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Locked Dynamic Hip Screw Plate for Osteoporotic Patients with Intertrochanteric Femur Fracture

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ABSTRACT

Background: Hip fractures are a leading cause of disability among the elderly. Treatment goals for this patient population include early mobilization with restoration of the anatomic alignment of the proximal part of the femur and maintenance of the fracture reduction.The aim of this study was efficient treatment of inter trochanteric femoral fracture in elderly patients.**Patients and Methods**: This study was a non-randomized clinical trial include eighteen patients with intertrochanteric femoral fracture fixed with locked dynamic hip screw plate, they came to orthopedic department in Zagazig university hospital and orthopedic department in Tripoli central hospital over 6 months from July 2020 until September 2020. Patients with sub-trochanteric extension were excluded. There was 10 cases group A1 and eight cases group A2 according to AO Orthopedic Trauma Association (OTA). **Results**: Clinical and radiological outcome assessments were 77.8% were excellent clinically, 11.1% were good and 11.1% were fair while regard radiological, 83.3% were excellent, 11.1% were good and 5.6% were fair. As regard complications 4 cases had groin pain and 1 case had lag screw cut-out and overall complication was in 22.2%. **Conclusion**: Locking DHS plate for trochanteric femur fractures is a good option in elderly patients.

Keywords:Dynamic hip screw (DHS), Elderly Patients, Femur Fracture

INTRODUCTION

Hip fractures are the most common cause of impairment in the elderly. Early mobilization with restoration of the anatomic alignment of the proximal part of the femur and maintenance of fracture reduction are treatment goals for this patient population[1].

Trochanteric femur fractures account for about half of all proximal femur fractures, with 50–60% categorized as unstable. Unstable fracture patterns are increasingly common as people get older and their bone mineral density decreases. Patients with intertrochanteric fractures tend to be less mobile and more reliant on others for care[2].

Since the introduction of internal fixation, the treatment of patients with trochanteric femur fractures has advanced substantially. However, recent research has highlighted the disparities in failure rates between stable and unstable intertrochanteric hip fracture patterns[3].

Restoring mobility in patients with unstable intertrochanteric fractures is ultimately dependent on the surgical construct's strength. The dynamic hip screw (DHS) is a frequent treatment for stable intertrochanteric fractures. Shortening, medialization of the distal fragment, implant cut-outs, uncontrolled lateralization of the proximal fragment, and varus collapse are all DHS complications[4].

The lag screw cutting out of the femoral head is the most common form of failure, followed by the plate being driven off the femur and the screws being pulled out of the osteoporotic bone. The post-operative cut off ranges between 1% and 6% [5].

To address these issues, a locking plate and screw mechanism was created. The locking compression plate combines two distinct anchorage systems in a single implant [6].

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In terms of complication rate and reduction maintenance, a locked side plate for DHS outperforms a normal DHS plate in treating intertrochanteric fractures[7]. The goal of this study was to find the most effective way to treat inter trochanteric femoral fractures in older adults.

PATIENTS AND METHODS

This study is a non-randomized clinical trial include eighteen patients aged above 50 years old with intertrochanteric femoral fracture fixed with locked dynamic hip screw plate, 12 patients came to orthopedic department in Zagazig university hospital and 6 patients came to orthopedic department in Tripoli central hospital over 6 months from July 2020 until September 2020 and followed up for 6 months. Patients with sub-trochanteric extension, unstable pattern of fracture and patients with severe debilitating disease were excluded.

Approval taking Institutional Review Board (IRB)approval and also informed written consent was taken from patients and/or their caregivers. This Work was performed according to the code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Pre-operative:

All patients underwent full history taking, detailed orthopedic examination, clinical and radiological evaluation. After primary stabilization of the patient, plain X-ray films with an anteroposterior view of pelvis including both hip joints in 15° internal rotation and a lateral view of hip joint were obtained. Each fracture was classified using AO Orthopedic Trauma Association (OTA). In this study, there were 10 hips with intertrochanteric fracture grade A1 and eight hips grade A2. Skin traction was done as to plint the fracture until the definitive management was planned. broad spectrum antibiotics in the form of intravenous cephalosporin was administered during induction of anesthesia.

