RADIOLOGICAL ALIGNMENT FOLLOWING FIN NAIL TREATMENT FOR FEMORAL SHAFT FRACTURES AT MUHIMBILI ORTHOPEDIC INSTITUTE, DAR ES SALAAM, TANZANIA.

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By

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A dissertation submitted in (partial) fulfillment of the requirement for the degree of Masters of Medicine(Orthopedics and Traumatology) of Muhimbili University of Health and Allied Sciences.

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CERTIFICATION

The undersigned certifies that, he has read and hereby recommends for examination by Muhimbili University of Health and Allied Sciences a dissertation entitled: ‘‘**Radiological alignment following fin nail treatment for femoral shaft fractures at Muhimbili Orthopedic Institute, Dar es salaam, Tanzania.**’’ in partial fulfillment of the requirements for the degree of Master of Medicine in Orthopedic and Traumatology at Muhimbili University of Health and Allied Sciences.

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Date

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(Co- supervisor)

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Date

DECLARATION AND COPYRIGHT

I, **Hasnain M. Rashid** declare that this, **dissertation** is my own original work and has not been accepted for a similar degree in any University.

Signature: …… Date: ……

ACKNOWLEDGMENT

I would like to acknowledge the Almighty God for keeping me alive up to this moment and blessing me with the opportunity to present my dissertation.

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DEDICATION

This work is dedicated to my late father, Mohamed Aliasghar Rashid for his dedication and unfailing devotion. May his soul rest in peace.

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LIST OF ABBREVIATIONS

AO: Arbeitsgemeinschaft für Osteosynthesefragen

AP: Anteroposterior

DFAA: Deviation from anatomic alignment

MOI: Muhimbili Orthopedic Institute

MUHAS: Muhimbili University of Health and Allied Sciences

OTA: Orthopaedic Trauma Association

SIGN: Surgical Implant Generation Network

SOSD: SIGN online surgical database

SPSS- Statistical Package for Social Sciences

DEFINITION OF TERMS

A closed fracture is when the bone breaks but there is no communication with the outside environment. An open fracture is one in which the bone breaks through the skin; it may then recede back into the wound and not be visible through the skin. This is an important difference from a closed fracture because with an open fracture there is a risk of a deep bone infection.

Most often, this wound is caused by a fragment of bone breaking through the skin at the moment of the injury.

Fracture pattern 32A-C

32A - Simple	• A1 - Spiral • A2 - Oblique, angle > 30 degrees • A3 - Transverse, angle < 30 degrees
32B - Wedge	• B1 - Spiral wedge • B2 - Bending wedge • B3 - Fragmented wedge
32C - Complex	• C1 - Spiral • C2 - Segmental • C3 - Irregular

ABSTRACT

Background

The Surgical Implant Generation Network(SIGN) Fin nail may have decreased challenges of intramedullary nailing for femoral shaft fractures since it removes the need for proximal interlocking screws when placed in a retrograde fashion. The Fin nail has an ability to fit within the proximal femoral canal and thus achieve stability. Angular malalignment is one of the complications of antegrade and retrograde nailing. Malalignment can lead to malunion, nonunion and deformity. The incidence of malalignment has been reported to range from 0-37%. This study aims to determine the immediate postoperative radiological alignment of femoral shaft fractures treated with Fin nail.

Objectives

To assess the radiological alignment of Fin nail in patients with femoral shaft fractures at Muhimbili Orthopaedic Institute, Dar es Salaam.

Methodology

A descriptive retrospective cross-sectional study was done from April 2020 to September 2020 which enrolled all adult patients 18 years and above of age with femoral shaft fractures(32A-B) from January 2010 to December 2019 in the SIGN online surgical database(SOSD). Fractures with AO/OTA Type 32C, patients with no postoperative radiograph, patients with radiographic evidence of pathological fracture and prior surgery of affected femur were excluded from the study. After ethical clearance, relevant data such as age and sex of the patient, fracture type, pattern and treatment approach were obtained from the SOSD. Radiological films were obtained from the SOSD and postoperative alignment was calculated by using the Radiant software. The postoperative radiological alignment was quantified by measuring the deviation from the normal anatomical axis of the femur. These numbers were recorded as the DFAA with units in degrees. Later confirmed by radiologist. Data entry was done using Microsoft Excel spreadsheets and analysis by importing the data into SPSS. Statistical significance was set at p-value < 0.05.

