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A study to evaluate functional outcomes of distal femur fractures

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Abstract

Purpose: Despite advances in techniques and improvements in surgical implants, treatment of distal femoral fractures remains a challenge in many situations. Debate continues around choice of implant for fixation of metaphyseal-diaphyseal fractures. In this prospective study, we had evaluated and compared clinical and radiological outcomes of distal femur fracture stabilization.

Study design: We conducted interventional study on adult patients having distal femur fractures. 58 fractures were presented during study period. 12 patients were excluded due to Polytrauma (6), head injuries (2), spine injuries (2) and unwilling to participate (2). Forty six patients were evaluated at the end of study. Demographic variables, fracture pattern, mode of injury, union time, non union, and complications were recorded in proforma evaluated at the end of follow up using Pritchett outcome scores.

Results: Mean age was 44.7 ± 18.18 yrs. Fifty percent had AO 3.3C injuries. 47.8% patients underwent distal femoral locked plate fixation. 26% had open fractures. 45.7% fractures united within 6 months of surgical procedure. 32.6% patient had excellent outcome. Loss of fixation was related to pain and tendency to worse outcome according to Pritchett score.

Conclusion: Stable fixation and early knee joint mobilization are important factors for good functional outcome of distal femoral fracture.

Keywords: Distal femoral fracture

Introduction

Distal femoral fractures account for about 6- 7% of all femoral fractures ^[1, 2] Presentation of these fractures has bimodal age of distribution, occurring in young patients due to high energy injuries and trivial injuries leading to fractures in elderly aged persons ^[2].

Due to high velocity injuries they present with severe metaphyseal comminution and intra articular extension leading to difficulty in alignment and restoration of articular congruity ^[1-4]. The goals of treatment include anatomical reduction of articular margin, stable fixation, early joint mobilization and rapid functional recovery ^[5].

Literature suggests that long term outcome from non operative treatment are unsatisfactory due to non-anatomical reduction and joint stiffness ^[6, 7]. For last 40 years surgical management had gained popularity for treatment of distal femoral fractures ^[6, 7]. Operative methods of treatment includes, blade plate fixation, condylar buttress plates, dynamic condylar screw and intramedullary nail fixations ^[6, 7] Periarticular distal femoral locking plate fixation has gained popularity due to preservation of blood supply and fracture healing. Comminuted intraarticular fractures have shown good results with primary arthroplasty of knee joint ^[6-9].

Despite popularity of arthroplasty of knee joint, salvage of distal femur is popular among trauma surgeons ^[10]

Our aim of this study to find the demographic variables, clinical, radiological and functional outcomes of distal femoral fractures.

Methodology

This was interventional study which was carried out in department of Orthopedics from June 2014 to June 2015. Institutional review committee and research committee approval was obtained before conducting study. Adult patients having distal femoral fractures presenting at

emergency or Outpatient department were included in the study. Polytrauma, associated head injuries, spine injuries leading to quadriplegia or paraplegia and patient who did not consent for study were excluded from the study.

Patients were thoroughly evaluated at first contact at emergency or Outpatient department. Emergency management was done. Limb was splinted and baseline investigation was done. Fractures were classified according to AO classification system ^[11] and treatment was planned by senior orthopedic surgeon. Those patients undergoing surgery were evaluated by Anesthetist. Open reduction and internal fixation was done in fracture table with fluoroscopic assistance in supine position. Surgical approach was used according to type and location of fracture. Cannulated cancellous screws, locked distal femoral plating, intramedullary nail, dynamic condylar screw, external fixator. Intra operative and postoperative parameters were evaluated during surgery. Third generation cephalosporin and injection aminoglycosides were used just before surgery and post operatively for 3 days and more days for compound fractures. post operative complications like infection, wound dehiscence, hardware failure, varus collapse, knee stiffness, limb length discrepancy, neurovascular deficit were recorded in proforma. Wound inspection was done at 2nd postoperative

days and suture removal was done at 14th post-operative days. Knee range of motion brace was used postoperatively. Knee range of motion and quadriceps strengthening exercise was done post operatively. Patients were advised non weight bearing axillary crutch walking and advised to walk on walker for adult patient. Follow up X-rays was done at 6 weeks, 3 months, 6 months and 1 year. Data were collected in proforma.

Pritchett scores ^[12] was used at the end of one year to evaluate the outcome.

Univariate analysis was done to find proportions and averages and inferential statistics was used to find relations with independent variables.

Results

Nine hundred thirty one patients of femur fracture presented during study period. Among them 58 patients had distal femur fractures. Twelve patients were excluded due to polytrauma (6), head injuries (2), spine injuries (2) and unwilling to participate (2). Among them 46 patients were enrolled during entire study period.

Details of patients profile and study parameters are illustrated in tables 1-5.

