CASE REPORT

Cocaine-related subcutaneous emphysema, pneumorrhachis and pneumomediastinum: a rare clinical finding

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SUMMARY

A young man presented with several days of dyspnoea and delirium due to cocaine use which was confirmed by urine drug screening. Imaging studies confirmed the diagnosis of subcutaneous emphysema, pneumorrhachis and pneumomediastinum. He was managed successfully with conservative therapy. Although a rare clinical finding, cocaine-related pneumomediastinum, subcutaneous emphysema and pneumorrhachis should be recognised early on presentation. This will certainly help to effectively direct the use of healthcare resources and avoid subjecting the patient to unnecessary investigations.

BACKGROUND

In the USA, recognising cocaine abuse and its complications is typically quite easy. Patients presenting to the emergency department will typically have signs and symptoms of agitation, disinhibition, hyperactivity, nosebleeds and even chest pain or arrhythmia. Unusual sequelae of cocaine abuse that must be recognised early include pneumomediastinum, pneumorrhachis and subcutaneous emphysema.

This case illustrates a unique presentation of cocaine abuse that poses a diagnostic and therapeutic challenge. The need for early recognition among emergency medicine physicians, internists and radiologists among other physicians cannot be overemphasised.

CASE PRESENTATION

A 19-year-old man presented to the hospital with complaints of hallucination, sore throat and redness of both eyes after smoking crack cocaine. He was previously in a normal state of health and admitted to using cocaine for the past 6 months. He stated his last use of the drug was approximately 48 hours prior to presentation. He had no medical history and denied other over the counter, prescription and illegal drugs. He reported occasional dyspnoea without complaints of neck pain, dysphagia or odynophagia. He also denied any recent history of trauma, vigorous exercise or cough spells.

On physical examination, the patient was drowsy but easy to arouse. His vital signs were remarkable for a heart rate of 113, fever of 39.2°C and mild tachypnoea. Of note, his oxygen saturation measured by pulse oximetry was normal ranging between 96% and 100% on ambient air. Physical examination findings were notable for palpable

Figure 1 Chest X-ray demonstrating extensive subcutaneous emphysema within the supraclavicular and axillary soft tissues on day 1.

subcutaneous emphysema involving the anterior and posterior part of the upper chest wall extending to the neck. There was no evidence of chest trauma,

Figure 2 Coronal view of chest CT scan demonstrating air outlining the visceral and parietal pleura of the mediastinum, along with emphysematous extension into the supraclavicular soft tissues.

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Figure 3 Axial image of chest CT showing pneumorrhachis and subcutaneous emphysema.

tracheal deviation or jugular venous distention. The patient's cardiopulmonary examination was unremarkable.

Laboratory abnormalities included a white cell count of 12 560 cells/ μ L, potassium 3.2 mEq/L, and creatinine 1.6 mg/dL. Urine drug screening (UDS) was positive for cannabinoids, cocaine and methamphetamines.

INVESTIGATIONS

Chest radiograph completed on the day of presentation demonstrated diffuse subcutaneous emphysema of the chest wall, lower neck and left pneumomediastinum ([figure 1](#)). Pneumothorax was not noted. General surgery and pulmonology consultations

Figure 5 Chest X-ray on day 4 showing complete resolution of subcutaneous emphysema.

Figure 4 Chest X-ray on day 2 showing marked improvement of subcutaneous emphysema.

were placed and the patient was monitored closely. His suspected acute kidney injury was managed with intravenous rehydration.

Further work up involved an upper gastrointestinal series to rule out perforation, as well as CT scans of the head/neck and thorax to rule out bronchopulmonary involvement. Apart from confirming the extensive emphysema and pneumomediastinum, there was an additional finding of pneumorrhachis otherwise known as gas in the spinal cord ([figures 2 and 3](#)). Other common causes of the condition such as infection or chronic obstructive pulmonary disease were quickly excluded.

OUTCOME AND FOLLOW-UP

Pulmonology recommended serial chest radiographs and observation. His previously abnormal laboratory values normalised the following hospital day. The palpable and radiological subcutaneous air progressively resolved by day 4 of his hospital stay ([figures 4 and 5](#)). The patient was discharged in stable condition to home with instructions to attend drug rehabilitation and follow-up with his primary care provider.