Results

This study had a total of 97 patients, with male predominance who were mainly below 30 years of age, with closed mid shaft transverse fractures treated with Fin nails via retrograde approach. Only 3.1% showed radiological malalignment with 1 being >10 degrees. Proximal femur shaft fractures and antegrade both constituted 20% of radiological malalignment.

Conclusion

This study showed that majority of the patients with simple femoral shaft fractures treated with fin nail were male with mean age of 30.9 years. Fin nail fixation did not cause significant malalignment and hence is an option for simple femoral shaft fracture treatment via the retrograde and possibly also the antegrade approach. Future larger scale studies need to investigate the long term postoperative alignment, long term clinical and functional outcomes post fin nail fixation.

1. INTRODUCTION

1.0 BACKGROUND

The annual mortality rate caused by injuries of individuals is around five million worldwide, the number being similar to a combination of deaths caused by HIV/AIDS, tuberculosis and malaria. Developing countries contributing to above 90% of these injuries. 24% of these deaths caused by road traffic accidents. The ratio of death versus permanent disability ranges from one to three up to one to eight. (1)

Annually road traffic accidents cause injuries or disabilities to 20-50 million individuals. By 2020, there will be an increase by approximately 67% of patients requiring stabilization of high energy fractures caused by road traffic accidents. (2)

A study done in Malawi showed high energy trauma causing a rate of 87% of femur fractures closely match with another study which was done in Pakistan where 86% of road traffic accidents cases had mid-shaft femur fractures in men under 40 years of age.(3)

The annual incidence rate of femur fractures in Tanzania is 2.1-18.4 per 100,000 individuals. In the same study, 61.2 % of patients recorded at MOI were treated surgically. (4) Intramedullary nailing systems were designed to be used in the optimal treatment of femur fractures and some may be used without fluoroscopy or image intensifier. (5)

In 2005, a study conducted at MOI showed the advantage of using the SIGN nail compared to conservative management for closed femur fractures. In this study, factors such as hospital stay, nonunion rates, knee stiffness and other complications were taken into consideration. (6,7,8) Another study done at Kenyatta National Hospital in 2012/2013 on femoral fractures showed intramedullary nailing had lower hospital stays, hospital costs and better outcomes while taking into consideration the rates of union, malunion and delayed union.(9)

A study done at MOI showed no differences in union rates and post-operative alignment following antegrade and retrograde nailing for femoral shaft fractures. Retrograde nailing was highly recommended since it did not cause any higher rates of knee complications.(8)

Theoretically, FIN nail has some advantages over standard SIGN nail. FIN nail reduced operative time as it removes the need of placing proximal interlocking screws when placed in a retrograde fashion (10), provides adequate distal fixation for stable fractures. However, FIN nails should not be used for comminuted fractures with longitudinal instability. (11) Despite these theorized benefits, FIN nail is not as widely used as standard SIGN nail, as noted from the SIGN surgical online database, where only 3.3% of femur fractures were treated with a Fin nail. (12)

One method of ascertaining if the surgical intervention was done properly is to look at the radiographical alignment. Postoperative alignment can be quantified by measuring the deviation from the normal anatomical axis of the femur. These numbers are recorded as the DFAA with units in degrees.

