Intertrochanteric Fracture Treated by Dynamic Hip Screw, Aden, Yemen

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Received: July 2021; Accepted: August 2021; Published: September 1, 2021.
Citation: Abdulsalam Abdullah Hadi Mohsen. Intertrochanteric Fracture Treated by Dynamic Hip Screw, Aden Yemen . World Family Medicine. 2021; 19(9): 31-38 DOI: 10.5742/MEWFM.2021.94122

Abstract

Objective: To evaluate the clinical outcomes of intertrochanteric fractures that were treated with Dynamic Hip Screw in Aden

Patients and method: This was a retrospective study of patients presenting with intertrochanteric fracture, to the Department of Orthopaedic Surgery at Algamhoria Teaching Hospital and at two private hospital in Aden, Yemen, during the period January 2018–December 2019. The patients were treated with Dynamic Hip Screw (DHS).

All information was obtained from the patient charts.

The collected data was tabulated and statistical analysis was done by estimating rates, means and standard deviations. Fisher test was used and p-value < 0.05 was considered as statistically significant. The statistical software package SPSS version 17 was used.

Results: Out of 48 patients, 29 patients were females (60.4%) and 19 patients (39.6%) were males and the mean age was 75.1±7.4 years. The mean age of male patients was 76.4 ± 6.9 years while for females was 74.2±7.7 years. The age ranged between 62 to 90 years.

The patients were categorized into 3 age groups: Group (I) ≤ 70 years old, (27.1%) were females and (10.4%) were males, Group (II) from 71 – 80 years old, (20.8%) were females and (14.6%) were males. Group (III) from 81 – 90 years old, (12.5%) were females and (14.6%) were males, (p > 0.05). Causes of injury were simple fall in most of the cases (79.1%).

The causes of injuries were significantly different among the age groups of patients (P < 0.05).

We found (58.3%) of intertrochanteric fractures were in the right side and (41.7%) were in the left side. The stable fractures were (52.1%) while unstable fractures were (47.9%).

According to Evan classifications (31.3%) of the intertrochanteric fractures were classified as Type I and (20.8%) were classified as Type II. Type III were predominant with (47.9%).

Superficial stitch infection were (4.2%) and (4.2%) were deep infection.

Shortening of 1-2cm occurred in (10.4%) of patients. Mal-union occurred in (20.8%) cases. Delayed union occurred in (10.4%) cases.

Active physiotherapy is given regularly for delayed union. Deep vein thrombosis developed in (8.4%) of cases and pulmonary thrombosis occurred in (4.2%) of cases.

Conclusion: The dynamic hip screw is a modality of choice in patients with intertrochanteric fracture; it is effective, simple, and safe. Further studies are needed to compare between our modality and other modalities.

Key words: dynamic hip screw, intertrochanteric fracture, femur, Aden, Yemen

Introduction

Intertrochanteric fractures are defined as extracapsular fractures of the proximal femur that occur between the greater and lesser trochanter. The intertrochanteric aspect of the femur is located between the greater and lesser trochanters and is composed of dense trabecular bone. The greater trochanter serves as an insertion site for the gluteus medius, gluteus minimus, obturator internus, piriformis, and site of origin for the vastus lateralis. The lesser trochanter serves as an insertion site for the iliacus and psoas major, commonly referred to as the iliopsoas [1,2].

The intertrochanteric fractures are classified as stable and unstable fractures according to the fracture fragment and direction of the fracture line [3]. A stable intertrochanteric fracture is a two-part fracture with a fracture line along the trochanter line, whereas an unstable intertrochanteric fracture is one where comminution of the posteromedial buttress exceeds a trochanteric fragment or where the fracture lines are within the subtrochanter [4]. Clinical results have indicated that the conventional Dynamic Hip Screw (DHS) can provide beneficial stability for simple and non-osteoporotic fractures but is unable to provide stable fixation for unstable or osteoporotic intertrochanteric fractures. Although use of DHS for stable intertrochanteric hip fracture fixation has been successful in fracture healing for more than 20 years, DHS fixation on unstable fractures has a failure rate of 3–26% [5,6,7], especially in osteoporotic fractures. Because the posteromedial buttress is the most crucial supporting point in load bearing [8], a single DHS fixation cannot provide stable fixation of a lesser trochanter fragment in an unstable intertrochanteric fracture. Supplemental fixation of the posteromedial buttress is required in unstable intertrochanteric fractures.

