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STUDY OF CLINICAL AND RADIOLOGICAL OUTCOME OF EXTRA-ARTICULAR PROXIMAL TIBIA FRACTURE TREATED WITH MINIMALLY INVASIVE PLATE OSTEOSYNTHESIS (MIPO) TECHNIQUE

Orthopaedics

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ABSTRACT

Background: Proximal extra articular tibia fractures management is challenging to surgeon because of its complex fracture pattern and anatomic location. Our aim of this study is to assess the functional, clinical, radiological outcome of MIPO in extra articular proximal tibia fractures. **Materials and methods:** Prospective study of 43 closed extra articular proximal tibia fracture patients. Study was done in between July 2017 to September 2019 at tertiary care centre in India. **Results:** The mean age was 32.5 years (range 31-65). Primary bony union was achieved average of 16.32 weeks (range 14 to 24 weeks). According to modified Rasmussen's criteria 23 patients (53.48%) had excellent outcome, 12 patients (27.90%) had good outcome and 8 patients (18.60%) had fair outcome. mean knee range of motion is 124.23° (Range 10-150°). Complication includes Infection rate (9.3%) and varus malunion (18.60%). **Conclusion:** Minimally invasive plate ostosyntesis technique offers biological advantages with minimal complication. It fulfills the demands of fast implantation, soft tissue protection and high biomechanical stability.

KEYWORDS

Extra-articular Fractures, Proximal Tibia, Minimal Invasive Plate Osteosynthesis, Rasmussen Score, Locking Compression Plate.

INTRODUCTION

Tibia fractures are one of most common long bone injury in lower limb fracture. Extra-articular proximal tibia fractures incidence account for 5-11% of all tibia fracture[1]. The proximal tibia anatomy and position and pattern of fracture make its management was challenging to surgeon. Even after multiple of treatment options like close reduction and casting, open reduction and plating and intramedullary nailing are available, the treatment of choice was still debatable.

Conventional open reduction and internal fixation of such injuries results in extensive soft tissue dissection and periosteal injury, compromising the blood supply, high rates of infection, delayed union [2,3]. Intramedullary nailing shows high rate of malreduction and malunion of fracture [4,5]. Similarly, external fixation of metaphyseal tibia fractures may also be associated with a high incidence of pin site infection and malunion [2]. Management of these fractures with closed reduction and cast application usually leads to problems related to prolonged immobilization, malunion and joint stiffness [2].

After development of low profile plates the minimally invasive plate osteosynthesis (MIPO) technique offers biological advantages. It offer stable fixation without compromising surrounding soft tissues [6]. The aim of our study is to assess the functional, clinical, radiological outcome of MIPO in extra articular tibial fractures.

MATERIAL AND METHODS

Prospective study of 43 patients in between July 2017 to September 2019 at tertiary care centre in India. Ethical committee approval was taken from institutional ethical committee. Written informed consent for study was obtained from each patient. Inclusion criteria includes, closed extra articular proximal tibia fractures in 19 -65 years age group. The open fractures, fracture at paediatric age group, pathological fractures and patients with severe comorbidities, fractures associated with neurovascular deficit were excluded from the study. Plan x-ray (anteroposterior and lateral view) of fractured tibia with knee taken to assess the fracture pattern. Fractures are classified with help of AO/OTA classification.

Management protocol: initial assessment and resuscitation of the patient according to the Advanced Trauma Life Support protocols done in casualty department. After preoperative workup and soft tissue swelling subside, we scheduled the patients for operative procedure. Under regional anesthesia surgery was performed on plain table in supine position. We didn't used Tourniquette in any patients. The knee was flexed on a quadriceps board by placing bolster under the knee for fracture alignment and ease of reduction. Painting and draping was done under aseptic conditions. Preliminary fracture reduction was done with traction and manipulation under image intensifier before starting the surgical procedure. Small skin incision of 3-4 cm length was taken starting just distal to the knee joint line and extending distally with anterior convexity to end just near tibia shin. The subcutaneous tissue was cut in the line of the incision & the origin of the tibialis anterior muscle was stripped off. The periosteum was preserved to prevent compromise of bold supply to underlying bone. We used proximal tibia locking plate in all patients. The plate was slided across the fracture site under submuscular plane. Indirect reduction was achieved by traction and physical manipulation. Fracture reduction and plate position was confirmed by image intensifier. Provisional k-wires are inserted through plate wholes to maintain reduction. At least three Locking cancellous screws were passed proximally in metaphyseal bone for adequate stability. The distal incision was kept directly over the holes of the plate, just lateral to the shin of tibia over the lower end of the plate. Depending on the quality of bone, cortex or locking screws were used to fix the plate distally. Plate placement and its length were evaluated according to the fracture geometry. Proximal & distal incisions were closed in layers. Sterile dressing applied. Before shifting the patient out of the operation theatre, distal pulses were confirmed. Post-operative limb elevation advised and patient vitals and soakage was monitored. Postoperative physiotherapy started since first postoperative day. Surgical site were evaluated on 3rd postoperative day.

