CASE REPORT

Spontaneous pneumomediastinum

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SUMMARY

Spontaneous pneumomediastinum is the presence of free air within the mediastinum that is not associated with trauma. It is a rare, self-limiting condition that can cause widespread subcutaneous surgical emphysema. We present the case of a 12-year-old boy who presented with widespread spontaneous surgical emphysema and pneumomediastinum, with no history of trauma or respiratory tract disease. We discuss our assessment of him and management with our multidisciplinary team (MDT), and whether radiological investigations including CT are helpful in such cases. In conclusion, we hypothesised that the child's coughing was the most likely cause of the tracheal rupture leading to the spontaneous surgical emphysema. Spontaneous pneumomediastinum in the paediatric patient is extremely rare. This case highlights how spontaneous pneumomediastinum can be successfully managed conservatively, and how MDT input can be helpful in guiding management in such unusual cases.

BACKGROUND

The presence of free air within the mediastinum, that is not associated with trauma, is known as spontaneous pneumomediastinum. It is a rare, self-limiting condition that can cause widespread subcutaneous surgical emphysema.¹ Such cases generally occur in healthy patients following Valsalva manoeuvre, emesis or excessive coughing.² This can lead to a tear in the skin, airway or gastrointestinal tract causing subcutaneous surgical emphysema. The incidence of spontaneous pneumomediastinum ranges from 1 in 800 to 1 in 42 000 paediatric cases.³ Spontaneous tracheal rupture can be a cause but it is extremely rare, with only a handful of cases being reported.

We present a case of spontaneous surgical emphysema with pneumomediastinum occurring in a child with no history of trauma or respiratory tract disease. We hope that this case will help to increase awareness among readers, and can help identify spontaneous pneumomediastinum in paediatric patients presenting acutely with respiratory distress and surgical emphysema, as well as highlighting how such cases can be managed successfully with conservative measures.

CASE PRESENTATION

A 12-year-old boy had been unwell over a week with coryzal symptoms and a 2-day history of coughing. Over the past 24 hours, he had felt some neck swelling, chest pain and difficulty in

breathing. He had no other significant medical history or family history, and was not on any regular medication.

His parents brought him to an accident and emergency department at a District General Hospital. He was talking with a normal voice, and had a patent airway. Initial observations showed he had oxygen saturation levels of 100% on air, a heart rate of 100 bpm, with a blood pressure of 112/69 mm Hg. He was alert and orientated with a Glasgow Coma Scale of 15/15 and with a blood sugar of 9.8, and was afebrile at 36.8°C.

On examination, he had evidence of intercostal and subcostal recession and a respiratory rate of 45. He had diffuse wheeze on auscultation and extensive surgical emphysema and crepitus on palpation, affecting his neck, chest and arms. Review of his other systems was otherwise unremarkable.

INVESTIGATIONS

Investigations revealed a blood gas that showed an initial respiratory acidosis with a pH 7.29 and pCO₂ of 6.55, which gradually improved with administration of oxygen. His lactate levels however were increasing from 5 to 7.9. A plain chest radiograph was done which showed significant widespread surgical emphysema and pneumomediastinum, suggesting the possibility of tracheal rupture. There was no mediastinal shift (figure 1).

His CT scan showed widespread surgical emphysema and pneumomediastinum but no evidence of oesophageal perforation, tracheal or bronchial tear. No specific cause for the emphysema was identified, but it was felt likely to be tracheal in origin (figure 2).

DIFFERENTIAL DIAGNOSIS

Spontaneous pneumomediastinum must be differentiated from oedema that can occur with anaphylaxis and nephrotic syndrome. Children with anaphylaxis will often have a history of a specific trigger, and although they can present with respiratory distress, 80% will also have accompanying cutaneous symptoms (such as hives and pruritus). Diagnosis can be aided with serum histamine and tryptase levels. Those with nephrotic syndrome tend to present with pitting oedema typically affecting the lower extremities, face, periorbital region and abdomen. Other signs include a preceding upper respiratory tract infection, history of allergy, macrohaematuria, signs of infection and respiratory distress associated with effusions. Diagnosis can be aided by tests

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Figure 1 Anteroposterior chest radiograph demonstrating widespread surgical emphysema.

confirming nephrotic-range proteinuria, hypoalbuminaemia and hyperlipidaemia (ie, urinalysis).

TREATMENT

He was kept nil by mouth and started on intravenous co-amoxiclav. After discussion with the cardiothoracic team, he was subsequently transferred to our Children's Hospital.

On arrival to our Children's Hospital, he was reassessed and stable, with repeat chest radiograph showing no further changes. At this point, our ear, nose and throat (ENT) team and the anaesthetic and respiratory teams were asked to review this patient. A multidisciplinary team (MDT) discussion took place where a

CT scan of his neck and chest was felt to be the next appropriate action. Although he was stable, we wanted to ensure that there was no underlying oesophageal perforation or tracheal/bronchial tear that may require surgical intervention. The MDT decided not to intubate at this stage in case a pneumothorax had developed.

Following review of his CT scan, the MDT felt he should be admitted to the paediatric intensive care unit (PICU) for observation, and that if his condition were to deteriorate, he would be in a safe environment for any acute intervention; however, he continued to remain stable throughout and no respiratory support was required.

While on PICU, he remained stable on humidified oxygen and intravenous antibiotics overnight, with instructions to intubate if there were any signs of increased respiratory distress. Repeat chest radiograph 24 hours later showed no further deterioration

OUTCOME AND FOLLOW-UP

He remained as an inpatient for 3 days where he eventually was stepped down to a ward. It took 4 days for the emphysema to completely resolve, and he was reviewed, as an outpatient, 2 weeks after by our ENT team where he was found to have fully recovered.