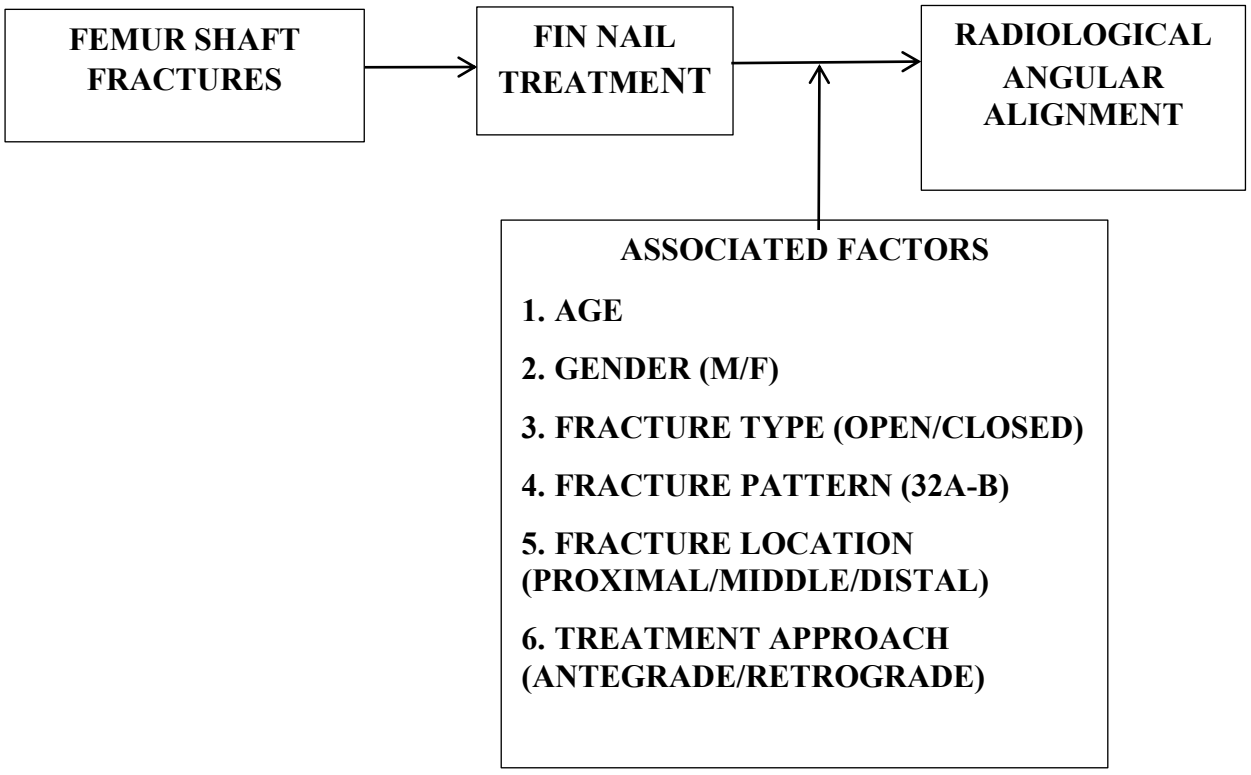
Angular malalignment is one of the complications of antegrade and retrograde nailing. Malalignment can lead to malunion, nonunion and deformity. The incidence of malalignment has been reported to range from zero to thirty-seven percent. The reason for this wide range is due to the lack of uniformity in the definition of malalignment. The two most commonly found definitions are "greater than or equal to 5 degrees" and "greater than 5 degrees" of angular deformity. Other reports refer to angular deformity as greater than or equal to 10 degrees, as 7 to15 degrees, as greater than 15 degrees, or not at all. (13)

1.1 PROBLEM STATEMENT

The rising number of motor traffic crashes which is partly attributed to the increase in activities of motor vehicles and motorcycles in developing countries accounts for a large number of long bone fractures especially the femur. Intramedullary nailing with proximally and distally locked nail is the most optimal treatment modality of femur fractures. Use of Fin nail allows faster and simple surgery for femoral shaft fractures since it has a single point screw locking, however, this practice is not done routinely at MOI, since it could lead to malalignment. There is no literature published on the radiological angular alignment post FIN nail surgeries at MOI as to date.

This study, therefore, aims to determine the radiological angular alignment of Fin nail at MOI and hence will provide appropriate care and treatment for the patients in a faster and simpler manner.

1.2 CONCEPTUAL FRAMEWORK



1.3 RATIONALE

Muhimbili Orthopedic Institute is a tertiary trauma center in Tanzania and the place where most of the femur fracture cases are referred to. Since angular malalignment post FIN nail surgeries inadvertently affects the outcome of any fracture treatment and hence mobility of the patient, gathered information will raise awareness among orthopedic surgeons on the Fin nail use. These study findings will form a baseline that could be used for future researches.

1.4 RESEARCH QUESTIONS

1. What is the immediate post-operative radiological alignment of Fin nail for femur shaft fractures?

2. What are the factors associated with the radiological malalignment of Fin nail for femur shaft fractures?

1.5 OBJECTIVES

1.5.1 Broad Objective:

To assess the radiological alignment of Fin nail in patients with femoral shaft fractures and associated factors at MOI, Dar es Salaam.