Femoral intertrochanteric fractures have been estimated to occur in more than 2,000,000 patients each year in the United States [9].

Closed methods of treating intertrochanteric fractures have been abandoned. Rigid fixation with early mobilization of patients should be considered as the standard treatment [10]. Although many devices can achieve rigid fixation, the dynamic hip screw (DHS) is the most commonly used device for intertrochanteric fractures [11,12].

The intertrochanteric fracture is one of the most common fractures of the hip in the elderly, and usually is a result of low-energy trauma [13]; it accounts for up to 48% of all hip fractures [14]. These fractures are associated with substantial morbidity and mortality, mechanical complications, and great financial burden to patients and their families[15].

Objective

To evaluate the clinical outcomes of intertrochanteric fractures that were treated with Dynamic Hip Screw in Aden.

Patients and Method

We retrospectively reviewed all charts of patients presenting with intertrochanteric fracture to the Department of Orthopaedic Surgery at Algamhoria Teaching Hospital and at two private hospitals in Aden, Yemen, over a 2-year period (January 2018–December 2019).

During the period, there were 48 patients with intertrochanteric fractures treated with Dynamic Hip Screw (DHS) and the postoperative follow up of the patients was at least 6 months in the outpatient units. The surgical technique, which we performed, was as follows:

Reduction of bones is usually achieved by first pulling in the direction of the long axis of the leg in order to distract the fragments and regain length.

Next comes the internal rotation; the reduction must be checked in both anterior-posterior (AP) and lateral with an image intensifier.

Insert the guide wire through the aiming device and advance it into the subchondral bone of the head, stopping 10 mm short of the joint.

In cases of Evan type 1 and Evan type 2, we used the DHS screw and 3 to 4 holes side plate with 3 to 4 screws. We placed the lag screw in the center or lower third in the anterior posterior view, and central on lateral view.

In cases of Evan type 3 we add Trochantric Stabilizing Plate (TSP). We keep the tip-apex distance of less than 25 mm. All information was obtained from the patient charts.

The collected data were sex, age, cause of injury, side, stability, Evan classification and postoperative complications.

The collected data were tabulated and statistical analysis was done by estimating rates, means and standard deviations. Fisher test was used and p-value < 0.05 was considered as statistically significant. The statistical software package SPSS version 17 was used.

Results

Out of 48 patients, 29 patients were females (60.4%) and 19 patients (39.6%) were males and the mean age was 75.1±7.4 years. The mean age of male patients was 76.4 ± 6.9 years while for females it was 74.2±7.7 years. The age ranged between 62 to 90 years; Table 1 and Figure 1.

As shown in Table 2 the patients were categorized into 3 age groups: Group (I) ≤ 70 years old, 13 (27.1%) were females and 5 (10.4%) were males, Group (II) from 71 – 80 years old, 10 (20.8%) were females and 7 (14.6%) were males. Group (III) from 81 – 90 years old, 6 (12.5%) were females and 7 (14.6%) were males. The difference between values shows no statistical significance ($p > 0.05$).

Table 1: Distribution of demographic characteristics of the study patients (n = 48)

Variable	Ratio	Range	Mean	No	%	p-value
Sex:						
Females				29	60.4	
Males				19	39.6	
Female to male	1.5:1					
Age range (years):		62-90				
Mean age ± SD* (years):						
All patients			75.1 ±7.4			P > 0.05
Male patients			76.4 ±6.9			
Female patients			74.2 ±7.7			

SD*: Standard deviation.

