CASE REPORT

Clostridium perfringens gas gangrene at a wrist intravenous line insertionCatherine Determann,¹ Craig Andrew Walker²

¹Department of Anaesthetics & Critical Care, NHS Lothian, Edinburgh, Midlothian, UK
²Department of Emergency Medicine, NHS Lothian, Edinburgh, Midlothian, UK

Correspondence to
 Dr Catherine Determann,
 catherinedetermann@gmail.com

SUMMARY

A patient admitted to the intensive care unit for management of hypotension following a multiple medications overdose subsequently deteriorated rapidly with sepsis. A cannula site was noted to be bruised, swollen and erythematous and the X-ray demonstrated gas sitting within the tissues surrounding the metacarpal bones. The patient was referred to the orthopaedic surgeons and quickly taken for debridement of the affected area and fasciotomies of the forearm. Microbiological investigation confirmed *Clostridium perfringens* to be present in multiple fluid samples taken from the affected site.

BACKGROUND

This is the first described case of sepsis as a result of gas gangrene from a cannula site. Gas gangrene is described as having a 5–18% associated mortality rate¹ depending on the stage of presentation and associated comorbidities. The key to survival without significant morbidity is early recognition with prompt surgical debridement, broad spectrum antibiotic therapy and physiological support.

CASE PRESENTATION

A 74-year-old woman was assessed in the emergency department having taken a multiple medicines overdose of Lisinopril, Verapamil and Nicorandil. She reported having consumed around 40 tablets in total, but was unable to report what dose of each medication she had taken. She was known to have a history of depression and had taken one previous medicine overdose 15 years prior to this presentation and described having taken the overdose intentionally on impulse due to stressful family circumstances at home.

At the time of assessment the patient was hypotensive with systolic blood pressure (BP) of 60 mm Hg, had an ischaemic appearance of her ECG with ST segment depression in the chest leads V3–V6 and was intermittently aggressive towards the emergency department staff. A 20 G venous cannula was inserted into the dorsum of the right hand and dressed with a Tegaderm cannula dressing. This was completed under aseptic technique; the skin site for cannulation was identified as being entirely healthy and prepared by cleaning with 2% chlorhexidine and the emergency department staff completed the task while wearing non-sterile gloves. Despite intravenous fluid resuscitation and a total of 30 mLs of intravenous 10% calcium gluconate, the patient had persisting hypotension and oliguria with urine output of around 5 mL/h. Serum creatine was

over 50% of the patient's baseline at 175 μ mol/L confirming an acute kidney injury as per RIFLE classification. Blood gas analysis revealed a raised lactate of 4.4 mmol/L and a metabolic acidosis with hydrogen ions of 74 nmol/L. The patient was admitted to the high dependency unit for treatment of ongoing hypotension with inotropic support and invasive cardiovascular monitoring. The patient's condition stabilised quickly with an infusion of norepinephrine 8 mg%, and cardiac index was not measured. Troponin-T level at 12 h following admission was not raised.

Over the following 2 days steady progress had been made in weaning from cardiovascular support until, at 48 h after her initial presentation, the patient had a sudden episode of bradycardia and hypotension. ECG demonstrated a sinus rhythm with a rate of 35 bpm and some depression of the ST segments in the lateral chest leads. Arterial blood gas analysis demonstrated type I respiratory failure with a significant and worsening metabolic acidosis (PaO₂ 8.21 nmol/L, PaCO₂ 3.37 kPa, H⁺ 91.2 nmol/L, base excess (BE) –10.2 mmol/L, HCO₃[–] 17.3 mEq/L).

She received further boluses of 10% calcium gluconate and fluid challenges, but became increasingly agitated and difficult to manage with a rapidly increasing norepinephrine requirement and worsening physiological parameters. She was transferred to the intensive care unit where she was sedated, intubated and ventilated.

INVESTIGATIONS

At this time, the patient's white cell count increased from 10.5×10^9 to 15.6×10^9 /L (with a predominance of neutrophils) and she developed a fever of 38.8 °C. It was noted that her right hand was bruised and swollen, with some superficial blisters and crepitus developing over the dorsal aspect at the site of the cannula which had been inserted in the emergency department. The cannula was removed and swabs of fluid from blisters at the site were sent for analysis, along with peripheral blood, urine and sputum cultures. The patient was started on intravenous vancomycin and clindamycin to cover a suspected group A streptococcal infection. X-rays of the right hand revealed gas within the tissues surrounding the metacarpal bones (figure 1).

