

# Comparing the outcomes of fixation of Intertrochanteric Fractures with the dynamic hip screw (DHS) using Conventional and Minimal Invasive Technique

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## Abstract

**Objective:** To compare the outcome of fixation of intertrochanteric fractures with the dynamic hip screw (DHS) using conventional and minimal invasive technique.

**Methods:** Quasi experimental prospective study from 1st March 2018 to 28th November 2021. The study was conducted from 1st March 2018 to 28th November 2021 under spinal anesthesia. All patients with intertrochanteric fracture aged greater than 60 years having surgeries performed within 3 weeks of injury were included. A total of 120 patients were included which were equally divided in MIDHS by conventional group. Outcome variables like operating time, blood loss, post-operative decrease in hemoglobin, hospital stay, pain score, early mobilization, Harris Hip score at 6 and 12 weeks and complications were noted.

**Results:** Of 120 patients, a significantly lower operating time (in mins) (p-value <0.001, 95% CI -34.29 to -28.89), blood loss (in ml) (p-value <0.001, 95% CI -32.02 to -16.65), post-operative decrease in hemoglobin (in g/dL) (p-value <0.001, 95% CI -3.43 to -2.88), hospital stay (in days) (p-value 0.002, 95% CI 1.25 to -0.28), pain score (p-value <0.001, 95% CI -2.43 to -2.16), Harris Hip score at 6 weeks (p-value <0.001, 95% CI 2.97 to 5.79), and 12 weeks (p-value 0.015, 95% CI 0.18 to 1.62) was found in MIDHS group as compared to conventional group. Moreover, early mobilization was found significantly higher in MIDHS group as compared to the conventional group, i.e., 35 (58.30%) and 22 (37%) respectively.

**Conclusion:** The finding of this study has showed that MIDHS is good technique with fewer complications of inter-trochantric fractures fixation.

Keywords:

Intertrochantericfractures, minimal Invasive dynamic hip screw,conventional method

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## Introduction

Hip fractures in most of the cases are caused by low-energy trauma in the elderly population. These fractures account for 30 per cent of all hospital admissions with mortality rates from 15 to 20 per cent worldwide<sup>1</sup>. Treatment focuses mainly on

the patient's return to the pre-fracture level of function that is usually best achieved with surgery. Non-surgical management resulted in an excessive rate of medical morbidity and mortality<sup>2</sup>. Several studies have shown that intertrochanteric fractures rise because of the combined effect of increased longevity and osteoporosis<sup>1,3</sup>.

It has been reported that, despite the fact of the development of new implantation systems like cephalomedullary nails due to suitable collapse or compression at fracture site, ease of technical application, long term results and familiarity of the most practical operator, operating bindings of those

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breakages with sliding hip screw and dynamic hip screw are still the gilded standard.<sup>3</sup> Apart from many internal fixation devices dynamic hip screw technique offers better outcome compared to conventional approach.<sup>4</sup> An attempt to reduce peroperative time and bleeding can be expected to significantly reduce the post-operative morbidity with high medical complications and risks of anesthesia and surgery in that already vulnerable population with medical co-morbidities. A comprehensive literature review has shown that local research on this subject are weak. The current study is therefore aimed at defining the tips and tricks needed to perform a minimally invasive DHS in an easy and accurate manner. In this regard, the result of the standard DHS technology was compared to the conventional technique with a minimally invasive approach. The purpose of study is to compare the outcome of Minimal Invasive dynamic hip screw (MIDHS) versus conventional method in patients with anatomically stable intertrochanteric fractures in patients attending Lyari General Hospital.

### Patients and Methods

This was an Analytical study. Non-probability consecutive sampling technique was used. The study was conducted from Six months from 1st March 2018 to 28th November 2021. Epi Info sample size calculator was used for the estimation of sample size. Confidence interval of 99% was used with the power 95%. Surgical duration reported in previous study among MIDHS cases  $53.6 \pm 13.66$  minutes and in conventional group cases  $77.6 \pm 16.19$  minutes<sup>8</sup>. The estimated sample size came out to be 58. However, we included 120 patients and 60 in each groups i.e Group A, MIDHS and group B, Conventional method.

Inclusion criteria was patients with Intertrochanteric fracture classified as OTA3-I A1-A2 Boyd & Griffin's - I- II or Evan's type-I, age greater than 60 years and surgeries performed within 3 weeks of injury

Exclusion criteria was all patients having poly-trauma, pathological fractures, compound fractures, and failed closed reduction fractures (unstable fractures) were excluded.