Figure 1: Distribution of study patients related to sex

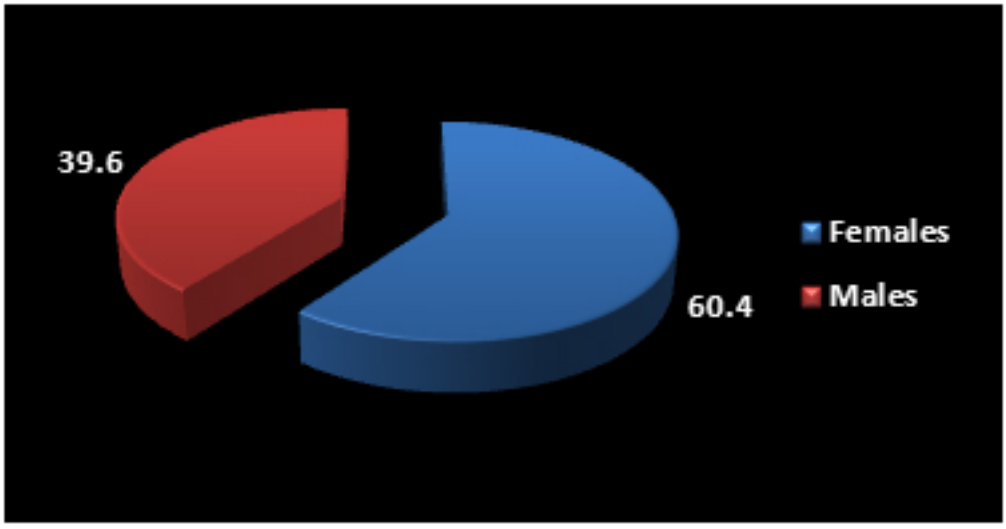


Table 2: Distribution of Age groups and Causes related to sex of the study patients (n=48)

Variables	Sex				Total		P-value
	Females		Males				
	No	(%)	No	(%)	No	(%)	
Age groups (years):							
≤ 70	13	(27.1)	5	(10.4)	18	(37.5)	
71 – 80	10	(20.8)	7	(14.6)	17	(35.4)	P > 0.05
81 – 90	6	(12.5)	7	(14.6)	13	(27.1)	
Cause:							
Simple fall (slipping)	22	(45.8)	16	(33.3)	38	(79.1)	
Fall Down (fall on stairs)	5	(10.4)	2	(4.2)	7	(14.6)	P > 0.05
Road Traffic Accident	2	(4.2)	1	(2.1)	3	(6.3)	

In this study, mechanisms of injury were simple fall in most of the cases 38 (79.1%) patients, fell on stairs 7 (14.6%) patients and Road Traffic Accident (RTA) in 3 (6.3%) patients; Figure 2. There is no statistical relation between causes of injuries and sex ($p > 0.05$).

The causes of injuries were significantly different among the age groups of patients ($P < 0.05$). The age group 71-80 years was injured in simple falls 17 (35.4%).

Injuries due to fall down were among the age group ≤70 years old 7 (14.6%) and also road traffic accidents 3 (6.3%) were among the age group ≤70 years old. Those 81-90 years old were injured through simple falls (slipping) 13 (27.1%) as shown in Table 3.

Twenty eight (58.3%) of intertrochanteric fractures were in the right side and 20 (41.7%) were in the left side. The stable fractures were 25 (52.1%) while unstable fractures were 23 (47.9%). According to Evan classifications 15 (31.3%) of the intertrochanteric fractures were classified as Type I and 10 (20.8%) were classified as Type II. Type III were predominant with 23 (47.9%) as shown in Table 4.

Four cases developed wound infection, 2 (4.2%) of them were superficial stitch abscess and 2 (4.2%) were deep infection, Table 4. The treatment protocol for superficial infection was continuation of antibiotics and daily dressing.

The 2 cases of deep infection were treated with thorough irrigation, excision of slough and debridement of infective material with continuation of antibiotics sensitive to the organism. Also in Table 4 we found shortening of 1-2cm occurred in 5 (10.4%) patients; none of them had any functional deficit. Mal-union occurred in 10 (20.8%) cases. Delayed union occurred in 5 (10.4%) cases. Active physiotherapy was given regularly for delayed union. Deep vein thrombosis developed in 4 (8.4%) cases and pulmonary thrombosis occurred in 2 (4.2%) cases, as shown in Table 4 and Figure 3.

