International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

Salvage of a Limb by Ilizarov Angiogenesis - An Interesting Case Report

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Abstract: ***Surgical management of open fracture with compromised soft tissue has always remained a challenge for orthopaedic surgeons. Delayed union and non union in such patients are treated by various methods of bone grafting, vascularized pedicle graft, free fibular vascularized graft , papineau methods and Ilizarov. We are reporting an interestingcase of treatment of open fracture of Tibia with soft tissue compromise treated by Ilizarov angiogenesis. In the presence of deep infections treatment of long bone fractures are often faced with the problem associated with wound healing and fracture healing. Poor wound healing and delayed fracture union can be treated by application of Ilizarov and utilizing the principle of neo angiogenesis. Increased vascularity will be favoured by application of Ilizarov wires and tensioning which will initiate aseptic inflammation. Drilling the proximal fragment in S shaped manner will improve the blood supply and enhance the chances of soft tissue and fracture healing.***

Keywords: Ilizarov, non union, angiogenesis, inflammation, open fracture

1. Introduction

Fracture healing in patients with open wounds with bacterial colonization has remained always a challenge for the treating orthopaedic surgeon. There is a higher rate of complications like delayed union and nonunion associated with such injuries (1). Wound infections are due to compromised soft tissue status and poor vascularity associated with such injuries. The standard method of treatment would be adequate debridement, stabilization of fracture and appropriate antibiotics to control infection. Such patients may require repeated debridements and planned soft tissue reconstruction. The nonunion can be treated by various other modalities like papineau technique, reamed intramedullary nailing and bone grafting, Ilizarov application etc... The standard methodology in Ilizarov application is excision of Non union site, acute docking and corticotomy followed by limb lengthening .Sometimes it may be necessary to excise the non union site ,perform corticotomy and then do bone transport depending on the length of the defect. Poor skin condition and compromised soft tissue will add to the doleful litany. Under such circumstances repeated surgeries, prolonged hospitalization and poor results sometimes ends in planned amputation of such patients

2. Case Report

A 30 year old Male patient was brought to our hospital with an open fracture of the leg type III B on may 2014. Radiological findings confirmed oblique fracture of distal 1/3rd of Tibia with short oblique fracture of lower 1/3rd of fibula (Fig 1).Patient underwent immediate debridement and stabilization of open fracture with A.O external fixator system. Post operatively patient received intravenous Ceftriaxone ,IV Amikacin and IV Metronidazole for 3 days. Wound was repeatedly assessed post operatively and appropriate wound care protocol was instituted.

Inspite of adequate debridement and stabilisation of fracture patient developed wound infection with discharge from wound and constitutional symptoms. The wound swab revealed both gram positive and gram negative bacteria. Organism grown were E.coli(ESBL) and S.Aureus (MRSA)(Annexure 1)both of which are a surgeons nightmare. Appropriate antibiotics were instituted after consultation with clinical microbiologist. Patient underwent repeated debridement and split thickness skin grafting (Fig 2). Wound extended to the heel pad which appeared unhealthy with active serous discharge. There was a poor soft tissue status and non healing wound with established delayed union at fracture site.

Usually in such cases because of gross infection and non union despite repeated surgeries amputation is the only option. However, we decided to plan a limb salvage procedure. Patient underwent Ilizarov application with multiple drilling in the figure of S in the proximal fragment (Fig 3). In subsequent follow up it was found that fracture has shown clear evidence of healing with good callus formation and wound healed well (Fig 4,5).Skin grafting has taken up well and patient was made ambulatory full weight bearing with support

3. Discussion

Many surgical protocols have been described to treat infected non-unions of the distal tibia with wound healing problems .In the presence of deep infections treatment of long bone fractures are often faced with the problem associated with wound healing and fracture healing. In this case report an Ilizarov external fixator was applied in staged

reconstruction for complete control of the infection and achieving fracture healing with concomitant wound healing.

