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Short Communication

Management of Distal Femur Fracture by Locking Compression Plate

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ABSTRACT

Distal femur fractures occur commonly due to high velocity trauma like road traffic accidents, fall from height. These fractures are associated with comminution, osteoporosis, articular involvement, bone loss. Distal femur fracture needs aggressive management in terms of open reduction and internal fixation with locking compression plate and early mobilization.

KEY WORDS: Osteoporosis, Bone loss, Articular involvement, Internal fixation, distal femur-locking compression plate.

INTRODUCTION

The supracondylar area of the femur is defined as the zone between the femoral condyles and the junction of the metaphysic 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 the treatment and prognosis will be considerably different.

Distal femur fractures are complex injuries that could be difficult to treat. These fractures are unstable, comminuted and tend to occur more commonly in elderly and multiply injured patients and associated with osteoporosis, comminution, bone loss, articular involvement. These fractures are usually caused by high velocity trauma and trivial trauma in osteoporotic elderly patients.

Distal femur fractures have the potential to produce significant long term disability due to deformity, bone loss and malunion and even fatal mortality due to massive haemorrhage and fat embolism.

It is now well recognised that the best treatment option for distal femur fracture is open reduction and internal fixation. The surgical goals of treatment are anatomic reduction of the articular surface, restoration of limb alignment, length, and rotation, bone grafting for extensive bone loss and stable fixation that allows for early mobilization. Nonetheless, internal fixation of the distal femur can be difficult due to thin cortices, a wide medullary canal, relative osteopenia, and fracture comminution make stable internal fixation difficult to achieve.

Distal femur- locking compression plate allows both locking and compression

screw fixation of the distal femur fracture along with articular surface realignment.

The following study was conducted to examine the short term clinical and radiological results particularly early complications and healing rate of distal femur fracture treated with distal femur-locking compression plate. [1,2,3]

Mechanism of injury:

In most distal femur fractures is thought to be axial loading with varus, valgus, or rotational forces. In younger patients, these fractures typically occur after high-energy trauma related to motor vehicle accidents. In these patients there may be considerable fracture displacement, comminution, open wounds, and associated injuries. On the other hand, in elderly osteoporotic patients, fractures frequently occur after a minor slip and fall on a flexed knee, leading to fragility fractures through compromised bone.

MATERIALS AND METHODS

The study was conducted in patients treated for distal femur fracture (type A, B & C – AO classification) at Adhichunchangiri Institute of Medical Science, BG Nagar, Mandya district from the month of Nov 2012 to Sep 2013. Ten distal femur fracture patients were taken into the study, all were fixed with distal femur-locking compression plate with Bone grafting where the distal femur fractures were associated with extensive bone loss. Patients' age ranged from 20 to 86 years with a mean of 53.

Technique:

The patients were positioned supine with a sand bag beneath the ipsilateral hip to internally rotate the leg. A direct lateral (posterolateral) approach was used to expose the fracture site. Skin incision was longitudinal and distally was centred over the lateral epicondyle. Fractures were reduced under direct vision using manual traction. Distal femur- locking compression plate length, axial and rotational alignment were checked and then placed over the fracture site. Fixation was achieved with distal and proximal locking screws and bone grafting done for fractures associated with extensive bone loss.

RESULTS

The sample consisted of ten patients with seven males and three were female. The patients' ages ranged from 20-86 years with a mean age of 53 years. The causes of fractures were motor vehicle accident in seven patients and a fall in three patients. There were no sports or industrial accidents. Eight fractures involved the right side and two involved the left. The average length of hospitalisation was 30 days with a range of 20 to 40 days. The average number of days from injury to surgery was 9 days with a range of 3 to 15 days. The operative time ranged from 90 minutes to 180 minutes. Patients were followed up from 01 to 12 months.

