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Supracondylar fracture femur with locking compression plate: A study on functional outcome

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Abstract
Locking compression plate has the advantage of combination of conventional compression plating and locked plating techniques which enhances the plate osteosynthesis. It acts as an internal external fixator. In addition, a Locking plate has got distinct advantages of unicortical fixation and least chance of plate back out as the screw gets locked to the plate. The DF-LCP is a further development from the LISS which was introduced in the mid to late 1990's. The shaft holes on the DF-LCP are oval allowing for the options of a compression screw or a locking screw. Data was obtained through structured questionnaires regarding the trauma, detailed clinical examination, relevant investigations, and entered in the case record form (CRF). All the patients were initially managed in emergency department according to advanced trauma life support guidelines. All patients were evaluated clinically and proper history of the incident was elicited. General, systemic examination as well as local examination of the patient was done. Thorough assessment was done to rule out head / chest / abdominal / spinal or pelvic injury. Injured limb was assessed carefully as regard to neurovascular status. Long term results were rated using Neer's rating system. Neer's score was assigned for each patient after 24 to 36 weeks. Using this scale 16 cases (53.3%) shown excellent, 11 cases (36.7%) good and 3 cases (10%) poor result.

Keywords: Supracondylar fracture femur, locking compression plate, neer's score

Introduction
The supracondylar area of the femur is defined as the zone between the femoral condyles and the junction of the metaphysis with the femoral diaphysis. This comprises approximately the distal 15 cm of the femur, as measured from articular surface. It is important to distinguish extra-articular fractures from intercondylar as well as diaphyseal fractures of the distal femur because the methods of treatment and prognosis are considerably different [1].

Fractures of the distal end of femur especially comminuted, intra-articular extension remain some of the most challenging fractures facing orthopaedic surgeons. These are serious injuries having the potential to produce significant long-term disabilities. These fractures reportedly account for less than 1% of all fractures and comprise 6% of all femoral fractures [2].

There is bimodal distribution of these fractures. Most high energy fractures caused by motor vehicle accidents, sports and pedestrian accidents occur in male between 15 and 50 years; while in women above 50 years, with osteoporosis, fractures occur due to low energy trauma following a ground level fall on a flexed knee.

Before 1970, the majority of distal femoral fractures were treated conservatively where traction achieved acceptable results but exposed patient to the risk of prolonged bed rest, and immobilization, persistent angulatory deformity, knee joint incongruity and loss of knee motion. These often contribute to a poor outcome [3].

With the development of improved internal fixation devices by the AO group, treatment recommendations began to change. Operative treatment is recommended for most of these fractures. The goal of operative treatment is anatomical reduction, stable internal fixation and early rapid mobilization of adjacent joints and early functional rehabilitation of the knee. Early surgical stabilization facilitates care of the soft tissue, permits early mobility and reduces the complexity of nursing care [4].

Locking compression plate has the advantage of combination of conventional compression plating and locked plating techniques which enhances the plate osteosynthesis. It acts as an

internal external fixator. In addition, a Locking plate has got distinct advantages of unicortical fixation and least chance of plate back out as the screw gets locked to the plate. The DF-LCP is a further development from the LISS which was introduced in the mid to late 1990's. 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 [4].

Present study is justified for the fact that it will be one of the solutions for the age-old complications associated with the treatment of supracondylar fractures with traditional fixed angle plates and nails of, postoperative loss of reduction (varus collapse) and malalignment due to the inherent lack of rigidity and in some cases, eventual implant failure. The distal femur locking compression plate is based on the firm principles of locked plating, which has really yielded a lot of success in the treatment of fractures over the years.

Methodology

Data was obtained through structured questionnaires regarding the trauma, detailed clinical examination, relevant investigations, and entered in the case record form (CRF).

Initial stabilization and pre-operative planning

- All the patients were initially managed in emergency department according to advanced trauma life support guidelines.
- All patients were evaluated clinically and proper history of the incident was elicited.
- General, systemic examination as well as local examination of the patient was done.
- Thorough assessment was done to rule out head / chest / abdominal / spinal or pelvic injury. Injured limb was assessed carefully as regard to neurovascular status.
- Primary immobilization of involved limb in Thomas splint with a cotton pad below the distal fragment for transport of patient.
- Radiological assessment: Anteroposterior and true lateral views of injured limb including complete knee joint and distal femur. Anteroposterior view of pelvis with both hips to rule out associated injuries.
- Patients with open wounds received immediate wound lavage with at least 9 litres of normal saline followed by povidone iodine, padding dressing and were put on intravenous antibiotics, which continued post operatively according to requirement.
- Upper tibial skeletal pin traction with a Steinmann or Derham pin under local anaesthesia followed by continuous traction given over Bohler-Braun splint.
- Compound injuries were taken for cleaning and debridement under anaesthesia at the earliest with meticulous debridement.
- Injection ATS 1500 IU, Injection AGGS 20,000 IV, broad spectrum injectable antibiotics and analgesics were administered for compound injuries.
- Intravenous Metronidazole was administered in open fractures where anaerobic contamination was suspected.

