

EARLY OUTCOME OF INTERLOCKING INTRAMEDULLARY NAILING OF INFECTED TIBIA FRACTURE NONUNIONS: A REPORT OF 2 CASES

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ABSTRACT

Background: Eradication of infection and fracture union are the two major objectives of treatment of infected non unions. Recent studies indicate that locked intramedullary nailing of tibia fracture non unions provide a mechanical environment which enhances fracture healing even in the presence of infection. It also allows early weight-bearing without the burden of an external frame making it more acceptable to patients than external fixators.

The Cases: The authors present 2 cases of infected tibia non unions. The first case had segmental fibulectomy, fracture debridement, deep tissue sampling, **locked intramedullary nailing**, cancellous bone grafting and antibiotic therapy. The second case had segmental fibulectomy, wound and fracture debridement, deep tissue sampling, **locked intramedullary nailing**, cancellous bone grafting, fasciocutaneous flap wound cover and antibiotic therapy.

Results: The first case had a satisfactory (early) outcome having achieved full weight bearing at 12 weeks with no clinical evidence of infection. Similarly, the second case had a good outcome having achieved full weight bearing without clinical signs of infection at 12 weeks (although immediate post-op period was complicated by surgical site infection which was effectively managed). Based on these two cases, the important guiding principles were identified and discussed.

Conclusion: With appropriate surgical technique and strict adherence to surgical principles, the outcome of interlocking intramedullary nailing for infected tibia non unions are satisfactory.

KEYWORDS: Early Outcome, Intramedullary Nailing, Tibia, Fracture Non unions

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INTRODUCTION

Infected fracture nonunion is typically characterized by failure of fracture healing in the presence of infection hence the core objectives of management include infection control, stimulation of fracture healing and stable fracture fixation with or without soft tissue reconstruction.¹ Undoubtedly, choice of fixation hardware is the most frequently debated aspect of management in view availability of various fixation devices.

Traditionally, external fixators are

considered ideal for fixation of infected fracture nonunions considering that the anchoring devices (screws, pins) are fixed to bone at a distance away from the fracture site and connected by external frames thereby reducing the effect of hardware infection on fracture healing. On the other hand, internal fixation devices including interlocking intramedullary nails traverse the fracture site and are completely embedded within the limb segments thereby theoretically increasing the effect of hardware related infection on fracture healing.

However, interlocking intramedullary nail is considered the ideal fixation device for long bone fractures (and fracture nonunions) providing good axial and rotational stability (while maintaining length) without the burden of external

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frames unlike external fixators.²In addition, some studies have shown that intramedullary nailing provides a stable mechanical environment for fractures to heal even in the presence of infection.³

Therefore, the authors present two cases of infected tibial fracture non-unions managed with interlocking intramedullary nailing to highlight our early experience and some important aspects of treatment.

THE CASES

CASE 1

The patient was a 35year old male farmer who presented on account of left leg deformity, abnormal movement and difficulty with walking of two years duration.

Symptoms were preceded by spontaneous appearance of sinuses on the left leg discharging pus and bony spicules for which he had tradomedical treatment comprising of local massage and application of local concoctions. The sinuses persisted and he subsequently sustained a tibiafracture necessitating his presentation to our facility.

Following diagnostic evaluation, a diagnosis of pathological fracture of the tibia secondary to chronic osteomyelitis of the tibia was made and he subsequently had sequestrectomy, curettage, segmental fibulectomy and POP cast immobilisation. Post-operatively, the sinuses and surgical wounds healed however recurrent pain persisted while the fracture remained un-united.

In view of this, a diagnosis of infected tibia fracture nonunion was made and patient was offered fracture debridement and internal fixation with interlocking intramedullary nailing plus cancellous bone grafting. Preoperatively he had intravenous

(IV) antibiotics for 5 days and at surgery he had fracture debridement, copious wound and medullary canal irrigation with gentamycin containing normalsaline after which gloves and drapes were changed before intramedullary nail (IM) fixation and cancellous bone grafting.

Post-operatively surgical wounds healed satisfactorily, antibiotic therapy continued for 6 weeks and patient achieved full weight bearing at 6 weeks. At 12 weeks there were no signs of infection and no significant functional limitation.



Preoperative radiographs



Post-operative radiographs

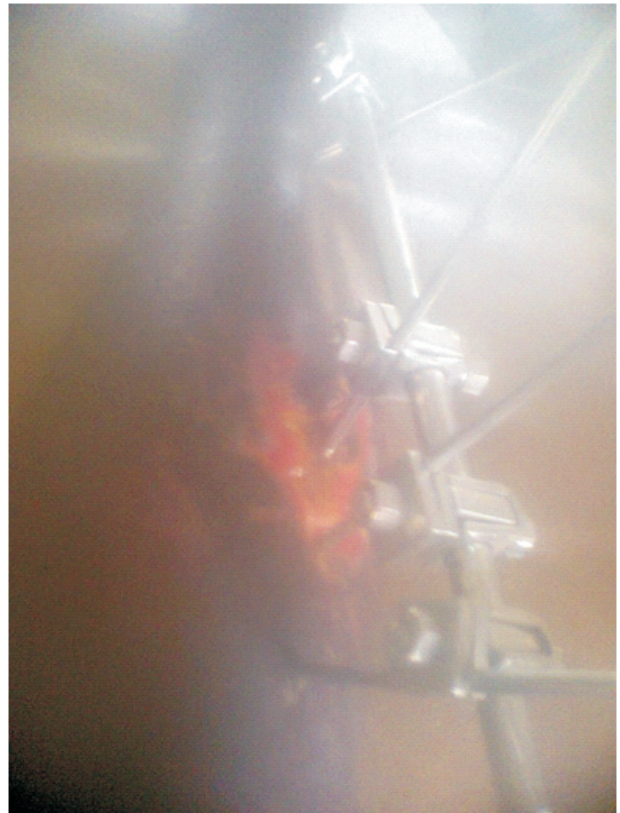
CASE 2

Patient was a 26 year old male footballer who presented with a progressive recurvatum left leg deformity with inability to bear weight on the left leg following monolateral (uniaxial) external fixation of an open Gustilo IIIA open left tibia and fibula fracture. In addition, the fracture was complicated with post-op wound necrosis and infection resulting in complete wound dehiscence with exposure of the underlying tibia fracture.

