

Clinical and Radiological Outcomes of Femoral Neck Fractures Treated with Dynamic Hip Screw, Derotation Screw and Iliac Bone Grafting: A Prospective Cohort Study

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Abstract

Background: Femoral neck fractures in younger adults require stable fixation and preservation of femoral head vascularity to achieve satisfactory functional outcomes. Dynamic hip screw (DHS) fixation with an additional derotation screw and iliac crest bone grafting is intended to provide stable fixation and promote fracture healing.

Aim: To evaluate the clinical and radiological outcomes of femoral neck fractures treated with DHS, derotation screw, and iliac bone grafting.

Materials and Methods: This prospective, hospital-based cohort study was conducted at Navodaya Medical College Hospital and Research Centre, Raichur, from August 2022 to August 2023. Twenty patients with femoral neck fractures were included. Data were collected through medical records, patient interviews, radiographic assessment, and follow-up examinations. The primary outcomes assessed were time to radiographic fracture union, postoperative complications including avascular necrosis (AVN) and infection, and functional outcome using the Harris Hip Score. Statistical analysis was performed using SPSS.

Results: The study included 20 patients with a mean age of 38.9 ± 3.15 years. Eleven (55%) were males and nine (45%) were females. Road traffic accidents accounted for 80% of injuries, while 20% were due to falls from height. Garden type II fractures were most common (50%). The mean operative duration was 90.25 ± 10.90 minutes, with a mean blood loss of 152.5 mL. Mean radiographic union occurred at 13.55 ± 2.07 weeks. AVN occurred in 2 patients (10%) and postoperative infection in 3 (15%), while 15 patients (75%) had no reported complications. The mean Harris Hip Score was 85.25 ± 7.06 , with 6 patients having excellent, 11 good, 1 fair, and 2 poor functional outcomes.

Conclusion: DHS fixation combined with a derotation screw and iliac bone grafting provided satisfactory radiological union and functional outcomes in this cohort of patients with femoral neck fractures. Most patients achieved good-to-excellent hip function, although AVN and infection remained important postoperative complications. Larger studies with longer follow-up are required to further establish the effectiveness of this treatment approach.

Keywords: Femoral neck fracture; Dynamic hip screw; Derotation screw; Iliac bone graft; Fracture union; Harris Hip Score; Avascular necrosis.

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Introduction

Femoral neck fractures are important injuries of the proximal femur because they occur within the intracapsular region and may be associated with disruption of the blood supply to the femoral head. Although these fractures are more frequently encountered in elderly patients, femoral neck fractures in younger and physiologically active adults are relatively uncommon and are usually associated with high-energy trauma such as road traffic accidents or falls from height. In young

patients, preservation of the native femoral head is a major treatment objective, and anatomical reduction followed by stable internal fixation is generally preferred whenever the femoral head remains viable [1,2]. The present study was conducted at Navodaya Medical College Hospital and Research Centre, Raichur, and included patients with femoral neck fractures treated with dynamic hip screw (DHS), derotation screw and iliac bone grafting. The femoral neck has a relatively vulnerable vascular

anatomy. The principal blood supply to the femoral head is derived from the branches of the medial femoral circumflex artery that ascend along the femoral neck. Fracture displacement can damage these vessels and compromise femoral head perfusion, thereby increasing the risk of osteonecrosis or avascular necrosis (AVN) [3,4]. The intracapsular location of the fracture also creates an unfavorable biological environment for healing because the fracture is exposed to synovial fluid and has limited periosteal contribution. Consequently, complications such as delayed union, non-union and AVN remain major concerns following internal fixation of femoral neck fractures, particularly in displaced fractures [5,6].

In young adults, the treatment strategy differs considerably from that commonly used for elderly patients. Arthroplasty may provide predictable early function in selected older patients, but replacement of the femoral head in a young, active individual carries concerns related to implant longevity, activity restrictions and the possibility of revision surgery. Therefore, head-preserving internal fixation is generally preferred in physiologically young patients when satisfactory reduction and stable fixation can be achieved [1,7]. The principal goals of treatment are restoration of the anatomical relationship between the femoral head and neck, maintenance of reduction, stable fixation, preservation of femoral-head vascularity and promotion of fracture union.

The degree of fracture displacement is an important determinant of outcome. The Garden classification categorizes femoral neck fractures into four types according to displacement and alignment. Garden I and II fractures are relatively undisplaced, whereas Garden III and IV fractures demonstrate progressive displacement and loss of alignment. Previous studies have demonstrated that fracture displacement, quality of reduction and adequacy of fixation are important factors influencing the development of complications and final functional outcome [8]. Displaced fractures are particularly challenging because they are associated with greater disruption of the vascular structures and increased mechanical instability. The biomechanical characteristics of the fracture also influence the choice of fixation device. Vertically oriented fractures, particularly those corresponding to higher Pauwels angles, are subjected to greater shear forces at the fracture site. Increased shear can lead to loss of reduction, implant failure and non-union if the fixation construct does not provide sufficient stability [9,10]. Thus, the fixation method should provide adequate resistance to shearing and rotational forces while permitting controlled compression across the fracture site. Dynamic hip screw fixation is one of the established methods of internal fixation for femoral neck fractures. The DHS consists of a large lag screw

placed within the femoral head and connected to a lateral side plate, allowing controlled sliding and compression across the fracture during loading. Its fixed-angle configuration provides substantial mechanical stability and has been widely used for femoral neck fractures. Comparative studies have reported that DHS fixation can provide reliable fixation and, in selected fracture patterns, may have advantages over multiple cancellous screws with respect to fixation stability and failure rates [11,12]. A meta-analysis comparing sliding hip screws with cannulated screws also demonstrated differences in failure and reoperation outcomes, supporting the continued role of sliding hip screw constructs in appropriate femoral neck fractures [13].