1.5.2 Specific Objectives:

1. To determine the demographic characteristics of patients treated with Fin nail for femur shaft fractures.

2. To assess the immediate post-operative radiological alignment of Fin nail.

3. To determine factors associated with the radiological malalignment of Fin nail.

1.6 LITERATURE REVIEW

Sari et al (1999) reported in a descriptive study conducted in Helsinki that the incidence of femur shaft fractures was 9.9 fractures per 100,000 person-years. The most affected age group and sex incidences were seen in males from 15 to 24 years of age and in females 75 years of age or older. Fractures of the middle third of the diaphysis were 79%. Based on the AO/OTA classification, Forty- eight percent of fractures were type A, 39% were Type B, and 13% were Type C fractures. (14)

Owona et al (2018) in a cross-sectional descriptive study conducted in Cameroon stated that the most affected age group was 21-30 years, the commonest fracture location and fracture type were the femur shaft and type 32A according to the AO classification respectively.(15)

A study done by Anyaehie et al (2015) in Nigeria revealed a male predominance of 63.7%. 26.5% of the fractures occurred at the mid-shaft with a mean age of 27.2 years.(16)

In another study done at Kenyatta National Hospital in 2012/2013 on femoral fractures, showed males were predominantly affected compared to females. (17)

In a north Tanzania, Hollis et al (2015) carried out a study in a referral center (KCMC) which showed 39% of all admissions were due to femoral fractures, road traffic accidents caused 59% of femur fractures in males, while falls caused 70% of femur fractures in females. In the age group of 21-30, 20% had femoral fractures and 80% of femur fractures were caused by falls in the age group of 51-100. The commonest fracture for both sexes was mid-shaft femoral fracture. The commonest mode of treatment was skeletal traction.(18)

Haonga et al (2015) studied the short-term outcome of patients with closed comminuted femoral shaft fractures at MOI. The authors found a male predominance of 88% and 20.3% of all femoral shaft fractures in elderly patients were comminuted. (19)

There were no studies in the developed countries on the postoperative radiological alignment of patients treated with Fin nail for femoral shaft fractures, however, Wilson, Nathaniel et al (2019), in a case-control study conducted in two Kenyans hospitals which was comparing postoperative radiological alignment of the SIGN nail to the FIN nail

showed no significant differences. Factors such as patient demographics, fracture pattern classification according to AO/OTA and surgical characteristics where taken into consideration. None of the groups had more than 5 degrees malalignment postoperatively. (10)

Haonga et al (2019) conducted a prospective cohort study in Dar es Salaam on comparison of the SIGN standard intramedullary nail to the Fin nail for distal diaphyseal femur fractures treated via a retrograde approach showed no differences in outcomes factors such as rate of reoperation, infection, limb length discrepancies, nonunion or radiographic malalignment. Follow up at one year did not show any differences in the mean EQ-5D, VAS pain score, RUST score, maximum knee flexion and extension or Squat and Smile function. The study found 8 patients with malalignment of more than 5 degrees after standard sign nail and no patients after fin nail, although this difference was not statistically significant. (12)

There have been no studies to determine factors associated with the radiological malalignment of Fin nail.

Another study done by Ricci et al (2001) on angular malalignment after intramedullary nailing for femoral shaft fractures at Washington University in Missouri, USA showed that there was a 9% incidence of malalignment after being treated by intramedullary nails, of this, 3% varus, 2% extension, 2% flexion, 1% valgus and 1% malaligned in the sagittal and coronal planes. The degrees of malalignment ranged from 6 to 9 degrees. The study also observed the malalignment based on fracture locations and reported 30% from the proximal third of the femoral shaft, 10% from the distal third of the femoral shaft and only 2% from the middle third of the femoral shaft. Therefore,

an increase in fracture angulation was associated due to locations of the fracture site at the proximal and distal side and also with unstable fracture patterns. (13)

Finally, a study done by Carsen et al (2015), on treatment with sign nail in closed diaphyseal femur fractures revealed the SIGN database as an excellent source for research references for radiographic images since 92% of the radiographs that were reviewed were of acceptable quality. (20)

2.0 METHODOLOGY

2.1 STUDY TYPE

This was a descriptive retrospective cross-sectional study.

