneumothorax and pneumomediastinum after a trauma. The boy had not been hospitalised before the accident and did not suffer from any lung disease. While riding a bike he crashed in an unknown manner. The arriving emergency doctors found an unconscious boy with laboured breathing. The exact accident

mechanism could not be reported from any pedestrians at that point of time. First, a Quincke-oedema or allergic reaction was suspected due to a severe facial swelling. Due to this assumption, glucocorticoids were injected intravenously. On the way to the hospital, the patient developed respiratory insufficiency and was intubated. In the clinic, extended physical examinations, performed in order to identify the reason for respiratory failure showed a bounce mark located below the thyroid gland as well as a severe skin emphysema. Reconstruction of the accident revealed that the origin of the bounce mark was due to a collision with a bollard.

3. Diagnostic

A chest radiograph showed a pneumothorax on the right side. Even though the patient was mechanically ventilated, his respiratory condition deteriorated continuously. Computer tomography presented bilateral pneumothorax as well as massive pneumomediastinum (Fig. 1). In order to find the cause, bronchoscopy was performed, which revealed a four by two cm lesion of the dorsal part of the trachea (Fig. 2). Followed by this intervention, gastroscopy showed an unremarkable oesophagus.

4. Differential diagnosis

Initially, due to facial swelling an allergic reaction had been suspected. Once breathing deteriorated, the list of differential diagnosis was expanded and a pneumothorax was diagnosed. Various causes can be taken into account: a traumatic event, an underlying clinical condition such as neoplasm, parenchymal

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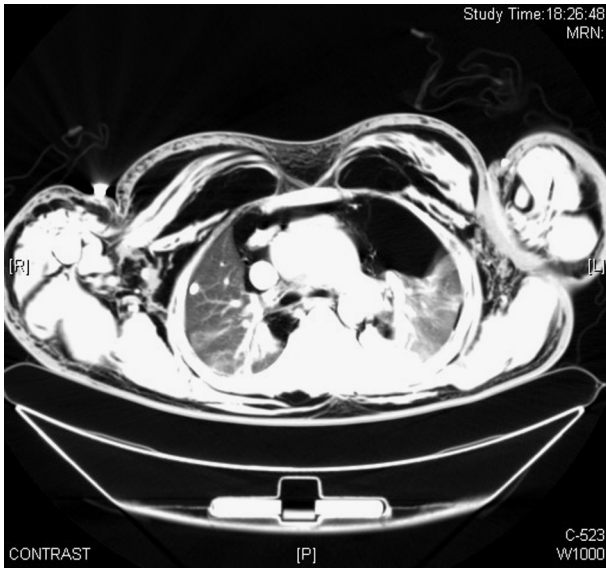


Fig. 1. CT scan with tissue emphysema and bilateral pneumothorax.

diseases or infections of the lung. Furthermore, spontaneous pneumothorax can occur. The combination of a traumatic event and a pneumothorax, first unilateral, then bilateral accompanied by pneumomediastinum resulted in two main differential diagnoses. Firstly, a rupture of the trachea or a rupture of the oesophagus or both.

5. Treatment

Resuscitation was achieved by mechanical ventilation through an orotracheal tube. In addition, bilateral chest decompression of the pleural space was performed by placing two 22 gauge chest tubes on each side into the interpleural space. The inserted orotracheal tube covered the whole lesion of the trachea and stented the traumatic area. Prophylactic antibiotic treatment was introduced with

cefuroxim intravenously. Because of fever and rising C-reactive protein values, ventilator-associated pneumonia was suspected. The antibiotic treatment was escalated to gentamicin, vancomycin and imipenem. The patient improved rapidly under this antibiotic regime. A control bronchoscopy was done on day three following hospitalisation. The oesophagus was still covering the traumatic rupture. The space between the oesophagus and the edges of the ruptured tissue had closed through granulation. The patient was extubated on day five in a stable respiratory condition. For three days non-invasive ventilation was still necessary for respiratory support. The clinical situation of the patient improved and the soft tissue emphysema was regressive. The right chest tube was removed on day nine, the left one on day ten.