However, insertion of the DHS lag screw can generate rotational forces within the femoral head and fracture fragments. In unstable or displaced fractures, this rotational component may compromise reduction during screw insertion or postoperative loading. The addition of a derotation screw is therefore intended to improve rotational control and supplement the stability provided by the DHS. A clinical and biomechanical study of DHS combined with a derotation screw in displaced femoral neck fractures reported that reduction quality remained an important determinant of clinical outcome and demonstrated the biomechanical rationale for using the combined construct [14]. The combination may therefore be particularly useful in fractures where rotational instability is a significant concern.

Bone grafting has also been considered in the management of femoral neck fractures, particularly when biological healing is considered potentially compromised. Autogenous iliac bone graft provides osteogenic, osteoconductive and structural support and may help fill a fracture gap and enhance the biological environment for union. Experimental and clinical work has explored the combination of DHS fixation and bone-grafting techniques to improve fracture healing, particularly in situations associated with delayed union or non-union [15]. The use of iliac bone grafting along with stable internal fixation is therefore based on the principle of combining mechanical stability with biological augmentation.

Despite advances in fixation techniques, AVN and non-union continue to represent important complications following femoral neck fracture fixation. Reported complication rates vary according to patient age, fracture displacement, reduction quality, fracture configuration, vascular injury and fixation technique [5,6].

The relationship between timing of surgery and AVN remains controversial; however, systematic evidence suggests that delayed fixation may increase the risk of non-union, while the effect of timing alone on AVN is less consistent [16]. These

considerations highlight the importance of careful preoperative assessment, timely treatment under appropriate conditions, accurate reduction and stable fixation.

Functional assessment is another essential component in evaluating the success of treatment. Radiographic union alone does not necessarily indicate satisfactory recovery, as patients may continue to experience pain, restricted hip movement, limb shortening or difficulty performing daily activities. The Harris Hip Score (HHS) is a commonly used clinical assessment tool incorporating pain, function, activities of daily living, gait and range of motion. Evaluation of HHS along with radiographic union and postoperative complications provides a more comprehensive assessment of treatment outcomes.

In the present study, 20 patients with femoral neck fractures were treated using DHS fixation combined with a derotation screw and iliac bone grafting. The study assessed demographic characteristics, fracture pattern, mechanism of injury, operative duration, blood loss, radiographic time to union, postoperative complications including AVN and infection, and functional outcome using the Harris Hip Score. The study population had a mean age of 38.9 years, and the majority of injuries were related to road traffic accidents. The rationale for the present study is therefore to evaluate whether a combination of DHS, derotation screw and iliac bone grafting can provide satisfactory mechanical stability, promote fracture union and preserve hip function in patients with femoral neck fractures. By assessing both radiological and functional outcomes and documenting complications, the study aims to contribute to the existing evidence regarding head-preserving fixation of femoral neck fractures in relatively young patients.

Materials and Methods

Study Design and Setting: This was a prospective, hospital-based cohort study conducted at Navodaya Medical College Hospital and Research Centre, Raichur. The study was conducted over a period of one year, from August 2022 to August 2023. All surgical procedures were performed by experienced orthopaedic surgeons using a standardized operative protocol.

Study Population: The study included patients presenting with femoral neck fractures who were considered suitable for head-preserving internal fixation. A total of 20 patients were included in the study.

Inclusion Criteria

1. Patients aged 18–50 years with femoral neck fractures.
2. Patients of either sex.

3. Patients willing to participate in the study and providing informed consent.

The source document specifies patients younger than 50 years and those providing informed consent as inclusion criteria.

Exclusion Criteria

Patients were excluded if they had:

1. Age below 18 years or above 50 years.
2. Pathological fractures.
3. Active infection.
4. Autoimmune diseases.
5. Surgical contraindications or were medically unfit for surgery.

Sample Size: The final sample size was 20 patients. The sample-size calculation was based on the difference in mean duration of hospital stay reported in a previous study, with values of 6.4 ± 2.2 days and 9.2 ± 3.1 days.

At a 95% confidence level and 80% statistical power, the calculated sample size was 16. Considering a 20% allowance for non-response/dropout, the final sample size was increased to approximately 20 cases.

Preoperative Assessment: All eligible patients underwent clinical and radiological evaluation following admission. Demographic details, mechanism of injury, side involved and fracture characteristics were documented. Fracture pattern was assessed using the Garden classification. Baseline clinical findings and relevant medical information were recorded before surgery.

