



Prospective Evaluation of Twenty Patients with Fractures of Müller Type A ,C1 and C2 Distal Femur Treated by Minimally Invasive Technique Using Locked Compression Plates and Screws

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ABSTRACT

Background: Fractures of distal femur are very complex injuries and they are difficult to manage. These injuries are severe and have a potential to produce long term disability. In 1960's most of these fractures were treated conservatively and documented better outcome than operative treatment. But with the advent of newer implants and modern techniques, these fractures are best treated with surgical stabilization. The newer modalities of treatment include minimally invasive plate osteosynthesis (MIPO) and less invasive skeletal stabilization.

Materials and methods: This is a Prospective Evaluation Of Twenty patients with Fractures Of Müller type A ,C1 and C2 Distal Femur Treated By Minimally Invasive Technique Using Locked Compression plates And Screws in Govt Kilpauk Medical college during the period from Period of Study : JULY 2011 to November 2013. All cases were internally fixed with locking plates. In this study modified standard lateral approach was used in all of the cases. The reduction was assessed with the image intensifier for quality of reduction, length, rotation and alignment. The condyles were fixed to the plate using 6.5mm cannulated locking head cancellous screws. Then the proximal end of plate is fixed to the proximal fragment using 5.0 mm locking head screw. The other proximal screws were inserted using multiple stab incisions and fluoroscopic control. Mobilization was started as soon as possible even from the first post-operative day. Joints were mobilized by active or active assisted movements. Non weight bearing ambulation was started as soon as possible and gradually partial weight bearing (10-15 kg) started within 2 weeks of surgery. The outcome analysis done using American knee society scoring system. The scoring system used was knee society scoring and the mean score was 153 compared to the score of 131 by Fankhauser et al. With this system 45 % had an excellent outcome, 30 % good, 15 % fair and 10 % with poor outcome. The percentage of patients with good and excellent outcome was 75 %.

Conclusion: In our study, Minimally Invasive Plate Osteosynthesis (MIPO) technique using Locking Compression Plate (LCP) shows good to excellent results in terms of union and functional outcome.

KEYWORDS

Müller type A ,C1 and C2 Distal Femur fractures, minimally invasive , locking plates

Introduction:

Fractures of distal femur are very complex injuries and they are difficult to manage. These injuries are severe and have a potential to produce long term disability. These fractures often are unstable and comminuted and tend to occur in elderly or multiply-injured patients. The fractures of distal femur account for 7% of all femoral fractures. If Hip fractures are excluded, 31% of fractures involve the distal femur. The fractures involving distal 15 cm of femur including distal femoral metaphysis (supracondylar) and articular surface (intercondylar) are classified as distal femur fractures. To evaluate twenty cases of distal femur fractures fixed with locking compression plate by minimally invasive plate osteosynthesis (MIPO) technique in the Department of Orthopaedic surgery at Kilpauk medical college and Hospital, Chennai between JULY 2011 to NOVEMBER 2013.

To prospectively analyze the clinical and radiological outcome of the above procedure.

Materials and methods:

Study topic: A short term analysis of the functional and radiological outcome Of distal femoral fractures fixed with locking compression plate by minimally invasive plate osteosynthesis (MIPO) technique.

Study Design : Prospective study

Study Venue : Department of Orthopaedics, Kilpauk Medical College and Hospital, Kilpauk, Chennai – 600010.

Period of Study : JULY 2011 to November 2013

Sample size : Twenty patients

Data collection : Collection of data as per proforma with written & informed consent from the patients admitted in Orthopaedic ward, Kilpauk Medical College hospital.

Inclusion criteria:

Patients in the age group of above 18 years, Distal femoral fractures – Müllers type A ,C1 and C2, < 2 weeks of injury Fractures reducible by indirect methods, Grade I and II compound injuries (Gustillo Anderson)

Exclusion criteria:

Fractures with grade III compound injuries, Active infection, Muller type B & C3 fractures, Skeletal immaturity , > 2 weeks of injury (fracture may not reducible by indirect methods), Periprosthetic fractures, Comatosed patients, Patients with risk of infections like on immune suppressants drugs.