In this case report, intraoperative cultures revealed ESBL and MRSA. The presence of Escherichia coli has been reported to be responsible for septic tibial non-unions in previous studies (2). The Ilizarov method has been used successfully for the treatment of septic tibial non-unions (3, 4). Many studies have demonstrated the effectiveness of the Ilizarov method and circular external fixation for eradication of infected tibial non-unions (5-14). Karargyris et al. reported the use of circular external fixation in a two-stage protocol for the treatment of septic pseudoarthrosis of the tibia (10).Acute osseous shortening followed by distraction osteogenesis has also been reported as a successful method for the treatment of tibial non-union with bone loss(12). Takahashi et al. presented a case where fragmental bone transport in conjunction with acute shortening was followed by gradual lengthening using the Ilizarov technique for a failed infected non-union of the tibia(15) .The placement of antibiotic-loaded bone cement has also been reported for the treatment of septic pseudoarthrosis(16,17).

The main advantage of this approach is the continuous local release of antibiosis over a longer period of time .However, this technique may also present as a potential source of infection. Gulan et al. has described a technique for the treatment of infected non-union of the tibia where autogenous cancellous bone from the iliac crest was placed on the anterior surface of the interosseous membrane (18). Schottle et al. reported a high rate of bone healing after two-stage reconstruction with free vascularized soft tissue transfer and conventional bone grafting within a cement-induced membrane (19). Vascularized muscle and fibular grafts have also been variably used for the reconstruction of infected tibial non-unions (20,21), but this method cannot be used in patients with extensive scarring of the lower extremity, large areas of skin loss and with questionable patency of the tibial vessels .

In our case we have achieved both wound healing and fracture healing by utilizing the concept of Ilizarov angiogenesis. This highlights the basic concept of fracture healing that is favoured by Ilizarov ring application and angiogenesis

4. Conclusion

Poor wound healing and delayed fracture union can be treated by application of Ilizarov and utilizing the principle of neo angiogenesis. This is of utmost significance in cases not responding to any treatment. Increased vascularity will be favoured by application of Ilizarov wires and tensioning which will initiate aseptic inflammation drilling the proximal fragment in S shaped manner in turn will improve the blood supply and enhance the chances of soft tissue and fracture healing. Using this technique, patient can be saved from the dreadful modality of amputation, however further studies are required to establish its usefulness.