Surgical Procedure: Patients were treated using dynamic hip screw (DHS) fixation with an additional derotation screw and iliac bone grafting. The procedure was performed under appropriate anaesthesia after achieving satisfactory positioning and reduction of the fracture. Following reduction on the fracture table, the operative field was prepared and draped under standard aseptic precautions.

The incision was made over the lateral aspect of the proximal femur. An angle guide was positioned and the guidewire was inserted under image intensifier guidance. Triple reaming was subsequently performed, followed by insertion of the lag screw. A derotation screw was used to provide additional rotational stability. The DHS plate was then positioned and secured to the femoral shaft. Final anteroposterior and lateral fluoroscopic images were obtained to confirm reduction and implant position. The operative sequence is documented in the intraoperative images in the source study.

Iliac Bone Grafting: Autologous iliac bone grafting was performed as part of the operative treatment protocol. The graft was used to provide biological augmentation at the fracture site with the objective of supporting fracture healing.

Postoperative Management and Follow-up: Patients were monitored postoperatively for wound-related complications, infection, pain, hip function and other adverse events. Follow-up assessment included clinical examination and radiographic evaluation. The primary outcomes included time to radiographic fracture healing, postoperative complications such as non-union and avascular necrosis, and functional outcome assessed using the Harris Hip Score.

Outcome Measures

The following parameters were evaluated:

1. **Demographic characteristics:** age and sex.
2. **Fracture characteristics:** side affected and Garden fracture type.
3. **Mechanism of injury:** road traffic accident or fall from height.
4. **Operative parameters:** duration of surgery and intraoperative blood loss.
5. **Radiological outcome:** time required for radiographic fracture union.
6. **Postoperative complications:** infection and avascular necrosis.
7. **Functional outcome:** Harris Hip Score.

In the study cohort, the mean age was 38.9 ± 3.15 years, mean operative duration was 90.25 ± 10.90 minutes, mean time to radiographic union was 13.55 ± 2.07 weeks, and mean Harris Hip Score was 85.25 ± 7.06 .

Data Collection: Data were collected using medical records, patient interviews and direct measurements during follow-up visits. Radiographs were used to assess fracture healing, while clinical evaluation was used to identify postoperative complications and determine functional status. The collected information was entered into a secure electronic database for analysis.

Statistical Analysis: Data were analyzed using SPSS statistical software. Descriptive statistics were used to summarize demographic, operative, radiological and functional variables. Continuous variables were expressed using mean and standard deviation, while categorical variables were summarized using frequencies and percentages. The major outcomes analyzed were duration of surgery, blood loss, time to radiographic union, postoperative complications and Harris Hip Score.

Ethical Considerations: Patients were enrolled after obtaining informed consent. Patient information and clinical records were handled confidentially and used solely for the purposes of the study



Figure 1: DHS Instrumentation Set

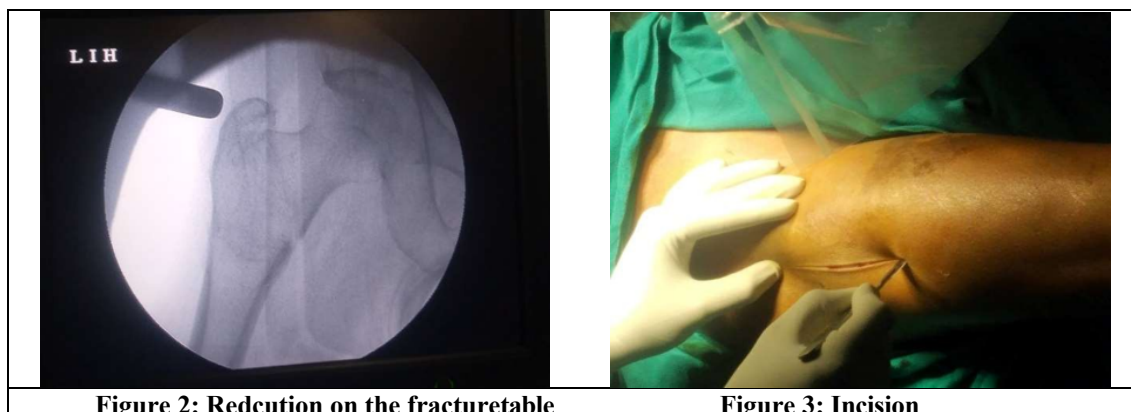


Figure 2: Reduction on the fracturetable

Figure 3: Incision



Figure 4: Placement of the angle guide



Figure 5: Insertion of guidewire



Figure 6: Triple Reaming



Figure 7: Richard Screw Insertion



Figure 8: DHS Plate Insertion



Figure 9: APV Iewon IITV



Figure 10: Lateral View on IITV



Results

The collected data from the study includes patient demographics, surgical details, postoperative complications, healing times, and functional outcomes measured using the Harris Hip Score. The sample consisted of 20 patients with femoral neck fractures treated with dynamic hip screw (DHS), derotation screw, and iliac bone grafting.

