CLOSTRIDIUM SEPTICUM GANGRENE COMPLICATING A CLOSED FEMORAL FRACTURE

T. MULIER[1], M. MORGAN[2], G. FABRY[1]

One of the basic principles of orthopedic surgery is that gas gangrene does not develop in closed fractures. That there are exceptions to this rule is demonstrated by the following report of an extremely rare case. Clostridium septicum myonecrosis developed after surgical treatment of a closed femoral fracture in a fit 45-year-old man, treated by antibiotics. The patient survived after having a right hip disarticulation and administration of high doses of intravenous penicillin. Prophylactically administered cephalosporins failed to prevent the Clostridial infection.

Keywords : Clostridium septicum ; myonecrosis ; closed fracture.
Mots-clés : nécrose musculaire ; clostridium septicum ; fracture fermée.

INTRODUCTION

Clostridia are ubiquitous, opportunistic organisms, and gas gangrene infection must constantly be borne in mind in wound treatment. Failure to recognize and treat the condition can result in the death of the patient (1). Clostridium myonecrosis complicating operations, especially treatment of open fractures, has been described in several reports (1, 2, 3). Myonecrosis due to Clostridium septicum alone after surgical procedures is more uncommon, with 11 of 360 cases of Clostridium gas gangrene reported to date. After orthopedic surgery Clostridium myonecrosis has been described in a definite set of conditions : immunosuppression, as with terminal cancer patients, open injury with contamination of dirt, and severe peripheral vascular disease (2).

Older patients undergoing elective implant surgery, such as hip nailing, are at definite risk of gas gangrene if prophylactic antibiotics are not administered. Until now there have been no reports of a patient developing gas gangrene from elective implant surgery after receiving prophylactic antibiotics (2).

CASE REPORT

A 45-year-old butcher was admitted after falling at an abattoir at work from a height of 8 feet.

Clinical examination and roentgenograms revealed a rather dirty man with a closed right four-part subtrochanteric femoral fracture (fig. 1). Routine preoperative antibiotic therapy (parenteral cefuroxime 1.5 g, continued 8 hourly for 24 hours) was followed by open reduction of the fracture and internal fixation with a Richards screw and plate. Early postoperative recovery was uneventful.

Four days later he reported sudden increasing pain, and a foul-smelling discharge was noted in his right thigh with crepitations present on palpation. Urgent Gram-stain revealed Gram-positive spore-forming rods, and subsequent cultures with growth of Clostridium septicum confirmed the clinical diagnosis of Clostridial septicum gas gangrene. Stool specimens were taken and remained

[1] Department of Orthopaedic Surgery, Katholieke Universiteit Leuven, UZ Pellenberg, Weligerveld 1, 3212 Pellenberg, Belgium.
[2] Department of Microbiology, Wonford Hospital, Barrack Road, Exeter, U.K.
Correspondence and reprints : T. Mulier.

negative. Urgent aggressive local debridement, high doses of penicillin (10 MU over 24 h), polyvalent gas gangrene antitoxin, followed by extensive excision of the necrotic fascia and muscles in the medial, lateral, anterior and posterior compartments were performed. Despite this treatment his condition deteriorated with progressive extension of the gas gangrene towards his scrotum and lower abdomen. Further radiological and biochemical investigations, to exclude an underlying malignancy, remained negative.

Fig. 1. — Forty-five-year-old butcher with a closed subtrochanteric fracture after falling at an abattoir.

A right hip disarticulation was necessary with resection of all muscles back to viable tissue (fig. 2). He was transferred elsewhere for hyperbaric oxygen therapy, and his condition improved slowly, complicated by a chest infection and temporary renal failure. Four weeks later a split-thickness skin graft was applied, leaving the patient on discharge with a short femoral stump for an above-knee prosthesis.

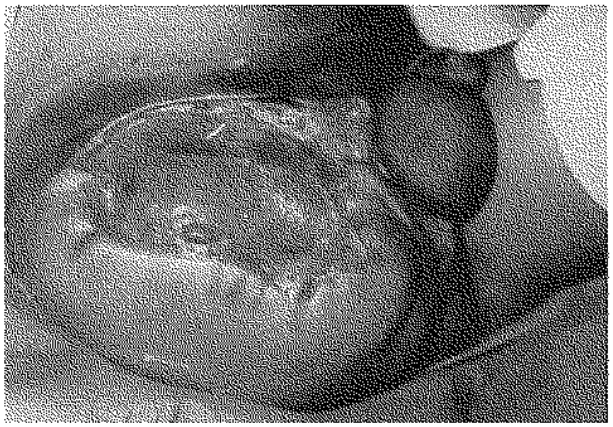

Fig. 2. — Four days after internal fixation, a right hip disarticulation was necessary, because of extensive gas gangrene spreading towards the scrotum and lower abdomen.

DISCUSSION

Clostridium septicum is a Gram-positive, sporulating, spindle-shaped rod, more aerotolerant than Clostridium perfringens, and motile in young cultures, exhibiting spreading growth on blood agar. Biochemically it can be differentiated from other Clostridia by a negative sucrose fermentation reaction, and animal toxin neutralization tests.

