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CLINICAL EVALUATION OF EFFICACY OF MINIMAL INVASIVE PLATE OSTEOSYN THESIS TECHNIQUE FORSURGICAL MANAGEMENT OF SUPRACONDYLAR FEMUR FRACTURES

Medicine

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ABSTRACT

AIMS AND OBJECTIVES: To study Union rate (time to union), time of mobilization, functional results, radiological results, complications of supracondylar femur fractures treated by MIPO techniques with distal femur locking compression plate (DF-LCP).

MATERIAL ANDMETHODS: This is a prospective study of 30 Patients, with supracondylar femur fractures (AO classification A) who were treated with distal femur locking compression plate (DF- LCP) by MIPO techniques at Department of Orthopaedics, SSKM & IPGMER KOLKATA from 1stJAN2015 to 31st JULY 2016.The study sample size was 30 patients and all these patients were included with predefined inclusion & exclusion criteria in this study. Minimum of 12 months and a maximum of 17 months follow up were done. The functional and radiographic results were recorded according to Knee Society Score criteria.

RESULTS: The average time to union was 3.93 months with a range of 2 – 7 months (8 – 28 weeks) and standard deviation being 1.13. The Mean range of flexion obtained postoperatively was 108.830 with a range of 900– 1250. Six decreased knee movements, two mal-alignment, two implant failure and two infection were the residual complications in our study. Follow up of our cases included from a minimum of 12 months to a maximum of 17 months. Excellent results were seen in 3 cases, good in 10, fair in 12 and 5 case of poor results was seen.

CONCLUSION: We conclude that MIPO technique with DF-LCP in distal femoral fractures is a safe and reliable option. It may substitute a conventional plate and screw system (compression method) in treatment of complex distal femoral fractures especially in osteoporotic bone. Further randomized controlled studies are required in different situations to know the usefulness of this implant.

KEYWORDS

Union rate; DF-LCP; Knee Society Score criteria, MIPO

INTRODUCTION

Fractures of the supracondylar femur constitute a heterogeneous group of injuries affecting knee[1]. High energy injuries tend to occur in young males, whereas low energy injuries occur in elderly females commonly [1]. These fractures often are unstable and comminuted and tend to occur in elderly or multiply-injured patients [2]. They are complex injuries that can be difficult to manage [3]. Distal femoral fractures account for about 4% to 7% of all femoral fractures [1]. These fractures have got wide variety of fracture patterns and they are commonly associated with injuries such as open wounds, patellar fractures and ligament disruption [1]. These serious injuries have the potential to produce significant long-term disability especially when they are associated with extensive articular cartilage damage, marked bone comminution, and severe soft tissue injury [2]. The problems which are commonly observed in these fracturesare:

- Standard implants used for other types of supracondylar femoral fractures like condylar blade plate and supracondylar nails are not helpful in articular surface reduction andfixation.
- In setting of medial comminutionand short distal segment, there is high incidence of loss of fixation and Varuscollapse.

The treatment of supracondylar femur fractures has evolved nevertheless, these fractures remain difficult to treat and carry an unpredictable prognosis. They are difficult to treat because they are usually resulting of a high velocity trauma, producing comminution and an unstable fracture pattern. The fracture characteristics which make these fractures difficult to treat include, Osteoporosis, Multi-planar articular injury, High degree of comminution, Short distal femoral block in which it is difficult to insert fixation, associated Open wounds, Internal derangement of knee including ligament and meniscal injuries and possible Extensor mechanism injuries. Complications are significant and include infection, knee stiffness, need for bone grafting, non union and melanin [4]. There is a bimodal age-distribution of these injuries. The 1st group is made up of young adults sustaining high energy trauma and the 2nd group comprising of elderly osteoporotic females who fall at home. In the past two decades there has emerged another injury group coming out of peri-prosthetic fractures which is not included in our study. This group in addition to the already existing problems of supracondylar femur fractures brings in the dimension of a prosthesis which might get loose.

The aims and objectives of study include the following:

1. To study the efficacy, technical requirements, functional results, radiologicalresults, pitfalls, complications & outcomes.
2. To study Union rate and Time of Mobilization.

