

Case Report

Management of Infected Non-Union by Implant Retainment and Papineau Open Bone Grafting – Report of Two Cases

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Abstract

Introduction : Infection following implant surgery in orthopaedics is a disaster both for surgeon and patient. Management of infected non-union is a most challenging task an orthopaedic surgeon can ever face. Infection following implant surgery not only leads to repeated surgeries, long term antibiotic use, stiffness of neighbouring joints and long term hospital stay but also affects patients economic, social, psychological status. **Cases :** Here we present report of 2 cases infected non-union ulna which was managed by stabilisation of non-union site by altering position of existing plate followed by period of open dressing till healthy granulation tissue appears. Later open bone grafting procedure done. Both patients were followed up for 15 months. **Results :** At the end of 4 months both patients achieved bony union without recurrence of infection. So, we conclude management of infected non-unions by altering plate position and by following papineau method of open bone grafting leads to satisfactory results. **Conclusion :** This technique is simple, effective and done with minimal expenditure and could be best procedure of choice in patients where cost benefit analysis appears critical.

Keywords

infected non-union, plate repositioning, papineau open bone grafting

Keymessage

Patient with infected non-union is a challenging task, it often requires multiple procedures and long term antibiotic use and hospital stay with questionable outcome. Our report of two cases where non-union was managed by cost-effective and simple procedure offers many advantages to patient with encouraging outcome.

Introduction

Post-operative infection in orthopaedics reduced drastically from 39% in 1896 to 2-5% at present with advent of strict aseptic measures and peri-operative antibiotic prophylaxis. However, due to increasing trend of high velocity road traffic accidents and open fractures, medical co-morbidities incidence of infected non-unions still remains unpreventable¹. Infected non-unions traditionally managed by repeated debridement's with retained implant and long term hospital stay, implant removal and external and internal stabilisation, local antibiotic therapy etc. These methods may lead to pin site infection, long term hospital stay, stiffness of joints along with high expenditure with poor to acceptable outcome². Here we present two cases of infected non-union where newer, simple and cost-effective method was employed. The technique employed here is the first of this kind method reported in english language literature to the best of our knowledge.

Case History

Two patients with past history of sustaining fracture radius and ulna of forearm presented to our orthopaedic

outdoor with infected non-unions of ulna without any signs of radius infection or non-union. Both were male patients in the age group of 30 – 40 years, manual labourers by occupation and belonged to lower socio-economic class, both had sustained fracture due to road traffic accident in their non-dominant hand. One patient (case-1) had sustained closed fracture and other (case-2) sustained open grade-3A fracture. Both patients had comminuted ulna fracture. None of the patients had any medical co-morbidity. Both patients were initially managed by open reduction and internal fixation wherein ulna was plated and radius was fixed with Talwarkar square nail at some other hospital (Figs. 1,3). After surgery the limb was immobilised by plaster cast for 6 weeks.

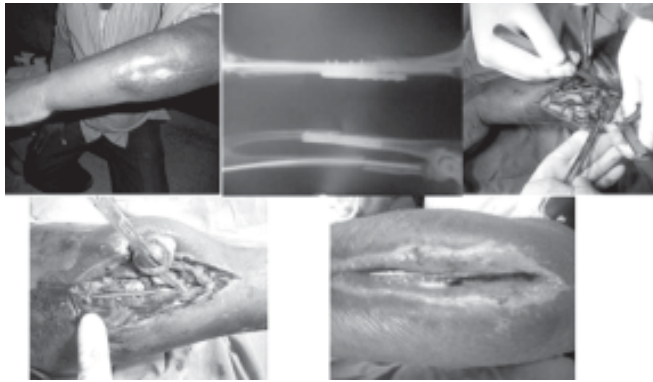


Fig. 1

Case-1: 35 year old male presented with discharging sinus and non-union of proximal ulna. He underwent debridement, plate repositioning and open papineau dressing till healthy granulation tissue formed throughout.