The study was carried out after the Lyari General Hospital approval was received. The conditions for inclusion is implemented in all patients. Following written, informed consent by patients and anesthesia health, Lorazepam 1 mg was pre-medicated one night prior to surgery and Nil was pre-medicated orally.

All patients were treated in a supine position on a radiolucent traction table under spinal anesthesia. Following sensitivity testing, 15 minutes before skin incision, a single prophylactic cefuroxime 1 gram antibiotic was given intravenously. The skin was painted properly and draped among MIDHS patients by removing the towel clips to prevent subsequent imagery from superposing the fracture. Also, the C-arm is draped individually. Now outer border of greater trochanter marked; with the help of guide wire entry portal made under image. The upper limit of incision of skin is entry point of guide wire and from here about 3cm line drawn (from entry point of guide wire). After that an incision is made on skin and then deep fascia incised and now onwards with manipulation plane developed in vastuslateralis to reach bone.

Guide wire passed from lateral border of femur 2.5cm below from trochantric flair. Correct placement of guide wire checked under image in AP & Lateral view. Sometimes a parallel guide wire is used to provide additional temporally stability for unstable fractures with later replaced with cancellous screw. After correct placement of pin measurement done reaming done and lag screw selected. After that plate (usually 4 hole) glided into wound initially facing laterally and then turned 180degree to slide over hip screw. Plate then fixed with cortical screws and fascia, subcutaneous tissue was used by absorbable suture and skin by non-absorbable suture.

Dressing changed regularly on the second post-op day, suction drain was removed and on the fourth post-operative day, the patient was discharged according to condition on oral antibiotics. The patients received training in static quadriceps and knee range of motion and equipped with crutch tol-

erated toe contact weights. At 2 weeks, sutures have been removed. The lateral aspect of the top thigh, beginning from the midpoint of the broader trochanteric prominence, reached down the side aspect of the femoral shaft in patients treatments using the traditional procedure, had a 10–15 cm incision of the longitudinal skins. The length of the lata fascia was cut into the skin line. Under a direct view, the large lateral muscle was divided. The fracture has been reduced and fluoroscope confirmed. The drain according to the surgeon's preference was used after the fixation of the fractures in standard form and the incision was closed in layers.

All patients had the same recovery procedure as the other party during the post-operative phase. Only after elimination of any wound complications and postoperative haemoglobin above 10 gm percent were these patients released on fifth or sixth day. For suture removal at 2 weeks, patients were recalled. X-rays were regularly conducted in both groups at 6 weeks and 12 weeks. Additional clinical and radiological testing was carried out. At follow-up visits at week 6 and 12, Harris Hip Score measurements measured the active hip joint's functional outcome.

Other outcome variables like length of incision, duration of surgery, technical difficulties in inserting hardware with small incision, blood loss and early mobilization were recorded in addition to demographic characteristics like age, gender and duration of injury of the patients.

Early mobilization was defined as active leg exercises (simple flexion & extension movement at knee & ankle), sit on bed's edge and out of bed from second postoperative day.

For the purpose of statistical analysis, SPSS-24 version was used. All quantitative variables like age, duration of injury, length of incision, duration of surgery, blood loss, and Harris hip score at 6 weeks and 12 weeks. Inferential statistics were computed using independent t-test.  $p\text{-value} \leq 0.05$  was taken as significant.