Surgical technique:

After Spinal or general anesthesia according to the anesthesia specialist. The patient was positioned to a fracture table with both legs on extension rails. The fracture was reduced by traction in abduction and then internal rotation of the lower limb. In five cases closed reduction failed then open reduction was performed through the lateral approach. Varusmalalignment was found in three cases corrected with additional longitudinal traction to disengage the fracture fragments, followed by reduction. Posterior sag was found in five cases the result of posterior comminution and corrected by manual correction with upward pressure applied to the buttock. Once the fracture was reduced, the patient was draped.

Straight lateral skin incision, beginning two finger breadths below the tip of the greater trochanter (figure 1).

Figure 1: Straight lateral skin incision.

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The iliotibial tract was split longitudinally from the tip of the trochanter distally. The vastuslateralis muscle was elevated anteriorly. Then elevation of the periosteum.Hohmann retractors were inserted anteriorly in the region of the proximal femur. The locked DHS angled guide was attached. Locked DHS guide wire with threaded tip was inserted into the sub-chondral bone. The guide wire was inserted to be central in the neck and the head in both anteroposterior and lateral views. The guide wire remained in place throughout the entire internal fixation. The position of the guide wire was checked with the image intensifier in both the anteroposterior and lateral planes.
The locked DHS measuring device was pushed over the guide wire. The length that was read of the guide wire was inserted in the bone directly. Then 10 mm from the length measured with the locked DHS measuring device was subtracted, and the setting of the triple reamer was adjusted to correspond (figure 2).

Figure 2: Measuring the length.

Reaming with locked DHS triple reamer; the locked DHS triple reamer was attached.The hole produced in one operation had three different diameters: one for the screw, one for the plate cylinder and one for the junction of plate and cylinder. The depth of drilling could be adjusted in 5 mm steps. The three elements of the locked DHS triple reamer were so designed that incorrect assembly was not possible.The locked DHS triple reamer was removed. The locked DHS centering sleeve was attached to the locked DHS tap and mounts the handle on the tap.The lag screw was screwed into the femoral head together with the long centering sleeve over locked DHS. When the zero marking in the window reached the upper semicircular edge of the centering sleeve that point towards the femur, the end of the screw had reached the lateral cortex. The handle of the screw wrench at the end must be parallel to the femoral shaft. Otherwise the locked DHS plate couldn't be pushed over the screw.
The locked DHS plate was pushed onto the femoral shaft until it touched the lateral cortex.
The guide wire was removed. The plate was driven with the impactor. The locked DHS plate was inserted, locked screwed to the femoral shaft (figure 3).

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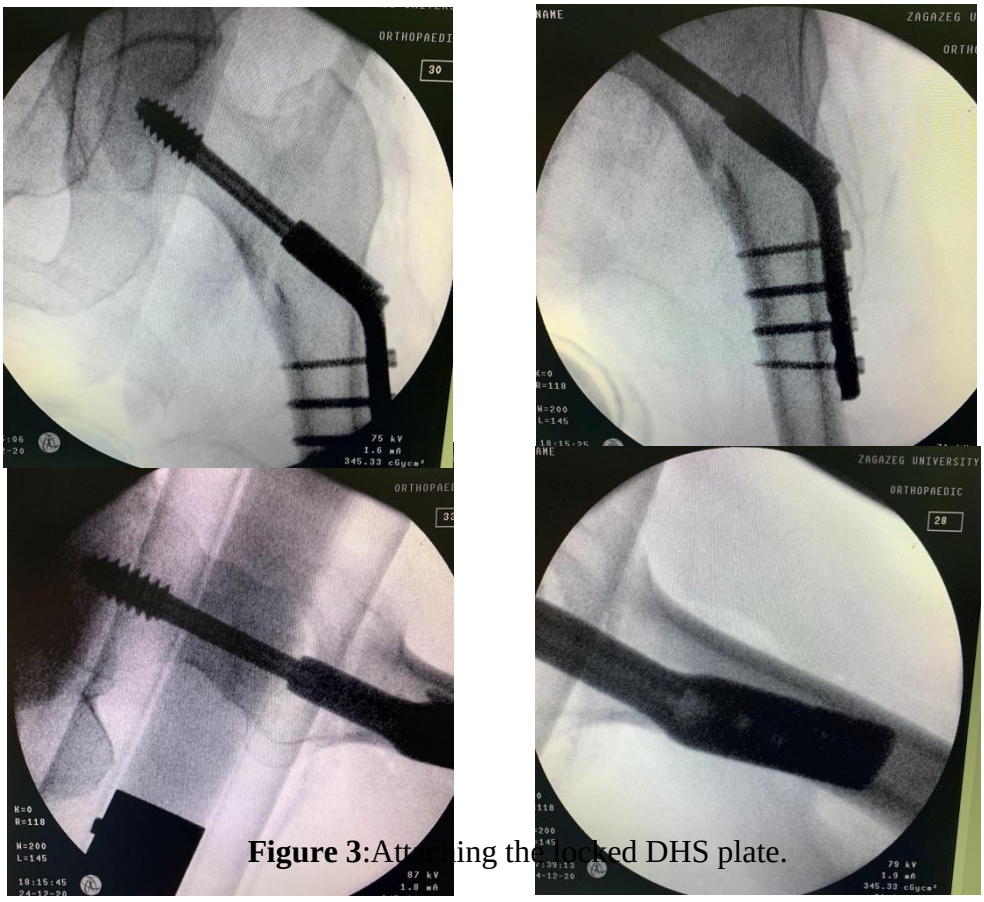