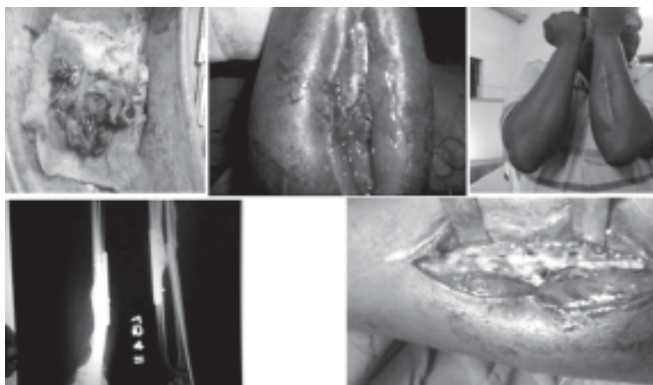


Fig. 2

Case-1 continued: Autogenous cancellous bone grafting of non-union site done at second stage. Wound closure occurred by spontaneous epithelisation. Follow-up at 3 months shows healthy scar and union. At time of implant removal.

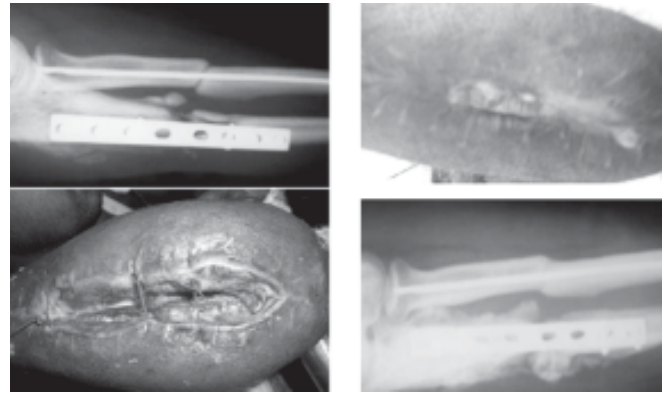


Fig. 3

Case-2: 40 years old with comminuted fracture ulna presented with discharging sinus and non-union of proximal ulna 4 months after internal fixation. He underwent papineau open bone grafting after plate repositioned. After a follow-up of 4 months radiological union seen.

Case-1 did not follow the post-operative instructions and started using limb by removing plaster cast. He presented to outdoor at 3 months with discharging sinus and pain over ulnar surgical scar. On examination there was local tenderness over proximal ulna. Investigation revealed staphylococcus aureus, there was radiological signs of atrophic non-union with bone loss at fracture site and unstable fixation.

Case-2 presented at 4 months with active sinus and without any pain, investigation revealed staphylococcal infection and atrophic non-union at fracture site with bone loss and unstable fixation.

Both patients after thorough investigation were posted for surgical exploration of non-union site and further management by papineau method.

Surgical procedure performed under suitable anaesthesia, under aseptic conditions. The Papineau method consists of three stages^{3, 4} as follows (Figs. 1, 2, 3).

A. Stage of Debridement and Stabilisation

- Sinus tracts and sequestra and unhealthy bone excised till healthy looking bone is visualised (fresh bleed- paprika sign), hardware removed.
- Non-union site was stabilised by reapplication of removed plate over healthy bone away from non-union site.

- Gap of 2.5cm(C-1) and 3cm(C-2) was created which was packed with dressing soaked in antibiotic.
- Dressing was done after 4-5 days continued till infection controlled and healthy appearing granulation tissue present throughout.

B. Stage of Grafting

- Autogenous cancellous bone graft was taken from iliac crest is placed in concentric and overlapping layers and cavity was completely filled.
- Wound was packed with dressing soaked in antibiotic solution.
- Dressings were changed on 3 or 5 day and replace any grafts that adhere to the dressing.
- Dressing changed until grafts stabilise.

C. Stage of Wound Coverage

- Coverage occurred by spontaneous epithelisation in both the patients.

During the course of treatment patients were put on parenteral antibiotics as per culture and sensitivity pattern for 2-3weeks. At the time of discharge patients were put on above elbow slab, and long term antibiotic therapy for 3 months.

