



STUDY OF FUNCTIONAL OUTCOMES OF RADICAL DEBRIDEMENT AND SEQUESTRECTOMY IN PATIENTS OF CHRONIC OSTEOMYELITIS OF LONG BONE

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ABSTRACT There is universal agreement that treatment of osteomyelitis should consist of debridement, obliteration of dead space, tissue coverage and antibiotic therapy, with debridement as the most important factor for therapeutic success. Seven patients, 10 to 67 years old, with chronic osteomyelitis after a fracture of the femur (three), or of the tibia (four), were included in this study. The patients had already undergone 1 to 5 (mean : 2) surgical procedures. The same surgical technique was used in all of them : sinusectomy followed by resection of necrotic bone until paprika sign seen. External fixator, was done to stabilize the bone defect created by radical debridement in 1 case followed by distraction histogenesis. All wounds healed without complications, and the infection did not recur. The average follow-up period was 6 months (range :3 to 12).

KEYWORDS : chronic osteomyelitis ;radical debridement ;sinusectomy ;sequestrectomy.

INTRODUCTION

Bone infection is one of the most serious complications in the field of orthopaedic surgery and traumatology. Chronic osteomyelitis presents as a complex diagnostic and therapeutic problem and, like many other chronic conditions, has a high economic burden for healthcare providers. These patients often require a multidisciplinary approach that involves an orthopaedic surgeon, a plastic surgeon and an infectiologist. Long-lasting infection is often associated with avascular necrosis of the bone(13) , but the degree of necrosis varies widely. Necrotic bone, once detached from the living bone, becomes a sequestrum, which is responsible for the chronicity of the disease. Treatment requires isolation of the pathogens, suitable antibiotic treatment, meticulous debridement of all infected and necrotic tissue and, finally, reconstruction of bone and soft tissues defect, if any. Antibiotic treatment is a milestone in the treatment sequence and should be administered according to the culture and sensitivity. There are two routes for administering antibiotics. The systemic route, which is used by most physicians, has been recommended for periods varying from 6 to 24 weeks(2,5). The direct route is based on delivery vehicles which enable the slow release of the antibiotic. The most widely used delivery vehicle is polymethylmethacrylate cement(28,29). Bioabsorbable vehicles, such as calcium sulphate, synthetic polymers, and fibrin clots, have also been described(10, 14, 17,18). Bead implantation and the choice of nonabsorbable versus bioabsorbable delivery systems are still controversial.

The goal of surgery in the treatment sequence of chronic osteomyelitis is to remove all nonviable tissue, leaving only viable bone. Obliteration of the dead space can be obtained with antibiotic impregnated beads or with flaps. Flaps yield living tissue, which has the ability to fight the infection process(1, 7-9, 12, 16, 19, 20, 22, 23). Many treatment procedures have been described, and the success rate of treating chronic osteomyelitis varies from 70 to 90%(3).

This study describes six patients with chronic osteomyelitis resistant to conventional treatment.

MATERIAL AND METHODS

Subject- 7 patients.

Complaints- All had persistent pus draining sinuses. The patients had Cierny-Mader types III or IV adult osteomyelitis.

Investigations- Osteomyelitic bone detected in Radiographs superadded with sinogram and later confirmed on MRI.

Surgical procedure-

It started with an intraoperative sinogram using methylene blue. The sinus was completely excised down to the bone. All necrotic bone was

aggressively resected until normal bleeding was seen i.e. the “paprika sign” (uniform punctuate haversian bleeding) was considered sufficient to stop the debridement.

Samples from the bone and from the deeper part of the wound were obtained for tissue culture and antibiogram. Massive irrigation was the rule. The bone defect without continuity of bone was supported by Rail Road fixator and further distraction histogenesis to fill the defect.

The wounds were primarily closed in the two patients with osteomyelitis of the tibia, without tension (stay suture) ; suction drainage was used till discharge stopped. In two patients with soft tissue defect, gasrtrocnemius flap was done followed by Skin graft. In the two patients with femur osteomyelitis , fasciocutaneous flaps for coverage of the skin was done.