Figure 1

Figure 2

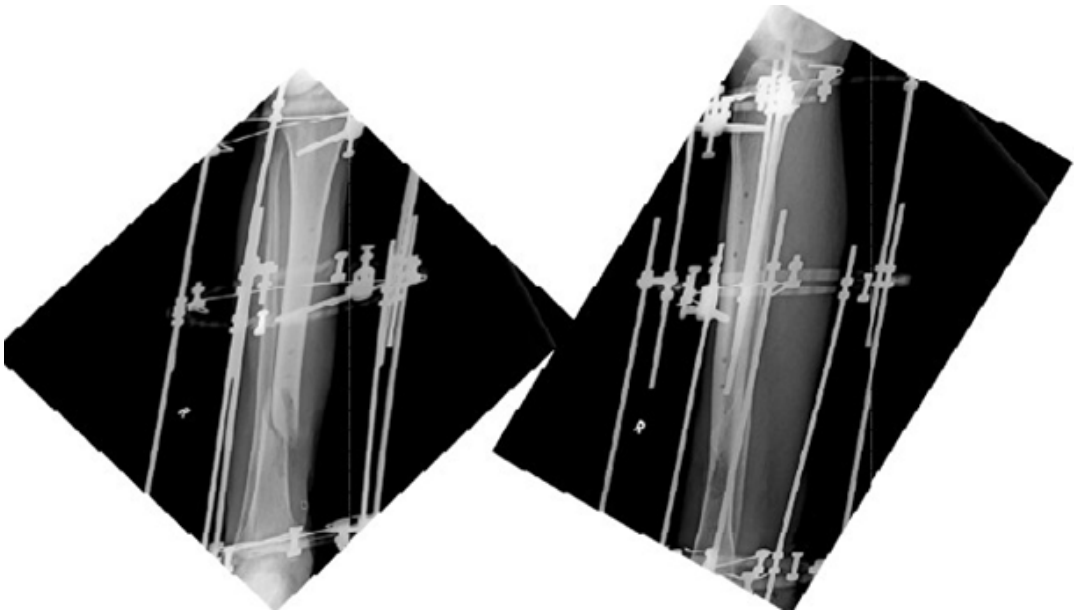


Figure 3

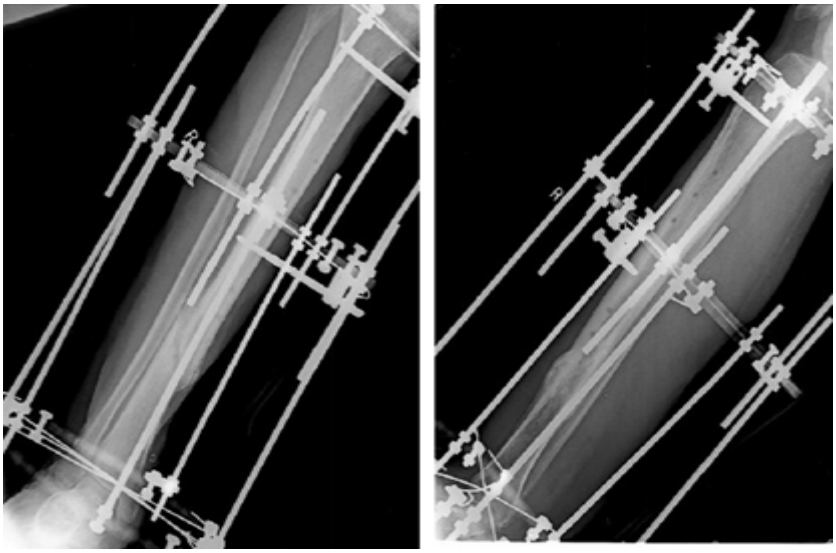
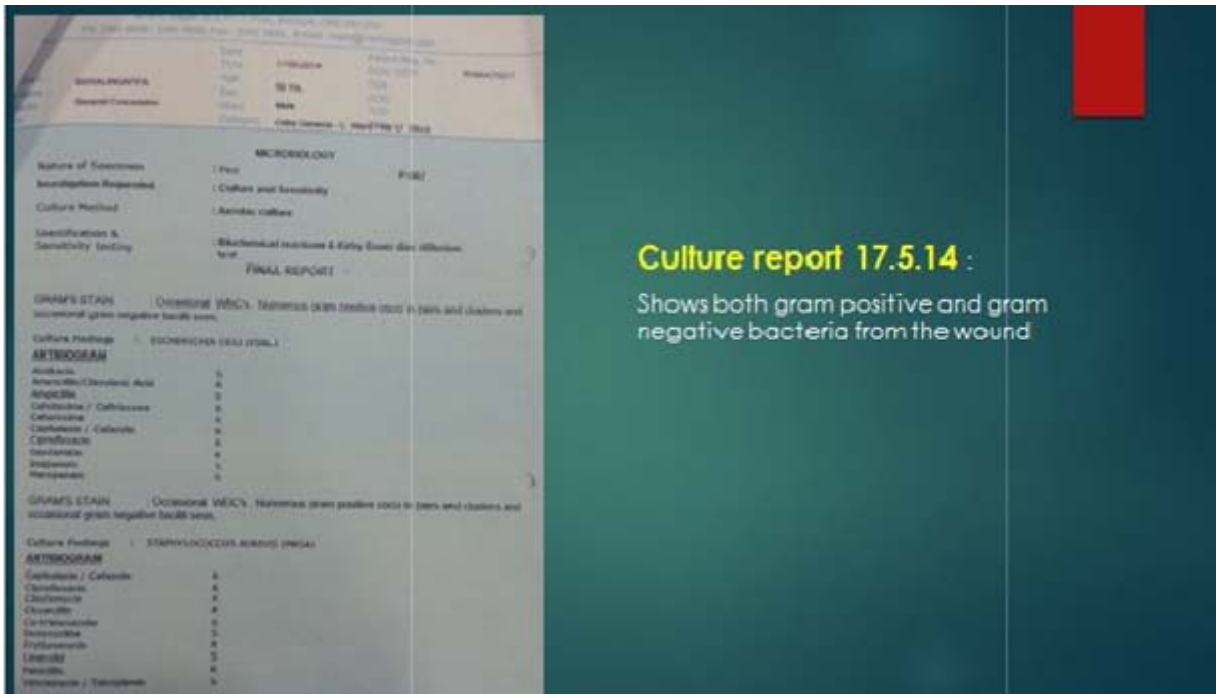


Figure 4

Figure 5:

Annexure 1



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