Figure 3:Attaching the locked DHS plate.

Compression of the fragments was done with locked DHS compression screw. After a radiographic check of the result, suction drain was inserted beneath the muscle. The wound was irrigated and then closed in layers.

Post-operative follow up:

Postoperatively, immediate post-operative X-rays to ensure good reduction and good position of the implant, intravenous broad spectrum antibiotic was administered for three days and low molecular weight heparin was started twelve hours after surgery.

All patients started range of hip and knee motion as well as quadriceps strengthening exercises in the second day postoperative.

Partial weight bearing is allowed according to stability of reduction. Full weight bearing was not allowed till good amount of fracture healing. Patients were followed up at 2 weeks for removal of sutures, 6 weeks, 12 weeks and 6 months for follow up check X rays. Anteroposterior and lateral radiographs were examined for union, lag screw position, collapse of fracture, Tip-apex distance (TAD) and femoral shortening. Potential complications were looked.

Statistical analysis

Data from the history, basic clinical examination, laboratory tests, and outcome measures were coded, entered, and analyzed in Microsoft Excel software. The data was then imported into the Statistical Package for the Social Sciences (SPSS version 20.0) program for analysis. Differences between quantitative independent groups were tested using the t test, paired with the paired t test, and the P value was set at 0.05 for significant results and 0.001 for highly significant results.

RESULTS

The mean age at time of surgery was 72.77±11.0 with minimum 53 and maximum 93 years, and as regards the sex distribution, the females represent 55.6% of studied group while the males represent 44.4% **[Figure 1a,b]**.

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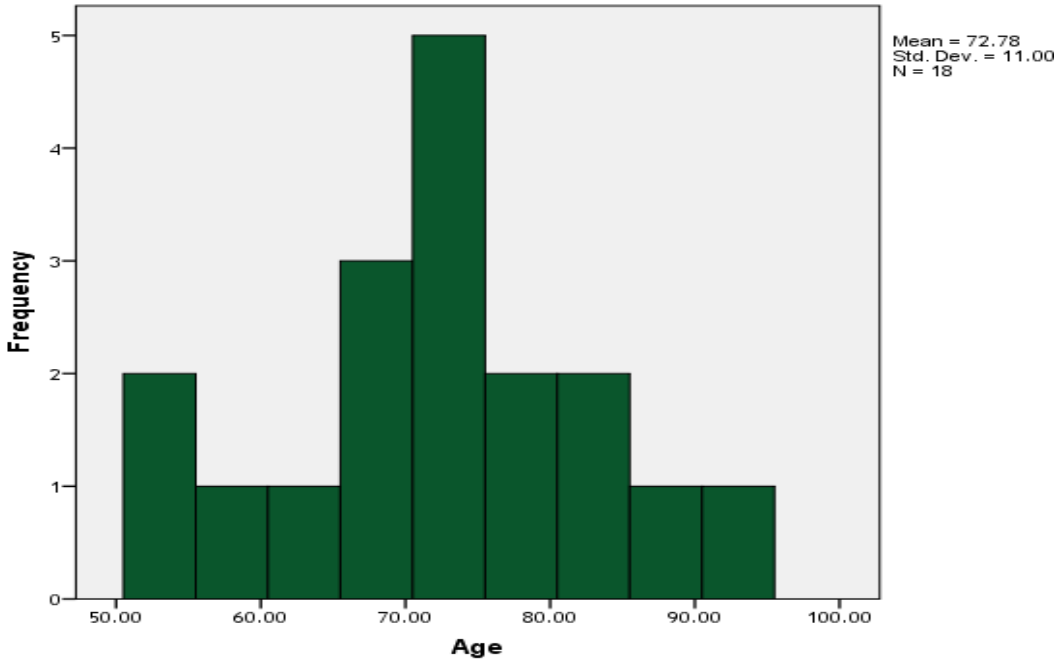

Figure 1a: Distribution of the studied patients group according to age.