Table 1: Summary of Results

Variable	Mean	Standard Deviation
Age (years)	38.9	3.15
Surgery Duration(mins)	90.25	10.90
Time to Healing(weeks)	13.55	2.07
Harris Hip Score	85.25	7.06

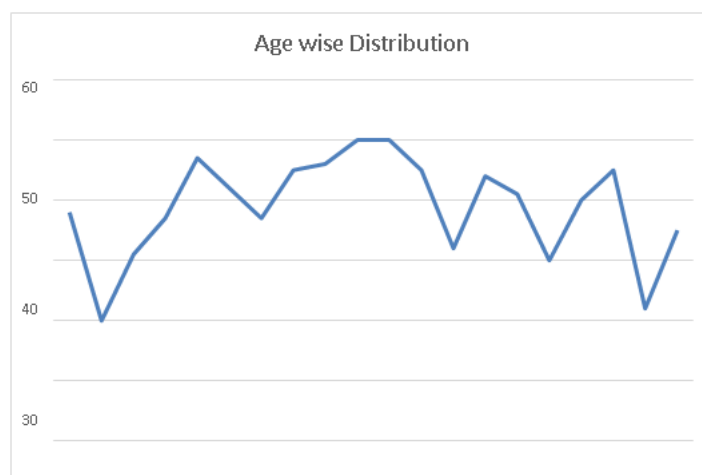


Figure 11: Age wise distribution

The graph shows the age wise distribution of the patients with patients ranging from 20 years old to 50 years old, with the average age being 38.9 years.

Table 2: Gender wise distribution

Gender	Count of Gender
Female	9
Male	11

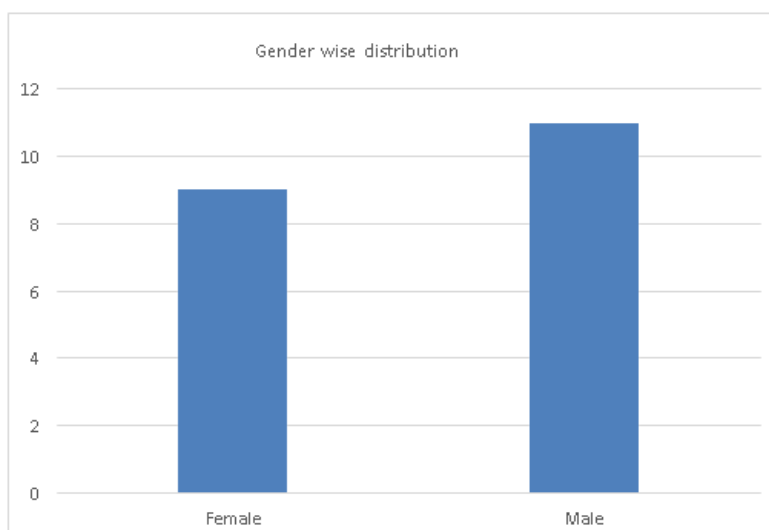
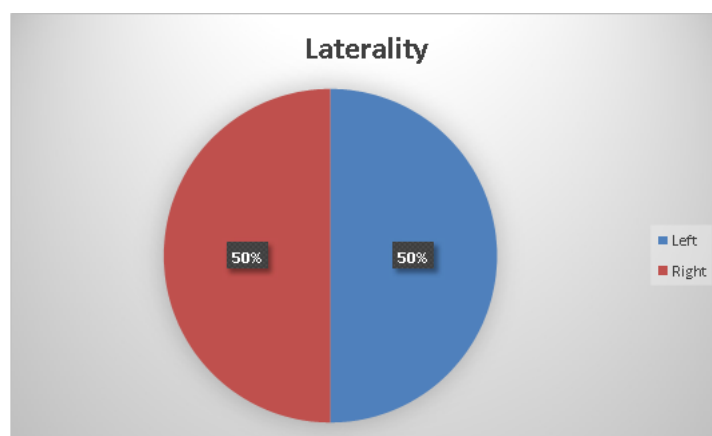


Figure 12: Gender wise distribution

This chart shows the sex wise distribution of the patients in our study with males being 55% and females being 45%.

Table 3: Laterality of the fracture

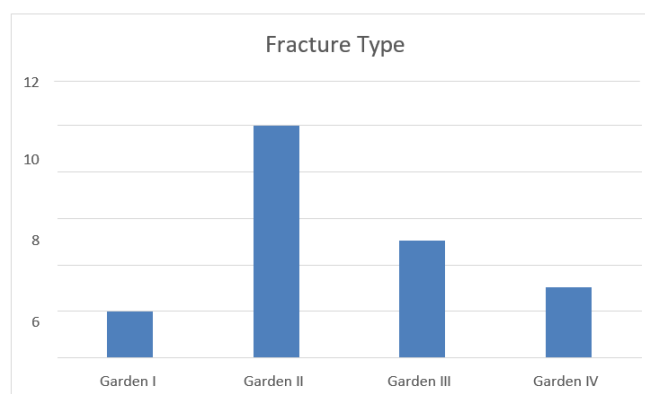
Side Affected	Count of Side Affected
Left	10
Right	10

**Figure 13: Laterality of the fractures**

This chart and the table show the sides affected in our patients, with 50% having left side and 50% having right side affected.

