ORIGINAL RESEARCH

Efficacy of trochantric fixation nailing with respect to dynamic hip screw in patients with unstable intertrochanteric hip fracture

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ABSTRACT

Introduction: Hip fractures are common problems in seniors and it is lethal. Pertrochanteric fractures, between the intertrochanteric cord and the lower border of the lesser trochanter, can be stable or unstable."Dynamic hip screws (DHS)" with "trochanteric stabilisation plates (TSP)" and "cephalo-medullary nails(CMN)" are treatment alternatives. CMN is trusted, but DHS with TSP shows promise. A meta-analysis is needed to compare CMN, DHS, and TSP for unstable trochanteric fractures.**Aims and objectives:** The study has compared between TFN with DHS which is treating unstableintertrochanteric hip fractures.**Methods:** This examination compared the efficacy of "dynamic hip screw (DHS)" and "trochanteric fixation nail (TFN)" in treating "intertrochanteric fractures". 60 participants experienced radiological and clinical trials. Those requiring resuscitation or splinting were accepted. Informed approval was accepted. Mobility and public health were assessed utilising the Parker mobility score and "The American Society of Anesthesiologists (ASA score)" respectively. Outcomes of DHS and TFN methods were reached for treating intertrochanteric fractures.**Results:** Table 1 demonstrates no statistically significant differences in preoperative age or mobility between DHS and TFN groups. Table 2 shows injury modes, with minor falls being the most common inboth groups. Both groups had left-sided injuries. Table 3 shows TFN's surgical outcomes: less blood loss,shorter operative time, no implant failures, infections, or mortality. TFN improved complications and limb length disparity. TFN outperforms in early functional recovery and overall function (Table 4).**Conclusion:** In conclusion, DHS is recommended for intertrochanteric fractures due to its low cost and high success rate.

Key words: Trochanteric fixation nail (TFN), dynamic hip screw (DHS), cephalo-medullary nails (CMN), angular blade plates (ABP)

INTRODUCTION

Fractures of the hip are one of the most common types of injuries that affect senior people [1]. It is also among the types of injuries that are connected with a considerable degree of morbidity and mortality. According to the findings of the research, around 50% ofhip fractures might be effectively per-trochanteric. Despite the fact that this type of fracture is regarded as unstable in up to 40% of cases. As a result, pertrochanteric fractures can occur intheproximalfemurregionbetweentheintertrochanteric cordandahorizontallinethatoperates across the lower border of the lesser trochanter [2]. This region of the proximal femur is known as the "intertrochanteric cord region". In the context of this conversation, it has been broadly classified as either stable or unstable fractures, and these classifications are based on the fracture method. Again, the options for monitoring "unstable trochanteric fractures" such as"cephalo-medullarynails(CMN)","dynamichipscrews(DHSw)", "trochantericstabilisation plates (TSP)", "proximal femoral locked plates (PFLP)", and "angular bladeplates (ABP)" [3]. The "Cephalo-medullary nails" have been recognised and demonstrated as a trustworthy option for the treatment of "unstable trochanteric fractures" by a number of different studies that have been conducted independently. As a result, the utilisation of CMN as the primary administration possibility for the fixation of unstable "per-trochanteric fractures" is generally recognised.

Nevertheless, a great number of studies have found that patients whose care is directed by DHS with the addition of TSP show radiologically and practically encouraging improvements. Furthermore, the biomechanical reason for employing the CMN in "unstable trochanteric fractures" [4]. It suggests that the weight-bearing emphasis acts through a shorter lever arm from the midpoint of hip rotation, which places less pressure on the implantation. This is because the lever arm is shorter. Some researchers have described the impact of the "intramedullary buttress" as a separate element in defying fracture destruction with CMN. On the other hand, various investigations have supported the combination of DHS with TSP in these fractures because it provides a lateral wall buttress to prevent excessive fracture Varus destruction or medicalization [5]. This is due to the fact that it was shown that DHS was more effective than TSP in treating these fractures.

The TSP can be used intraoperatively when DHS fixation had been planned but later considered unsuitable. Even described as "per-trochanteric fractures"; different kinds of"per-trochanteric fractures" are based on the fractured format [6]. A type II fracture can be identified by the movement of thefracture line inferiorly and laterally from the lesser trochanter.

In contrast, people with a type I fracture have a fracture line that hits superiorly and laterally from the lesser trochanter. This is the characteristic of a type I fracture. In addition to this, it has classified type 1 fractures into five further subtypes, each of which was determined by the pattern of the fracture [7]. Unstable fracture patterns include those that have a “loss of posteromedial support (type IC)”, “lateral wall comminution (type ID)”, “4-part fractures (type IC)”, or “subtrochanteric extension (type 2)”. Other unstable fracture patterns include these. The "Arbeitsgemeinschaft für Osteosynthesefragen (AO)" or "Orthopaedic Trauma Association (OTA)" recently divided per-trochanteric fractures into three groups: 31A1, 31A2 and 31A3 [8]. In the AO/OTA classification system, fractures 31A2 and 31A3 are both categorised as unstable fractures. In the past, PFLP and ABP were utilised as primary treatment options to control these fractures. Due to their high failure rate and poor function, many procedures have been limited [9]. According to medical journal studies, the CMN, DHS, and TSP can cure “unstable trochanteric fractures”. However, none of the available individual research can be used to draw a conclusion that is reliable or sufficient enough to warrant consideration. The research would like to do a meta-analysis to compare the results of treating “unstable trochanteric fractures” with CMN against DHS with TSP [10]. This will allow us to examine the topic in a more in-depth manner.