After surgery Above Knee slab were given for protection to the patient till wound healing and adequate bone stock detected radiologically.

Antibiotics were administered intravenously for 2 weeks, followed by oral antibiotics for other 4 weeks according to the antibiogram.

Partial weight-bearing with walking frame was allowed after 2 to 3 months after confirmation of sufficient bone stock on radiographs with protection by “Ankle Foot Orthosis” in patients with osteomyelitis of tibia and “Thigh brace” in patients with osteomyelitis of femur.

CASE 1

A 60 year old male had undergone 5 operations for chronic osteomyelitis of tibia after a fracture at age 54 year before coming to us. Surgery consisted of removal of implant, sinusectomy, sequestrectomy, gastrocnemius flap. Partial weight bearing with crutches was initiated on 3rd post operative day. And full weight bearing after 3rd week. The wound healed uneventfully. No clinical or radiological signs of chronic infection were seen at follow up after 6 months. The knee and ankle had a full range of motion.



Removal Of Implant

Intra-Operative Image



Intra-Operative Image



Sequestrum, Sinuses And Removed Implant



Pre-Operative X-Ray

CASE 2

A 60 year old man had suffered from chronic osteomyelitis of the distal third of the femur since 10 year. He had undergone 2 operations. A draining sinus was still present. After radical debridement with sequestrectomy and saucerization. Fasciocutaneous flap was necessary to fill the bone cavity. Partial weight bearing with crutches allowed after 3rd week and full weight bearing after 5th week later. No recurrence after 7th month of surgery.



Pre-Operative X-Ray Distal Femur Osteomyelitis



Post-Operative X-Ray Distal Femur Osteomyelitis

CASE 3

A 15 year old male had a history of chronic osteomyelitis of the tibial diaphysis since 9 months. He had undergone antibiotic treatment for 6 month, but sinus was still active. Then he was operated and surgery included radical debridement with sequestrectomy and saucerization. Post operative anterior and posterior above knee slab given. Partial weight bearing started after 3rd month and full weight bearing started after 4th month. No active sinus after 9 months of follow up.



Clinical & Intraoperative : Right Distal Tibia Osteomyelitis



Post-Operative X-Ray



Follow Up After 4 Months

CASE 4

A 67 year old male had been operated upon 3 times, over a period of 5 years. For chronic osteomyelitis of the proximal tibia. Surgery consisted removal of implants, debridement, sequestrectomy and

saucerization, fasciocutaneous flap. Partial weight bearing started after 2nd week and full weight bearing started after 3rd week. 1 year later function of the knee was quite satisfactory, while total eradication of the infection was achieved.

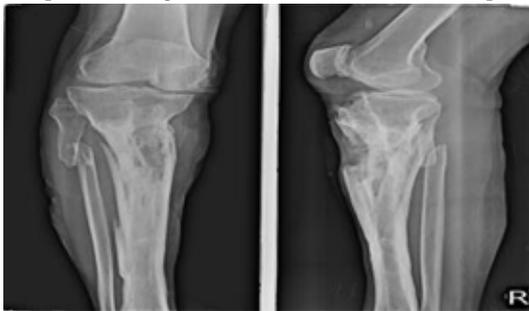


Pre-Operative X-Ray Proximal Tibia Osteomyelitis



Intra-Operative Image

Gastrocnemius Flap



Post Operative X-Ray Proximal Tibia Osteomyelitis

CASE 5

A 10 year old girl had a history of 4 month of chronic osteomyelitis at distal femur. Radical debridement and antibiotic beads inserted in bone cavity. Partial weight bearing started after 2nd week and full weight bearing after 3rd week. antibiotic beads removed after 3month. Follow up after 9 month showed absence of recurrence



Pre-Operative X-Ray Of Right Distal Femur Osteomyelitis



Post-Operative X-Ray Of Right Distal Femur Osteomyelitis

CASE 6

A 18 year old boy had suffered from chronic osteomyelitis of distal tibia since 4 months. He had undergone 5 operations. Surgery consisted of removal of implant, sequestrectomy and saucerization, corticotomy, rail rod on first stage and bone graft. Distraction and osteogenesis started then bone grafting done after 3 month, once appropriate length was achieved. Partial weight bearing started after 9th month. Superficial pin tract infection was noted but successfully treated with oral antibiotics and regular local dressing. 9 month after surgery no recurrence was seen and the post operative range of motion was preserved.



