

## Role of locking dynamic hip screw fixation in the treatment of osteoporotic intertrochanteric fractures

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### ABSTRACT

Pertrochanteric femoral fractures are of intense interest globally. They are the most frequently operated fracture type, have the highest postoperative fatality rate of surgically treated fractures, and have become a serious health resource issue because of the high cost of care required after injury. Interestingly there has been no significant improvement in mortality or functional recovery over the past 50 years of surgical treatment. The treatment goal in pertrochanteric fractures is a stable and strong fixation of the fracture fragments. The failure of fixation using a dynamic hip screw (DHS) will lead to reduced mobility and the associated ill healths. Using a fixed angle locking plate in a dynamic hip screw would reduce the risk of DHS failure. This study was intended to assess the failure rate and functional outcome of intertrochanteric fractures that were treated using locking DHS. A prospective case series study was done of 30 patients who underwent dynamic hip screw fixation with locking side plate, after following them for 12 months, to find out the advantages and disadvantages occurring with the locking DHS and to look for the major postoperative complications associated with the treatment. The functional outcome was measured using Salvati –Wilson scoring system. It was found to be excellent in 39.28% and good in 42.85% of the patients after one year of follow up. In 66.67% of patients, fracture was found to be radiologically united at the 3rd month of follow up. 38.46 % of patients had complications due to technical failures. Locking DHS can be considered effective to treat trochanteric fractures in terms of functional outcome.

**Key words:** Intertrochanteric fracture; DHS fixation; Locking plates; Salvati Wilson scoring.

### Introduction

Intertrochanteric fractures account for nearly 50% fractures around the hip. Although predominantly associated with low-energy trauma in older age patients, high-energy trauma in young patients can result in similar patterns of fracture. Injury creates a spectrum of fractures in this proximal metaphyseal region of bone, with damage to the mechanically optimized placement of intersecting cancellous compression and tensile lamellae networks and the weak cortical bone with resulting displacement from the respective attachment of muscle groups to the fracture fragments and an adjacent high mobility joint.

The occurrence of intertrochanteric fractures is estimated to be doubled by 2040. Burden of intertrochanteric fractures are (1) its association with a high rate of morbidity and mortality (2) malunion (3) failure of implant (4) financial burden to the family (5) associated medical problems like diabetes, hypertension. The focus of surgical research regarding internal fixation in the late twentieth century was to minimize implant failure and avoidance of cutout of the femoral head and neck fixation components. Various surgical modalities have been known to date for the treatment of intertrochanteric fractures, including DHS, bipolar hemiarthroplasty, proximal femoral nail, trochanteric fixation nail (TNF) and external fixation, all of which have their specific advantages and disadvantages [1, 2]. Treatment Once selected, surgical management should be performed as soon as any correctable metabolic, hematologic, or organ system instability has been rectified. Usually this is within the first 24 to 48 hours. The literature is inconclusive as to increased mortality after this time,

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but patient suffering and hospital efficiencies demand timely intervention. Stable fixation is the keystone of successful union of trochanteric fractures. Factors that are not under the control of the surgeon for successful treatment are: (i) fracture geometry and stability, (ii) quality of bone, (iii) comminution. Factors under the control of surgeon are: (i) good reduction, (ii) proper choice of implant, (iii) proper technique. Surgical stabilisation substantially reduces the mortality risks, in comparison to the conservative methods of treatment. The dynamic hip screw (DHS) is the standard and is the most common device for fixation of intertrochanteric femoral fractures[3]. The goal of surgical treatment is the strong and stable fixation of the fracture fragments. Most patients with intertrochanteric fractures have considerable osteopenia and hence the bone quality is poor to validate a stable fixation. Failure of a DHS fixation leads to decreased mobility of the patient and frequently to a decrease in general health. The most common method by which a DHS fails is cut out of the lag screw from the femoral head and plate lift off from the femur. So a dynamic hip screw with a fixed angle locking screw would reduce the risk of cut out, whereas a locking screw plate would provide a stronger construct and prevent plate lift off from the femur. Managing intertrochanteric fracture with a locking DHS leads to sound bone healing and is not associated with any major complications (3). This study was intended to assess the failure rate and functional outcome of intertrochanteric fractures that were treated using locking DHS after 12 months of follow up, to evaluate the advantages and disadvantages associated with the locking DHS and to evaluate the major postoperative complications associated with the treatment.