This case was discussed at our radiology meeting where it was felt that he likely had a spontaneous tracheal defect that had now resolved, which was the underlying cause for his spontaneous surgical emphysema.

DISCUSSION

In this particular case, we hypothesised that the child's coughing was the most likely cause of the tracheal rupture leading to the spontaneous surgical emphysema. It is thought that a pre-existing weakness of the tracheal wall existed, and that the increased intrathoracic pressure resulted in rupture at this point, resulting in air escaping into the mediastinum.³ In this case, the leak was felt to be tracheal in origin from the extent and distribution of the emphysema on the CT scan, suggestive of a more proximal, wider calibre of the bronchial tree being the source. Air then typically spreads through the neck and subcutaneous tissue planes resulting in surgical emphysema. It is usually clinically detectable by the presence of crepitus on palpation. Due to air leaking into the visceral layers of the deep cervical fascia, and this being continuous with the mediastinum, air usually decompresses into the neck preventing a pneumothorax from occurring.

Patients with subcutaneous surgical emphysema tend to present with neck pain, swelling, dyspnoea and chest pain. However, often, their symptoms may not be as pronounced, with some being completely well with entirely normal observations.

In this case, we ordered plain radiographs to help diagnose and assess resolution, as well as a CT scan to ascertain a cause for his pneumomediastinum. CT scanning can also be useful in aiding diagnosis, and can identify tracheal injury in 70% of cases. In terms of diagnosis, plain chest and neck radiographs, both lateral and anteroposterior views should always be obtained; otherwise up to 50% of cases of pneumomediastinum detected on lateral views would be missed.⁴ In this case, our CT scan did not alter the management, and one study found that imaging studies beyond the initial chest radiograph (including CT) did not lead to a change in treatment in their 81 paediatric patients with spontaneous pneumomediastinum.⁵ On reflection, there may be an argument to only consider CT scanning if the patient

Figure 2 CT coronal image of chest demonstrating extent of surgical emphysema.

shows any signs of deterioration, or if there is any uncertainty with respect to a diagnosis.

In this case, the patient was successfully managed conservatively, and this is recommended for tracheal tears less than 2 cm in length.⁴ Management consists of treating the underlying cause; however, when there is no identifiable cause, it is reasonable to manage the patient with observation and oxygen, bronchodilators and steroids if indicated (ie, patients with asthma). We also gave broad-spectrum intravenous antibiotics to reduce the risk of deep neck space infection and mediastinitis. Some studies advocate the use of prophylactic antibiotics for preventing mediastinitis, but more recent studies have shown no additional benefit, with no reported patients with spontaneous pneumomediastinum developing mediastinitis.⁶

In severe cases, primary surgical repair is advocated, and in the acutely distressed patient, tracheostomy and skin incisions over the neck and anterior chest wall should be considered.⁷ Although there are no standardised clinical guidelines on how to manage such cases, current best evidence suggests that an otherwise well child with spontaneous pneumomediastinum

who remains stable can simply be observed for a short period and discharged home with no further imaging and advised to rest.⁵

This case highlights the importance of increasing awareness of spontaneous pneumomediastinum in the paediatric patient. With an MDT input, in this case, the combination of the ENT, respiratory and cardiothoracic teams and the paediatric intensivists, we were able to assess and manage this child to achieve a successful outcome. On reflection and review of current literature, it would be reasonable to manage stable children conservatively, only considering further intervention and escalation of care if the diagnosis is in question.

Contributors SO: writing of report, planning. JG: clinical management, supervisor and data collection.

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Learning points

- ▶ Spontaneous pneumomediastinum in children is rare.
- ▶ A key point in the history is no evidence of preceding trauma.
- ▶ It can present with surgical emphysema, neck pain, dyspnoea and/or chest pain.
- ▶ Lateral and anteroposterior radiographs of neck and chest must be obtained.
- ▶ A well-appearing stable child with spontaneous pneumomediastinum can often be managed conservatively with simple observation.

REFERENCES

- 1 Meireles J, Neves S, Castro A, *et al.* Spontaneous pneumomediastinum revisited. *Respir Med CME* 2011;4:181–3.
- 2 Pratibha CB, Satish D, Gopal S, *et al.* An Interesting Case of Spontaneous Pneumomediastinum with Subcutaneous Emphysema following Oral Provocative Manoeuvre. *Otorhinolaryngology Clinics - An International Journal* 2015;7:93–6.
- 3 Chalumeau M, Le Clainche L, Sayeg N, *et al.* Spontaneous pneumomediastinum in children. *Pediatr Pulmonol* 2001;31:67–75.
- 4 Lillard RL, Allen RP. The extrapleural air sign in pneumomediastinum. *Radiology* 1965;85:1093–8.
- 5 Fitzwater JW, Silva NN, Knight CG, *et al.* Management of spontaneous pneumomediastinum in children. *J Pediatr Surg* 2015;50:983–6.
- 6 Ebina M, Inoue A, Takaba A, *et al.* Management of spontaneous pneumomediastinum: Are hospitalization and prophylactic antibiotics needed? *Am J Emerg Med* 2017;35:1150–3.

- 7 Thaler MM, Krieger E, McKee JA, *et al.* Treatment of mediastinal and subcutaneous emphysema complicating asthma in children: report of a case. *J Pediatr* 1964;65:75–80.

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