6. Outcome

Under chest tube treatment, bilateral pneumothorax and pneumomediastinum declined rapidly. The lesion of the trachea healed, leaving only a small scar (Fig. 3). The following clinical course was uneventful, and the patient was discharged after 21 days of hospitalisation. A follow-up bronchoscopy four weeks later showed complete healing of the traumatic lesion (Fig. 4). The patient had regained his previous health condition.

7. Discussion

In this report we present a rare case of a traumatic tracheal rupture with bilateral pneumothorax. Unilateral pneumothorax is not an uncommon clinical condition, which can occur spontaneously, can be due to a traumatic event, or can be caused by any other underlying clinical condition. Bilateral pneumothorax combined with a pneumomediastinum as shown in our case is rare. Facial swelling as the first symptom is extremely seldom. In this case it became evident that a seemingly harmless symptom had a life-threatening cause.

The aetiology of tracheobronchial injuries was reviewed in Germany in a study from 2001 to 2005. Schneider and colleagues reported a total of 1033 tracheobronchial injuries, with 429 being

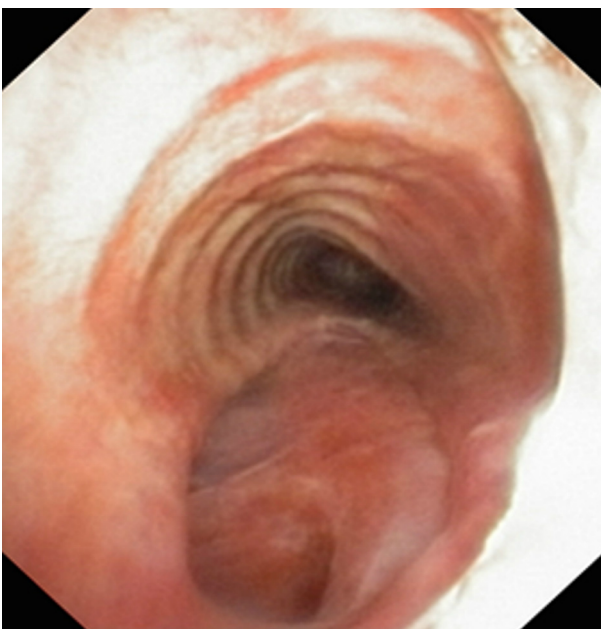


Fig. 2. Wound healing with granulation tissue 4 days after admission.



Fig. 3. Rupture of the trachea with 4 cm length.

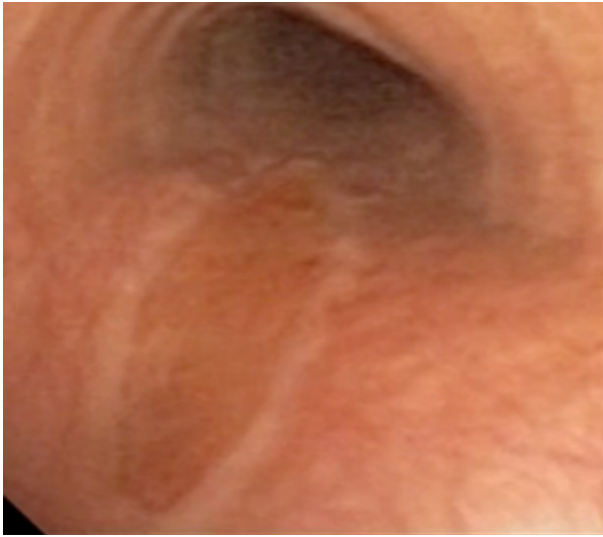


Fig. 4. Complete wound healing four weeks after the accident.

iatrogenic and 624 being non-iatrogenic. Looking at the non-iatrogenic tracheal injuries, the majority (64%) was caused by a blunt chest trauma. The remaining percentage was caused by rare entities such as penetrating traumata and bullet injuries [9]. In our case, the emergency doctors first suspected an allergic reaction and treated the boy with glucocorticoids. The correct diagnosis of tracheal laceration could only be made after radiographic imaging and a bronchoscopy. In case of accidents with blunt chest trauma where patients suffer from respiratory insufficiency, tracheobronchial rupture is one main differential diagnosis and should be taken into account.