DISCUSSION

Cocaine is the second most consumed and trafficked illicit drug in the world, next to marijuana. Not surprisingly, it is the most widely abused illicit drug presenting to the emergency department and a leading cause of drug abuse-related deaths.¹

The diagnosis of suspected pneumomediastinum is easily made with chest radiograph alone. CT scan can confirm the diagnosis and look for air in other structures not noted on initial radiograph as in the case of our 19-year-old patient with pneumorrhachis. Once pneumomediastinum is confirmed, an oesophagogram and a flexible bronchoscopy may be considered to rule out oesophageal and tracheo-bronchial rupture.² Once organ rupture-related pneumomediastinum has been ruled out, cocaine-related pneumomediastinum can be managed conservatively and most patients experience a complete resolution usually within 24 hours on follow-up radiological evaluation.³ There are documented treatments of symptomatic cases using high concentration of

inspired oxygen or hyperbaric oxygen therapy to promote air reabsorption (nitrogen washout).^{4–6}

The exact pathophysiological mechanism of pneumomediastinum, subcutaneous emphysema and other related manifestations among this population of cocaine users is not known. One proposed mechanism includes the abusers deep inhalation followed by a Valsalva in order to augment absorption and enhance the desired effect of the drug.^{7,8} They may sometimes cough vigorously while snorting. These events may lead to barotrauma via increased intrathoracic pressure resulting in air leaks. Another speculated mechanism includes a more direct toxic effect of cocaine to the lung parenchyma.³ The subsequent rupture of the alveoli results in tracking of free air along the peribronchial vascular sheaths towards the lung hilum and into the mediastinum.⁹ These air molecules may spread further along tissue planes to involve other areas like the pericardium, spinal canal, peritoneum and subcutaneous tissues of

the chest wall and neck.⁹ This phenomenon was described as the Macklin effect in 1939.¹⁰

Competing interests None declared.

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REFERENCES

- 1 Karila L, Petit A, Lowenstein W, *et al.* Diagnosis and consequences of cocaine addiction. *Curr Med Chem* 2012;19:5612–8.
- 2 Kouritas VK, Papagiannopoulos K, Lazaridis G, *et al.* Pneumomediastinum. *J Thorac Dis* 2015;7:S44–9.
- 3 Gotway MB, Marder SR, Hanks DK, *et al.* Thoracic complications of illicit drug use: an organ system approach. *Radiographics* 2002;22 Spec No:S119–S135.
- 4 Patel V, Raval G, Gavadia K. Pneumothorax, pneumomediastinum, subcutaneous emphysema and pneumorrhachis as complications of common flu. *Am J Case Rep* 2012;13:198–201.
- 5 Oertel MF, Korinth MC, Reinges MH, *et al.* Pathogenesis, diagnosis and management of pneumorrhachis. *Eur Spine J* 2006;15 Suppl 5:636–43.
- 6 Manden PK, Siddiqui AH. Pneumorrhachis, pneumomediastinum, pneumopericardium and subcutaneous emphysema as complications of bronchial asthma. *Ann Thorac Med* 2009;4:143–5.
- 7 Lucena J, Blanco M, Jurado C, *et al.* Cocaine-related sudden death: a prospective investigation in south-west Spain. *Eur Heart J* 2010;31:318–29.
- 8 Malik H, Mohandas S, Mukherjee D. Epidural pneumatosis as a consequence of cocaine use. *BMJ Case Rep* 2012.
- 9 Akinyemi R, Ogah O, Akisanya C, *et al.* Pneumomediastinum and subcutaneous emphysema complicating acute exacerbation of bronchial asthma. *Ann Ib Postgrad Med* 2007;5:78–9.
- 10 Sakai M, Murayama S, Gibo M, *et al.* Frequent cause of the Macklin effect in spontaneous pneumomediastinum: demonstration by multidetector-row computed tomography. *J Comput Assist Tomogr* 2006;30:92–4.

Learning points

- ▶ Although a rare clinical finding, cocaine related pneumomediastinum and other associated findings should be recognised early on presentation.
- ▶ Early recognition of this condition will help to effectively direct the use of healthcare resources and avoid subjecting the patient to unnecessary investigations.
- ▶ Once more serious conditions have been ruled out, the healthcare provider can be confident that this is a benign condition which often resolves with supportive care.

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