

Management of Segmental Tibial Fracture with Composite Fixation - Technical Aspect

Dr. Tilak Raj. K¹, Dr. Vijaysoruban*²

¹Post graduate, Dept of orthopaedics, Sree Balaji Medical College and Hospital, No.7, Works Road, New Colony, Chromepet, Chennai- 600044, Tamil Nadu, India

²Assistant professor, Department of orthopaedics, Sree Balaji medical College and Hospital, 7, Works Road, New Colony, Chromepet, Chennai-600044, Tamilnadu

*Corresponding author

Dr. Vijaysoruban

Email: tilakraj640@gmail.com

Abstract: Fracture reduction of the proximal tibia is technically challenging in terms of attaining coronal and sagittal alignment by surgical reduction and fixation. Especially in a segmental fracture tibia with proximal third involvement difficulty arises in terms of choice of implant, approaches and complications especially malalignment. This demonstrative case is of a 35 year old woman involved in a car versus motorcycle collision sustaining an open, proximal right tibia and fibula fracture. Extensive soft tissue stripping and exposed bone was noted at presentation. Plantar sensation was intact; dorsalis pedis and posterior tibialis pulses were felt. Surgical debridement and temporary stabilization was urgently performed. Subsequent composite fixation was performed using proximal tibial locking compression plate and intramedullary stabilisation using patellar tendon splitting technique for tibial nail insertion. Bone healing without infection was able to be achieved with good clinical outcome. Sometimes additional forceps and implants are needed to secure stability.

Keywords: composite fixation, patella tendon splitting technique, tibia nailing and plate

INTRODUCTION:

Proximal tibial fractures present a clinical and technical challenge because of the difficulty of obtaining and maintaining reduction until fracture union [1-4]. Reduction and fixation with intra medullary devices requires surgical adjuvants like additional anterior plating for sagittal alignment that are commonly used to overcome these challenges. Special concern has to be given for segmental tibial fractures for intramedullary nailing. Proximal tibial plating with patellar tendon splitting technique in the flexed hanging position can be a useful technique in the treatment of these difficult injuries. Biomechanical studies underline superior stability in unstable proximal fractures [14].

CASE REPORT

This case report concerns a 35-year-old woman motorcycle passenger injured after being struck by a car. She was initially transported to a tertiary hospital nearby from the accident scene, where they have given first aid and then she was referred to our hospital from there. The patient was awake and alert with a GCS of 15. She was hemodynamically stable with her only complaint of pain to her right lower extremity. The patient relayed no significant current medical problems, medical history, surgical history, or previous injury to her right leg. Her family history was negative for musculoskeletal disease, bleeding dyscrasias, or problems with anaesthesia. The musculoskeletal assessment of her bilateral upper

extremities, pelvis, spine, and left lower extremity was negative. An isolated injury to her right leg below the knee was noted with exposed muscle and bone. Detailed evaluation of the right lower extremity revealed intact plantar sensation. Plantar flexion of the ankle and toes was noted to be intact. Extensor function at the foot was present along with dorsal foot sensation. Vascular examination revealed dorsalis pedis and posterior tibial pulses were felt. Broad spectrum IV antibiotics for gram positive and gram negative organisms and tetanus toxoid were urgently administered. Radiologic evaluation confirmed the diagnosis of right tibial and fibular fracture with a proximal, segmental fracture pattern.

The final diagnosis was a type III A open segmental right tibia and fibula fracture with proximal one-third involvement. Investigations confirmed fractures at 2 sites that are proximal end and other at diaphysis. By principle of fixation, proximal fracture requires fixation by absolute stability and diaphyseal fracture requires relative stability. Long plate could have been an option but ruled out as plate fixation for a weight bearing bone is biomechanically inferior to intramedullary device. Recon nail alone could be an option, but ruled out as it is technically demanding to have critical entry point. Moreover it requires accessory fixation devices like anterior plating. So we chose a composite fixation option, where proximal fracture fixed with plate and diaphyseal fracture stabilised with

intramedullary device. Emergency orthopaedic intervention was undertaken. Surgical Debridement of the open wound was done. Definitive stabilization of fracture with placement of proximal tibial locking

compression plating and reamed locked tibial intramedullary nailing was done through patellar tendon splitting technique.