Table 4: Distribution of Fracture types

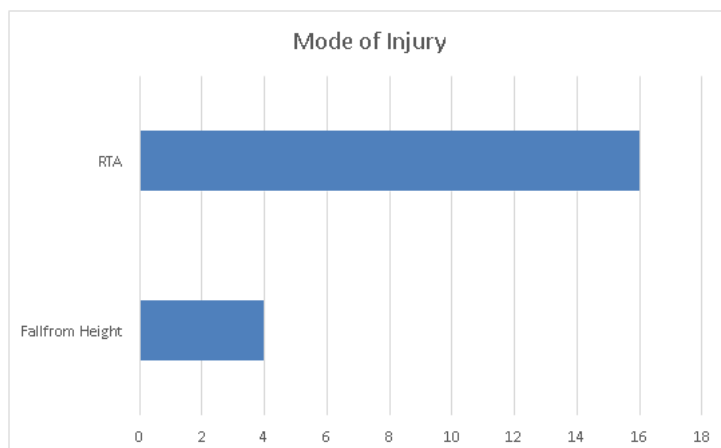
Fracture Type	Distribution of Fracture Type
Garden I	2
Garden II	10
Garden III	5
Garden IV	3

**Figure 14: Distribution of Fracture types**

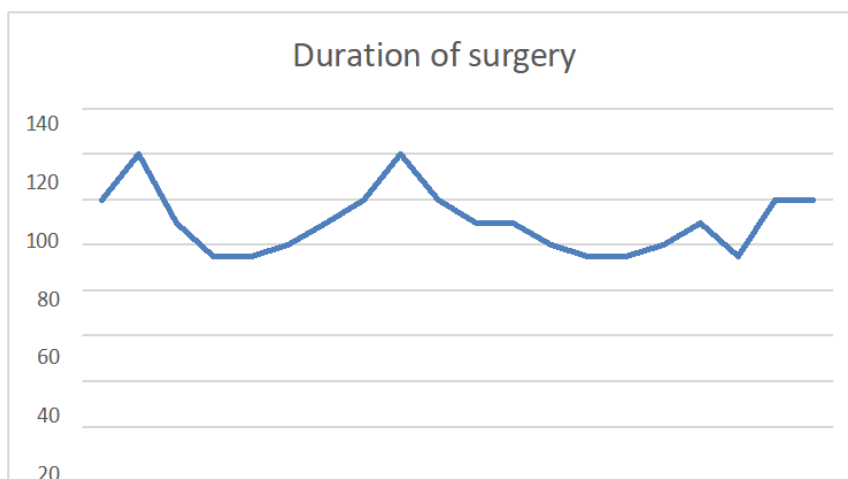
This graph shows the distribution of the patients according to the fracture pattern as per the Garden Classification. We had 50% patients with Garden II, followed by 25% with Garden III, 15% Garden IV and 10% patients with Garden I pattern of fracture.

Table 5: Mode of Injury

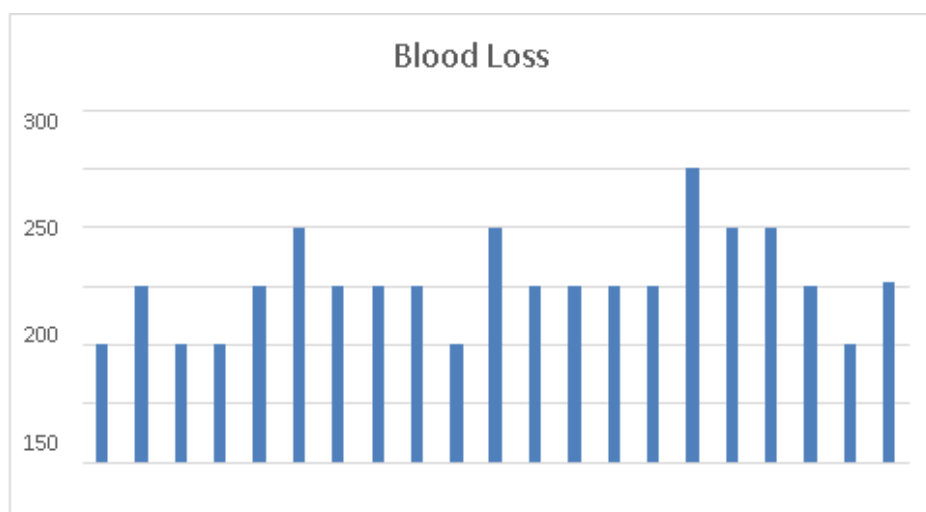
Mode of Injury	Mode of Injury
Fall from Height	4
RTA	16

**Figure 15: Mode of injury**

The graph showing the distribution of patients as per the mode of injury, with RTA being the majority of patients with 80% and 20% being from the fall from height.

**Figure 16: Duration of surgery**

This figure shows the duration of the surgery in minutes with durations ranging from 75 minutes to 120 minutes. The average duration being 90.25 minutes.