## Results

A total of 120 patients were included with 60 patients in each group, i.e., conventional and MIDHS. In table- 1, the mean age of the patients in MIDHS group was  $69.02 \pm 12.65$  years while mean age in conventional group was  $70.88 \pm 11.38$  years ( $p\text{-value} 0.397$ , 95% CI -6.22 to 2.48). The mean wound size in MIDHS group was  $29.53 \pm 3.49$  cm whereas mean wound size in conventional group was  $29.56 \pm 3.19$  cm ( $p\text{-value} 0.957$ , 95% CI -1.24 to 1.18). The mean operating time was significantly lower in MIDHS group as compared to conventional group, i.e.  $35.46 \pm 5.79$  minutes and  $67.06 \pm 8.83$  minutes respectively ( $p\text{-value} < 0.001$ , 95% CI -34.29 to -28.89). The mean blood loss was also significantly lower in MIDHS group as compared to conventional group, i.e.,  $91.12 \pm 18.43$  ml and  $115.45 \pm 23.75$  ml respectively ( $p\text{-value} < 0.001$ , 95% CI -32.02 to -16.65). The mean post-operative decrease in hemoglobin was also significantly lower in MIDHS group as compared to the conventional group, i.e.,  $1.32 \pm 0.15$  g/dL and  $4.48 \pm 1.06$  g/dL respectively ( $p\text{-value} < 0.001$ , 95% CI -3.43 to -2.88). The mean hospital stay was significantly lower in MIDHS group as compared to the conventional group, i.e.,  $5.02 \pm 0.94$  days and  $5.78 \pm 1.64$  days respectively ( $p\text{-value} 0.002$ , 95% CI 1.25 to -0.28). The mean pain score in MIDHS group was significantly lower as compared to the mean score in conventional group, i.e.,  $3.42 \pm 0.38$  and  $5.71 \pm 0.35$  respectively. ( $p\text{-value} < 0.001$ , 95% CI -2.43 to -2.16). The mean Harris Hip score at 6 weeks was  $59.85 \pm 4.14$  in MIDHS group while in conventional group, mean Harris Hip score at 6 weeks was  $55.46 \pm 3.65$ . ( $p\text{-value} < 0.001$ , 95% CI 2.97 to 5.79). The mean Harris Hip score at 12 weeks was  $84.73 \pm 2.21$  in MIDHS group while the mean Harris Hip score at 12 weeks in conventional group was  $83.83 \pm 1.78$ . ( $p\text{-value} 0.015$ , 95% CI 0.18 to 1.62).

As shown in table 2 there were 25 (41.7%) males and 35 (58.30%) females in MIDHS group whereas in conventional group, 27 (45%) were males and 33 (55%) were females. There were 24 (40%) patients with right side of fracture and 36 (60%) patients with left side of fracture in MIDHS group .

whereas in conventional group, there were 33 (55%) patients with right side and 27 (45%) patients with left side of fracture. There were 45 (75%) diabetic patients in MIDHS group whereas in conventional group, there were 39 (65%) patients. There were 31 (51.7%) hypertensive (HTN) patients in MIDHS group whereas in conventional group, there were 19 (31.7%) patients. There were 14 (23.3%) patients with cerebrovascular accident (CVA) in MIDHS group whereas in conventional group, there were 10 (16.7%) patients.

Table 3 shows early mobilization was also found significantly higher in MIDHS group as compared to the conventional group, i.e., 35 (58.30%) and 22 (37%) respectively. In MIDHS group, analgesia requirement was observed in 10 (16.6) patients whereas in conventional group, 35 (53.8) patients needed analgesia (p-value <0.001). Urinary tract infection was significantly lower in patients with MIDHS group as compared to the conventional group, i.e., 2 (3.3%) and 9 (15%) respectively.

**Table 1.** Comparison of MIDHS and Conventional Method

S#	Variables	MIDHS Mean $\pm$ SD	Conventional Method Mean $\pm$ SD	P-Value
1.	Age	69.02 $\pm$ 12.65	70.88 $\pm$ 11.38	0.397
2.	Size Of Wound (In Cm)	29.53 $\pm$ 3.49	29.56 $\pm$ 3.19	0.957
3.	Operative Time (in minutes)	35.46 $\pm$ 5.79	67.06 $\pm$ 8.83	<0.001
4.	Blood Loss (in ml)	91.12 $\pm$ 18.43	115.45 $\pm$ 23.75	<0.001
5.	Post-Operative Decrease In Hemoglobin (in g/dL)	1.32 $\pm$ 0.15	4.48 $\pm$ 1.06	<0.001
6.	Hospital Stay (in days)	5.02 $\pm$ 0.94	5.78 $\pm$ 1.64	0.002
7.	Pain Score	3.42 $\pm$ 0.38	5.71 $\pm$ 0.35	<0.001
8.	Harris Hip Score At 6 Weeks	59.85 $\pm$ 4.14	55.46 $\pm$ 3.65	<0.001
9.	Harris Hip Score At 12 Weeks	84.73 $\pm$ 2.21	83.83 $\pm$ 1.78	0.015