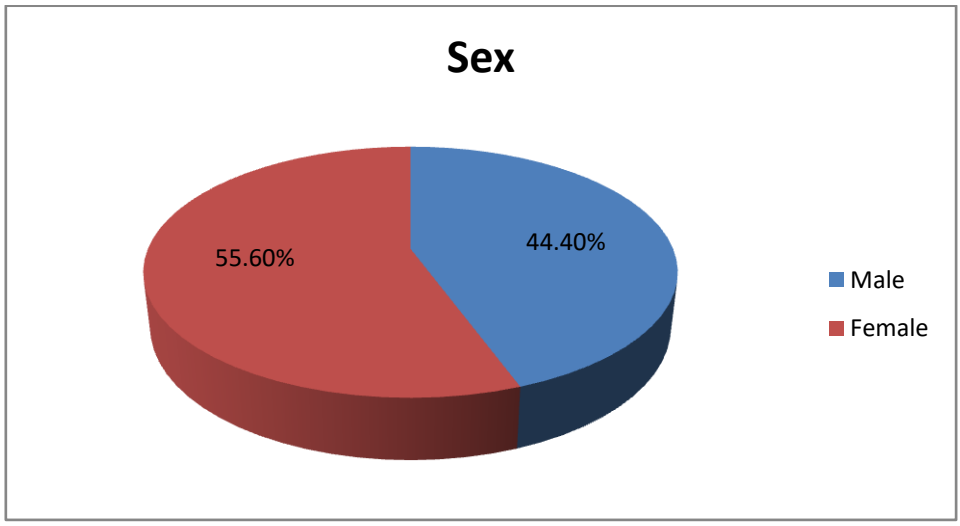

Figure 1b: Pie chart for sex distribution in the study group.

Mean time before surgery was 3.88±2.24 days with a minimum of one day and a maximum of 10 days, eleven cases were left sided (61.1%) and seven cases were right sided (38.9%), the most commonmechanism of injury (MOI) was simple fall (55.6%) then RTA and fall down stairs were 22.2% and regards the AO classification A1 was 55.6% and A2 44.4% **[Table 1].**

Table 1: Fracture characters distribution among studied group:

	Time before surgery in days
Mean± SD	**3.88±2.24**
Median (Range)	**3.0 (1-10)**

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		N	%
Side	Lt.	11	61.1
	Rt.	7	38.9
MOI	Fall down stairs	4	22.2
	RTA	4	22.2
	Simple fall down	10	55.6
AO Classification	A1	10	55.6
	A2	8	44.4
	Total	18	100.0

The mean operative time was 115.27±30.98 minutes with a minimum of 85 and a maximum of 180 minutes (figure 2). The union time was distributed as 13.72±1.01 with minimum 12 and maximum 15 weeks(figure 3).

