

Sub-trochanteric fractures of the femur: Results of ORIF at KMCTH

Rijal KP¹, Manandhar RR², Pandey BK³

¹Acting Professor and HoD, ²Lecturers, Department of Orthopaedic Surgery, Kathmandu Medical College Teaching Hospital

Abstract

Sub-trochanteric fractures of the femur are not commonly encountered as compared to trochanteric or neck of femur fractures. Relatively younger persons are injured more and a considerable violence is required for this fracture to occur. These fractures, treated conservatively by methods like traction, splints or casts, are often associated with complications like non-union, mal-union, shortening of the limb etc. Thus, we undertook this study of 10 consecutive cases of sub-trochanteric fractures of the femur treated by open reduction and internal fixation and bone grafting in Kathmandu Medical College Teaching Hospital, Sinamangal, from the year Nov. 2000 to April 2006. There were 4 females and 6 male patients. Their age on average was 46.8 years (range 15 to 86 years). Most of the patients were in Type II or III in Seinsheimer classification; Type II A, B, and C, one, two and one respectively, and in Type III A and B three patients each. Seven patients were treated with dynamic hip screw. Three patients with type III were managed with centro-medullary interlocking nail with one cerclage suture. They were followed for a period of minimum 6 months to 6 years (average 3.5 years). Union was achieved in all, on an average 4 months postoperatively. Results were excellent and complications like nonunion, malunion or breakage of the implants, were not encountered in any patient.

Sub-trochanteric fractures of the femur is not a common type of fracture that we encounter in our daily practices as compared to trochanteric or neck of femur fractures. High energy injuries (1) such as road vehicle accident or fall from height are the most common causes of these fractures in younger individuals and are often associated with multiple injuries. But, in elderly, low energy and pathological injuries¹ are often associated and should be considered.

Sub-trochanteric fractures are often accompanied by bad treatment outcome such as nonunion, malunion when treated conservatively by splints, cast or tractions². Open reduction and internal fixation, utilizing either intramedullary or extramedullary devices, with or without bone grafting are the best forms of treatment for these fractures^{3,4}.

Here, we present our series of 10 cases with sub-trochanteric fractures treated by open reduction and internal fixation utilizing either, dynamic hip screw with long barrel plate or interlocking nail with one cerclage suture, and with bone grafting. Our series presents an excellent result having fractures united in all cases without any complications.

Materials and methods

All the patients attending casualty or out-patients department of Orthopaedic surgery of Kathmandu Medical College Teaching Hospital (KMCTH), Sinamangal from the year Nov. 2000 to April 2006, with sub-trochanteric fractures of the femur were the subject of this study (Fig. 1, 4). There were 4 females and 6 male patients. Their age ranged from 15 years to 86 years (average 46.8 years). According to Seinsheimer classification⁵ there was one patient in Type II A, two in Type II B, one in Type II C, and three patients each in Type III A and B. The left side was involved in 5, and right side in the remaining 5 patients. Mechanisms of injuries were high-energy injuries, that is, road vehicle accident in 5 and fall from height in 2 patients and low energy injury, that is, fall on slippery ground in 3 patients.

Correspondence

Dr. Kiran Prasad Rijal
Department of Orthopaedic Surgery
Kathmandu Medical College Teaching Hospital
Sinamangal, Kathmandu, Nepal
E-mail: drkpr1956@yahoo.com

Seven out of ten patients were treated by open reduction and internal fixation utilizing dynamic hip screw with long barrel plate (Fig. 2). Bone grafting was performed in all of these patients. Rest of the three patients with Seinsheimer's type III were treated with centro-medullary interlocking nails (Fig 5). In the latter group of the patients, one cerclage suture was used to hold the reduced comminuted fragment in position. Bone grafting was performed over the comminution site in these three patients. They were followed for a period of minimum 6 months to 6 years post-operatively (average 3.5 years). During the postoperative period, patients were allowed out of the bed, after removal of the stitches in 10 days time, with bilateral crutches non-weight bearing walking. Partial weight bearing was started from three weeks onward followed by full weight bearing after six weeks with single crutch. Quadriceps, hamstrings and gluteus muscles strengthening exercises were started once the patient was out of bed. Radiographs were taken at 3, 6 and 12 weeks post-operatively and at follow-up. The range of motion of the hip joint was noted at follow-up.

Results

Fractures united in all the ten patients treated by open reduction and internal fixation and bone grafting (Fig 3 A & B; Fig 6). The distribution of age and sex are shown in Table 1. The average age of 4 female patients was 54 years and that of 6 male patients was

42.4 years. There were 6 patients under the age of 50 years and 4 patients over 60 years of age. Motor vehicle accident was the mode of injury (high energy injury) in 5 patients with an average age of 35.4 years. Fall from height, that is, landslide was the mode of injury in two patients with an average age of 25 years. Fall on slippery ground (low energy injury) was the mode of injury in 3 patients with an average age of 72 years.

The average age of the patients in dynamic hip screw group was 51.4 years, and in those with interlocking nail was 37.6 years. All the three patients with interlocking nail were of Type III A. Rest of the patients irrespective of Seinsheimer type underwent dynamic hip screw with long barrel plate. All of 10 the patients irrespective of implants used underwent bone grafting. Radiographically, the union time for type II ABC fractures was on average 3 months (range 2.5 to 3.5 months). Type III A fractures took longer time to unite on average 4.5 months (range 4 to 6 months), whereas type III B fractures united in 4 months on average time (range 4 to 5 months).