Radiological evaluation

- Anteroposterior and lateral radiographs of the femur taken along with a pelvis to rule out proximal fractures.
- 45-degree oblique views can better delineate inter-condylar involvement.
- Radiographic evaluation of the entire involved lower extremity is
- Warranted, as concomitant injuries are common.
- Fractures were classified with the help of radiographs according to the AO/OTA classification.

Computed tomography portrays the distal femur in cross section, which helps to identify fracture lines in the frontal plane. Three dimensional (3D) reconstructions may also improve understanding of the fracture pattern in preparation for surgery was indicated in TYPE C fractures.

Results

Table 1: Knee flexion in this study

Table 1A:

Knee Flexion (Degrees)	Number Of Patients	Percentage (%)
>110	15	50
91-110	12	40
≤90	3	10

In this study 50% of the patients had knee flexion of more than 110 degrees, 40% had 91-110 degrees and 10% had less than 90 degrees.

Table 1B:

Type of Fracture OTA Classification	Number of Fractures	Average Knee Flexion (Degrees)
Type A	13	118.66
Type C	17	110.27
Total	30	114.47

Average knee flexion in type A fractures was 118.66 degrees and type C was 110.27 degrees. Overall average knee flexion in 30 patients in this study was 114.47°.

Table 2: Neer's pain score in present study

Pain	Number Of Patients	Percentage (%)
No pain	4	13.3
Intermittent	22	73.4
With fatigue	4	13.3
Restrict function	0	0
Constant or at night	0	0

Table 3: Neer's function score in present study

Function	Number OF Patients	Percentage (%)
As before injury	4	13.3
Mild restriction	22	73.4
Restricted, stairs sideways	4	13.3
Cane or severe restriction	0	0
Crutches or brace	0	0

Table 4: Neer'sscoring forwork capacity in present study

Work Capacity	Number Of Patients	Percentage (%)
Same As before injury	7	23.3
Regular but with handicap	20	66.7
Alter work	3	10
Light work	0	0
No Work	0	0

Table 5: Neer's score gross anatomy

Gross Anatomy	Number Of Fractures	Percentage (%)
Thickening only	20	66.7
5º angulation or 0.5 cm short	10	33.3
10º angulation or rotation, 2.0 cm short	0	0
15º angulation or rotation, 3.0 cm short	0	0
Union but with greater deformity	0	0
Non-union or chronic infection	0	0

Table 6: Neer's score roentgenogram in present study

Roentgenogram	Number Of Fractures	Percentage (%)
Near Normal	12	40
5º angulation or 0.5 cm displacement	15	50
10º angulation or 1.0 cm displacement	3	10
15º angulation or 2.0 cm displacement	0	0
Union but with greater deformity; spreading of condyles; osteoarthritis	0	0
Non-union or chronic infection	0	0

Table 7: Neer's score-overall rating in present study

Out Come	Number Of Patients	Percentage (%)
Excellent	16	53.3
Satisfactory / good	11	36.7
Unsatisfactory / fair	3	10
Failure	NIL	0

Long term results were rated using Neer's rating system. Neer's score was assigned for each patient after 24 to 36 weeks. Using this scale 16 cases (53.3%) shown excellent, 11 cases (36.7%) good and 3 cases (10%) poor result.

Discussion

In our study the average time interval between injury and surgery was 6 days. This was in accordance with the study conducted by Yeap *et al*. [5] in which the average number of days from injury to surgery was 9.9 days with a range of 4-19 days.

Table 8: Comparison of time interval

Studies	Time Interval Between Trauma and Surgery(days)				Average(days)
	1-3	4-7	8-14	>15	
Present study	13	9	6	2	6
Yeap *et al*, 2007 [5]	-	-	-	-	9.9

In this study majority of cases 22 (73.3%) had surgery within 7 days. The delay in surgery (>15 days) for 2 patients was due to late presentation, delay in surgical fitness and associated injuries. Few other patients between time intervals of 8-14 days had delay in surgery due to medical co-morbidities and financial constraints. It was found that all 3 unsatisfactory result patients had delay in surgery. We conclude that interval between injury to surgery plays an important role in fracture union and rehabilitation.

Post operatively physiotherapy in bed was started on the 2nd post-operative day or according to the tolerance of patient. The patients were started with quadriceps strengthening exercises, knee and ankle mobilization exercises.

Partial weight bearing was started after 6 weeks and full weight bearing was started after full union of fracture on follow up. In this study weight bearing was delayed in three patients, up to 20 weeks in two patients and another case up to 24 weeks. In these two patients the weight bearing was delayed in view of infection. There were no cases in which weight bearing was not allowed as there were no cases of non-union.

In 2009 Kolb *et al*. [6] also mobilised their patients non-weight bearing as early as 2-3rd postoperative day.