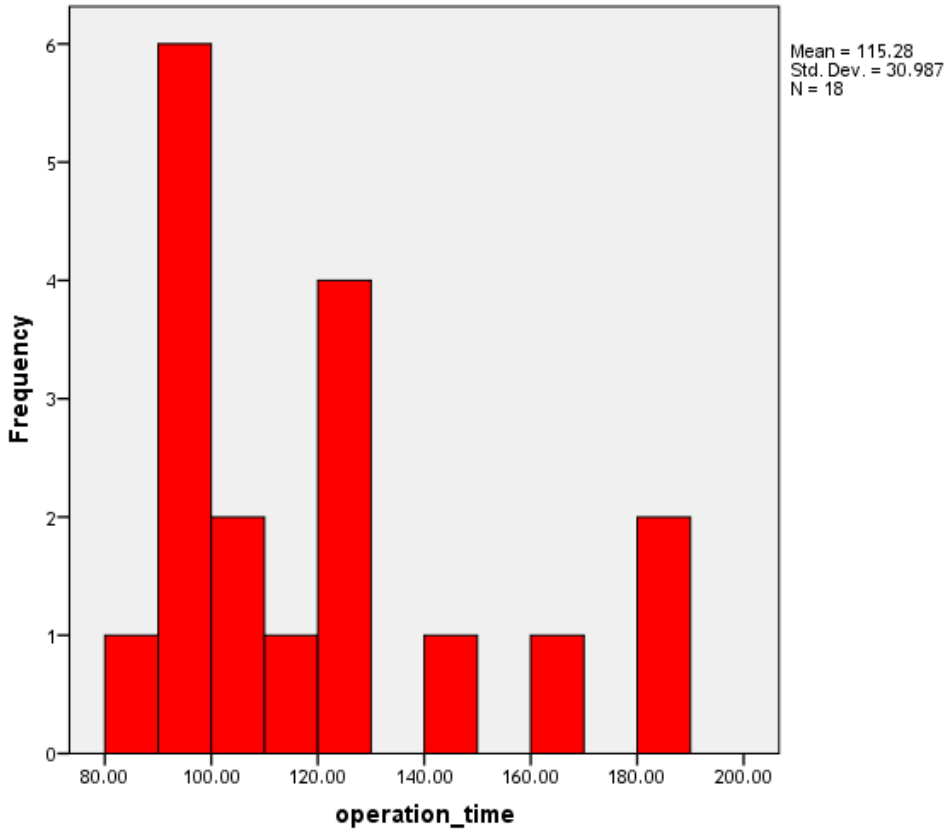

Figure 2: Distribution of the studied patients group according to operation time.

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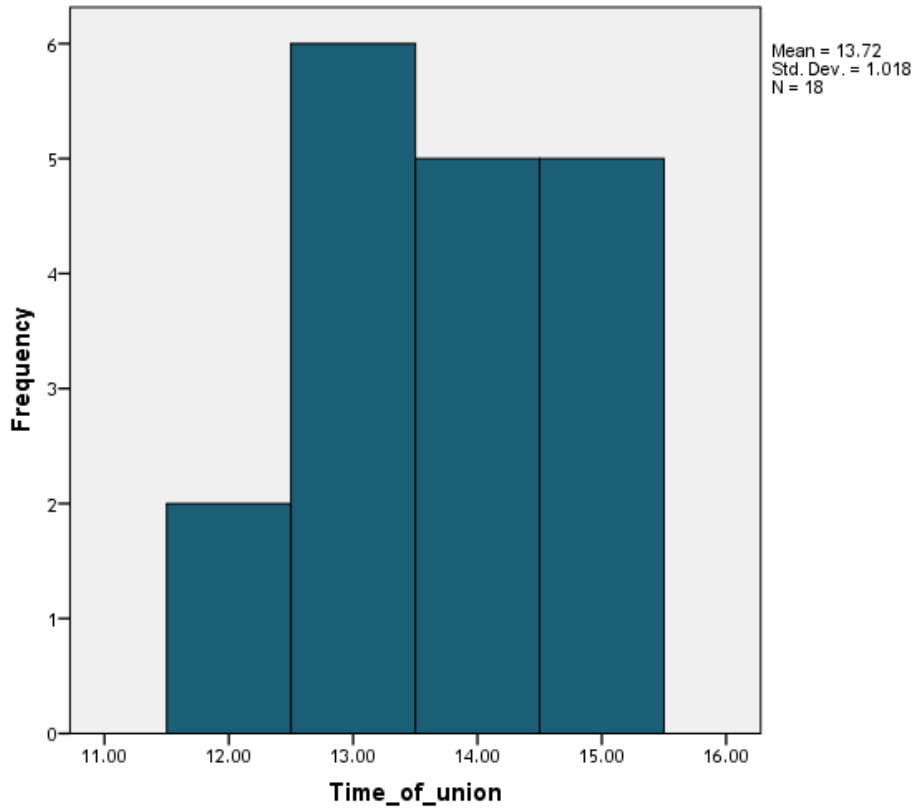

Figure 3 Distribution of the studied patients group according to time of union.

Fourteen hips (77.8%) were excellent clinically, two hips (11.1%) were good and two hips (11.1%) were fair while regard radiological, 83.3% were excellent, 11.1% were good and 5.6% were fair **[figure 4a,b]**.