### Materials and methods

The study was a prospective case series study involving 30 patients of different intertrochanteric fractures from February, 2008 to February, 2009. The study was conducted in a tertiary care centre in Kerala, India. All patients were treated with dynamic hip compression screw with locking side plate. 28 patients were followed up for 1 year (2 patients died within this one year period). All patients with closed peritrochanteric fractures of femur in the adult age group were included in the study. Patients with age less

than 50 years, pathological fracture, open injury, Ipsilateral skeletal injuries and severe arthritic hip were excluded from the study. After evaluation patients were then taken up for surgery. A lateral approach was used to expose the femur in all cases. The locking plate was fixed to the shaft with locking screws of appropriate length. All patients received one dose of 2nd generation cephalosporin intraoperatively and 3 days course postoperatively. Suction drains were used in all cases, and removed by 48 hours. Stitches were removed on the 10th day, if healthy wound margins. Ankle and calf exercises, leg dangling with patient sitting by the edge of the bed and exercises to strengthen hip abductors were started on postoperative day one, two and three respectively. At 6 weeks, patients were instructed to use a single crutch and bear successive weight on the affected limb. At 3 months, patients were allowed walk with a cane on the affected side and started stair case climbing. All patients were followed up for a period of 1 yr; follow up visits were done at 6 weeks, 3 months, 6 months and 1 year. The important Clinical parameters assessed were wound condition, function on SALVATI & WILSON scoring system (5), and shortening. Radiological union and amount of collapse were assessed. Informed ethical consent was obtained from Institutional ethical committee.

### Results

The mean age of the studied cases was 67.46 years (50 to 92 years), and the majority belongs to 60 to 69 years. 17(56.66%) cases were males and 13 (43.33%) were females. The more complex pattern and comminution was seen more commonly in females. 53% of the fractures were on right side, and 47% on left. Majority, 46% belongs to Tronzo type 3 fractures, and 35 % belongs to type 4 and 16% each of type 5. Only 3% of patients belong to Tronzo fracture type 2. Stable fracture reductions were found in 12(40%) patients, and in 18 (60%) patients the fracture reductions were found to be unstable. As compared to the stable reduction group, the Salvati Wilson score is found to be less satisfactory in other group. The duration of surgery was calculated from the time of incision to skin closure. In the second group, the duration of the surgery and the requirement of blood transfusion was more, and the average duration was 80 minutes.

**Table 1: Salvati Wilson Score (1 ½ And 3 Months)  
6 weeks**

SCORE	FREQUENCY	PERCENTAGE
<16	15	50
16 - 23	15	50
24 - 31	0	0
>32	0	0

**3 MONTHS**

SCORE	FREQUENCY	PERCENTAGE
<16	0	0
16 - 23	22	73.33
24 - 31	8	26.66
>32	0	0

**Table 2: Salvati Wilson score (6 and 12 months)  
6 MONTHS**

SCORE	FREQUENCY	PERCENTAGE
<16	2	7.14
16 - 23	8	28.57
24 - 31	16	57.14
>32	2	7.14

**12 MONTHS**

SCORE	FREQUENCY	PERCENTAGE
<16(POOR)	2	7.14
16 – 23(FAIR)	3	10.71
24 – 31(GOOD)	12	42.85
>32(EXCELLENT)	11	39.28

**Table 3: Outcome and Type of fractures**

OUTCOME	TYPE-2		TYPE-3		TYPE-4		TYPE-5	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
<b>EXCELLENT</b>	1	100	8	57.14	2	25	0	0
<b>GOOD</b>	0	0	6	42.85	5	62.50	1	20
<b>FAIR</b>	0	0	0	0	1	12.50	2	40
<b>POOR</b>	0	0	0	0	0	0	2	40

**Functional outcome**

All patients were subjected to SALVATI WILSON SCORE at the one month, three month, six month and one year follow ups. The outcome was excellent in 39.28% and good in 42.85% cases. It was observed that

patients with low score in the initial follow up continued to have low score even at the 1 year follow up as compared to patients with high score in the initial follow up. Two patients complicated with DHS cut through and side plate lifting off, showed poor score

(Table 2: SALVATI WILSON SCORE (6 and 12 months)).

**Fracture union:** In 66.67% of patients, fracture was found to be radiologically united at the 3rd month follow up and in 33.33% of patients, fracture was found to be united at the 6th month follow up. It was observed that in patients who showed evidence fracture healing at the 3rd month follow up had excellent score at 1 year follow up. Patients who had stable reduction before fixation also showed early radiological union.