In 2007 Kanabar *et al*. [7] study, early partial weight bearing was allowed under supervision of the physiotherapist. Full weight bearing was started depending on the clinical and radiological progress of fracture healing.

We conclude that physiotherapy and rehabilitation have important role in restoring maximal functional outcome. Physiotherapy should be started on 2nd postoperative day and partial weight bearing at 4-6 weeks. Full weight bearing should be started when radiological union is apparent.

The average time for the fracture union was 15.1 weeks. Most of the fractures 26 (86.6%) were united within 12 to 18 weeks. There was delayed union in 2 patients and none of the patients had non-union.

In Yeap *et al*. (2007) [5] study average time of union was 18 weeks with a range from 6 to 36 weeks.

In Bachu S. *et al* (2017) [8] study bony union was achieved on average in 16.6 weeks.

In Weight *et al*. (2004) [9] in their study all fractures healed at a mean of 13 weeks (range 7-16 weeks).

In Wong *et al*. (2004) [10] all fractures united with an average union time of 30 weeks (range 16-68 weeks).

The time frame for distal fracture union is longer than the usual fractures due to higher incidence of comminution and osteoporosis. However, the early union in our study in compression with others might be due to early intervention, less soft tissue handling and early mobilization.

Majority of the patients 27 (90%) in this study group are allowed full weight bearing within 16 weeks. Average duration for full weight bearing in this study was 13.43 weeks.

In our study, 50% of the patients had knee flexion more than 110 degrees, 40% had 91-110 degrees and 10% had less than 90° flexion. The minimum flexion obtained was 85° and maximum being 135 degrees. Average knee flexion in type A fractures was 118.66 degrees and type C was 110.27 degrees, which shows that intra articular fractures lead to intra-articular stiffness and decreased range of motion. Three of our patients had extension lag which persisted even after physiotherapy. In this study group, overall average knee flexion in 30 patients was 114.47 degrees. It was attributed to the stable and study construct and the early range of motion achieved with DF-LCP.

Knee range of motion in our study was better compared to other studies because of early operative intervention, less intra operative duration and early physiotherapy. We conclude ROM around knee is better in patients treated with DF-LCP. Post-operative ROM is less in type C fractures compared to type A.

All the patients in our study were followed for an average of 11.83 months (ranging from 6-18 months). All fractures were united eventually and there were no non-unions.

In our study 16 (53.3%) cases had excellent functional outcome, 11 (36.7%) cases had good functional outcome and 3 (10%) cases had unsatisfactory results.

Conclusion

- DF-LCP remains the implant of choice in type C fractures though associated with less satisfactory results

in few cases.

- It provides stable fixation, prevents metaphyseal collapse and maintains limb length in severely comminuted fractures. However, type C fractures are associated with complications like varus malalignment and extensor lag in a few cases
- As locking head screws are used, the plate does not need to be contoured exactly to the bone and there is angular stability in the metaphyseal zone.
- Limited-contact design provides minimal periosteal disruption. As this DF-LCP has combi-hole, based on need of surgeon can use either locking orstandard bicortical screw.

References

1. Rockwood and Green's fractures in adults /8th edition. Section four - lower extremity. 2015; 2(53):2229-268.
2. Court-Brown CM, Caesar B. Epidemiology of adult fractures: a review. Injury. 2006; 37:691-97.
3. Gwathmey FW, Jr, Jones-Quaidoo SM, Kahler D, Hurwitz S *et al*. Distal Femoral Fractures: Current Concepts Journal of the American Academy of Orthopaedic Surgeons. 2010; 18(10):597-07
4. Ng AC, Drake MT, Clarke BL, Sems SA, Atkinson EJ, Achenbach SJ *et al* Trends in sub trochanteric, diaphyseal, and distal femur fractures, 1984-2007. Osteoporos Int. 2012; 23(6):1721-726
5. Yeap EJ, Deepak AS. Distal Femoral Locking Compression Plate Fixation in Distal Femoral Fractures: Early Results. Malaysian Orthopaedic Journal. 2007; 1(1):12-17.
6. Kolb KP. Grutzner H, Koller C, Windisch F, Marx W. Kolb. The condylar plate for treatment of distal femoral fractures: A long-term follow-up study. Injury 2009; 40:440-48.
7. Kanbar P, Kumar V, Owen PJ. Less invasive stabilisation system plating for distal femoral fractures, Journal of orthopaedic surgery. 2007; 15(3):299-302.
8. Bachu S, Ramulu L. A study of surgical management of distal femoral fractures in adults using locking compression plate. Int J Res Orthop. 2017; 3(2):253-58.
9. Weight M, Collinge C. Early Results of the Less Invasive Stabilization System for Mechanically Unstable Fractures of the Distal Femur (AO/OTA Types A2, A3, C2, and C3). J Orthop Trauma. 2004; 18(8):503-08.
10. Wong MK, Leung F, Chow SP. Treatment of Distal Femoral Fractures in the Elderly Using a Less-Invasive Plating Technique. Int Orthop. 2005; 29:117-20.