Fig 1: X-ray shows: proximal 1/3rd tibial involvement with extension of proximal fragment

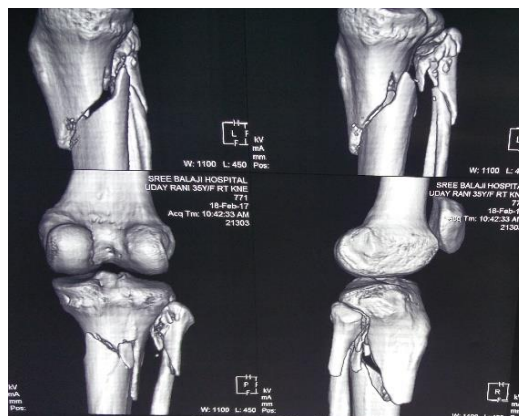


Fig 2: CT-Scan: confirmed no intra articular extension but close to metaphysis



Fig 3: C-Arm pic showing composite fixation of segmental fracture with proximal tibial lcp and intra medullary nail

DISCUSSION:

The patient was discharged to home at 14 days after injury. Initial follow-up occurred at 2 weeks after discharge noting no clinical signs of infection. Sutures were removed and full range of motion was allowed. Follow-up occurred 8 weeks after discharge where the initial postoperative x-rays were obtained. Maintenance of reduction and early callous formation were noted. Progressive weight bearing as tolerated was allowed. Formalized physical therapy was also ordered.

Radiographs at that time revealed interval callus formation and well-maintained alignment. Active Knee range of motion from 5-100 degrees and passive range of motion was from 0 to 25 degrees. Nail design has evolved to provide improved interlocking options with superior biomechanical stability as compared with traditional tibial nailing or plating [8, 9]. As an alternative, the hybrid external fixator may be applied [10].



Fig: 4 showing post op wound after 14 days of surgery



Fig 5: post-op xray showing composite fixation of the segmental fracture

CONCLUSION:

Fractures of the proximal tibia present a challenging problem particularly from a surgical reconstruction perspective. An option for surgical repair is done using plating and nail fixation. Post op period for 8 months we have reviewed. Patient is normal, active and passive range of movements is full. Patient is able to do his daily routine activities.

REFERENCES

1. Krieg J. Proximal tibial fractures: current treatment, results, and problems. *Injury*. 2003 Aug 31; 34:S2-10.
2. Lindvall E, Sanders R, DiPasquale T, Herscovici D, Haidukewych G, Sagi C. Intramedullary nailing versus percutaneous locked plating of extra-articular proximal tibial fractures: comparison of 56 cases. *Journal of orthopaedic trauma*. 2009 Aug 1; 23(7):485-92.
3. Nork SE, Barei DP, Schildhauer TA, Agel J, Holt SK, Schrick JL, Sangeorzan BJ. Intramedullary nailing of proximal quarter tibial fractures. *Journal of orthopaedic trauma*. 2006 Sep 1; 20(8):523-8.
4. Hiesterman TG, Shafiq BX, Cole PA. Intramedullary nailing of extra articular proximal tibia fractures. *Journal of the American Academy of Orthopaedic Surgeons*. 2011 Nov 1; 19(11):690-700.
5. Cole DJ. Intramedullary Fixation of Proximal Tibia Fractures. *Techniques in orthopaedics*. 1998 Jan 1; 13(1):27-37.
6. Krettek C, Miclau T, Schandelmaier P, Stephan C, Möhlmann U, Tscherne H. The mechanical effect of blocking screws (" Poller screws") in stabilizing

tibia fractures with short proximal or distal fragments after insertion of small-diameter intramedullary nails. *Journal of orthopaedic trauma*. 1999 Nov 1; 13(8):550-3.

7. Hansen M, Mehler D, Voltmer W, Rommens PM. The extra articular proximal tibial fractures. *Der Unfallchirurg*. 2002 Oct; 105(10):858-72.
8. Lee SM, Oh CW, Oh JK, Kim JW, Lee HJ, Chon CS, Lee BJ, Kyung HS. Biomechanical analysis of operative methods in the treatment of extra-articular fracture of the proximal tibia. *Clinics in orthopedic surgery*. 2014 Sep 1; 6(3):312-7.
9. Freeman AL, Craig MR, Schmidt AH. Biomechanical comparison of tibial nail stability in a proximal third fracture: do screw quantity and locked, interlocking screws make a difference? *Journal of orthopaedic trauma*. 2011 Jun 1; 25(6):333-9.
10. Bono CM, Levine RG, Rao JP, Behrens FF. Non-articular proximal tibia fractures: treatment options and decision making. *Journal of the American Academy of Orthopaedic Surgeons*. 2001 May 1; 9(3):176-86.