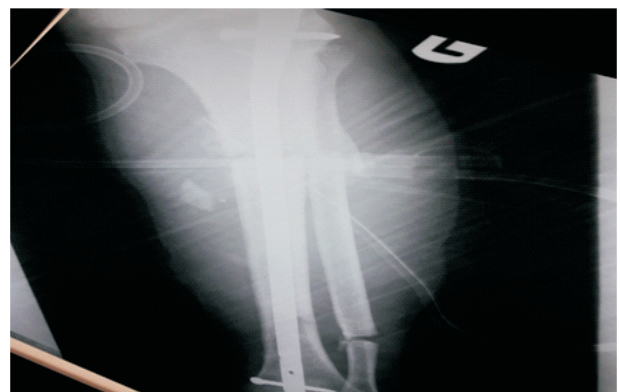
Subsequently, he had decortication and fenestration of the exposed tibia cortex to stimulate granulation tissue growth which was unsuccessful. Upon further diagnostic evaluation, a diagnosis of infected tibia fracture non-union was made and patient was offered wound and fracture debridement and internal fixation with interlocking intramedullary nailing with cancellous bone grafting and fasciocutaneous flap for wound cover.

Pre-operatively, the external fixator was removed and he had intravenous antibiotics for 5 days to control infection. At surgery, he had segmental fibulectomy and wound and fracture debridement after which gloves and drapes were changed before IM nail fixation, cancellous bone grafting and fasciocutaneous flap for wound cover over a suction drain which showed non-airtight wound cover after its activation.

Post-op period was initially complicated by surgical site infection which subsided with antibiotics and local wound care resulting in satisfactory wound healing. At 12 weeks, patient was weight bearing while there were no signs of infection.



Pre-op pictures



Post op radiograph



Clinical picture at 12 weeks

DISCUSSION

Traditionally, orthopaedic surgeons exhibit a lot of restraint with using internal fixation devices for the management of infected non-unions because these devices provide a large surface area for possible microbial contamination, colonisation and eventual infection.⁴ However, **the concept of 'race for the implant surface'** (whereby host and bacterial cells compete in determining the ultimate fate of the implant) proposes that **when host cells colonize the implant surface first, the probability of attachment of bacterial cells is very low and vice versa.**⁵ Therefore, prevention of bacterial contamination of the implant surface is key to successful use of internal fixation devices particularly IM nailing in infected tibial nonunions.

As demonstrated by these cases a **multidisciplinary approach** was adopted because studies have shown good outcomes

from using a multidisciplinary team in the treatment of chronic osteomyelitis.^{6,7} Ziran et al compared their outcomes before and after the introduction of dedicated multidisciplinary team approach to treatment of chronic osteomyelitis and noted significantly better outcomes with the latter. Such an approach allows each element of the clinical problem to be addressed individually so that the best outcome is achieved.⁶ This team (as depicted in our cases) should include the orthopaedic surgeon, plastic surgeon, medical microbiologist, radiologist, physiotherapist and other medical personnel as the case may require. In addition, **pre-operative Infection control** by early removal of explants (if present) with preoperative parenteral antibiotics for 3 to 5 days will at least theoretically reduce bacterial load at the surgical site.

Intraoperatively, **radical wound and fracture debridement** which allows complete excision of bacterial biofilm is essential to prevent persistent or recurrent infection.⁸ In addition, copious wound and medullary canal irrigation with antibiotic (gentamycin) containing normal saline reduces bacterial contamination as the solution to pollution is dilution. Similarly, **change of drapes and operative wear** before IM nail insertion helps to prevent implant surface and deep tissue bacterial contamination which assists host cells in winning the race for the implant. Also crucial is the **restoration of viable soft tissue envelope.** This may require the intervention of a plastic surgeon as flap tissue wound cover may be necessary in the presence of soft tissue defects as shown in this report. This vascularises the recipient site, improves antibiotic delivery, fills dead space and prevents further contamination.⁹ Active (suction) drain should be used only when the wound cover (closure) is air tight to prevent bacterial translocation from the

exterior to the depths of the wound, otherwise a nonsuction drain (like the penrose drain) should be used.

Post-operatively, **antibiotic therapy** directed by sensitivity results of deep tissue samples taken at surgery for a minimum of 6 weeks is appropriate for controlling residual infection. Rehabilitation under the supervision of a physiotherapist is essential for functional recovery while partial weight bearing can commence as soon as post-op pain subsides and patients can gradually progress to full weight bearing between 6 to 12 weeks. Very importantly, patients should be followed up after discharge and should always be offered **nail extraction and medullary reaming after fracture healing** to eradicate any residual infection.¹⁰

CONCLUSION

Although a longer follow-up is required for the long term outcomes of interlocking intramedullary nailing for infected tibianonunions to be determined, this report demonstrates the expanding indications of intramedullary nailing. The early outcomes (in terms of infection control and functional recovery) make satisfactory long term outcomes a logical expectation particularly when the underlying principles guiding the race for the implant surface are understood and adhered to.

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