**Figure 17: Blood loss during surgery**

This chart depicts the amount of blood loss in the patients with the average blood loss being 152.5ml.

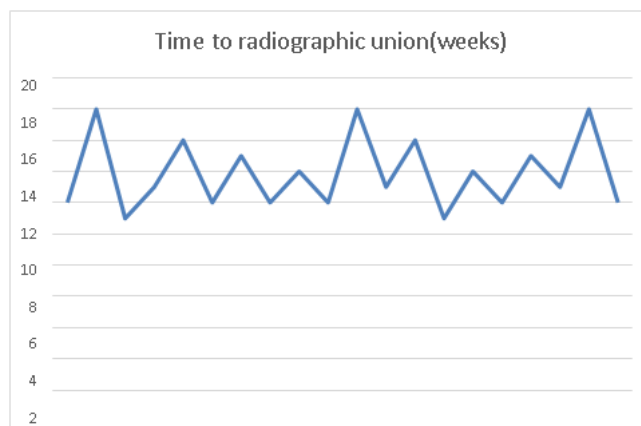


Figure 18: Time to union of fractures

This chart shows the time for radiographic union of the fracture in weeks with the average time being 13.55 weeks in our study.

Table 6. Incidence of Complications

Complications	Incidence of Complications
AVN	2
Infection	3
None	15

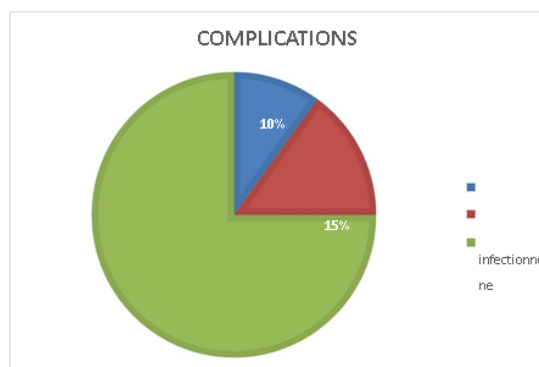


Figure 19: Incidence of Complications

This chart shows the complications in our study with Infection amounting to 15% and AVN being 10%

Table 7: Harris Hip Score

Harris Hip Score	No. of Patients
Excellent	6
Good	11
Fair	1
Poor	2

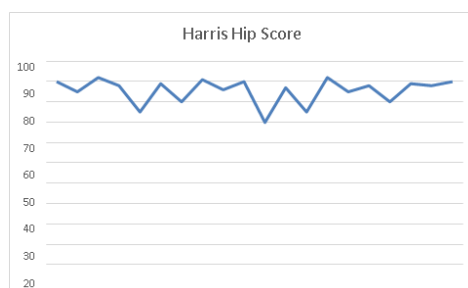


Figure 20: Harris Hip Score

A histogram displaying the distribution of Harris Hip Scores among the patients shows a range from 70 to 92, with the majority of scores falling between 80 and 90. With the average Harris Hip score of 85.25 in our study

A total of 20 patients with femoral neck fractures treated with dynamic hip screw (DHS), derotation screw and iliac bone grafting were included in the present study. The mean age of the study population was 38.9 ± 3.15 years, with patients ranging from 20 to 50 years. There were 11 males (55%) and 9 females (45%), demonstrating a slight male predominance.

With regard to laterality, the distribution was equal, with 10 patients (50%) having left-sided fractures and 10 patients (50%) having right-sided fractures. According to the Garden classification, Garden type II was the most frequently observed fracture pattern, accounting for 10 patients (50%). Garden type III fractures were observed in 5 patients (25%), while Garden type IV and type I fractures were present in 3 (15%) and 2 (10%) patients, respectively. Thus, the majority of patients had Garden type II or III fractures.

Regarding the mechanism of injury, road traffic accidents were the predominant cause, accounting for 16 patients (80%), whereas 4 patients (20%) sustained their fractures following a fall from height. This indicates that high-energy trauma, particularly road traffic accidents, was the principal mechanism of femoral neck fracture in the study population. The operative parameters demonstrated a mean surgical duration of 90.25 ± 10.90 minutes. The recorded duration of surgery ranged from approximately 75 to 120 minutes. The mean intraoperative blood loss was 152.5 mL, indicating relatively limited blood loss during the procedure. Radiological assessment demonstrated a mean time to fracture union of 13.55 ± 2.07 weeks. Radiographic follow-up showed progressive healing of the femoral neck fractures following fixation with DHS, derotation screw and iliac bone grafting. Postoperative complications were documented in a minority of patients.

Avascular necrosis (AVN) of the femoral head occurred in 2 patients (10%), while infection was reported in 3 patients (15%). The remaining 15 patients (75%) had no documented postoperative complications. Functional outcome was assessed using the Harris Hip Score (HHS). The mean HHS was 85.25 ± 7.06 . Based on the reported functional categories, 6 patients had excellent outcomes, 11 had good outcomes, 1 had a fair outcome and 2 had a poor outcome. Therefore, 17 of the 20 patients (85%) achieved good-to-excellent functional outcomes, whereas 3 patients (15%) had fair-to-poor outcomes. The reported scores ranged from approximately 70 to 92, with most patients having scores between 80 and 90.