Pre-Operative X-Ray Of Right Proximal Tibia Osteomyelitis



Clinical & Intraoperative Images



Post-Operative X-Ray Of Right Proximal Tibia Osteomyelitis

CASE 7:

A 56 year old male patient having history of right side distal femur fracture 20 year ago. He had suffered from chronic osteomyelitis of distal femur since 20 year. Surgery consisted of removal of implant, sequestrectomy and saucerization, stimulan beads consisting vancomycin. Partial weight bearing started after 1.5 month. There is no recurrence of infection with preservation of range of motion of knee and ankle.



Distal Femur Showing Sinus Tract

Pre Operative X-Ray Of Right Distal Femur



Intra Operative Image

Image Showing "Stimulan"



Post Operative X-Ray

RESULTS

Subject-7 patients. Male – 6, Female -1
 Age group- 10 to 67 years (Avg- 38.16 years)
 Duration of complaints- 4 months to 10 years (3.73 years)
 Bones affected- Femur-3 , Tibia -4
 Fracture associated-4 , without fracture-3
 History of previous surgery-1 to 5 surgical procedures (average : 2) in other hospitals.
 The mean hospitalisation time varied from 15 to 46 days (average : 21 days).

The wounds healed without complications and there were no signs of recurrent infection during the follow-up period.

Only one patient required a supplementary bone grafting procedure. Restoration of the bone structure, sufficient for functional loading, was obtained in all patients.

No pathological fracture was recorded. The only minor complication was a superficial pin tract infection in one patients ; it resolved with local antiseptics and systemic antibiotics.

DISCUSSION

The classical treatment of chronic osteomyelitis includes thorough debridement, obliteration of the dead space, good tissue coverage and antibiotics(12).

Despite recent advances in antibiotic therapy, radical surgical debridement is still the most important factor for therapeutic success. However, inspite of radical debridement, systemic antibiotics and soft tissue coverage, the published failure rate is still up to 30%(25, 27).

Our patients were exposed to multiple surgical interventions with radical debridement and long-term antibiotic treatment.

Our success rate was 100% with no recurrence and patient satisfaction. The term "radical surgical debridement" is the definitive management where excessive debridement with excision of the necrotic/avascular tissue till "paprika sign" (punctiform bleeding) are obtained for which debridement with the bone rongeur or creating window must be more aggressive, even if the stability of the bone is endangered.

Of course, the risk of an iatrogenic fracture is high, when debridement reduces the cortical volume to less than 70% which needs protection of the bone(21, 27).

Prevention of a pathologic fracture was the rationale for using a prophylactic external fixator to protect the bone. A plaster cast is an alternative, but it hampers wound care, and it requires long-term immobilization of the adjacent joints, which results in joint stiffness. Internal fixation is another alternative, but it introduces a foreign body in an infected area. In other words, external fixation appears to be ideal to compensate for the aggressive debridement. The external fixator can be extended, if needed, to the adjacent bone segment for temporary trans articular immobilization, especially in case of peri-articular osteomyelitis. The thin wire circular Ilizarov device provides enough stability for functional weight-bearing.

In patients with massive defect and no continuity , the bone resection may be followed by distraction osteogenesis for limb length restoration(4, 15, 24,26).

CONCLUSION

Hence in all patients with chronic osteomyelitis, radical debridement with soft tissue or bone loss even if needed, should be performed. Soft tissue loss can be compensated by muscle flap and skin defect with skin graft. While bone defect if in continuity can be compensated by bone graft, bone graft analogues or spontaneous growth and defect without continuity can be stabilized by external fixate, rail rod or ilizarov and can be regrown by distraction histiogenesis.

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