2.2 STUDY PERIOD

The study was conducted for a period of six months i.e. from June 2020 to May 2021.

2.3 STUDY POPULATION

All patients with femoral shaft fractures treated with FIN nail at MOI from January 2010 to December 2019 in the SIGN surgical database.(www.signsurgery.org).

The SIGN Surgical Database was implemented in August 2003 to record SIGN surgeries. Approximately five thousand SIGN surgeons worldwide have reported almost seventy thousand of the SIGN surgeries to an online surgical database. MOI is one of the center which has surgeons who record their SIGN surgeries into the database.

2.4 STUDY AREA

The study was conducted at MOI in Dar es Salaam for six months from June 2020 to November 2020.

MOI is a Tertiary hospital and largest orthopedic and trauma referral center based in Dar-es-salaam, Tanzania.

MOI is an institute providing services in the field of Orthopaedics, Traumatology and Neurosurgery. Its bed capacity is 360 beds, sixty-four private beds, eighteen ICU beds, sixteen HDU beds, nine operating rooms and has approximately forty Orthopedic surgeons, five anesthesiologists, three radiologists, residents, 120 operating room and ward nurses.

2.5 SAMPLE SIZE

The sample size was calculated using the formula.

$$n=\frac{Z^2SD^2}{d^2}$$

Z = 1.96 for 95% CI

SD = Standard deviation. (0.45 from a study done in Kenya)

d = Absolute error or precision. (0.05)

Therefore, the total required sample size is 312.

At MOI (136 Fin nails/ 10 years).

Adjustment for finite population of small size (Thrusfield et al, 2005)

n(adj) = (N*n)/(N+n)

n(adj)=(312x136)/(312+136)

Sample size =95

Adjusted Minimum Sample Size for this study = 95

2.6 SAMPLING PROCEDURE

The SOSD database was searched for patients who underwent FIN nail treatment between January 2010 and December 2019. All of them were included in the study.

Inclusion Criteria;-

1. Adult patients (Age 18 years and above) with femur shaft fractures recorded in the SOSD.

Exclusion Criteria;-

1. Patients with type 32C fracture.
2. Patients with no post-operative radiograph recorded in the SOSD.
3. Radiographic evidence of pathological fracture.
4. Prior surgery of the affected femur.

2.7 STUDY VARIABLES

Independent Variables: age of the patient, sex of the patient, fracture type, fracture pattern and treatment approach.

Dependent Variables: postoperative radiological alignment.

2.8 DATA COLLECTION PROCESS

Relevant data such as age and sex of the patient, fracture type, fracture pattern and treatment approach was obtained from the SOSD.

Radiological films were obtained from the SOSD and the immediate post-operative alignment using either AP or lateral view was calculated by using the Radiant software.

Postoperative alignment was quantified by measuring the deviation from the normal anatomical axis of the femur. These numbers were recorded as the DFAA with units in degrees, which was later confirmed by a radiologist.

2.9 DATA ANALYSIS PLAN

Data was coded and entered into Microsoft Excel spreadsheet. The data was then imported into SPSS for analysis. Relevant frequencies and tables were generated for all variables. Means and proportions were calculated for appropriate variables. All factors were analyzed to determine their association to postoperative radiological alignment by use of the chi-square test. Logistic regression analysis was done to find out the independent risk of each factor towards the outcome. Statistical significance will be set at p-value < 0.05.

2.10 ETHICAL CONSIDERATION.

This proposal was ethically cleared by the Institutional Research Ethical review board of MUHAS. Permission from MOI administration was sought. The data obtained during the study was and will be kept anonymous.

2.11 STUDY LIMITATIONS.

Not all the surgeries have been done by a single surgeon and hence the approach, technique and experience of the surgeon matters in the final outcome. Since there have been only few

cases of FIN nail surgeries done at MOI, I took all the cases and saw the outcomes based on the radiological angular alignment.

2.12 VALIDITY AND RELIABILITY.

The validity and reliability of this study was determined by the deviation from the normal anatomical axis as practiced in Orthopedic surgery.

