Results of Minimally Invasive Plate Osteosyntheses in Periarticular Knee Fractures

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ABSTRACT

Objectives: To evaluate the outcome of periarticular knee fractures treated with MIPO technique.

Methods: This descriptive cross sectional study was conducted from January 2012 to December 2014. Data including: age, gender, mechanism of injury, bone involved, Final outcome and complications during surgery were recorded on a pre-formed proforma. Knee Society score was used to assess the final outcome.

Results: There were 26 patients, 16 (61.5%) male and 10 (38.5%) female. The overall mean age was 37.15 years±3.64 (SD) (17-65years). 11(42.3%) patients had distal femur fracture while 15 (57.7%) patients had proximal tibial fracture. 22 (84.6%) patients had closed fractures while open fractures in 4 (15.4%) patients, all involving proximal tibia. Mean union time for distal femur was 15.55week2.98 (SD) (10-20weeks), while mean time for union of proximal tibia was 18.33weeks+_3.56 (SD) (12-24 weeks). Mean follow-up was 11.88months 7.1(SD)(8-20months). According to Knee Society Score, Clinical results were excellent in 6 (23.1%) patients, good in 16(61.5%) patients, fair in 2(7.7%) patients, and poor in 2(7.7%) patients. Functional outcome was excellent in 6(23.1%) patients, good in 17(65.4%) patients and poor in 3 (11.5%) patients.

Conclusion: MIPO is well-documented technique and achieves good biological fixation in periarticular knee fractures with good results and low complication rates.

Key words: MIPO (minimally invasive plate osteosynthesis), Periarticular fractures, fracture fixation. RTA (road traffic accidents)

INTRODUCTION

Fractures around the knee are common, and high energy trauma[2] such as road traffic accidents is the usual cause. It is hard to treat these fractures because of its unique characteristics such as fracture extension into joint, precarious blood supply and operative treatment is usually recommended for good outcome [3,4,5,6].

Open reduction and internal fixation, with plates and screws have the benefits of direct fracture visualization, reduction and fixation but it also has the adverse effects like periosteal stripping, soft tissue dissection, risk of wound breakdown, disruption of fracture hematoma, joint stiffness and deep infections. These problems are avoided by circular ring fixator, but have the risks of non-union and pin-tract infection [9,10]. Minimal invasive plate osteosynthesis (MIPO) improves the healing by preserving the blood supply of the fracture fragments, minimizing soft tissue dissection and avoiding fracture hematoma disruption [11,12]. The anatomically designed locking plate allows for its easy and quick application with screws fixed only proximally and distally from the fracture site in a bridging mode, and allows early functional rehabilitation. The pull out strength of locking plates is higher than the conventional plates, making it particularly useful in osteoporotic bones [13,14].

Treatment goals of periarticular knee fractures are to restore joint congruity, limb alignment and stable fixation [15]. Functional outcome mainly depends on range of motion of knee, and extensor mechanism strength. There is limited local data on the management of periarticular knee fractures treated by MIPO technique. The purpose of this study was to evaluate the outcome of MIPO in periarticular knee fractures.

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METHODS

This prospective study was done from January 2012 till December 2014. Patient data including age, gender, bone involved, mechanism of injury, final outcome and complications occurring during surgery were documented on a preformed proforma.

Inclusion criteria were patients from either gender having age more than 10 years, with fractures of distal femur and proximal tibia, either close or open. An exclusion criterion was patients age less than 10 years, fractures involving proximal femur, distal tibia, and fractures already treated somewhere else. Fractures were classified according to the AO *Arbeitsgemeinschaft für Osteosynthesefragen* classification system. Open fractures were classified according to the Gustilo and Anderson Classification. Either skin traction or long leg splints were applied before surgery. Open fracture was treated with thorough debridement and tissue was taken for culture and sensitivity. Definitive surgery was delayed till culture reports were finalized, usually after 72 hours.

All surgeries were done in supine position, on a radiolucent table. Indirect Fracture reduction was done under fluoroscopic guidance. We used conventional MIPO technique. Pre contoured locking plates were used in both fractures of distal femur and proximal tibia. 4-5 cm incision was made either proximal or distal to the fracture site for plate entry and same size incision was made at the other end of the plate for fixation by 4 or more locking screws. Care was taken to prevent sagging at the fracture site. Wound closure was done in layers. Antiseptic dressing was applied.

Table 1: Knee Society Score

Outcome	Clinical score	Functional score
Excellent	80 – 100	80 – 100
Good	70 – 79	70 – 79
Fair	60 – 69	60 – 69
Poor	< 60	< 60

Range of motion exercises were started on first post-operative day. Skin stitches were removed after 2 weeks. Patients were mobilized non-weight bearing with crutches for 6 -8 weeks. Partial weight bearing was advised till 12 weeks. After 12 weeks, patients were mobilized full weight bearing. The progression of fracture healing was assessed with antero-posterior and lateral radiographs, every 4 weeks. Patients were followed for 8-20 months. Clinical and functional outcomes were assessed using the Knee society Score (table 2).