**Table 2.** Basic Characteristics of Group A and Group B

S#	Variables (n=60)	MIDHS	Conventional Method (n=60)	P-Value
1.	<b>Gender</b>			
	Male	25 (41.70)	27 (45)	0.173
	Female	35 (58.30)	33 (55)	
2.	<b>fracture side</b>			
	Right	24 (40)	33 (55)	0.143
	Left	36 (60)	27 (45)	
3.	<b>Diabetes</b>	45 (75)	39 (65)	0.232
4.	<b>HTN</b>	31 (51.70)	19 (32)	0.026
5.	<b>CVA</b>	14 (23.30)	10 (17)	0.361

**Table 3.** Comparison of Post-Operative Outcomes

S#	Variables	MIDHS (n=60)	Conventional Method (n=60)	P-Value
1.	<b>Early Mobilization</b>	35 (58.30)	22 (37)	0.017
2.	<b>Analgesia Required</b>	10 (16.6)	35 (58.3)	<0.001
3.	<b>UTI</b>	2 (3.30)	9 (15)	0.027

## Discussion

The source of morbidity and mortality in the elderly population is hip fractures, which is correlated with significant health expenses. Although many internal fixation devices provide adequate stability, intertrochanteric treatment of femoral fractures remains challenging<sup>6,9</sup>. The dynamic hip screw provides stability and early deployment because it enables maximum breakdown and site compression, is the most common extramedullary device used for intertrochanteric fractures and has reasonable results<sup>10,11</sup>. However, there is no clear indication of a reduced failure rate of intramedullary nails in unstable intertrochanteric fractures relative to sliding hip screws.<sup>12</sup>

The routine use of intramedullary nail for treating intertrochanteric fractures is therefore not recommended, and the dynamic hip screw is still the standard type of fitting for intertrochanteric fractures<sup>13</sup>. Nonetheless, it usually requires an incision of 10-15 cm separating large lateral tissues, which results in severe bleeding and soft tissue overflowing injury, and an Intertrochanteric fracture also occurs in the elders who often suffer several com-

orbid conditions that may worsen due to a major operation requiring surgical trauma<sup>6</sup>. In our study the average surgical time for Harri Hip was significantly lower in MIDHS group compared to conventional score at 6 weeks, blood loss, postoperative reduction in hemoglobin, hospitalization, pain score, Harris Hip score at 12 weeks. Some authors use custom implants or new products which require the purchase of additional instruments and implants through the hospital, to find techniques which are less invasive for simplifying surgery and lower complication by reducing the amount of surgical time and blood loss<sup>10,12,14</sup>.

On the other hand, the minimum invasive DHS technique uses existing tools that are familiar and confident to the operating team and do not need to buy new tools. Various authors showed that by changing the operating approach while using existing fixing devices, the same advantages can be gained, so that they do not need a new plating system and training for the operating theaters staff. The development of the minimally invasive technique of dynamic hip screwing that causes lower tissue and hemorrhage and shorter operating times and good fixation may therefore lead to better results, in particular in elderly sufferers<sup>15,16</sup>.

It is beneficial, because it reduces the risks of general anesthetic, to reduce operational time, particularly in the elderly with comorbid conditions or with weak cardiopulmonary storage. This can also be significant in the reduction of postoperative morbidity and mortality in these patients along with reduced surgical trauma.

In the surgical blood loss, the average distance from the large lateral crest to the first important perforating branch of 9.3 cm was found in an earlier angiographic analysis<sup>17</sup>. This area is therefore a relatively safe vascular area. A 3–5 cm incision and the incision point is about 4 cm below the vast lateral ridge in a minimally invasive dynamical hip screw technology.

Blood pressure decreases due to lower dissection of soft tissue and less susceptibility to fracture and because incision occurs in the healthy

vascular zone<sup>12,18</sup>. Diminished blood loss may be considered an indication of the decreased cardiovascular risks that minimize the need for blood transfusion.<sup>13,19</sup>

Fast movement in the MIDHS community has also been found to be significantly higher than traditional movement in our research. Moreover, urinary tract infection in patients with the MIDHS group was significantly lower than in the conventional group in the current study. These findings also correspond to other studies<sup>14,15,20</sup>.

### Conclusion

The present study shows the advantage of MIDHS technique as compared to conventional method, as it includes less operative time, less blood loss with early mobilization and shorter hospital stay and fewer complications.

### Conflict of Interest

Authors have no conflict of interest and no grant/funding from any organization.

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