MATERIALAND METHODS

We studied prospectively 30 Patients, with supracondylar femur fractures (AO classification A) who were treated with distal femur locking plate by MIPO technique at Department of Orthopedics, SSKM & IPGMER, Kolkata from 1st JAN 2015 to 31st JULY 2016. The study sample was 30 patients and all these patients were included with predefined inclusion & exclusion criteria in this study. All the patients underwent surgical fixation of fracture with DF-LCP by MIPO technique with a mean of 6.1 days and duration of post operative hospitalization mean was 2.6weeks.

Minimum of 12 months and a maximum of 18 months follow up were done. Records available in the form of admission notes, operative notes, progress notes and follow up OPD records were analyzed. Patients not coming up for late follow up at OPD were interviewed on phone and sent mail. We considered a fracture united if there were no pain on palpation or attempted motion, no increase in warmth at the fracture site, no discomfort on full weight bearing and serial roentgenograms demonstrated bone trabeculae crossing the fracture site. The functional and radiographic results were recorded according to Knee Society Score criteria.. Functional grading was made depending on pain, walking capacity, mobility and work. Radiological grading was made based on varus or valgus deformity, shortening, signs of osteoarthritis and union of fracture. The final outcome is compared with the results available from the latest literature.

OBSERVATIONS AND RESULTS

We found that the distribution of age of study group: < 20 yrs=3.3%, 21-40 yrs =40%, 41-60 yrs=23.3%.>60 yrs =33.3%. sex of study group: male=73.3%, female =26.7%. MOI of study group: FALL=46.7%, RTA =53.3%. Side of fracture of study group: LEFT=46.7%, RIGHT=53.3%. type of fracture of study group: AO A1=20%, A2=43.3%, A3=36.7%. associated injury of study group: Absent=87%, Present =13%. Systemic illness of study group: Absent=60%, Present =40%. Duration of post operative hospitalization of study group: 2 wks=46,7%, 3 wks =50%, 4wks=3.3%. Duration ofinjury before operation of study group: <8 days=53%, 9-10 days=47%. LLD of study group.: Absent=80%. Present =20%. Physiotherapy performed of study group : Yes=87%. No =13%. time of union (in months) :< 3 months=6.7%. 3-4 months =90%,> 4 months=3.3%.

We showed that the movements of knee(flexion in degree) : (60-80)0=0%, (80-100)0 =40%., (100-135)0= 60% Grading of Knee Society Score : Excellent=30%, Good=40%.,Fair=33.3%, Poor=16.7%. There was no significant association or correlation between Knee Society Score grading and age (in yrs) of the study group. (p value=0.716). There is no significant association between sex and grading of Knee Society Score, as (p value-0.8775). There is no significant association between mean time of Duration of injury and grading of Knee Society Score, as (p value-0.3972). There is no significant association between mean time of Duration of injury and grading of Knee Society Score, as (p value-0.116). There is no significant association between comorbidity present among study group and grading of Knee Society Score, as (p value-0.8745).

In our study we showed that there is significant association between comorbidity present among study group and Duration of post operative hospitalization as (p value-0.001). There is no significant association between comorbidity present among study group with different type of fracture and grading of Knee Society Score, as(A1 type - p value=0.4724, A2 type- p value=0.3066 , A3 type-p value= 0.6323). There is no significant association between comorbidity present among study group with different type of fracture and union in months , as(A1 type - p value=0.43857, A2 type- p value=0.48775 , A3 type-p value= 0.33835).

Table Showing : Distribution of Movement of Knee (flexion in degrees) of study group.

Movement of Knee	Frequency	Percent
(60-80)^0	0	0.0%
(80-100)^0	12	40.0%
(100-135)^0	18	60.0%
Total	30	100.0%

Table showing :Association of grading of Knee Society Score vs Comrbidity present among the study group.

Comorbidity			
Grading	**Absent**	**Present**	**TOTAL**
Excellent	2	1	3
Row %	66.7	33.3	100.0
Col %	11.1	8.3	10.0
Fair	8	4	12
Row %	66.7	33.3	100.0
Col %	44.4	33.3	40.0
Good	5	5	10
Row %	50.0	50.0	100.0
Col %	27.8	41.7	33.3
Poor	3	2	5
Row %	60.0	40.0	100.0
Col %	16.7	16.7	16.7
TOTAL	18	12	30
Row %	60.0	40.0	100.0
Col %	100.0	100.0	100.0

DISCUSSION

Fractures in the supracondylar femur have posed considerable therapeutic challenges throughout the history of fracture treatment. Most of these surgical failures were due to inadequate fixation of the fracture fragments (Mize et al 1982)[5]. The prognostic factors for supracondylar fracture included age, intra-articular involvement, methods of treatment, timing of joint motionetc (Morre 1987)[6].