Figure 2: Causes of intertrochanteric fracture

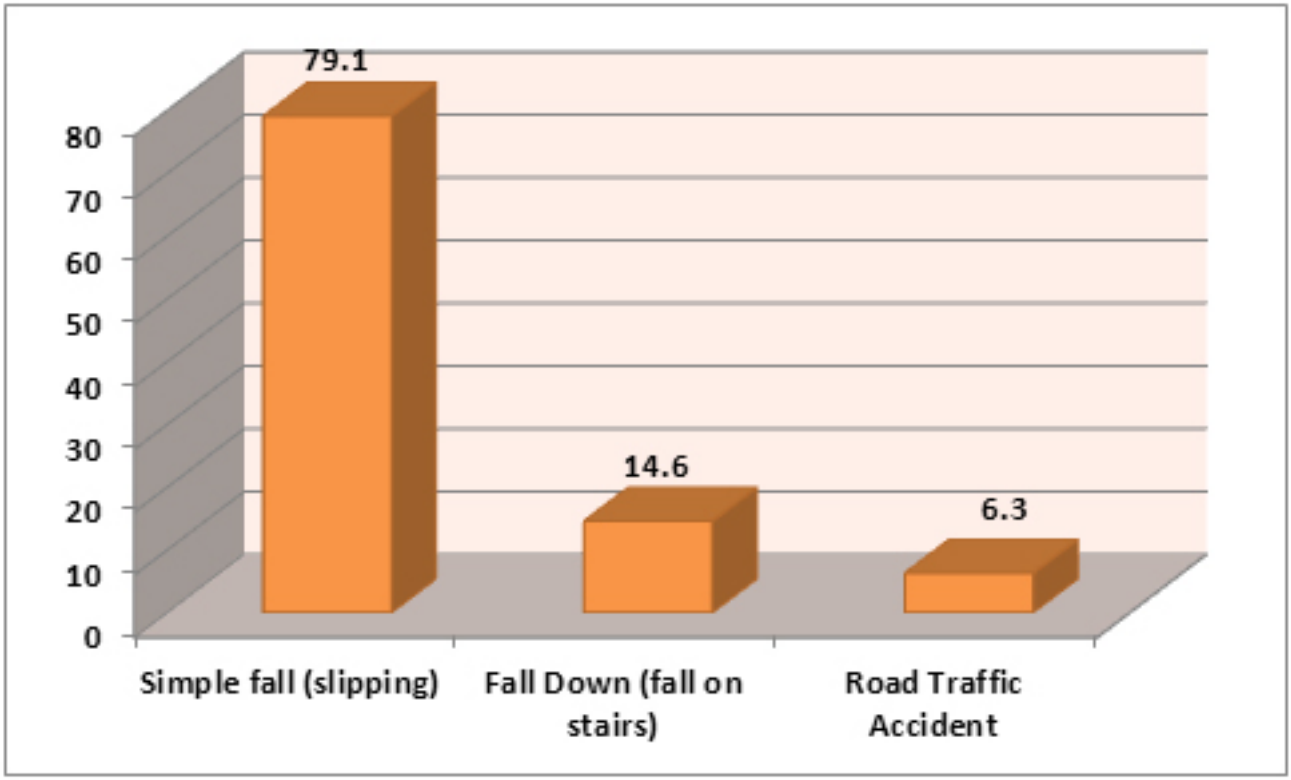


Table 3: Distribution of causes related to age groups of patients

Variables	Causes						Total	
	Simple fall		Fall Down (on stairs)		RTA			
	No	(%)	No	(%)	No	(%)	No	(%)
≤70	8	(16.7)	7	(14.6)	3	(6.3)	18	(37.5)
71-80	17	(35.4)	0	(0.0)	0	(0.0)	17	(35.4)
81-90	13	(27.1)	0	(0.0)	0	(0.0)	13	(27.1)
Total	38	(79.2)	7	(14.6)	3	(6.3)	48	(100)