Patient was discharged at 3rd postoperative day. Surgical sutures are removed after 14th postoperative day on outpatient basis. Partial weight bearing was encouraged after 6-8 week after conforming callous through x-ray. Full weight bearing advised after conforming bony union. All the patients were regularly followed up at 6-8 weeks interval till complete fracture union. On follow up the patients were evaluated for clinical and Radiological outcome according to modified Rasmussen's criteria [6,7].

OBSERVATION AND RESULTS

Forty three proximal extra articular tibia fracture patients met the inclusion criteria. Total study sample contains 32(74.4%) males and 11(25.58%) female patients. The mean age was 32.5 years (range 31-65). The mechanism of injury was Road Traffic Accidents in 34(79.06%) patients, domestic in 6(13.9%) patients and industrial in 3(6.9%) patients. According to AO/ OTA classification 28(65.1%) fractures are AO/OTA 41A2 and 13(34.8%) fractures are AO/OTA 41A3 category. The average duration between injury and procedure was 7.39 days. 72.09% of patients were operated within first week of trauma and 27.90 % patients underwent for operative procedure in 2nd

week because of local swelling and oedema. Mean hospital stay of patients was six days. Primary bony union was achieved in all 43 patients an overall average of 16.32 weeks (range 14 to 24 weeks). According to modified Rasmussen's criteria 23 patients (53.48%) had excellent outcome, 12 patients (27.90%) had good outcome and 8 patients (18.60%) had fair outcome. Mean loss of extension is 4.34° (Range 5-16°) and mean knee range of motion is 124.23° (Range 10-150°). The overall Infection rate was 9.3 %. 3(6.97%) patients had superficial skin infection at surgical site which healed eventually by wound dressing and antibiotics, 1(2.32%) patient had deep infection which required implant removal after fracture union.

A malunion was defined as coronal plane (varus-valgus) or sagittal plane (anterior-posterior) angulation of >5 degree [8]. In our study 8(18.60%) patients had varus malunion of average 7 degree.

DISCUSSION

Proximal extra articular tibia fractures management is challenging to surgeon because of its complex fracture pattern and anatomic location. Road traffic accidents are one of most common cause for this type fractures. Any fracture around the weight bearing joint like knee joint is of paramount importance as it would result in significant morbidity and reduced quality of life[9]. Even after variety of treatment options available, the choice of treatment is still debatable[10]. Goal of treatment was early restoration of strength of bone and function of knee joint with minimal injury to soft tissue. Proper preoperative planning, less soft tissue damage, stable fixation and early knee joint mobilizations are the key points to achieve good outcome[11,12]. Conventional plating results in extensive soft tissue dissection and periosteal injury, compromising the blood supply, and may be associated with high rates of infection, delayed union, and nonunion[2,3]. Intramedullary nailing shows high rate of malreduction and malunion. Factors responsible malalignment include the tibial nail entry, angulation of nail, pull of pattelar tendon and difference between the diameter of the implant and medullary canal in the metaphysis[13]. External fixation method shows high rate of pin tract infection and malunion[2].

Minimal invasive plate osteosyntesis (MIPPO) is effective method of stabilization. It is the internal fixation of fractures using indirect reduction techniques and insertion of implant remote from fracture site by using small incision[14]. It fulfills the demands of fast implantation, soft tissue protection and high biomechanical stability[15]. Because of predominance of metaphysical bone and rich vascular supply the nonunion was rare in these fractures [16]. In our study we used the anatomically contoured plate and locking screws. He helps to provide angular stability at the screw plate junction. The load transmission across the fracture site occurs through screw- plate junction. In this case the tight apposition of plate to bone not required, which spares the bone vascularity. The problems associated with stiff fixation are avoided by not using excessive locking screws when not needed. To prevent malalignment the plate is placed with the knee in semi-extended position, and the fixed angle screws prevent the displacement of the reduced fracture[13,17].

The radiological and functional outcome assessed according to modified Rasmussen criteria[6,7]. In our study, 23 patients (53.48%) had excellent outcome, 12 patients (27.90%) had good outcome and 8 patients (18.60%) had fair outcome. Mean loss of extension is 7.34° (Range 5-20°) and average range of motion is 124.23° (Range 10-150°). Meena R.C [8] and Dr AD Gupta[7] also reported average knee range of motion of 115.2 degree and 147.33degree respectively. Primary bony union was achieved in all 43 patients at an overall average of 16.32 weeks (range 14 to 24 weeks). Monappa A Naik et al[18] reported union after 20 weeks in closed fracture.

Overall Infection rate was 9.3 %. 3(6.97%) patients had superficial skin infection at surgical site which healed eventually by wound care, 1(2.32%) patient had deep infection which required implant removal after bone union. Lindvall et al[19] reported high rate of infection rate24%. In our study 8(18.60%) patients had varus malunion of average 7 degree. monappa A Naik et al[17] and Lindvall et al[18] reported 20.14% and 20.6 malunion respectively.

CONCLUSION:

minimal invasive plate osteosyntesis technique (MIPPO) is better choice in extra-articular tibia treatment due to its better results with minimal complication. It was technical demanding procedure, require proper preoperative planning, intraoperative radiographic intervention for fracture alignment, limb axis and to maintain the limb length.

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