Pre-operative assessment:

After initial resuscitation a meticulous history was taken and thorough clinical examination was done to rule out other associated injuries. Distal vascularity and neurological status was assessed. Open injury were addressed vigorously with thorough wound debridement and stay sutures applied. Informed and written consent for the surgery and willingness to participate in the study were obtained from all the patients.

Investigations:

Radiographs of affected femur with knee in AP & Lateral projections were taken along with the pelvis x-ray with hips, proximal femur and x-rays of other affected extremity. The fracture was then classified based on AO Muller

classification. Initially the limb was immobilized with a high above knee slab or skeletal traction. Routine investigations like complete haemogram, Blood sugar, Urea, Creatinine, Serum electrolytes, X- ray Chest , ECG, BT, CT were done. Medical and anaesthetic fitness was obtained for all the patients before surgery.

Implant selection:

The preoperative x-ray was used to determine the length of the distal femur LCP and the position of the screws. To measure the length of the condylar screw, the Maximum condylar width on the radiograph was determined to determine the real condylar width. The two important values were used in determining the length of the plate.

Plate span ratio: The plate span ratio is the quotient of the plate length to the overall fracture length. Empirically the plate span ratio should be 2-3 times in multi fragmentary fractures, 8-10 times in simple fractures

Surgery:

Anaesthesia:

All the patients were operated under spinal, epidural or combined spinal- epidural anaesthesia. Spinal anaesthesia was generally used. Combined spinal – epidural anaesthesia was chosen in case of anticipatory increase in duration of surgery due to difficulty in fracture reduction.

Prophylactic antibiotics:

Gram positive prophylactic antibiotic in case of closed fractures, adding a gram negative prophylactic cover in open fractures.

Patient positioning:

The patient positioned supine on a radiolucent operating table with a bolster or a sterile sand bag beneath the knee of the injured extremity in 60-70 degrees of flexion. The patella should face anteriorly and in neutral. Sterile scrubbing and draping should allow adequate exposure and free movements of the knee and thigh. The image intensifier was positioned on the side opposite to the injured limb.

Technique:

Then the plate is inserted into the sub muscular tunnel and the distal end seated over the anterior 2/3rd of the lateral femoral condyle and fixed with temporary k-wire. The plate usually lays 1.0-1.5 cm posterior to the most anterior aspect of distal femoral condyle and 1.0-1.5 cm cranial to the articular surface. The proximal end of plate is visualized in the proximal incision and the central position of the plate in the lateral shaft of femur is ensured. Then the fracture is reduced under fluoroscopic guidance by indirect reduction techniques. The indirect reduction techniques includes placing a bolster or pads behind the knee to attain 60 degrees of knee flexion. Manual traction applied to the ankle with a force vector directed posteriorly using the posterior pad acting as a fulcrum. This maneuver will help to reduce the fracture and restore the limb length, rotation and alignment. The schanz screw inserted in antero-posterior direction can be used as a joystick to derotate and align the fragment into proper alignment. The anatomically pre shaped plate aid in some amount of indirect reduction by bringing the bone towards the plate with the use of standard cortical screws

Definitive fixation:

The reduction was assessed with the image intensifier for quality of reduction, length, rotation and alignment. The condyles were fixed to the plate using 6.5mm cannulated locking head cancellous screws. Then the proximal end of plate is fixed to the proximal fragment using 5.0 mm locking head screw. The other proximal screws were inserted using multiple stab incisions and fluoroscopic control. During the entire procedure the reduction and the position of the plate were controlled clinically and often checked with image intensifier to avoid any loss of reduction or implant malpositioning. Conventional cortical screw was not used in any of our cases.

Post-operative period:

Post-operative i.v antibiotics to cover both gram positive and gram negative spectrum were given for 5- 7 days. Adequate analgesia in the form of epidural / intravenous/ intramuscular were administered to reduce the pain and to improve patient comfort. This would encourage the patient to cooperate effectively in post-operative rehabilitation program. DVT prophylaxis started in high risk patients like patients with previous history, obesity, prolonged bed rest, polytrauma and oestrogen use.

Wound care & drain:

Drains were removed within 48 hours of surgery. Wound was kept clean & dry. Soaked dressing changed. Sutures removed after 12-14 post-operative day.