Follow-up and Outcome

Both patients were discharged after mean duration of 2 weeks in hospital. They were asked to attend outdoor once in a 6 weeks till 6 months later once in 3 months. During follow-up infection status assessed by ESR, CRP, and status of bone assessed by standard AP and LATERAL radiographs. The oral antibiotics and were changed in case of active infection according to fresh culture and sensitivity pattern. Two of the patients were put on linezolid and flouroquinolones respectively.

At 4 weeks period two of our patients had complete infection control and radiological callus. Slab was replaced by functional brace and patients were asked to do active and passive physiotherapy of all free joints to reduce functional limitation.

There were no signs of infection both clinically and haematologically at the time of complete union and both

achieved clinical and radiological union at 3months (case-1), and 4 months (case-2) duration (**Figs. 2, 3**). Both patients underwent implant removal at duration of 8 months and 10 months. Reason for implant removal was recurrence of infection at 8 months in case-1 and hardware prominence in case-2. And there were no signs of chronic osteomyelitis at final follow-up.

Most common complication noted in our cases was stiffness of elbow joint. Stiffness in our case was due to pre-existing stiffness which was aggravated by immobilisation provided by our method. Other complication was excessive scarring.

One of our patient developed recurrence of infection at 8 months after complete union. Infection subsided after implant removal and antibiotic therapy.

Discussion

Infected Non-union of ulna in our two cases occurred in proximal third and had clinical and radiological signs of radius union. One of possibilities for occurrence of infection and non-union of ulna might be its subcutaneous location, poor muscular cover proximally and lack of compression due to radius union. Traditionally non-union are managed by long term antibiotics and debridement or in staged manner wherein implant removal done first followed by temporary stabilisation until infection controls followed by revision stabilisation and bone grafting. Other methods mentioned in literature are use of wave plate for ulna non-union, use of local antibiotic beads for infection control. Most of the traditional methods require repeated procedures, long hospitalisation, expensive and also leads to stiffness of joints.

Papineau method traditionally employed for management of chronic osteomyelitis provides adequate drainage, allows for formation of healthy granulation tissue which resists infection and uses cancellous bone graft which revascularise rapidly. Method also allows for skin closure by spontaneous epithelisation or healthy granulation tissue formation after cancellous bone graft placed. Most of the cases closure can be achieved spontaneously or by split skin graft⁵.

As per earlier studies it is safer to saucerize and remove sequestrum and unstable metal implants, combined with irrigation and renewal of rigid internal or extrasketal fixation as a first procedure and to perform bone grafting as a secondary measure on a freshened pseudarthrotic bed in a quiet period a few weeks later.

In 1999 Ueng SW, Wei FC, Shih CH. Two -stage treatment of infected non-union of femur diaphysis with implant removal, debridement, antibiotic beads local therapy, definitive external skeletal fixation, and staged bone grafting is an acceptable treatment protocol. It results in rapid recovery from osteomyelitis and a predictable recovery from non-union⁶.

In 2006 S.C Goel mentioned infected nails and plates be treated with removal of hardware followed by over reaming / debridement and external fixation along with antibiotic beads. Followed by papineau technique employed for bone reconstructionw .

Our study differs from above mentioned studies by the fact that our study used pre-existing plate for skeletal stabilisation. Results of our study where both patients achieved strong union and infection control are comparable to results of above mentioned studies.

So, we conclude our new method could be good alternative for management of infected non-unions. However further studies with large sample size are required to completely assess effectiveness and complications associated with it.

Conclusion

This technique is simple, effective and done with minimal expenditure and could be best procedure of choice in patients where cost benefit analysis appears critical. Also it may be used as a salvage technique when all other modalities of treatment fail. Patient with infected non-union is a challenging task, it often requires multiple procedures

and long term antibiotic use and hospital stay with questionable outcome. Our report of two cases where non-union was managed by cost-effective and simple procedure offers many advantages to patient with encouraging outcome.

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