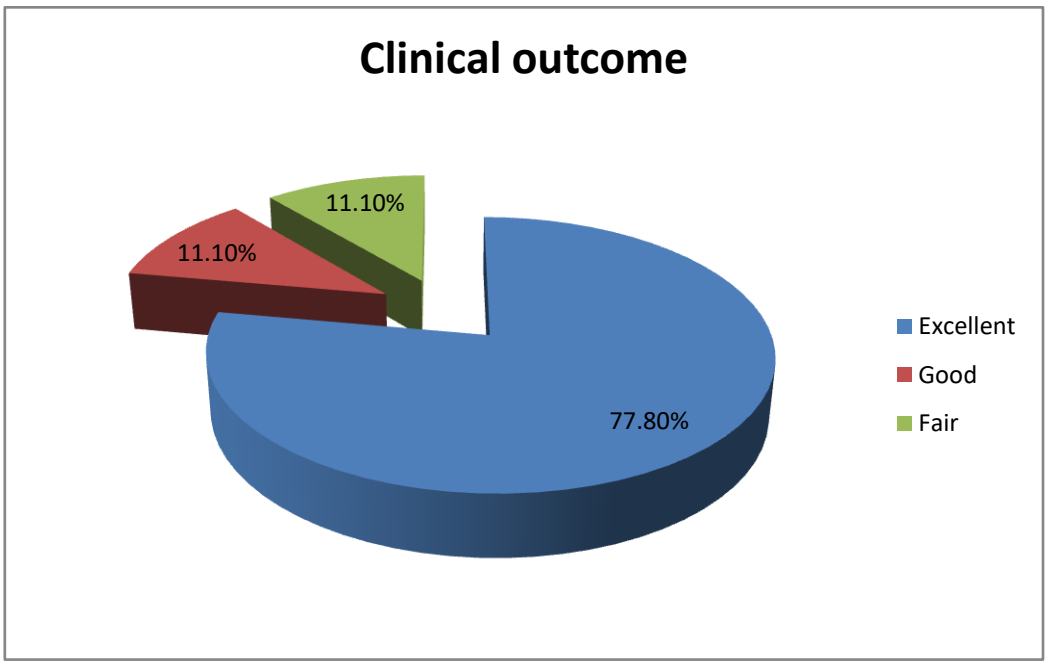

Figure 4a: Pie chart for clinical outcome in the study group.

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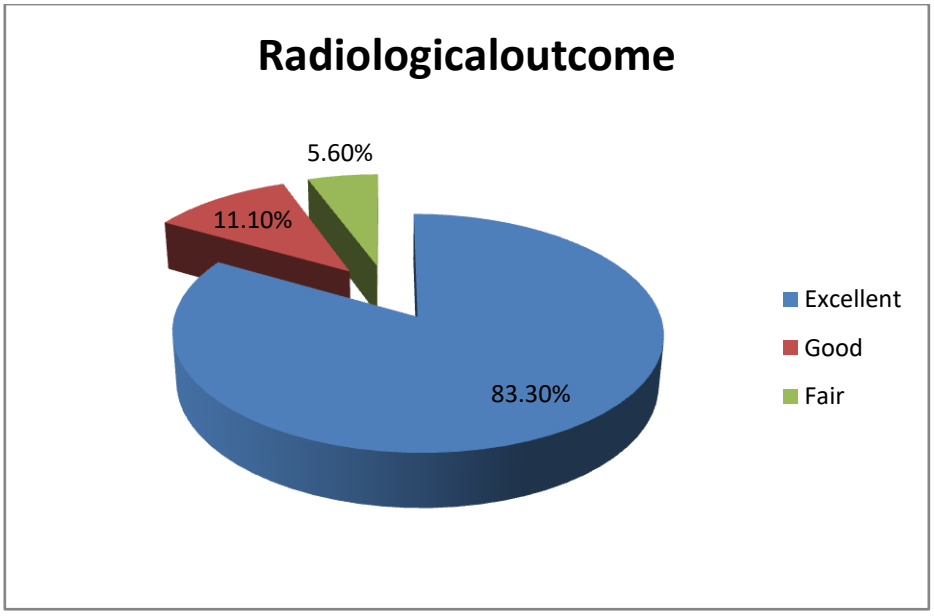

Figure 4b: Pie chart for radiological outcome in the study group.

Two cases had mild groin pain, 2 cases had severe groin pain and 1 case had lag screw cut-out, overall complication was in 22.2% **[Table 2]**.