2.13 DISSEMINATION OF RESULTS

The outcomes of this project was compiled into a dissertation to be submitted as a partial fulfillment for the award of Degree Masters of Medicine in Orthopedics and Traumatology of Muhimbilli University of Health and Allied Sciences. One copy of the dissertation was made available to the department of Orthopedics and Traumatology, while another copy was stored in MUHAS library for future reference. Manuscript was prepared and made available for publication.

3.0 RESULTS

Table 1: Patient demographics and injury characteristics of the study population (N=97)

Variables	Frequency (%)
Age (years) - Mean: 30.9 ± 11.5	
Below 30 years	52 (53.6)
30 and above	45 (46.4)
Sex	
Female	21 (21.6)
Male	76 (78.4)
Type of Fracture	
Closed	82 (84.5)
Open Gustilo Type I	7 (7.2)
Open Gustilo Type II	5 (5.2)
Open Gustilo Type IIIa	3 (3.1)
Fracture Pattern (AO)	
32A1	7 (7.2)
32A2	26 (26.8)
32A3	55 (56.7)
32B1	2 (2.1)
32B2	6 (6.2)
32B3	1 (1.0)
Fracture Location	
Distal third	12 (12.4)
Middle third	80 (82.5)
Proximal third	5 (5.2)
Approach	
Antegrade	5 (5.2)
Retrograde	92 (94.8)

The total study population was 97 patients.

Mean age: 30.9 ± 11.5years, with 53.6% of the total population below 30 years of age and 46.4% accounting for 30 years and above.

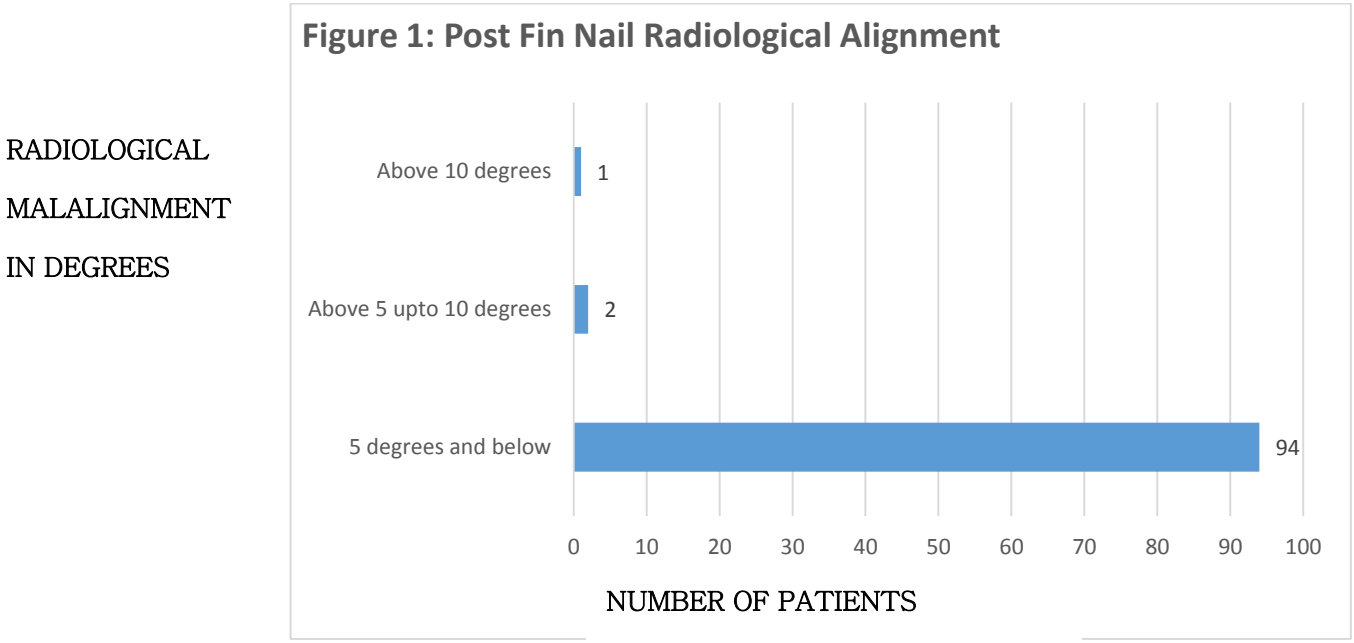
Males are predominantly accounting for 78.4% of the total population.