Overall, the study demonstrated satisfactory radiological and functional outcomes following treatment of femoral neck fractures with DHS, derotation screw and iliac bone grafting. The majority of patients achieved fracture union within approximately 14 weeks and attained good-to-excellent hip function, while AVN and infection were the principal postoperative complications observed in this cohort.

Discussion

Femoral neck fractures in young and middle-aged adults are clinically challenging injuries because treatment must achieve both mechanical stability and biological preservation of the femoral head. Unlike elderly patients, in whom arthroplasty may frequently be considered, head-preserving internal fixation remains an important treatment strategy in younger patients because preservation of the native hip can avoid the long-term concerns associated with prosthetic replacement [1,2]. The present prospective study evaluated 20 patients with femoral neck fractures treated with dynamic hip screw (DHS), an additional derotation screw, and iliac bone grafting. The overall findings demonstrated satisfactory radiological healing and functional recovery, although avascular necrosis (AVN) and infection remained important complications.

The mean age of patients in the present study was 38.9 ± 3.15 years, indicating a predominantly young adult population. There was a slight male predominance, with 11 males (55%) and 9 females (45%). This pattern is consistent with the recognized epidemiology of femoral neck fractures in younger individuals, in whom high-energy trauma is an important mechanism of injury [1,3]. In the present series, 80% of fractures resulted from road traffic accidents, while 20% occurred following falls from height. The predominance of road traffic accidents supports the concept that femoral neck fractures in younger patients are frequently associated with high-energy trauma. The fracture distribution in our study showed that Garden type II fractures were the most common (50%), followed by Garden type III (25%), Garden type IV (15%) and Garden type I (10%). Garden classification remains a commonly used system for describing displacement of femoral neck fractures and assists in treatment planning [7]. However, the classification should not be considered the only determinant of prognosis because reduction quality, fracture orientation, posterior tilt, patient factors and implant stability can also influence outcome. Previous literature has emphasized that anatomical reduction and stable fixation are particularly important in displaced fractures [4,7].

The predominant use of DHS in the present study was based on its ability to provide fixed-angle fixation and controlled compression across the fracture. DHS has remained an established option

for femoral neck fracture fixation, particularly when a stable construct is required [11,12]. The biomechanical advantage becomes particularly relevant in vertically oriented or high-shear fractures, where shear forces may predispose to loss of fixation and non-union [9,10]. A systematic review and meta-analysis of Pauwels type II and III fractures found that DHS was associated with a lower risk of non-union compared with cannulated cancellous screws, although osteonecrosis rates were not significantly different [17].

The present study additionally employed a derotation screw with the DHS. Rotational instability is an important concern during fixation of femoral neck fractures because insertion of a large lag screw can produce rotational torque and potentially compromise reduction. The additional derotation screw is intended to resist rotational forces and improve stability of the femoral head-neck fragment. Zhu et al. evaluated DHS combined with a derotation screw in displaced femoral neck fractures and demonstrated that reduction quality was an important determinant of clinical and biomechanical outcome [13,18].

The operative duration in our study was 90.25 ± 10.90 minutes, with a mean blood loss of approximately 152.5 mL. These findings indicate that the combined fixation technique could be performed within a reasonable operative period. Contemporary comparative literature indicates that different internal fixation devices have varying operative requirements, and minimally invasive screw-based techniques may reduce operative time and blood loss; however, implant choice must be balanced against fracture stability [19,20]. A large network meta-analysis involving 5,703 patients found differences between fixation methods in operative time and intraoperative blood loss, while emphasizing that functional and complication outcomes should also be considered when selecting fixation [19].

An important feature of the present study was the use of iliac bone grafting as biological augmentation. Autologous bone graft provides osteogenic and osteoconductive properties and may improve the biological environment around a fracture with compromised healing potential. Experimental work examining bone-graft-assisted DHS fixation has suggested that this approach may contribute to fracture stability and bone union [14]. The combination of mechanical fixation with biological augmentation is particularly attractive in femoral neck fractures because successful treatment requires both adequate stability and preservation or enhancement of the local healing environment.

The mean time to radiographic union in our study was 13.55 ± 2.07 weeks. This represents a satisfactory healing period for the treated fractures.

The observed union time is comparable to values reported in other studies of young adults treated with internal fixation. For example, studies comparing newer fixation systems with conventional screw fixation have reported fracture healing times in the approximate range of 13–14 weeks [20]. The relatively consistent union time in our study may be related to satisfactory fixation, fracture reduction and the use of iliac bone grafting, although the small sample size prevents definitive attribution of the result to any individual component of the treatment. Postoperative complications remain a major concern following femoral neck fracture fixation because the blood supply of the femoral head is vulnerable to injury. In our study, AVN occurred in 2 patients (10%), while postoperative infection occurred in 3 patients (15%). Fifteen patients (75%) had no documented postoperative complications. The observed AVN rate is clinically relevant but remains within the range reported in previous literature. Displacement, vascular injury, reduction quality and other patient-related factors have all been associated with the risk of osteonecrosis [3,4,6].