Range of motion of the hip was full in all the patients at follow-up. There was no pain and functional outcome was excellent in all. Complications like delayed union, mal-union (like varus deformity) or non-union, implant failure etc were not present in any patients at follow-up (Table 2).

Table 1:

Age (Yrs.)	Sex		Total
	Female	Male	
0-15	1	0	1
16-30	0	2	2
31-45	1	2	3
46-60	0	1	1
61-67	1	1	2
Above 76	1	0	1
Total	4	6	10

Table 2:

No. of cases	Type of fractures	Treatment	Union Time (Month)	ROM	Functional outcome	Complications
1	IIA	DHS	3	Full	Excellent	Nil
2	IIB	DHS	2.5	Full	Excellent	Nil
1	IIC	DHS	3.5	Full	Excellent	Nil
3	IIIA	ILN	4.5	Full	Excellent	Nil
3	IIIB	ILN	4	Full	Excellent	Nil

DHS – Dynamic Hip Screw; ILN – Interlocking Nail; ROM – range of motion



Fig 1: Pre-operative radiographs showing sub-trochanteric fracture Type III A.



Fig 2: Post-operative radiograph showing dynamic hip screw (DHS) in place with bone grafting.



Fig 3A: Follow-up radiograph AP View one year post-operative showing united fracture,



Fig 3B: Follow-up radiograph lateral View one year post-operative showing fracture union



Fig. 4: Pre-operative radiographs showing sub-trochanteric fracture type III B, Lat and AP views



Fig 5: Post-operative radiographs showing centro-medullary nail; AP and Lat views



Fig 6: Follow-up radiographs one year post-operative showing fracture union; Lat and AP views

Discussion

Sub-trochanteric fractures of the femur are rather uncommon fractures encountered in our daily practices. By far trochanteric or neck of the femur fractures are more commonly encountered amongst the fractures around the hip. High-energy injuries such as motor vehicle accident (MVA) or fall from height are the commonest mode of injury, especially in younger individuals. Low-energy injuries are mostly encountered in elderly persons, especially women and pathological fractures are also found in them. In our series, in 7 patients the mechanism of injury was high-energy injury (in 5, MVA and in 2, fall from height) with an average age of 37 years. The rest of the three patients had low-energy injury (fall on a slippery ground) with an average age of 72 years. There were no patients with pathological fractures.

The treatment outcome of sub-trochanteric fractures of the femur has been poor when treated conservatively by utilizing methods such as tractions, splints and casts, contributing to mal-union, varus deformity, non-union etc.

The treatment of choice for sub-trochanteric fractures of the femur is open reduction and internal fixation utilizing various devices with or without bone grafting. Amongst the implants either intra-medullary devices as interlocking nails such as long Gamma nails⁶ and Zickel nails⁷ as are used or extra-medullary devices used are dynamic hip screw with long barrel plate or right-angled blade plate⁸ etc are used. In our series, dynamic hip screws were used in 7 patients with bone grafting and the results were satisfactory with an average follow-up of 2 years. With the availability of implants we preferred to use intra-medullary devices (centro-medullary interlocking nails) in patients with comminution with bone grafting. The results in these three patients were also satisfactory.

Complications like varus deformity, non-union, mal-union, failure of implants and infection were not encountered in any of the patients in our series. We took special care to utilize interlocking nail with one cerclage suture to reduce and hold the comminuted fragment and bone grafting in Type III fractures. The

union time was longer in these patients. Functional outcome regarding pain and range of motion of hip was excellent in all of our patients. This can be attributed to the choice of implant, bone grafting and early rehabilitation.

Conclusion

Open reduction and internal fixation utilizing either intra-medullary like interlocking nails or extra-medullary like dynamic hip screw with bone grafting are the best form of treatment for sub-trochanteric fractures of the femur.

References

1. William G, Delong, JR. Sub-trochanteric fractures. In Robert W. Bucholz and James D. Heckman editors - Rockwood and Green's Fractures in adults., Vol. 2; 5th ed. Lippincott-Williams and Wilkins, 2001; 1665 – 1681.
2. Waddell JP: Sub-trochanteric fractures of the femur: a review of 130 patients. *J Trauma* 1978; 18: 513.
3. Bergman GD, Winqvist RA, Mayo KA, Hansen ST Jr. Sub-trochanteric fractures of femur: fixation using Zickel nail. *J Bone Joint Surg.* 1987; 69 – A 1032.
4. Wile PB, Panjabi MM, Southwick WO: Treatment of subtrochanteric fractures with a high-angle compression hip screw. *Clin Orthop* 1983; 175; 72.
5. Seinsheimer F. Sub-trochanteric fractures of the femur. *J Bone Joint Surg.* 1978; Am. 60; 300 – 306.
6. Barquet A, Mayore G, Fregeriro J et al. The treatment of sub-trochanteric non-union with long gamma nail; twenty six patients with a minimum of 2 years follow-up. *J. Orthop. Trauma* 2005 Apr; 19: (4); 294.
7. Zickel RE. An intra-medullary fixation device for the proximal part of femur, nine years experiences. *J Bone Joint Surg.* 1976; 58 – A; 866.
8. Kinast C, Bolhofer BR, Mast JW, et al. Sub-trochanteric fractures of the femur: results with 95 degrees condylar blade plate. *Clin Orthop* 1989; 28; 122 – 130.