MANAGEMENT OF CHRONIC OSTEOMYELITIS IN A DEVELOPING COUNTRY USING CEFTRIAXONE-PMMA BEADS: AN INITIAL STUDY

TO ALONGE MD, FRCS, SO OGINLADE FRCS, AB OMOLOLU FRCS, AN FASHINA AMEM, A OLUWATOSIN FMNC. Divisions of Orthopaedics and Trauma, Plastic and Reconstructive Surgery, Department of Surgery, College of Medicine, University of Ibadan, Nigeria; Department of Medical Microbiology, University College Hospital, Ibadan, Nigeria

SUMMARY. Chronic osteomyelitis is a debilitating disease that is fairly common in developing countries. Various operative techniques have been adopted in the management of this disease but there have been few reports of their use in Africa. In this report, we present our experience of the use of a modified two-staged Belfast operation in patients with chronic osteomyelitis in Ibadan, Nigeria. An important modification of the procedure was the substitution of gentamicin beads (Septopal) with ceftriaxone-polymethylmethacrylate (PMMA) beads at the saucerised segment of bone at the first stage. Thirty-four patients with chronic osteomyelitis had the two-stage Belfast operation in 35 long bones; of these, 32 patients had ceftriaxone-PMMA antibiotic beads inserted at the saucerised segment of bone at the first stage, while the other two patients had gentamicin beads inserted. One of the two patients who had gentamicin beads had a residual collection of pus at second stage surgery but, following a repeat debridement, the cavity was rid of infection. There was recurrence of infection in three patients (8.6%) who had a suction drain inserted at the first stage and in six patients (17.1%) who had no suction drain at the first stage. The locally produced ceftriaxone-PMMA beads were found to be as efficient as the commercially available gentamicin beads in eluting antibiotics locally, thereby eliminating the residual infection in the bone cavities after the first stage. Another important outcome was a fourfold saving in cost in choosing to use ceftriaxone-PMMA beads rather than gentamicin beads. (Int J Clin Pract 2002; 56(3): 181-183)

Chronic osteomyelitis is more a problem of chronic ischaemia than of chronic sepsis. Primary chronic osteomyelitis arising de novo or following acute osteomyelitis is common among patients with sickle cell anaemia. Secondary chronic osteomyelitis arising as a complication of open fractures, arthroplasties or following bone surgery are encountered in all orthopaedic and trauma units worldwide. Several operative procedures have been carried out in the management of this distressing condition ranging from simple saucerisation and curettage, to the Papineau technique, continuous wound irrigation with antibiotic, the two-stage Belfast technique, bone resection and callotasis and the versatile but cumbersome Ilizarov frame. Irrespective of the operative option embarked upon, chronic osteomyelitis requires treatment that is primarily surgical because the complete debridement of all the devitalised bone and soft tissue is essential, regardless of the size of the wound.

In this study, we employed the Belfast technique in the management of 35 long bones in 34 patients with primary and secondary chronic osteomyelitis. Ceftriaxone polymethylmethacrylate (PMMA) beads were made intraoperatively and used in all but two patients. The outcome of the two-stage Belfast procedure using these custom made or patient-specific antibiotic beads is presented.

PATIENTS AND METHODS

The subjects of the study were 34 patients with chronic osteomyelitis who were seen at the orthopaedic unit of the University College Hospital, Ibadan, Nigeria between September 1995 and August 2000. Seven other patients with chronic osteomyelitis were seen during the same period but were unable to afford the cost of operative treatment and were therefore excluded from the study.

Evaluation of patients

Initial assessment comprised a thorough general examination with emphasis on anaemia, jaundice and other hallmarks of haemoglobinopathy. Wound swabs were taken for microscopy, culture and sensitivity, routine haematological investigation (full blood count, erythrocyte sedimentation rates and haemoglobin genotype), and baseline bone biochemistry and electrolytes and urea were carried out as appropriate. Joint review and preoperative planning were carried out with the plastic surgeon.

The perioperative antibiotic regimen consisted of
Chronic osteomyelitis occurred around the knee in three patients, with infection spreading to the contiguous knee joint, necessitating an arthrodesis at the first stage of the Belfast operation. Twenty-one patients had primary chronic osteomyelitis, of whom seven (33.3%) suffered from sickle cell anaemia (HbSS). Thirteen patients had secondary chronic osteomyelitis, seven (53.8%) of these following open reduction and internal fixation (Table 1). All the patients had been on various antibiotics for a minimum of 12 weeks. Twenty-nine (82.9%) of these patients had chronic discharging sinuses at the time of presentation in the outpatient clinic.

At surgery, and in all instances, the periosteum was hyperaemic and rough, with variation in its attachment to the bone. In all cases, pus exuded from the marrow of the affected bone, even with an intact skin and despite prolonged antibiotics. Bacteriological examination of the discharging sinuses in 24 patients revealed positive cultures in 21 patients and no growth in three patients; 75% of the isolates from the chronic discharging sinuses and necrotic bones removed at surgery grew *Staphylococcus aureus*. All the patients except one had healthy granulation tissue filling the cavity at second stage surgery. This patient, with known sickle cell anaemia and chronic osteomyelitis of the humerus, had gentamicin-PMMA beads inserted, but pus reaccumulated at the second stage, necessitating a repeat debridement.

There was radiological evidence of bone regeneration in most instances, as evidenced by cortical thickening and bony the tibia alone in 12 patients. Chronic osteomyelitis occurred around the knee in three patients, with infection spreading to the contiguous knee joint, necessitating an arthrodesis at the first stage of the Belfast operation. Twenty-one patients had primary chronic osteomyelitis, of whom seven (33.3%) suffered from sickle cell anaemia (HbSS). Thirteen patients had secondary chronic osteomyelitis, seven (53.8%) of these following open reduction and internal fixation (Table 1). All the patients had been on various antibiotics for a minimum of 12 weeks. Twenty-nine (82.9%) of these patients had chronic discharging sinuses at the time of presentation in the outpatient clinic.

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There was slippage of the antibiotic bead off the wire suture technique, making this treatment modality affordable to most (Figure using the Alonge-Wale intraoperative antibiotic bead maker). The mass production of ceftriaxone-PMMA beads for up to five patients can use the beads produced at one sitting, considerably reducing the cost of the beads per patient, as four to five patients can use the beads produced at one sitting. The mass production of ceftriaxone-PMMA beads using the Alonge-Wale intraoperative antibiotic bead maker (Figure 1), coupled with the advantages of the Belfast technique, make this treatment modality affordable to most patients in resource-poor environments.

The antibiotic beads used in the Belfast operation in these patients serve as fillers but, most importantly, deliver ceftriaxone to the site of implantation in the bone. The operation obviated the need for prolonged wound dressing and antibiotic therapy with its attendant adverse effects. Primary wound closure at both stages shortened hospital stay and allowed the patients to return to work. The use of suction drains appears to affect the outcome of the operation with respect to the rate of recurrence. From this initial report we advocate the use of a suction drain at both stages but certainly at the first stage to aid the evacuation of the residual haematoma, thereby minimising the risk of reinfection.

In developing countries where healthcare funding is the primary responsibility of patients and their relations, the Belfast technique appears to be a safe and cost-effective operation in the management of chronic osteomyelitis. The ceftriaxone-PMMA beads used in this initial study appear to be cheaper and the outcome of this modality of treatment and the shelf life of these beads is the subject of ongoing research in our unit. A randomised clinical trial comparing ceftriaxone-PMMA beads with simple saucerisation and curettage is planned.

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REFERENCES


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