There is no consensus of how tracheal lacerations should be managed. It is certain that once a tracheal lesion is revealed by bronchoscopy a statement of a thoracic surgeon have to clarify whether urgent surgery is required or conservative treatment should be continued. This statement is based on the clinical condition of the patient. Several clinical points should be considered: stable respiratory situation, no high volume fistula, reversible pneumothorax after chest tube drainage, no oesophageal lesion and reduced pneumomediastinum. However, in the past years publications favoured a conservative treatment for tracheal lacerations over interventional procedures [1–3]. In a case review of 29 patients suffering from iatrogenic tracheobronchial injury, treatment options were reviewed. Conservative treatment was favoured in patients who did not require mechanical ventilation or patients where ventilation was possible without any loss of tidal volume. Operative treatment was preferred in patients with progressive soft tissue emphysema or in patients with open perforations [1]. All conservatively managed patients survived. In the group of surgically treated patients, one died due to sepsis and one because of an ischaemic insult.

Other authors related the treatment method to the length of the laceration. Sippel and colleagues recommended conservative treatment in lacerations under 3 cm length [4], whereas Carbognani favoured conservative treatment in patients with an uncomplicated tear under 2 cm [2]. Non-invasive treatment for tracheobronchial injuries smaller than 4 cm was also recommended by other groups [5,6]. These results support conservative management in patients with a small laceration of the trachea, where mechanical ventilation is successful. This supports the treatment performed in our patient.

From our point of view the length of the tracheal rupture is not the only determining factor when choosing the optimal treatment.

Several other conditions must be taken into consideration. Gomez-Caro and colleagues recommended conservative treatment in patients with no signs of mediastinitis or with no rapid progressive subcutaneous emphysema [7]. Furthermore, the respiratory situation of the patient should be closely evaluated. This includes oxygen requirement, type of respiratory support and if present, the status of a skin emphysema. In addition, to ensure optimal treatment for the patient the whole clinical condition should be evaluated on a multi-disciplinary level by thoracic surgeons, anaesthesiologists, radiologists as well as pulmonologists.

When choosing conservative treatment, two options can be considered. One option is to manage the traumatic lesion with a silicon stent, aiming to stabilize the lesion. The advantages are safe stabilization of the lesion and early extubation. By choosing this treatment option, the wound healing process can not be monitored. In our case, we favoured to stabilize the lesion with an orotracheal tube. This technique has the advantage of moving the tube position, which allows the wound healing process to be observed. We recommend treating tracheal ruptures via an orotracheal tube.

In our case report, the clinical sequela was complicated by a ventilator-associated pneumonia, which was treated successfully with broad spectrum antibiotics. Since mechanical ventilation is mostly needed in patients with a tracheal rupture, and a mixed bacterial population is present in the tracheobronchial tree, prophylactic broad-spectrum antibiotic coverage should be applied [8].

7.1. Take home message

- The aetiology of bilateral pneumothorax is mostly traumatic.
- It can be caused by rupture of the oesophagus or the trachea.
- Is a tracheal lesion revealed by bronchoscopy, an urgent surgical treatment has to be discussed considering several clinical issues by multi-disciplinary panel of thoracic surgeons, anaesthesiologists, radiologists as well as pulmonologists before continue conservative treatment.
- When bilateral pneumothorax is suspected, initial multi-disciplinary evaluation is important. Surgery is recommended for clinically unstable patients. All other patients should be managed conservatively.
- Pneumonia and mediastinitis prophylaxis should be applied for all patients.

Funding

No funding was involved for the work of this paper.

Conflict of interest

The involved authors have nothing to declare. There is no competing interest. No funding was involved for the work of this paper.

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