**Complications:** Two patients died from reasons not obviously related to the surgery, two patients developed respiratory infection and two patients developed catheter related urinary tract infection, and one patient developed DVT. Out of the 7(27%) technical complications we have faced, four were improper reduction, two inappropriate length of Richard hip screw and one inappropriate length of locking screw in side plate. Out of the three late complications one was a neck screw cut out, one plate lift off, and another was a mal union.

**Shortening:** Post operatively 42% patients developed 1 cm shortening, 42% patients had 2 cm shortening and 16% patient developed 3 cm shortening.

#### Relationship between age and functional outcome

100% patients in the age group below 60 years had excellent score in Salvati Wilson. In the age group of 60 to 69 years, 50 % of each had excellent and good score; in the age group of 70 to 79 years, 54 % had excellent score, 38 % had good score and 8% poor score; in the age group of 80 to 89 years 25 % had excellent score , 50 % had good score and 25% poor score; in the age group above 60 yrs, 66% had poor results, which shows the functional outcome is more favourable in younger age groups.

#### Relationship between type of fracture and functional outcome

100% excellent results were found with the fracture type 2 and 57.14% for Type 3 fractures (Table 3).

#### Discussion

Hip fractures are devastating injuries that most often affect elderly and have a tremendous impact on health. The result of this study is comparable to study conducted by Heysemore et.al, Leung et.al[6], Laskin et.al [7] and Kyle et.al [8]. Mean age of this study group was 67.46 years which is quite different from 80 years in Desjardines et.al, 79 years in Heysemore et.al , 86 years in Laskin et.al[7], 78.2years in Leung et.al[6], and 75.1years in Ecker et.al [9] is less. This is due to

the early onset of osteoporosis that usually occurs 10-20 years earlier in Indian population (10). Sex incidences in this study showed an interesting comparison with the western literature that female to male ratio is 86:14 in Davis et.al (11) , 84:16 in Ecker et.al [9], 82:18 in Laskin et.al [7], 83:17 in Heysemore et.al, and 69:31 in Desjardines et.al. In this study the sex ratio, female to male is 43:57, which shows a high incidence in of males. This is because of the fact that the Indian males have higher risk of osteoporosis than the western counter parts[12]. A nutritional factor, including decreased calcium has been implicated as the cause. Mean surgical time for the sliding hip screw fixation of intertrochanteric fractures, including stable and unstable fractures were 0.67 hours in Wolfgang et.al (13), 0.78 hours in Gargen et.al (14) and 0.68hrs in Laskin et.al (7). The mean time of duration of surgery of our study was 80 minutes.

This may be due to difficult procedure and use of fixed angle locking side plate. While assessing the functional outcome in our study with respect to other studies, we had 39.28% excellent results and 42.85% of good results as compared to the study by M.Tyllianakis (the study which used Salvati Wilson Score) who had 40% of excellent score, 33% of good score and 27% fair score. The results of our study were comparable with various other studies of conventional DHS in terms of functional outcome and complications, but have not shown any added advantage over conventional DHS. In this study, 66.67% of fracture was found to be radiologically united at the 3rd month follow up and in 33.33% of patients fracture found to be united at the 6th month follow up. The average time of radiological union in various other studies like Desjardines et al ( 14.2 weeks), Heysemore et al (13 weeks), Laskin et al (14 weeks) were comparable to our study. General postoperative complications were 27% in this study group, which is comparable to 16.5% in Davis et.al [11].Fracture complication alone were 20%, compared with 10% in Leung et.al[6],19.64% in Harrington and Johnston [15], 6.8% in Jacob et.al (16), 10% in Bannister and Gibson [17], 14% in Gordon et.al (5) and 4% Rao et.al[18].. Mortality in the study group was 8.2% which is comparable with 13% in Gordon et.als (5), 7% in Laskin et.al [7], 16% in Ecker et.al [9], and 6% in Harrington and Johnstons [15]. There was one case of side plate lift-off from the femoral shaft. In this patient, all the three locking cortical screws had unicortical purchase and the case had severe osteoporosis. The locking side plate was removed by a second operation and revised with a longer side plate (7 holed). The mean shortening was 1.75 cm comparable with 1.5cm in Laskin et.al [7], 2cm in Heysemore et.al,

1.2cm in Clawson et. al[19] , 1.5 cm in Dimon and Houghson [20] and 2cm in Ecker et.al [9].