According to the AO/OTA classification system, there were three Type A1, two Type A2, two Type A3, two Type C1, one Type C2 fractures. Among which five were closed and five were open fractures requiring bone grafting. Successful fracture union was defined as complete bridging callus in three cortices, together with painless full weight bearing. Average time of union was 18 weeks with a range of 8 to 32 weeks. Mean extension was 1^0 (range 0^0 to 5^0), with mean flexion 108^0 (range 40^0 to 140^0). Mean range of motion was from $1^{0\ to}$ 180^0. Using Schatzker scoring system, there were three excellent results, four good, two fair and one failure.

Complications

Included 01 periprosthetic mid and distal third right shaft femur fracture which was treated close reduction and internal fixation with proximal femur nailing. There

was delayed union and late weight bearing in two patients. There was no non-unions, deep seated infections or osteomyelitis.

TABLE 1:MASTER CHART

No:	Age (yrs)	Sex	Mech of injury	Type	Side	Bone grafting	Full wt bear (mths)	ROM	Comp	F/ up (mths)	Schatzke score
1	45	M	RTA	33C2	Right	Yes	5	0-130	-	12	Good
2	20	M	RTA	33A2	Right	-	2	0-140	-	9	Excellent
3	70	F	FALL	33A1	Right	Yes	8	5-90	Delayed Union	10	Fair
4	55	F	RTA	33A1	Left	-	5	0-120	-	10	Good
5	86	F	FALL	33A2	Right	-	-	0-30	Periprosthetic #	10	Failure
6	30	M	RTA	33A3	Right	-	3	0-130	-	10	Excellent
7	55	M	RTA	33C1	Right	Yes	4	0-120	-	9	Good
8	48	M	FALL	33A3	Right	Yes	4	0-110	-	8	Good
9	28	M	RTA	33A1	Left	-	4	0-130	-	10	Excellent
10	59	M	RTA	33C1	Right	Yes	7	5-90	Delayed union	9	Fair

CASE 1

Fig:(1) Radiograph of right knee, preoperatively AP view

Fig:(3) Radiograph of right knee, postoperatively lateral view

Fig:(2) Radiograph of right knee, postoperatively AP

Fig:(4) Postoperative wound.

CASE 2

Fig:1) Radiograph of right knee, preoperatively lateral view.

Fig:2) Radiograph of right knee, preoperatively AP view.

Fig:3)Deformity of right lower limb (preoperative).

Fig:4) Incision (Direct lateral approach).

Fig:5) Intraoperative image of DF-LCP

Fig:6) Radiograph of right knee, postoperatively AP view.

Fig:7) Radiograph of right knee, post-operatively lateral view.

Fig: 8) Postoperative day 02 wound.

Fig: 9) Postoperative day 10 wound.

Fig: 10) Postoperative follow up at 3rd month with right knee extension of 110°

Fig: 11) Postoperative follow up at 3rd month with knee flexion of 90°

DISCUSSION

Current fracture patterns are tended towards complex communited open fractures due to high velocity road traffic acciendents. Improved health care in terms of Open reduction and Internal fixation with locking compression plate and early mobilization results in longer and healthier life span. [4,5,6]

Locking compression plate is a single beam construct where the strength of its fixation is equal to the sum of all screw-bone interfaces. Its unique biomechanical function is based on splinting rather than compression resulting in flexible stabilisation, avoidance of stress shielding and induction of callus formation. The shaft holes on the distal femur- locking compression plate 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. When applied via a minimally invasive technique, it allows for prompt healing, lower rates of infection and reduced bone resorption as blood supply is preserved. [7,8,9,10]

Although the follow-up period of our series was short, studies have shown that early function is comparable to final long term outcome. The outcome seems to correlate with fracture severity, anatomic reduction, aetiology, bone quality, length of time elapsed from injury to surgery, concomitant injuries, and exact positioning and fixation of the implant.

CONCLUSION

The distal femur- locking compression plate is a good implant to use for fractures of the distal femur. However, accurate positioning and fixation are required to produce satisfactory results. We recommend use of this implant in Type A and C, osteoporotic fractures. Our early results are encouraging but long term studies are needed to prove definitively acceptable outcomes so that the technique can become part of the in the armamentarium of the orthopaedic trauma surgeon.

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Consent - was taken from the institutional ethical committee.

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