Table 1: Showing preoperative variables among patients

Characteristics	Categories	No of pts	%
Age(yrs)	> 60 yrs	31	67.4
	<60 yrs	15	32.6
Mean age in years \pm SD		44.70 \pm 18.18	
Sex	Male	24	52.2
	Female	22	47.8
Involved side	Right	24	52.2
	Left	22	47.8
Part of femur	Supracondylar region	35	76.1
	Intercondylar region	7	15.2
	Lateral condyle	3	6.5
	Medial condyle	1	2.2
Mode of injury	RTA	16	34.8
	Fall	27	58.7
	Farm	2	4.3
	Others	1	2.2
Compound fracture	Closed	34	73.9
	Open	12	26.1
Gustilo grading	Grade I	2	16.7
	Grade 2	5	41.7
	Grade 3	4	33.3
	Grade3B	1	8.3
Associated injuries	No	38	82.6
	Yes	8	17.4
Associated bone	Patella	3	37.5
	Tibia	2	25.0
	Clavicle	1	12.5
	Neck femur	1	12.5
	Hand injury	1	12.5
	Foot injury	1	12.5

According to AO types fractures were presented in our study as follows: AO type 3A were 18(39.1%), 3 B were 5 (10.9%) and 3C 23(50%).

Table 2: Showing modalities of treatment 47.8 % fractures were stabilized with fixed angled distal femoral locking plate.

Surgery performed	No of fractures	Percentage
Distal femoral locking plate	22	47.8
Dynamic condylar screw	3	6.5
Cannulated cancellous screw	7	15.2
Intramedullary nail(antegrade)	5	10.8
Supracondylar nail(retrograde)	8	17.3
External fixation	1	2.2

Table 3: Showing post-operative complications 19.6% patients had complications. Four patients had delayed union.

Complications	Frequency	Percentage
No	37	80.4
Yes	9	19.6
Delayed union	4	44.4
Wound infection	2	22.2
Fracture	1	11.1
Knee stiffness	1	11.1
Wound dehiscence	1	11.1
Additional surgery performed		
No	36	78.3
Yes	10	21.7
Flap	1	10.0
Bone graft	3	30.0
Dynamization of nail	1	10.0
Refixation with locking plate	2	20.0
Exchange nailing	1	10.0
Quadricepsplasty	1	10.0
Implant prominence and removal	1	10.0
Wound debridement	2	20.0
External fixation after removal of Infected implant	1	10.0

Table 4: Showing outcomes during follow up two patients had nonunion.

Union	No of fractures	Percentage
Less than 6 months	25	54.3
More than six months	21	45.7
Non union		
Yes	2	4.3
No	44	95.7

Table 5: Showing functional outcome at end of follow up

Pritchett rating system	No of fractures	Percentage
Excellent	14	30.4
Good	24	52.2
Fair	6	13.0
Poor	2	4.4

As shown in above table more than 80% patients had good to excellent function where as only 4.4% patients i.e 2 fractures had poor functional outcome.

Discussion

Distal femur fracture is a complex, challenging injury due to nearby knee joint involvement. There is consensus regarding need for surgical management of distal femoral fracture for the last 40 years due to complications like varus or valgus malunion, non-union and problems of prolonged immobilizations like deep venous thrombosis, pulmonary embolism, pressure sores, knee stiffness and functional loss. [10-14]

Regarding optimal methods of management, there is still controversy among treating surgeons and also a uniform clinical guidelines are lacking for the reference [13-16].

In our study, mean age of the patients were 44.70 ± 18.18 (years \pm SD); 67.4% patients were elderly patients with distal femur fracture following trivial trauma. With rise in motor vehicle accidents younger age groups of patients had sustained fractures, which are similar to other studies showing bimodal age of distribution according to mechanism of injuries [17].

In our study, 24 (52.2%) patients were male and 22 (47.8%) right side was involved in 24 patients. Supracondylar fracture was commonest part involved where as intercondylar, uni condyles were less involved; 35, 7, 3 and 1 respectively;

involvement pattern is similar in the literature [18]

In our study, 58.7% patients had fall injuries, followed by road traffic accidents, farm related fractures. In our study 12 (26.1%) patients had compound fractures which are similar to other studies (19%–54%) [19]

In our study 8(17.4%) patients had associated fractures among which 3 patients had patella fractures which are similar to other studies [20]

22(47.8%) had distal femoral locking plate fixation where as dynamic condylar screw(3), cannulated cancellous screw (7), antegrade intramedullary nailing (5), retrograde nailing (8) and external fixation was done in one patient. Intramedullary nail was done in supracondylar fractures whereas most of intercondylar fractures were fixed with distal femoral locking plate. Literature shows various studies in which different modalities of treatment are used for fixation of distal femur fractures [21]

In our study 19.6% patients had complications among which delayed fracture healing occurred in 4 patients for which bone graft was done in 3 patients whereas one case undergone exchange nailing following which fracture united. Three patients had wound infections which was managed with antibiotics and wound debridement after which healed [18-19]

Two (4.34%) fractures did not heal among all patients for which secondary procedures done. Literature shows up to 20% non union rate [19, 20].

Pritchett's rating score were used to follow up; excellent results in 14(30.4), good in 24(52.2), fair in 6(13.0) and poor in 2(4.4) patients. Outcome has been previously defined by reduction quality, range of motion, and pain. Outcome score is similar to described in the literature [12, 20-23].

Distal femoral fracture is rare and complicated injuries to manage. Complex injuries and inappropriate fixation and care leads to deficiency of proper knee function and overall gait changes. Hence stable fixation and early knee motion exercises and muscles strengthening exercise around knee joint help in satisfactory recovery. Our study has limitations due to less number of sample size and less duration of follow up. We recommend longer follow up and randomization clinical trials comparing different modalities of treatment.

Conclusion

Distal femoral fracture is rare and complex injuries of lower limb. Goal of treatment must follows principles of anatomical reduction, stable fixation and early knee range motion exercise to achieve satisfactory recovery and function.

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