### Conclusion

There is high incidence of intertrochanteric fracture in Indian males compared to the west. It may be due to high incidence of osteoporosis in Indian males. Intertrochanteric fracture occurs at an early age in Indian population indicating an early onset of osteoporosis in the same. The results of our study were comparable with various other studies of conventional DHS in terms of functional outcome and complications. Hence locking DHS can be considered an effective method of treating trochanteric fractures.

### Reference

- Seyfettinoğlu F, Ersan O, Kovalak E, Duygun F, Ozsar B, Ateş Y. Fixation of femoral neck fractures with three screws: results and complications. *Acta Orthop Traumatol Turc.* 2011;45(1):6–13
- Bhandari M, Devereaux PJ, Swiontkowski MF, Tornetta P, Obremskey W, Koval KJ, et al. Internal fixation compared with arthroplasty for displaced fractures of the femoral neck. A meta-analysis. *J Bone Joint Surg Am.* 2003 Sep;85-A(9):1673–81.
- Janzing HM, Houben BJ, Brandt SE, et al. The Gotfried percutaneous compression plate versus the dynamic hip screw in the treatment of pertrochanteric hip fractures: minimal invasive treatment reduces operative time and postoperative pain [J]. *J Trauma* 2002; 52(2):293–8.
- Barwar N, Meena S, Aggarwal SK, Garhwal P. Dynamic hip screw with locking side plate: a viable treatment option for intertrochanteric fracture. *Chin J Traumatol.* 2014 Nov 4;17(2):88–92.
- Gordan A. Hunter and Ivan J.K. 1978” “*J Bone Joint Surg,* 137A:140-43
- Leung K.S.et.al 1992”Gamma nail and Dynamic hip screws for pertrochanteric fractures”*J Bone Joint Surg,(Br),*74B:345-51
- Laskin RS et.al1979”Intertrochanteric Fractures in the elderly :A retrospective analysis of 236 cases”*Clin.orthop.,*141:188-195
- Kyle RF, Wright TM, Burstein AH, Biomechanical analysis of the sliding characteristics of compression hip screws. *J Bone and Joint Surf Am* 1980; 62: 1308-1314.
- Ecker Malcolm L.et.al.1975 “treatment of trochanteric hip fractures using compression screw “*J Bone Joint Surg,*57A:23-27.
- Gupta A.1996 “osteoporosis in India-The nutritional hypothesis.”*Natl Med J India,*9:268-274. Original article, *International Journal of Preventive and Therapeutic Medicine* ISSN 2347-9205 [www.ijptm.com](http://www.ijptm.com) IJPTM Vol 2 (4) / OCT-DEC, 2014 8
- T.R.C.Davis et al. 1990”intertrochanteric femoral fractures: mechanical failure after internal fixation” . *J Bone Joint Surg[Br];* 72-b:26-31
- Nordin Bec.1966”International patterns of osteoporosis.”*Clin Orthop,*17-30
- Wolfgang et al. 1982. “Treatment of intertrochanteric fractures of femur using sliding screw plate fixation” *Clin.orthop ,* 163:148-158
- Gargan M.F. 1994 How effective are osteotomies for trochanteric fractures? *J Bone Joint Surg [Br],* 76-b, 789-792.
- Harrington KD et al. 1973” Management of unstable intertrochanteric fractures” *J Bone Joint Surg[Am],*55-A: 1367-76.
- Jacob R.R and Maclaino.1976 “Invitro strain patterns in intertrochanteric hip fractures with a hip screw and a nail plate” *Surg .Forum,* 27:511
- Bannister G. C, Gibbson A. G. F. 1983. “Jewett Nail Plate or AO Dynamic Hip S crew for trochanteric fracture? A randomized prospective controlled trial. “ *J Bone Joint Surg (Br),* 65B:218
- Rao JP.1983” Treatment of unstable intertrochanteric fracture with anatomical reduction and compression screw fixation,”*Clin Orthop,*175:65-71
- Clawson D.K 1964 “Trochanteric fractures treated by sliding screw plate fixation method “*J.Trauma,*4;737-52
- Dimon JH,Hughston JC.1967 “Unstable intertrochanteric fractures of the hip.”*J Bone Joint Surg,*49- A:440-50

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