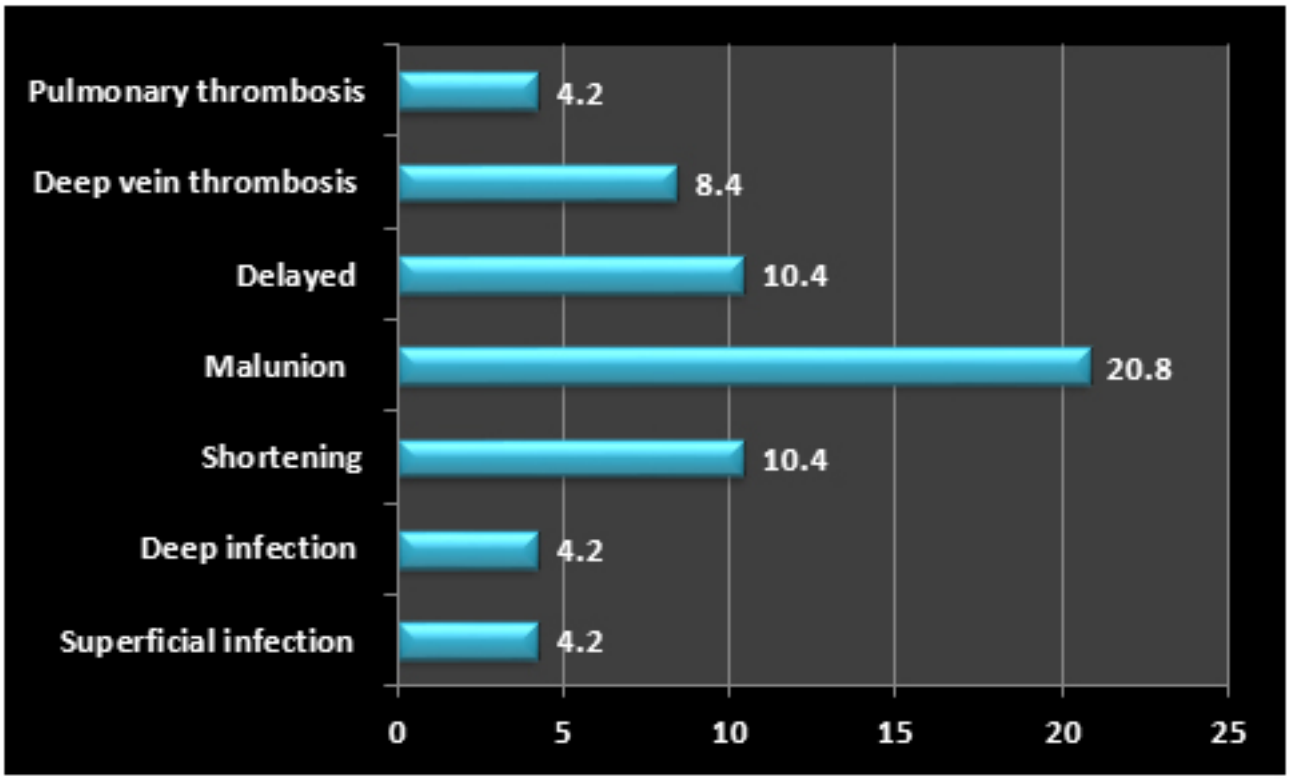
P = 0.000

Table 4: Distribution of characteristics and complications of intertrochanteric fractures (n = 48)

Variables	No	%
Side:		
Right	28	58.3
Left	20	41.7
Stability:		
Stable	25	52.1
Unstable	23	47.9
Evan Classification:		
Type I	15	31.3
Type II	10	20.8
Type III	23	47.9
Superficial infection:		
No	46	95.8
Yes	2	4.2
Deep infection:		
No	46	95.8
Yes	2	4.2
Shortening:		
No shortening	43	89.6
Yes 1-2 cm*	5	10.4
Mal-union:		
No	38	79.2
Yes	10	20.8
Delayed:		
No	43	89.6
Yes	5	10.4
Deep vein thrombosis:		
No	44	91.6
Yes	4	8.4
Pulmonary thrombosis:		
No	46	95.8
Yes	2	4.2

*Cm = centimeter

Figure 3: Distribution of complications of intertrochanteric fractures



Discussion

The dynamic hip screw, which provides rigid fixation and allows early mobilization as it enables optimal collapse and compression of the fracture site [7], is the most common extramedullary device used for intertrochanteric fractures and has reasonable results [16,17].

The treatment for intertrochanteric fractures has evolved significantly over the last few decades. Several methods were introduced for fixation for fractures. Among all DHS could be considered as the gold standard for fixation of intertrochanteric fractures [18].

Since 1951, when the Polish physician Ernst Pohl first demonstrated the use of the classic form of DHS for the treatment of femoral fractures, DHS has been considered to be the ideal treatment option for extra-medullary fixation of the intertrochanteric fracture [19].

DHS provides continuous dynamic pressure to promote bone union and thus reduces the occurrence of nonunion. However, the unlimited dynamic pressure tends to cause complications and treatment failure [20]. It has been reported that when screw sliding exceeds 15 mm, it is considered a treatment failure [21].

In our current study we found out of the total study patients, 29 patients were females (60.4%) and 19 patients (39.6%) were males and the mean age was 75.1±7.4 years. The mean age of male patients was 76.4 ± 6.9 years while for females was 74.2±7.7 years. The age ranged between 62 to 90 years.

Kani et al [22] mentioned in their study that intertrochanteric fractures occur both in the elderly and the young, but they are more common in the elderly population with osteoporosis due to a low energy mechanism. The female to male ration is between 2:1 and 8:1. These patients are also typically older than patients who suffer femoral neck fractures.