Closed fractures (84.5%), were the commonest, and the remaining 15.5% of open fractures were shared between Gustilo type 1(7.2%), Gustilo type 2(5.2%) and finally Gustilo type 3(3.1%).

Fracture pattern 32A3 (56.7%) was the most common, followed by 32A2 (26.8%) and 32B3 (1.0%) being the least.

Majority of the fracture location was mid shaft (82.5%), followed by distal (12.4%) and finally proximal (5.2%).

Retrograde approach (94.8%) was predominantly used. (Table 1).



In this study, radiological malalignment was considered to be above 5 degrees which was found in 3 patients (3.1%). (Figure 1)

Table 2: Factors associated with post fin nail radiological malalignment (N=97)

Variables	Radiological Malalignment		Total (N=97)	Odds Ratio (95% CI)	P value
	Yes (%) n=3	No (%) n=94			
Age Group					
Below 30	0	52(100)	52	-	0.096
Above 30	3(6.7)	42(93.3)	45		
Sex					
Female	1(4.8)	20(95.2)	21	0.541	1.000
Male	2(2.6)	74(97.4)	76	(0.047-6.269)	
Type of Fracture					
Closed	3(3.7)	79(96.3)	82	-	1.000
Open Gustilo Type I	0	7(100)	7		
Open Gustilo Type II	0	5(100)	5		
Open Gustilo Type IIIa	0	3(100)	3		
Fracture Pattern					
32A1	0	7(100)	7	-	1.000
32A2	1(3.8)	25(96.2)	26		
32A3	2(3.6)	53(96.4)	55		
32B1	0	2(100)	2		
32B2	0	6(100)	6		
32B3	0	1(100)	1		
Fracture Location					
Distal	0	12(100)	12	-	0.186
Middle	2(2.5)	78(97.5)	80		
Proximal	1(20.0)	4(80.0)	5		
Approach					
Antegrade	1(20.0)	4(80.0)	5	0.89(0.007-1.	0.148
Retrograde	2(2.2)	90(97.8)	92	198)	

None of the patients below 30 years of age had malalignment, compared to 6.7% who were above 30 years of age.

Female constituted 4.8% of the patients with malalignment compared to 2.6% of males.

None of the open fractures were radiologically malaligned, however 3.7% of closed fractures had radiological malalignment.

Fracture pattern 32A2 and 32A3 constituted 3.8% and 3.6% of radiological malalignment respectively, whereas the other fracture patterns were not radiologically malaligned.

Proximal shaft fractures constituted of 20.0% of radiological malalignment compared to only 2.5% of mid shaft fractures and none distally.

While comparing the approaches, 20% of antegrade approach was radiologically malaligned, compared to 2.2% by retrograde approach.

However none of these differences were statistically significant. (Table 2).

4.0 DISCUSSION

Intramedullary nailing systems were designed to be used in the optimal treatment of femur fractures and some may be used without fluoroscopy or image intensifier. (5) Some are aided by external targeting arm.

Theoretically, FIN nail has some advantages over standard SIGN nail by which it reduces operative time as it removes the need of placing proximal interlocking screws when placed in a retrograde fashion (10), provides adequate distal fixation for stable fractures.

One method of ascertaining if the surgical intervention was done properly is to assess the radiographical alignment, in which >5 degrees is considered gross or significant malalignment.

Postoperative malalignment of >5 degrees was found in 3.1% of the patients, however this study did not take into consideration rotational displacement or the long term clinical or functional outcomes following Fin nail placement.

There are no studies reported in the developed countries on the postoperative radiological alignment of patients treated with Fin nail for femoral shaft fractures, however, Wilson et al (2019), in a case-control study conducted in two Kenyans hospitals which was comparing postoperative radiological alignment of the SIGN nail to the FIN nail showed no significant differences. None of the groups had >5 degrees malalignment postoperatively. (10).

Male predominance for attaining femur shaft fractures has been reported in multiple studies done by Sari et al (1999) in a descriptive study conducted in Helsinki(14), 63.7% in a study done by Anyaehie et al (2015) in Nigeria(16), 80.4% in a study done in Kenya by Wilson et al in 2019(10), 59% in a study by Hollis et al(2015) at KCMC (18) and 88% in a study by Ndalama et al (2015) at MOI, which have been in keeping with this study which has a male predominance of 78.4%, which could be since majority of the male populations are the one who are involved in motor traffic accidents.