Table 2: Complication distribution among studied group:

		N	%
Groin pain	**No**	**14**	**77.8**
	Yes	**4**	**22.2**
Infection	**No**	**18**	**100.0**
	Yes	**0**	**0.0**
Mal- union	**No**	**18**	**100.0**
	Yes	**0**	**0.0**
Delayed union	**No**	**18**	**100.0**
	Yes	**0**	**0.0**
Lag screw cut-out	**No**	**17**	**94.4**
	Yes	**1**	**5.6**
Overall complication	**Not complicated**	**14**	**77.8**
	Complicated	**4**	**22.2**
	Total	**18**	**100.0**

DISCUSSION

The mean age in this study was 72.7711.0, with a minimum of 53 and a maximum of 93 years, which is higher than the mean age reported by Barwar et al [5], who reported a mean age of 64.8, and Yadkika et al [8], who reported a mean age of 67. In this study, age has a negative link with the final outcome.

In this study, females account for 55.6 percent of the studied group, while males account for 44.4 percent. In our study, there was a female sex preponderance. This was consistent with the findings of Dhar et al [9], Lei, JieShen, et al[10], while Daivesh et al [11], Chang et al [12], and Yadkika et al. [8] found a male sex majority. There was no significant relationship between sex and the end outcome in this study.

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The average period before surgery was 3.88 days, with a minimum of 1 day and a high of 10 days. The shorter the period between admission and operation, the better the outcome. This is consistent with Barwar et al. [5], A Dhar et al. [9].

Guo-Chun et colleagues discovered that the average surgical time for treating trochanteric fractures using a proximal femur locking compression plate was 35.5 minutes[13].

Govindasamy et al., who retrospectively evaluated dynamic hip screws with locking side plates in the repair of trochanteric fractures, observed an average operation time of 50 minutes[14]. In this investigation, the operation length was distributed as 115.2730.98 minutes, with a minimum of 85 minutes and a maximum of 180 minutes.

In 83 patients, Zhong et al compared the stabilization of femoral fractures by PFLP against DHS. In their 30 cases, all of which were classified as unstable inter-trochanteric fractures. They reported that the average operation time for PFLP was 55.73 minutes compared 603.3 minutes for DHS[15].

According to Asif et al, the average operational time for instances of unstable intertrochanteric fractures treated with a Dynamic hip screw with locking side plate was 755 minutes, compared to 569 minutes for cases treated with DHS[16].

It was discovered that patients who had less operating time had more satisfactory results than those who had greater surgical time. There was, however, no statistically significant relationship between operative time and final score.

Nikhil et al[17] were another author that sought to investigate the outcomes of Locking Dynamic Hip Screw fixation. They enlisted 25 patients with intertrochanteric femur fractures who were hospitalized to their health facility in India. All of their patients were considered geriatric, and clinical and radiological outcomes were evaluated with regular follow-up, as well as functional grading based on the Harris Hip Score. Regarding the duration of union, they defined successful fracture union as complete bridging callus in three cortices combined with painless full weight bearing, and according to that definition, they found that of 25 patients, 10 (40%) exhibited radiological union before 12 weeks, 12 (48%) exhibited union between 13-16 weeks, and 3 (12%) exhibited union between 17-2 weeks. The average time for radiological union was 13.96 weeks. This was substantially longer than the average length of our union. In their study, the average Modified Harris Hip Score was 82.12, with a range of 66.5-92.5. The complications encountered were not particularly serious. 12 percent of the patients had superficial wound infections that responded to antibiotics alone, 4% had deep infections that required a prolonged course of IV antibiotics and protected weight bearing, and 8% developed decubitus ulcers that were managed with aseptic dressings, air beds, and increased mobilization. Only 4% of patients developed shaft medialization, which was followed by delayed weight bearing and resulted in union at 22 weeks. Their most significant finding in terms of outcome was that no implant-related complications such as lag screw cut-out or side plate pull out were reported[17].

One limitation of our study was the small number of patients, which may have a negative impact on the level of evidence. All of the patients were slightly younger than patients in other studies, with a maximum age of 72 years, so the bone quality of the patients may be stronger than in other studies, allowing them to resist failure; however, we aimed to introduce a suggestion, not a stron.

CONCLUSION

Locking DHS plate technique significant merits in treating trochanteric femur fractures in terms of lower complication rate and maintenance of reduction especially in osteoporotic patients. Locking DHS plate for trochanteric femur fractures is a good option in elderly patients. Mobilization and early functional results are good to satisfactory. The sooner the

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operation done the better is the results regarding functional and anatomical outcome in addition to time of union.

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