The occurrence of AVN despite successful fixation emphasizes that mechanical stabilization cannot completely eliminate the biological consequences of the original injury. Karaeminogullari et al. demonstrated that fracture displacement and timing of surgery are associated with AVN and non-union following osteosynthesis of femoral neck fractures [4]. More recent evidence similarly demonstrates that displaced Garden III/IV fractures and poor reduction quality are important predictors of fixation failure and AVN [21]. Thus, the 10% AVN rate observed in our study may reflect the underlying vascular insult associated with femoral neck fracture rather than failure of the fixation construct alone.

The 15% infection rate observed in our study deserves attention. Infection is a potentially preventable complication and may adversely affect fracture healing and functional recovery. The small number of patients makes direct comparison with larger published series difficult. Nevertheless, meticulous surgical technique, appropriate perioperative antibiotic prophylaxis, adequate wound care and careful postoperative monitoring remain essential to minimize infection-related complications. Functional outcome was assessed using the Harris Hip Score, which provides an assessment of pain, function, activities and hip mobility. The mean HHS in the present study was 85.25 ± 7.06 . Six patients (30%) achieved excellent outcomes and 11 patients (55%) achieved good outcomes, while one patient (5%) had a fair outcome and two patients (10%) had a poor outcome. Thus, 85% of patients achieved good-to-excellent functional results. These findings suggest that most patients regained satisfactory hip function following fracture fixation. The use of HHS is consistent with

contemporary studies evaluating functional recovery following internal fixation of femoral neck fractures [20,22]. Recent systematic evidence has shown that postoperative HHS is influenced by fracture healing, femoral neck shortening, femoral head necrosis, neck-shaft angle and other postoperative factors [22].

The favorable functional outcome observed in our study may be related to successful fracture union and maintenance of a stable femoral head-neck relationship. The combination of DHS and derotation screw provides both angular and rotational stability, while bone grafting may support biological healing. Nevertheless, functional recovery should be interpreted alongside radiological findings and complications. Patients who develop AVN or non-union may initially demonstrate acceptable function but can subsequently experience progressive pain and deterioration of hip function.

The findings of our study are also broadly consistent with the literature supporting stable internal fixation in appropriately selected young patients. Li et al., in a systematic review and meta-analysis comparing DHS and cannulated screws, found broadly similar rates of mortality, non-union and revision, although differences in AVN were reported [17]. Another meta-analysis specifically evaluating sliding hip screws versus cannulated screws reported that the choice of fixation should take fracture configuration into consideration rather than relying on a single implant for all fracture patterns [12].

The present findings should therefore be interpreted in the context of the characteristics of the study population. The majority of patients were young adults with high-energy injuries, and Garden type II fractures constituted half of the sample. The treatment strategy may be particularly relevant for patients in whom preservation of the native femoral head is desirable. Current literature continues to investigate newer fixation devices, including the femoral neck system, but DHS remains an established and biomechanically sound option [19,20]. Recent systematic analyses suggest that newer implants may offer advantages in operative parameters or functional scores, but evidence regarding their superiority for preventing AVN or non-union remains evolving [19,20]. An important strength of the present study is that it evaluated radiological union, postoperative complications and functional outcome together, rather than relying on a single endpoint. The combination of a mean union time of 13.55 weeks, mean HHS of 85.25 and 75% complication-free patients suggests an overall favorable outcome with the treatment protocol. However, the results should not be generalized without caution because the study included only 20 patients and did not include a comparative control group.

Overall, the findings suggest that DHS fixation combined with a derotation screw and iliac bone grafting can provide satisfactory mechanical stability, fracture union and functional recovery in selected patients with femoral neck fractures. The 85% good-to-excellent functional outcome is encouraging, while the occurrence of AVN in 10% of patients highlights the continuing biological challenges associated with intracapsular femoral neck fractures. Accurate reduction, appropriate implant positioning, preservation of vascularity, careful postoperative monitoring and adequate rehabilitation remain critical determinants of successful treatment.

Conclusion

The present study demonstrated that dynamic hip screw (DHS) fixation combined with a derotation screw and iliac bone grafting provided satisfactory clinical and radiological outcomes in patients with femoral neck fractures. The mean time to radiographic union was 13.55 ± 2.07 weeks, while the mean Harris Hip Score was 85.25 ± 7.06 . Overall, 85% of patients achieved good-to-excellent functional outcomes, indicating satisfactory recovery of hip function. Although avascular necrosis occurred in 10% and infection in 15% of patients, 75% remained free of postoperative complications. These findings suggest that the combined fixation technique can be an effective head-preserving treatment option in appropriately selected patients with femoral neck fractures, providing stable fixation and satisfactory fracture healing and functional recovery.

Limitations

The study was limited by the small sample size of 20 patients and the absence of a control or comparison group.

The relatively short study period and limited follow-up restrict assessment of long-term complications, particularly late-onset avascular necrosis and functional deterioration.

Declarations

Conflicts of interest: There is no any conflict of interest associated with this study

Consent to participate: There is consent to participate.

Consent for publication: There is consent for the publication of this paper.

Authors' contributions: Author equally contributed the work.

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