RESULTS

Total 26 patients studied prospectively in this study, including 16 (61.5%) male and 10 (38.5%) female. Mean age of patients was 37.15 years 13.64 (2SD) ranging from 17-65 years. 15 (57.7%) patients had history of road traffic accidents, 8 (30.8%) patients had history of fall from height or trees, 2 (7.7%) patients had history of fire arm injury while 1 (3.8%) patient had a history of physical assault. 11 (42.3%) patients had fractures of the distal femur while 15 (57.7%) patients had fracture of proximal tibia. There were close fractures in 22 (84.6%) patients while four (15.4%) patients had open fractures. All open fractures were in proximal tibia. Mean union time for distal femur was 15.55 weeks 2.98(2SD) (10-20weeks), while mean union time for proximal tibia was 18.33 weeks 3.56(2SD) (12-24weeks).

Table 3: Results for Tibia (n=15)

Functional outcome		**Clinical outcome**	
Excellent	n=3 (20%)	Excellent	n=3(20%)
Good	n=11(73.3)	Good	n=10(66.6%)
Fair	---------	Fair	n=1(6.7%)
Poor	n=1(6.75%)	Poor	n=1(6.7%)

Table 4: Results for Femur (n=11)

Functional outcome		**Clinical outcome**	
Excellent	n=3(27.3%)	Excellent	n=3(27.3%)
Good	n=6(54.5%)	Good	n=6(54.5%)
Fair	----------	Fair	n=1(9.1%)
Poor	n=2(18.2%)	Poor	n=1(9.1%)

Mean follow-up was 11.88months 7.1(2SD)(8-20 months). Clinical results on Knee society Score were excellent in 6 (23.1%) patients, good in 16 (61.5%), fair in 2 (7.7%) patients and 2 (7.7%) patients had poor results. Functional results on knee society scores were excellent in 6 (23.1%) patients, good in 17 (65.4%) patients and poor in 3 (11.5%) patients. Clinical and Functional outcome scores were also calculated individuallyfor distal femur and proximal tibia (table 3 and 4 respectively). 3 patients showed no or minimal signs of healing at 10 weeks on radiographs, all were treated with bone grafts, and healed. 2 patients had superficial skin infection, which was treated with

antibiotics. There was no implant failure or deep infection.

A. Preoperative x-rays of patient with bilateral proximal tibia fractures.

B. Post-operative X-rays after MIPO platting.

C. Pictures of same patient after healing with good range of motion.

DISCUSSION

The idea of biological fixation plating technique, in which the blood supply to the fractured fragments is maximally, preserved gaining popularity. The MIPO technique is devised to preserve fracture hematoma [16,17], prevent iatrogenic soft tissue injury and prevent periosteal stripping. MIPO technique acts on the principle of internal fixator [18].

The most common cause of fracture in our study was road traffic accident, which is also the causative agent in other studies performed by Walia 2014 and Nayak 2011 [19]. The mean time of union in our study for distal femoral fracture was 15.55 weeks, which is comparable to the studies done by Nayak 2011 [19] (3.7 months) and Walia 2014 (16.2 weeks). The mean time of union for proximal tibial fracture in our study was 18.33 weeks, which is slightly less than studies done by Sharma 2013 [20] (19.5 weeks), and Kim JW 2012 [21] (19.4 weeks).

Clinical results in our study were good or excellent in 83.6% patients (n=22), while functional results were good or excellent in 88.5% (n=23) patients. In a study done by Nayak 2011 [19] on 31 patients with distal femur fractures, the results were good or excellent in 93.54%. In another study done by Walia 2014 on distal femur fractures (50 patients), 18 had excellent and 28 had good results. In 4 patients, the results were poor. Sharma 2013 [20] compared the results of Buttress plate and MIPO in 40 patients with proximal tibia fractures and his results showed that operative time and post-operative complications were less in the MIPO group and results were better compared to the Butress plate group. The mean healing time was almost similar in both groups.

In our study 2 patients (7%) had superficial skin infection and none had deep surgical site infection. In a study done by Kim JW 2012 [21] on MIPO in open proximal tibial fractures, 8 out of 30 patients (26%) had post-operative infection, 3 patients (10%) had superficial infection while 5 (16%) had deep infection. Same study showed 6 (20%) patients having delayed union, which were treated with bone grafting. 3 patients (11%) in our study showed delayed healing, which were treated with bone grafting. All of these patients healed without any complications.

None of the patients in our study group had lateral thigh pain, as shown by some other studies.

CONCLUSION

Periarticular knee farctures are common . they are difficult to treat. They are notorious for causing knee stiffness. Treatment should be aimed to achieve healing and avoid stiffness. MIPO is well-documented

technique and achieves good biological fixation in periarticular knee fractures. Results are good and complication rates are low

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