Our finding is similar to the finding in a study conducted in Egypt by Rashad et al [23] who found 50 patients with intertrochanteric fractures of femur where 37 (74%) were females and 13 (26%) were males; all of them were above 60 years old ranging from 60 - 75 years old. Our study also correlates with White and colleagues' [24] study where average age was 75.4 years.

In this study, mechanisms of injury were simple fall (slipping) in most of cases 38 (79.1%) patients, fall on stairs 7 (14.6%) patients and Road Traffic Accident (RTA) in 3 (6.3%) patients. There was no statistical relation between causes of injuries and sex ($p > 0.05$).

A study in Egypt [23] reported that mechanisms of injury were simple fall in most of the cases 34 (68%), fall on stairs 12 (24%) patients and Road Traffic Accident in 4 (8%) patients.

In our study we found 28 (58.3%) of intertrochanteric fractures were in the right side and 20 (41.7%) were in the left side. This finding was in agreement with that reported by Rashad et al [23] who found 29 patients (58%) were in the right side and 21 patients (42%) were in the left side. We found in our study the stable fractures were 25 (52.1%) while unstable fractures were 23 (47.9%). Intertrochanteric

fractures are classified as stable and unstable fractures according to the fracture fragment and direction of the fracture line [3].

A stable intertrochanteric fracture is a two-part fracture with a fracture line along the trochanter line, whereas an unstable intertrochanteric fracture is one where comminution of the posteromedial buttress exceeds a trochanteric fragment or where the fracture lines are within the subtrochanter [4].

Four cases developed wound infection, 2 (4.2%) of them were superficial stitch abscess and 2 (4.2%) were deep infection. The treatment protocol for superficial infection was continuation of antibiotics and daily dressing. The two cases of deep infection were treated with thorough irrigation, excision of slough and debridement of infective material with continuation of antibiotics sensitive to the organism.

Puram et al [25] found in their study 7 (6.7%) complications, one superficial infection (1%), one deep vein thrombosis (1%), and one (1%) deep infection.

We found also, in our study shortening of 1-2cm occurred in 5 (10.4%) patients, none of them had any functional deficit. It has been demonstrated that proximal femoral shortening is affected by multiple factors after surgical treatment for femoral intertrochanteric fractures. In particular, the degree of tip-apex distance (TAD) and the fracture aspect have been suggested to be significant risk factors [26].

In a study [27] from Koria, 7 patients had TAD exceeding 25 mm; among them, 6 were further categorized into the high-risk group (>10%) of femoral offset shortening.

In the current study mal-union occurred in 10 (20.8%) cases. Delayed union occurred in 5 (10.4%) cases. Active physiotherapy was given regularly for delayed union.

Huang et al [20] reported that DHS provides continuous dynamic pressure to promote bone union and thus reduces the occurrence of nonunion. It has been reported that when screw sliding exceeds 15 mm, it is considered a treatment failure [21].

To deal with these clinical problems, Limited Dynamic Hip Screw (LDHS) preserves the feature of the traditional dynamic screw by keeping the screw sliding cavity, which not only maintains the dynamic pressure to facilitate bone union, but also prevents the main screw from unlimited outside sliding. These modifications effectively limit the main screw sliding and reduce the complications of DHS [28].

For a femoral intertrochanteric fracture, many devices can result in stable fixation and achieve union [29,30,31]. The advantage of the DHS was interfragmental compression effect with a high union rate [12].

In our study, we found deep vein thrombosis developed in 4 (8.4%) cases and pulmonary thrombosis occurred in 2 (4.2%) cases.

Laohapoonrungsee et al [32] reported in their study from Thailand, there were no cases of deep vein thrombosis. The incidence of post-operative deep vein thrombosis in Asia was reported much lower than the western population [33].

Venous thrombosis is a substantial cause of morbidity and mortality in patients following hip fracture [34].

Asymptomatic deep vein thrombosis (DVT) has been reported in up to 50% of all patients who sustain a hip fracture, with an incidence of fatal pulmonary embolus (PE) of up to 10%. The incidence of asymptomatic thrombi will always be markedly higher than those that are clinically apparent [34,35].

Conclusion

As a result of our experience we found that the dynamic hip screw is a modality of choice in patients with intertrochanteric fracture; it is effective, simple, and safe. Further studies are needed to compare between our modality and other modalities.

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