Mobilization & weight bearing:

Mobilization was started as soon as possible even from the first post-operative day. Joints were mobilized by active or active assisted movements. Non weight bearing ambulation was started as soon as possible and gradually partial weight bearing (10-15 kg) started within 2 weeks of surgery. In case of articular fractures continuous passive motion may be helpful in restoring joint motion. Full weight bearing was allowed after radiological evidence of healing.

Knee society score:

The outcome analysis done using American knee society scoring system. The total score is 200 comprises of knee score – 100, function score – 100.

TABLE – XIV OUTCOME

S. no	OUTCOME	No.of patients	Percentage
1	Excellent	9	45
2	Good	6	30
3	Fair	3	15
4	Poor	2	10

X-RAY ILLUSTRATIONS



DISCUSSION:

There are many surgical alternatives for distal femur fractures, each with its own pearls and pitfalls. Many studies were conducted using different implants and techniques resulted in varying outcome and complications. After the introduction of locking compression plate (LCP) by AO in 2000, the trend is shifting towards it due its added advantages like, Providing both angular and axial stability Applied in both locking and compression mode Better hold in osteoporotic bone .Due to the changing concepts towards relative stability and biological fixation from absolute stability and rigid fixation, minimally invasive plate osteosynthesis (MIPO) technique evolved. Many studies proved better outcome with lesser morbidity than the conventional technique.

In our study involving 20 patients with 13 males and 7 females with mean age of 47 and the mean follow up period ranges between 6 month to 18 month(mean - 12 month). 15 patients had type A fracture and 5 patients had type C fracture and 25% of patients had open injuries.The mean time to radiological fracture union was 15 weeks (range 12 -20 weeks) Which was comparable to 11 weeks by Kregor et al., 14.3 weeks by Schandelmaier et al.,12 weeks by Fankhauser et al and 18 weeks by Yeap and Deepak et al.The average knee flexion achieved was 92 degrees comparable to that of 103by Kregor et al 104 by Schandelmaier et al.The scoring system used was knee society scoring and the mean score was 153 compared to the score of 131 by Fankhauser et al . With this system 45 % patient is having an excellent outcome, 30 % good, 15 % fair and 10 % with poor outcome. The percentage of patients with good and excellent outcome was 75 % comparable to 87.5 % by Markmiller et al, 72.7 % by Yeap and Deepak et al.The complications encountered are deep seated infection (n=1), post-operative loss of reduction which requires a revision surgery (n=1), deep vein thrombosis (n=1),Knee stiffness (n=3), varus malalignment (n=2), reactive synovitis (n=1). The incidence of loss of reduction requiring a revision surgery was 5% comparable to 10 % by Markmiller et al, 9 % by Yeap and Deepak et al 7.9 % by Schandelmaier et al and 6 % by Schutz et al.

The infection rate in our study was 5 % comparable to 7 % by Schutz et al and 3 % by Kregor et al. We had two cases of varus malalignment (< 5 deg) but within acceptable limits in contrast to 15 % by Markmiller et al and 13 % by Schandelmaier et al, both having significant malalignment (> 10 deg). These patients may require a long term follow up to evaluate the development of arthritis.

There was an incidence of 15 % knee stiffness (n =2) < 30and (n=1) 70 and failed to show any improvement even after aggressive continuous motion therapy. We had a complication of post op DVT and reactive synovitis, which settled uneventfully with symptomatic therapy. Union was achieved in all cases and bone grafting was not required in any of our cases.

CONCLUSION:

In our study, Minimally Invasive Plate Osteosynthesis (MIPO) technique using Locking Compression Plate (LCP) shows good to excellent results in terms of union and functional outcome. When operated within two weeks of injury, it was easier to achieve closed reduction. This decreases the operating time, blood loss and intra-operative morbidity. MIPO technique could results in satisfactory union and eliminates the need for bone grafting. The incidence of infection and post-operative morbidity was less compared to conventional open technique. LCP has a better hold in osteoporotic bone with less chances of failure. Inadequate fixation leads to loss of reduction, resulting in an open reduction and revision fixation. Long term follow up is necessary to study the development of arthritis in patients with varus/ valgus malalignment. From our study, we conclude that the Minimally Invasive Plate Osteosynthesis

(MIPO) technique using Locking Compression Plate (LCP) will results in early post- operative rehabilitation, satisfactory union and good functional outcome. The chances of infection and implant failure are less. Proper patient selection and meticulous surgical techniques will give the best results.

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