53.6% of the total population were below 30 years of age which has been tallying with a cross sectional descriptive study conducted in Cameroon by Owona et al, in 2018 (15) and a study conducted in Nigeria by Anyaehie et al, in 2015 (16), as this is the age group which is more active in using the motorcycles.

Closed fractures accounted for 84.5%, which was similar to 85.7% from a study done in Kenya in 2019 by Wilson et al(10).

According to AO/OTA classification, in this study, 90.7% were type A fractures and 9.3% were type B fractures as compared to a study done Kenya in 2019 by Wilson et al which revealed 75% being type A fractures, 21.4% being type B fractures and 3.6% being type C fractures. (10). This study did not include any type C fractures as it was part of the exclusion criteria since it was a retrospective study which did not include any complex fractures.

The Fin nail has been ideally designed to be used for transverse type fractures and to a certain extent short oblique fractures, which is in keeping with this study, since the fracture pattern 32A3 (56.7%) was the most common, followed by 32A2 (26.8%), which was similar with Wilson et al (2019), 32A3 (53.6%) and 32A2(17.9%). (10)

The ideal fracture location which need to be treated by Fin nails is the mid shaft femur which was the case in this study as 82.5% were mid shaft femur location.

Ideally retrograde approach is being used for Fin nail placement however this study revealed that 5.2% of the patients were treating using the antegrade approach

In this study, the differences were not statistically significant, however proximal shaft fractures constituted of 20.0% of radiological malalignment, which was a similar finding for Ricci et al (13), however their study does not mention what type of intramedullary nail was used. While comparing the approaches, 20% of antegrade approach were radiologically malaligned. Due to no statistical significance, the Fin nail can be used for both proximal shaft fractures and also via antegrade approach.

STRENGTHS AND LIMITATIONS

The main aim of the study was to assess the immediate radiological alignment following fin nail treatment for femoral shaft fractures, however this study had several limitations as it does not take into account the long term radiological alignment, long term clinical or functional outcomes post fin nail fixation.

The sample size for this study was calculated to be 95, however since 97 cases recorded in the SOSD for fin nail fixation post femoral shaft fractures were in the inclusion criteria, all the 97 cases were included in the study to strengthen the data. The initial number of 136 fin nail cases in the pilot study was actually incorrect as some of the cases had been recorded incorrectly or a double entry was done. Hence the SOSD provided all the required data for the study to be completed.

Not all cases had both AP and lateral views and hence this was another limitation, however only single radiographs were used from the SOSD to assess the postoperative radiograph.

Retrospective study design carries some limitations in terms of quality, however since the actual data in the SOSD has been collected in a prospective manner and since the data collection and analysis for the radiological alignment was performed specially for this study, hence the aspect of recall bias is ruled out.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

This study showed that majority of the patients with simple femoral shaft fractures treated with fin nail were male with mean age of 30.9 years.

Fin nail fixation did not cause significant malalignment and hence is an option for simple femoral shaft fracture treatment via the retrograde and possibly also the antegrade approach.

5.2 RECOMMENDATIONS

Fin nailing is a viable method with acceptable outcome in intramedullary femur fracture fixation.

I would recommend future larger scale studies to investigate the long term postoperative alignment, long term clinical and functional outcomes post fin nail fixation.

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APPENDICES-QUESTIONNAIRE.

1. **AGE OF PATIENT IN YEARS : -**

A) 18-30,

B) 31-40,

C) 41-50,

D) 51-60,

E) >60years

2. SEX OF PATIENT:-

A) Male

B) Female.

3. FRACTURE TYPE:-

A) Closed.

B) Open

i. Type I,
ii. Type II,
iii. Type IIIa,
iv. Type IIIb,
v. Type IIIc.

4. FRACTURE PATTERN (AO) :-

A) 32A

B) 32B

5. FRACTURE LOCATION :-

A) Proximal third

B) Middle third

C) Distal third

6. APPROACH :-

A) Antegrade.

B) Retrograde.

7. RADIOLOGICAL OUTCOME- ANGLE OF DEVIATION IN DEGREES :-

A) 0-5,

B) 5-10,

C) >10