INTERNAL FIXATION FOR NONUNION COMPLICATING OSTEOMYELITIS OF FEMUR

by

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Abstract
Two cases are reported to highlight the morbidity attendant to nonunion associated with chronic osteomyelitis, and a method of treatment involving prolonged antibiotic treatment and internal fixation with or without allograft bone grafting. This method successfully achieved fracture healing in femoral nonunion complicating osteomyelitis.
Introduction

Chronic osteomyelitis (COM) is commonly sequel to acute haematogenous osteomyelitis and is frequently seen in children and adolescents. It is a common clinical entity in Nigeria, associated with immense morbidity, which is aggravated when a fracture occurs in the infected bone. Osteomyelitis associated with such fracture may lead to nonunion. Achieving healing of such nonunion is difficult and may require multiple surgical procedures. The difficulty may in part be due to depletion of endogenic bone morphogenic protein (BMP) at the fracture site, which has been observed in animal models [18]. It remains to be shown what the contribution is of local infection on such depletion and especially in human beings. Success with treatment depends on controlling the infection with prolonged antimicrobial therapy, inducing osteogenesis and ensuring stability at the fracture site, as illustrated by these case reports. Although internal fracture fixation is rarely indicated in the presence of an infection, the procedure can be useful, occasionally, in osteomyelitis of the femur.

The aim of this case report is to highlight the morbidity associated with nonunion complicating chronic osteomyelitis of the femur and describe a method of achieving healing of such nonunion, in selected patients, using internal fixation devices.

Case 1

A four year old girl was seen with COM of the right femur that started at the age of One month and a pathological fracture of the diaphysis of the same femur that occurred at the age of nine months and that has remained ununited, till presentation, despite treatment with skin traction and antibiotics at another hospital. A discharging sinus in the distal right thigh had persisted. There was painless abnormal movement at the fracture site but no demonstrable sequestrum on X-rays.

Her standing height was 102 cm and she had an eight cm shortening of the right lower limb. Pus from the sinus, on culture, grew *staphylococcus aureus*. Treatment included skin traction to enforce rest, and oral erythromycin initially for three weeks to control the infection. To achieve healing of the nonunion, open reduction, debridement and internal fixation with an intramedullary Rush pin with allograft cancellous bone grafting was then done. Oral erythromycin was changed three weeks postoperatively to cefuroxime and rifampicin due to a flare of infection and
discharge. The sinus healed at five weeks and the new antibiotics were used for eight weeks and five months postoperative respectively. She was ambulated six weeks in a high above-knee cast, which was continued until radiological union was confirmed 20 months postoperative, fig.1. The intramedullary pin was removed 24 months postoperative and she remains well.

![Figure 1](image1.jpg)

*Figure 1.*
The femur of the 4yr old girl showing atrophic nonunion (A) and the healed fracture 20 months postoperatively (B). The absent femoral head may be due to earlier unrecognized septic arthritis.

**Case 2**

A 14yr old boy was admitted with a four month old osteomyelitis of the right femur that was pathologically fractured in the midshaft. The fracture was not united and the fragments were displaced with 5cm overlap. There were two profusely discharging sinuses in his distal thigh (pus was sterile) but radiographs showed no sequestrum in the femur. He was treated empirically with oral erythromycin, and skin traction for nine weeks without fracture healing. One of the sinuses had by now healed but the other still discharged intermittently. To achieve healing of the nonunion, open reduction,
debridement and internal fixation with a broad dynamic compression plate and screws was then done. Oral pefloxacin was commenced and continued for four months thereafter and radiological union of the fracture was confirmed six months postoperative (fig2) but a sinus discharged occasionally, at follow-up three years postoperative. He is ambulant, awaiting removal of implants. There was no complication with the use of pefloxacin.

Figure 2. The femur of the 14yr old boy (A) and the healed fracture 6 months postoperatively (B).

Discussion

*Staphylococcus aureus* remain the commonest pyogenic organism associated with COM, representing 60% to 90% of organisms isolated [1,7]. However, isolation of other gram positive, and gram-negative organisms is now more common than before [2]. The preeminence of S. aureus in causing osteomyelitis may be multifactorial. This includes the frequency of its asymptomatic carriage that range from 25% to 50% in the community [3], growth in a biofilm when in contact with living tissue like bone.
 Successful treatment of nonunion in a chronically infected bone depends on operative debridement, stable internal or external fixation, as is appropriate and antimicrobial therapy, which is most beneficial when used for several weeks [8,16]. Parenteral beta lactam agents yield clinical success for many patients while oral fluoroquinolones has proved as useful as parenteral beta lactams [6,13]. Combinations of beta lactam/rifampicin as in case1 and fluoroquinolone/rifampicin have also been found useful, achieving bacteriological cure rate of over 80% even in the presence of orthopaedic implants [6]. The antibacterial activity of rifampicin and beta lactams are not affected by hypoxia that occurs in infected bone tissue whereas aminoglycosides are affected and thus are less efficacious than the former [2]. It must be noted however that rifampicin is better avoided where tuberculosis is endemic so as to reduce the risk of resistance of mycobacteria to it.

The standard operative treatment of nonunion is stable fixation and bone grafting [4,14] (osteosynthesis) but different procedures exists. External fixation can be done but the procedure has associated complications and failure of treatment (nonunion) does occur [6,12,17]. External fixators can be rather bulky and inconvenient for the patient [11]. Internal fixation on the other hand is convenient for both surgeon and patient as the fixation device is unobtrusive and does not require daily care. Infections associated with metallic devices can be eradicated with implant removal [16]. It must be emphasized that internal fixation for nonunion in an infected bone should be reserved for carefully selected patients. A larger series is required to establish selection criteria and its advantages.

In conclusion, treatment of fracture nonunion in an infected bone is difficult. When the femur is affected, success can however be achieved by a combination of prolonged antimicrobial therapy, operative debridement and internal fixation in selected patients.

References