TREATMENT

Surgical debridement of the right hand was performed with fasciotomies of the dorsal compartment of the forearm the same day. Microscopy and Gram stain demonstrated Gram-positive bacilli, thought to be *Clostridium*, and the patient

To cite: Determann C, Walker CA. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-200242

Figure 1 X-ray of the right hand demonstrating gas within the tissues surrounding the metacarpal bones.

remained on vancomycin and clindamycin while sensitivities were awaited.

During the course of 48 h following her surgical debridement and the start of antibiotic therapy the patient significantly improved. Multiple samples of fluid from the right hand were growing large numbers of *C perfringens* sensitive to clindamycin and vancomycin. She was weaned from both cardiovascular and respiratory support and successfully extubated. At this time the patient was referred to the plastic surgical team for negative pressure dressings and a plan for later skin grafting to her right hand wound.

OUTCOME AND FOLLOW-UP

Prior to discharge the patient underwent psychiatric review. She was found to have taken an impulsive overdose of her medications, demonstrated significant remorse and was regarded as being at low risk for taking future overdoses.

Since her admission to the intensive care unit, the patient has undergone further debridement and skin grafting of her dorsal right hand wound under local anaesthetic. The wound continues to gradually increase in size with a sloughy area at the base and the plastic surgery team currently plan to continue conservative management with regular review.

DISCUSSION

The finding of gas gangrene at a venous cannula site has not previously been reported. In this case it was established as a cause of sepsis in a rapidly deteriorating patient who was then quickly referred for surgical debridement and source control.

Previous case reports of *C perfringens* causing gas gangrene and septicaemia associated with indwelling arterial catheters exist, but when appropriate aseptic techniques are followed *Clostridium* species is an exceptionally unusual pathogen to isolate.² This suggests that in order for even the most

pathogenic species to cause infection the environment must be optimised.³ Hyperbaric oxygen therapy has been shown to inhibit *C perfringens* toxin production in vitro⁴ and, as such, hypoxaemia is likely to contribute to bacterial cell growth in patients developing early infection.

Despite improved investigation, advanced monitoring techniques and new antibiotics, *Clostridium* species continue to result in significant morbidity and mortality.¹ Complete early debridement of clostridia cellulitis and myositis is vital,⁵ and delay in diagnosis is a critical determinant of clinical outcome.

Our patient received prompt diagnosis and surgical debridement within just hours of deterioration requiring intubation and ventilation. The hypoxaemia which may have contributed to the growth of *C perfringens* was recognised and managed promptly. The principles of management of *Clostridium* are well known; early and aggressive surgical debridements with broad spectrum antibiotic therapy, close monitoring and physiological support. These can easily be forgotten as the disease is uncommon. Nevertheless, awareness of this potentially life-threatening and limb-threatening disease is important as a differential cause of a rapidly deteriorating patient with a cannula site infection.

Learning points

- ▶ All indwelling venous and arterial catheters should be inserted in an aseptic and antiseptic manner.
- ▶ If an unexpected deterioration occurs, all intravascular lines should be examined and promptly removed if possible.
- ▶ Consider gas gangrene as a cause of rapidly worsening cellulitis/necrotising fasciitis, particularly in the presence of hypoxaemia.
- ▶ Early referral for urgent surgical debridement is of critical importance in this instance.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Hart G, Lamb RC, Strauss MB. Gas gangrene: I. A collective review. *J Trauma Inj Infect Crit Care* 1983;23:991.
- 2 Banks DC, Cawdrey HM, Yates DB, *et al.* Infection from intravenous catheters. *Lancet* 1970;295:443–5.
- 3 Rose HD. Gas gangrene and *Clostridium perfringens* septicemia associated with the use of an indwelling radial artery catheter. *CMAJ* 1979;121:1595–6.
- 4 Brummelkamp WH, Boerema I, Hoogendijk JL. Treatment of clostridial infections with hyperbaric oxygen drenching; a report on 26 cases. *Lancet* 1963;1:235–8.
- 5 Wiuis AT. Clostridia of wound infection. *CMAJ* 1969;212:1564–5.

Copyright 2013 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow