



Surgery

STUDY OF SINGLE STAGE PRIMARY ILIZAROV FIXATION FOR TIBIAL DIAPHYSEAL FRACTURES

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ABSTRACT Twelve cases of compound, comminuted tibial diaphyseal fractures of Gustilo-Anderson type-II and III-A were treated by primary, single stage Ilizarov external ring fixation. The second stage surgeries like bone grafting, skin and myocutaneous flap transfer were not done for various reasons. There were no major complications like, compartment syndrome, late neurovascular injury and joint stiffness. All the patients were allowed early mobilization. Range of movement exercises of knee, ankle and supported weight bearing were encouraged during immediate post operative period. There was good compliance by patients and relatives till the bony union and fixator removal. In developing countries like India this single stage procedure should be considered for economically poor patients who are not willing for multiple procedures and repeated hospital admission.

KEYWORDS : Tibial Diaphyseal Fractures, Ilizarov Fixation, Bony Union.

Introduction:

Road traffic accidents, fall from height and construction labour related injuries are common in our region. Long working hours with no proper rest time, no safety measures at work place and alcoholism are prone to accidents. The most frequent injuries are compound comminuted diaphyseal fractures of tibia due to its sub-cutaneous location and due to direct injury. These fractures pose challenge to orthopaedic surgeons to decide the type of internal fixations like, plating or nail. The conventional unilateral external fixations are associated with high rates of non-union and secondary procedures like, nailing, plating and bone grafting may be needed. In our region of India there is taboo that repeated surgical procedures and taking the patient to operation theatre may ultimately leads to amputation.

The Ilizarov fixation offers comfortable wound dressings and large comminuted fragments can be stabilized by olive wires. The stability offered by this fixation is more, compared to the other procedures. Axial micro motion which is important factor for callus formation is possible. The patients can be allowed early partial weight bearing which is not possible with any other fixation. The active and passive movements are encouraged early and inflammatory signs and symptoms subside with exercises. The soft tissue biology at fracture site is not disturbed and remaining vasculature is not injured with the use of Ilizarov fixator. So, the presence of hardware like Ilizarov fixator can be explained to patients and attendants and assured that there will not be any second procedure of surgery. This is a retrospective study and the clinical outcome and emotions of patients are studied.

Material and Methods

The study of 12 cases of compound fractures of both bones of leg, treated by Ilizarov fixation at Pooja hospital, Tirupati, India from August 2009 to September 2011. Among the 12 cases 04 were in Gustilo-Anderson type II with 2-6 cm external wound and exposed fragments of bone. 08 cases were G-A type-III A with more than 10 cms wound and exposed fragments of bone with contamination. These were AO type 41-A3-Metaphyseal Multifragmentary. All the patients reached the hospital within 12-24 hours of injury. Thorough wound irrigation with saline, H₂O₂, betadine done, debridement of devitalized tissue and closure of the wound to possible extent done to minimize the exposed raw area. After taking proper informed consent and necessary investigations surgery was done within 01-02 days. The age group of patients 28-40 years. All the patients were male. There were no poly trauma patients and no co-morbid conditions like diabetes, hypertension and CAD. For 3 patients pre-operatively, 2 units of compatible blood transfusion given. 3rd generation cephalosporins, aminoglycosides and metronidazole were given from 01st day of admission till 05th post-op day.

Surgical technique

All the cases were operated under spinal anaesthesia without tourniquet on traction table with foot fixed in the shoe. The fixator with

half rings and connecting rods are assembled as per the requirement of the patient's fracture anatomy and assembled fixator was autoclaved and kept ready in each case. 1.8 diameter wires with bayonet tips were used for diaphyseal cortical bone and trocar tip wires were used at metaphyseal cancellous bone. For alignment and reduction of small fragments olive wires were used. Surgical safe corridor was kept in mind while passing the wires with electrical drill. Muscles were properly positioned for maximal excursions of joints. The position of fragments was assessed throughout in image intensifier fluoroscopy. From 2nd post-op day all the patients were allowed supported partial weight bearing within the limits of pain. Regular wound care and pin tract care were attended. Patients with G-A type-II fractures were discharged after 10 days and type III-A fractures were in admission for 3-6 weeks depending on the wound healing. Regular weekly follow up done for fixator stability, pin tract wounds and radiological, clinical assessment of bony union. All patients were encouraged for supported weight bearing and routine daily activities. Regular X-rays were studied for periosteal bridging callus and obliteration of fracture gaps.

Results

Initially the author left the Ring fixator *in situ* for 4-6 months with regular follow up and wound, pin tract care at OP for the following reasons. Patients were not willing for prolonged admissions and second stage surgeries like bone grafting and skin grafting. Due to lack of financial support by the employer, relatives and dependents, the patients were not willing for further stages of surgeries. There was good compliance by the patients and attendants to keep the fixator for extended periods. This made the author to wait and see more time for bony union. So, after studying the first 6 patients (G-A typeII-3, typeIII A-3) with single stage of primary Ilizarov fixation without any second procedures, author found satisfactory bony union with good skin coverage within 4-6 months. This prompted the author to prospectively study and performs for the next G-A type-II and type-III fractures of 6 patients with only single stage procedure.

All the patients had good clinical and radiological union in 4-6 months. Full weight bearing with stick support allowed after the formation of bridging callus and allowed for dynamization of fixation from 4th month. The average time for union in G-A type-II was 16 weeks and type-III A was 24 weeks. The final results according to Tucker (Ref no 2.) criterion were excellent in 8 patients: 66.7%, good in 2 patients: 16.7%, fair in 2 patients: 16.7%. There were no failures or poor results in this small sample of study.

Discussion

The treatment of tibial diaphyseal fractures is challenge to orthopaedic surgeons. The chances of non-union, infection are always kept in mind and counseled the patients for the proper method of surgery. Due to the precarious blood supply and lack of soft tissue cover, these diaphyseal fractures are fixed with Ilizarov ring fixator without additional damage

of blood supply and soft tissue dissection during surgery. The Ilizarov method is ideal to meet all these requirements. The incidents of deep infections and osteomyelitis are reported with plate osteo synthesis was from 8-69% by (Ref 3,4). The chances of pin tract infection and potential for non union and mall union are seen with conventional external fixators as 20% (Ref 5). The widely accepted primary IM nailing is associated with infections and delayed union (Ref 6). Joshi et al (Ref 13) had infection rate of 7% in un-reamed nailing for fractures of G-A type-III.

In Russia and Western Europe the Ilizarov method is the treatment of choice for open tibial fractures ref 17 as it offers solid fixation, early weight bearing with adequate wound management. It offers high union rates and the same is seen in our small sample of study. The time taken for sound union in various studies like Inon(ref no.8) is 19 weeks for type-III A fractures and our study it is 24 weeks. We have not advocated additional procedures like, skin grafts and myo-cutaneous flaps which require plastic surgeons' interventions. The Ilizarov fixation is associated with complications like pin tract infections which are treated by regular dressings. The muscle contracture, joint stiffness, deep infections, septic arthritis and re-fractures after fixator removal are published in various studies. But these are not noticed in our study.

Conclusion

- Ilizarov fixation is safe and effective method in developing countries with compromised infrastructure and socioeconomically poor patients.
- There was no stress shielding osteopenia under the implant which is seen in plate osteo-synthesis and no endosteal osteoporosis as in IM nailing.
- There was no chance of re-fracture after implant removal as seen in with other methods.
- The Ilizarov method allows early full weight bearing and provides axial compression forces at fracture site which stimulates bone healing.
- This method is minimally invasive with little interference to the biology of fracture.

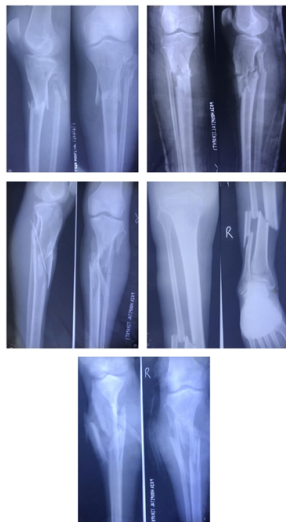


Figure 1. Pre-operative radiographs

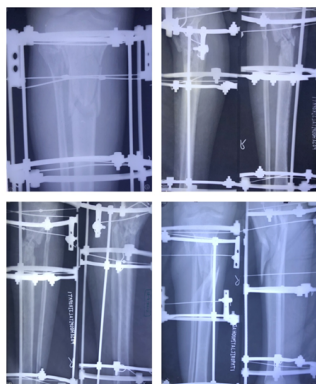


Figure 2. Post-operative radiographs



Figure 3. Clinical photographs

Reference

1. Anderson J.T. and Gustilo R.B. Immediate internal fixation in open tibial fractures, Orthop Clin. North Am. 1980; 11; 569-579.
2. Tucker H.L. Kendra J.C. Kinnebrew T.E. Management of unstable open and closed fractures using the Ilizarov method. Clin orthop. 1992; 280: 125-135.
3. Giannoudis PV, Papakostidis C, Kouvidis G, Kanakaris NK (2009) The role of plating in the operative treatment of severe open tibial fractures: a systematic review. Int Orthop 33(1):19-26
4. Bach AW, Hansen ST Jr (1989) Plates versus external fixation in severe open tibial shaft fractures. A randomized trial. Clin Orthop Relat Res 241:89-94.
5. Papaioannou N, Mastrokalos D, Papagelopoulos PJ et al (2001) Non-union after primary treatment of tibia fractures with external fixation. Eur J Orthop Surg Trauma 11:231-235.
6. Hupel TM, Weinberg JA, Aksenov SA, Schemitsch EH (2001) Effect of unreamed, limited reamed and standard reamed intramedullary nailing on cortical bone porosity and new bone formation. J Orthop Trauma 15:18-27.
7. Sidharthan S, Sujith A, Rathod AK, Pathak RH (2005) Management of high energy tibial fractures using the Ilizarov apparatus. Internet J Orthop Surg 2(2).
8. Inan M, Tuncel M, Karaoglu S, Halici M (2002) Treatment of type II and III open tibial fractures with Ilizarov external fixation. Acta Orthop Traumatol Turc 36(5):390-396.
9. Inan M, Halici M, Ayan I, Tuncel M, Karaoglu S (2007) Treatment of type IIIA open fractures of tibial shaft with Ilizarov external fixator versus unreamed tibial nailing. Arch Orthop Trauma Surg 127(8):617-623.
10. Campbells: Operative orthopaedics. 11th edition. Philadelphia: Mosby Elsevier; 2007.
11. Ilizarov GA: A New Principle of Osteosynthesis with the Use of Crossing Pins and Rings. In Collected Scientific Works of the Kurgan Regional Scientific Medical Society. Edited by Ilizarov GA. Kurgan: Union of Soviet Socialists Republic; 1954:145-160.
12. G. S. Kulkarni. Treatment of fractures by Ilizarov method. Clinical Orthopaedics India 1991;6: 44-70.
13. Joshi D, Ahmed A, Krishna L, Lal Y. Unreamed interlocking nailing in open fractures of tibia. J Orthop Surg. 2004; 12(2): 216-221.