It is not part of the normal flora of the human gastro-intestinal tract. In one study of 175 patient stools examined for Clostridial species, not one isolate of Clostridium septicum was found.

Clostridium septicum infection in surgery is associated with underlying malignancies, hematological and gastrointestinal solid tumors primarily. There is also an association with diabetes mellitus and atherosclerotic disease (2).

Almost all cases of Clostridia septicum gangrene after orthopedic surgery develop in open wounds closed primarily or puncture wounds not adequately debrided, in association with peripheral vascular disease and after implant surgery in

elderly immunocompromized patients. Even after closed fracture treatment Clostridium gas gangrene has been found (7).

Werry and Meek (7) in 1986 reported a case of Clostridial gas gangrene following a closed reduction of a Colles fracture performed in hospital. No report has been found in the literature of Clostridium septicum gas gangrene developing in a fit patient undergoing semielective implant surgery, such as hip nailing, for a closed fracture prophylactically covered by a cephalosporin (cefuroxime) as in our case (2).

In contrast, in patients allergic to penicillin, a cephalosporin has been recommended as both a safe and effective alternative form of prophylaxis (2-6).

In this case, there was no compound fracture to become contaminated from the floor of the abbatoir, and normal surgical preoperative skin preparation was done.

The history of prior trauma predisposing to gas gangrene in an area of intact skin has been reported elsewhere (7) with Clostridium perfringens. The possibility remains that the onset of gangrene may have indicated an underlying malignancy, or bacteremia leading to metastatic infection peripherally. Kornbluth *et al.* found that of 162 cases of Clostridium septicum infection, 81% of patients had some form of underlying malignancy : colorectal carcinoma in 34% of patients, and a hematological malignancy in 40% of patients. Of the malignant conditions, 37% were occult at presentation. Despite intensive investigation in our case, no malignancy has been found to date.

The possibility that because of his occupation the patient was more likely to have gastrointestinal carriage of C. septicum cannot be ignored. The organism was not isolated from stool specimens although these were all submitted for testing while he was undergoing treatment.

The routine prophylaxis used to cover the original operations was 1.5 g of cefuroxime. C. septicum is known to be relatively less sensitive to cephalosporins (and even thienamycins) than other Clostridial species. Cefoxitin, a cephalosporin used widely in the United States, has good activity against all Clostridia, yet there are reports of gangrene developing despite seemingly adequate prophylaxis using this drug (5).

Surgical debridement of the affected tissues and adequate dosages of appropriate antimicrobial agents are essential. The value of hyperbaric oxygen therapy has been questioned, but it has been used in the majority of published reports of survivors (1, 2, 3).

In our case, the initial bolus dosage of 10 MU (6 grams) of benzyl penicillin and concomitant metronidazole was intended to cover anaerobes, including anaerobic Streptococci, but until a Gram-stained film of the blister fluid and tissues could be examined, the possible coexistence of Gram-negative aerobes causing a "synergistic" gangrene could not be excluded and so an initial dose of gentamicin 120 mg was also given.

There is some evidence to suggest that C. septicum is slightly less susceptible to hyperbaric oxygen than other Clostridial species, not surprising perhaps, in view of its comparative aerotolerance.

CONCLUSION

Clostridia are ubiquitous, opportunistic organisms. Gas gangrene due to Clostridium septicum can complicate surgical treatment of closed fractures, despite treatment with prophylactic antibiotics.

Prevention by thorough surgical preparation of the patient and administration of penicillin in combination with cephalosporins in high-risk patients is necessary.

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SAMENVATTING

T. MULIER, M. MORGAN, G. FABRY. Clostridium septicum gangreen als complicatie na behandeling van een gesloten femurfractuur.

Een van de basisprincipes in orthopedische chirurgie stelt dat gas gangreen niet optreedt in gesloten of adekwaat gedebrideerde, opengelaten fracturen.
Dat er op deze regel uitzonderingen zijn wordt bewezen met een hieronder beschreven zeer zeldzaam casus.
Clostridum septicum gangreen ontwikkelde zich na routine chirurgische behandeling van een gesloten femurfractuur in een gezonde vijfenveertig-jarige man, onder antibioticaprofylaxie.
De patiënt overleefde slechts na het uitvoeren van een rechter heup desarticulatie en toedienen van hoge dosissen intraveneus Penicilline.
Profylactisch toedienen van adekwate dosissen Cephalosporines belette de ontwikkeling van Clostridia myonecrosis niet.

RÉSUMÉ

T. MULIER, M. MORGAN, G. FABRY. Gangrène par clostridium septicum, complication d'une fracture fermée du fémur.

En chirurgie orthopédique il est généralement admis qu'une gangrène gazeuse ne survient pas dans les suites d'une fracture fermée ou d'une fracture ouverte correctement débridée.
Le fait clinique présenté est d'un caractère exceptionnel. Une gangrène à clostridium septicum s'est développée après traitement chirurgical classique d'une fracture fermée du fémur chez un patient de 45 ans en bonne santé sous antibioprophylaxie.
Le patient a survécu après désarticulation de la hanche et antibiothérapie intraveineuse à base de pénicilline. Une prophylaxie à base de céphalosporines ne prévient pas l'installation d'une myonécrose à clostridium.