The Locking Compression Plate (LCP) by MIPO technique system offers a number of advantages in fracture fixation combining angular stability through the use of locking screws with biologic fixation techniques. However, the system is complex, requiring careful attention to biomechanical principles and good surgical technique[6].

The 'angular stability' provided by LCP at the plate-screw interface, allows extra-periosteal fixation of the plate to the bone. By preserving periosteal blood supply to the bone it addresses the importance of the biological factors involved in fracture healing. The principles of flexible fixation are employed where the goal is for indirect healing with the formation of callus. Although the LCP system offers a number of advantages in fracturemanagement, its successful use requires careful pre-operative planning, consideration of biomechanical principles, and the use of the appropriate plate and screws combined with good surgical technique. Failure to address these issues can lead to potential pitfalls in terms of implant breakage or non-union. LCP is a single beam construct where the strength of its fixation is equal to the sum of all screw-bone interfaces rather than a single screw's axial stiffness and pullout resistance in unlocked plates. Its unique biomechanical function is based on splinting rather than compression resulting in flexible stabilization, avoidance of stress shielding and induction of callus formation. The DF-LCP is a further development from theLISS, which was introduced in the mid to late 1990's [7]. The main difference between the DF- LCP and the LISS is that the LISS utilizes an outrigger device for shaft holes, functioning essentially as a locking guide jig, which is attached to the distal part of the plate and guides the placement of the proximal locking screws.

Whereas the shaft holes on the DF- LCP are oval allowing for the options of a compression screw or a locking screw. This leads to a more precise placement of the plate, as it is able to be compressed more closely to the bone.

In this study, thirty cases of supracondylar femur fractures without intra articular extension treated by DF-LCP by MIPO technique at department of Orthopedics, SSKM& IPGMER were included. Distal femur locking compression plates were used. Study was done from JAN 2015 to JULY 2016.

AGE/SEX INCIDENCE

In our study of 30 patients the mean age of the patients was 46.83years and there were 22 males (73.3%) and 8 females (26.7%). The present study shows a biphasic age distribution of the patient population as seen in studies (Bell et al, 1992) [8].This is a reflection of the mechanism of injury which was high energy trauma in 54% of our patients of which most of whom were younger. The reason being that, in male patients there was more outdoor activities, so they were more prone to vehicular accident and majority females being house wives were less exposed to road trafficaccidents.

Yeap and Deepak [50], conducted a retrospective review of 11 patients who were fixed With Titanium Distal femur locking compression plate and reported higher incidence in males compared to females and the mean age in their study was 44years.

MongkonLuechoowong [10], analyzed retrospectively medical records of 19 patients who underwent LCP plating for complex distal femoral fractures and reported higher incidence in males than females and the mean age in the study was 41.6years.

Yang Teng-heng, ZhongZhi-nian, Lao Ji-yi [11], studied retrospectively clinical data of 35 patients with distal femur fractures treated with locking compression plate and reported higher incidence in males than females and a mean age of 38years.

SUMMERY AND CONCLUSION

In our study we treated 30 fractures of supracondylar femur belonging to type A of AO Muller classification. We evaluated the results of radiological union and functional outcome in these fractures. We used Distal femur locking compression plate (DF-LCP) by MIPO technique for fixation via a modified lateral approach.

The age group included in our study ranged from 17-72 years, with a mean age of 46.83 years. There were 22 (73.3%) males and 8 (26.7%) females. Mode of injury included 16 (53.3%) road traffic accidents and 14 (46.7%) falls. This mode of injury confirms to the high incidence of road traffic accidents and hence high velocity injury as the major cause of this fracture. Predominant lower limb involved was right side accounting for 16 cases (53.3%) and remaining 14 cases (46.7%) were left sided fractures. There were 20 % AO type A1 and 43.3% AO type A2 , 36.7% A3 fractures. This pattern confirms to the high velocity injuries being commonly associated with AO type A3. Majority of the surgeries (53.30%) were performed in the initial 8 days. Delayed surgeries were due to associated injuries and comorbidities, and hence consequently delay in fitness for surgery.

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