

## CASE REPORT

# *Clostridium novyi* causing necrotising fasciitis in an injecting drug user

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Necrotising fasciitis with pronounced local oedema is described in an injecting drug user. *Clostridium novyi* was an unexpected single pathogen isolated from infected tissue. The patient was among a cluster of cases, all injecting drug users, presenting with toxæmia and soft tissue infection. The causal role and pathogenicity of *C novyi* is discussed.

### CASE REPORT

A previously well 28 year old woman, a known injecting drug user, presented with a three day history of a painful right buttock after injection of drugs into this area. She had taken oral flucloxacillin for three days. She felt generally unwell with sweats and vomiting. She had a fever of 38.7°C but was normotensive. Pronounced oedema extended over the right buttock and proximal thigh. The area was tender, indurated, and erythematous. There was associated right inguinal lymphadenopathy. She was given intravenous flucloxacillin, benzylpenicillin, and metronidazole and underwent wide surgical excision of necrotic dermal and subcutaneous tissue down to, but not including, the gluteal muscles. There was dermal gangrene and very thin watery pus but no collections were present. The surface of the gluteal muscles was grey but the muscle bulk was viable. The area was packed with proflavin soaked gauze as daily dressings. Her temperature settled on the day of surgery and she remained stable for six days, when her leg became more swollen, with cellulitis developing around the original wound. She was afebrile. Her leucocyte count was  $16.6 \times 10^9$ /litre. She underwent further debridement of skin, subcutaneous tissue, and superficial layers of the gluteus maximus, leaving an 18 × 13 cm defect in the lower buttock and posterior thigh. No pus, crepitus, or malodorous fluid was detected. Postoperatively she became febrile at 38.5°C and her albumin fell to 21 g/litre. She continued intravenous antibiotics with daily iodisorb and alginate dressings preceded by a 10 minute soak in 1% aqueous povidone iodine. Her temperature settled over the next 48 hours. Her wound began to granulate and contract at the edges. She was referred to another institution where low pressure suction was applied to the wound to aid healing before skin grafting.

### MICROBIOLOGY

A swab and a sample of necrotic debris were cultured within one hour of surgery and a Gram's stain prepared. A sample of resected tissue stored overnight at 4°C was cultured after homogenisation in a Griffith's tube (Merck BDH, Poole, Dorset, UK). An aliquot of this specimen was also cultured after enrichment in cooked meat medium for 18 hours at 37°C. Culture media included blood agar and chocolate blood agar incubated in air and 5% CO<sub>2</sub> at 37°C for 48 hours, MacConkey agar in air at 37°C for 24 hours, and fastidious anaerobic agar (FAA) in an anaerobic cabinet (Don Whitley, Shipley, UK) for five days. A Gram's stain of the specimen showed pus cells and

necrotic tissue but no organisms. Culture media incubated aerobically were examined after 24 and 48 hours and showed no growth. The FAA plates were inspected after 48 hours of continuous anaerobic incubation. The medium inoculated with homogenised tissue showed a few small translucent colonies, which on further incubation showed spreading growth with haemolysis of the underlying medium. The organism was identified as *Clostridium novyi* type A by the Anaerobe Reference Unit, Public Health Laboratory Service, Cardiff. The production of α toxin was demonstrated. This isolate was not obtained from the swab, directly cultured necrotic material, or from the enrichment medium.

### DISCUSSION

Six weeks after this patient's admission, on 9 June 2000, "serious unexplained illness" was described among injecting drug users in England and Wales.<sup>1</sup> Similar cases had been reported earlier in Scotland<sup>2</sup> and Ireland. Oedema and necrosis at the injection site were often associated with severe toxæmia and a high mortality rate. No consistent agent had been identified. A specific case definition was later formulated of "an injecting drug user admitted to hospital or found dead since 1 April, 2000 with soft tissue inflammation (abscess, cellulitis, fasciitis, or myositis) at an infection site and either severe systemic toxicity (total peripheral white blood cell count  $> 30 \times 10^9$ /litre and sustained systolic pressure  $< 90$  mm Hg despite fluid resuscitation) or evidence at necropsy of diffuse toxic or infectious process including pleural effusion and soft tissue oedema or necrosis at an injection site".<sup>3</sup> Our patient did not meet the full case definition. Systemic toxicity may have been modified by oral antibiotics but the degree and extent of local oedema and necrosis presented a distinctive picture. Our patient was one of the first injecting drug users presenting with this syndrome in England to yield *C novyi* from infected tissue.

Although ubiquitous, *C novyi* is only rarely reported as a pathogen, contributing to mixed infections in contaminated traumatic wounds. The establishment of *C novyi* as a single pathogenic agent in healthy tissues may require special conditions or contributory factors, such as a heavy bacterial load or the presence of foreign material.

When injected into experimental animals infection may not be established unless 1% calcium chloride is added to the inoculum.<sup>4</sup> All affected injecting drug users injected heroin subcutaneously with citric acid,<sup>1</sup> and it is likely that the presence of foreign material facilitated the establishment of *C novyi* infection in these patients.

Operative findings in our patient were of a necrotising fasciitis. Muscle involvement was consistent with severe infection.<sup>5</sup> Microbiological culture of affected tissue most often yields mixed anaerobes and facultative anaerobes.<sup>5</sup>

**Abbreviations:** FAA, fastidious anaerobic agar

Infection with a single agent has so far only been ascribed to *Streptococcus pyogenes*. However, the typical clinical picture can be reproduced when *C novyi* is injected into experimental animals. The animals develop toxæmia and massive oedema spreading from the site of inoculation. In the mouse, the oedema is said to be so extensive that the animal "assumes the shape of a flattened pear". Postmortem examination shows tissue necrosis and thick gelatinous oedema with no gas formation or pus.<sup>4</sup> These findings are strikingly similar to the typical presentation in affected injecting drug users and support the causative role of *C novyi*.

*Clostridium novyi* is a nutritionally demanding strict anaerobe, which dies rapidly on exposure to air. It fails to grow unless optimal anaerobic conditions are afforded and this may account for the many culture negative cases among affected injecting drug users. Arguably, homogenised tissue is most likely to yield a positive culture.

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