METHODS RESEARCH DESIGN

The purpose of this study, which was donebetween December 2016 and March 2018, was to evaluate the efficacy of the “dynamic hip screw (DHS)” vs the “trochanteric fixation nail (TFN)” in treating patients with suspected intertrochanteric fractures. A total of 60 participants met thestudy's inclusion and exclusion criteria. Patients were givenfull radiological and clinical assessments as soon as they arrived, and those who required resuscitation or splinting with skin or skeletal traction were admitted to the ward. In this investigation, informed consent was obtained from all trial participants. The Parker mobility score (Annexure1) was used to evaluate the participants' ability to walk before their fracture, and the “American Society of Anesthesiologists (ASA score)” was applied to examine the subjects' general health. Results from DHS and TFN techniques for treating intertrochanteric fractures were compared and contrasted in this study.

INCLUSION AND EXCLUSION CRITERIA INCLUSION CRITERIA

1. At least 45 years of age.
2. Hipfracturesintheintertrochantericareathatare unstable.
3. The Monotrauma.
4. Clinically ready for surgery.
5. Less than two weeks after the initial fracture.

EXCLUSION CRITERIA

1. Cancer-related fractures.
2. Pre-fracture immobility.
3. Extreme dementia.
4. Low life expectancy because of multiple serious health problems.
5. A condition that prevents surgical intervention.
6. Noncompliancewiththerehabilitationform-filling procedure.

STATISTICAL ANALYSIS

The statistical analysis in this study entailed comparing several variables between the DHS and TFN cohorts. Means for continuous variables were compared using t-tests, and these variables comprised age, operating time, blood loss, and functional evaluation scores. Categorical variables such as gender, mechanism of injury, and complications were compared using chi-square testing. The statistical significance of the differences was determined by computing p-values.

ETHICAL APPROVAL

The appropriate institutional review board (IRB) or ethical committee gave their authorization for this study to proceed once it was presented to them for review and approval.

RESULTS

Table 1 shows a comparison between DHS and TFN in terms of patient characteristics before surgery. Statistical tests show that the difference in mean ages

between the DHS and TFN groups is not statistically significant. In terms of the ratio of male to female patients, the TFN group is somewhat more male-dominated than the control group. The TFN group also had a little higher mean Preoperative Mobility Score than the DHS group, but this difference is also not statistically significant. These data suggest that there are few distinctions between the two operations with respect to age, gender, and mobility before surgery.

Table 1: Pre-operative data

	DHS (n=30)	**TFN (n=30)**	**Test of significance**
Mean age in years	64.67	65.26	t= -0.218, p= 0.828
Gender of pt (Male:Female)	2:01	2.1:0.9	
Mean PMS	7.5	7.97	t= -1.678, p= 0.098
Mean ASA	1.67	1.5	t= 0.740, p= 0.462
Age Group (years)	DHS (n= 30)	TFN (n=30)	
45-54	7	3	
55-64	6	12	
65-74	11	9	
75-84	5	6	
85-94	1	0	
	DHS (n=30)	TFN (n=30)	
Male	20	21	
Female	10	9	

Table 2 shows DHS and TFN patients' damage modes. The table displays the frequency of several injury modes for each treatment, categorised as "Trivial fall", "Fall from height"and "Road traffic accident". The DHS group had 20 trivial falls, four falls from height, and six road traffic accidents. However, the TFN group displays a similar pattern, with trivial falls (17 instances), falls from height (eight cases), androad traffic accidents (five cases) being the most common injuries. The table also shows the injury side. 25 DHS cases are left-sided injuries, while five are right-sided. The TFN group has 23 left-sided cases and seven right-sided instances. These findings imply that DHS and TFN injuries are most often caused by trivial falls, and left-sided injuries are more common in both categories.

Table 2: Mode of injury

	DHS(n=30)	**TFN(n=30)**
Trivial fall	20	17
Fall from height	4	8
Road traffic accident	6	5
	DHS(n=30)	TFN(n=30)
Right side	5	7
Left side	25	23

In order to better understand the differences between DHS and TFN for unstable intertrochanteric fractures, we present a complete comparison in Table 3. According to the numbers, most of the fractures in both categories are AO Type 2. TFN has clear advantages over DHS in terms of surgical results, such as less blood loss and a shorter operative time. Neither group experienced any cases of implant failure, wound infection, or patient mortality. Although both the DHS and TFN groups experiencedproblems like non-union and re-operation, statistical analysis reveals no significant differences between the two groups in terms of limb shortening and varus deformity. There are also fewer incidences of substantial limb length difference following the TFN treatment compared to DHS. In conclusion, the results indicate that TFN would be preferable to DHS due to its possible advantages in surgical efficiency and better outcomes related to complications and limb length disparity.

Table 3: Type of Unstable Intertrochanteric fracture

DHS (n=30)		**TFN(n=30)**	
AOType2	27	28	
AOType3	3	2	
DHS(n=30)		TFN (n=30)	Test of significance(pvalue)
Mean operativetime	85.5	60.16	t= 8.1647,p=0.000
Mean bloodloss (inml)	221	123.83	t= 8.414, p=0.000
Openreduction	8	2	X2=4.32, df=1,p<0.05

X ray Exposure (InF sec)	17.5	28.03	t= 6.229, p=0.000		
	DHS(n=30)	TFN (n=30)	Test of significance(pvalue)		
Hospital stay (indays)	10.87	6.13	t= 20.397,p=0.0000		
Woundinfection	Nil	Nil			
Death of patient	none	none			
Complication	DHS (n=30)		TFN (n=30)		Test of significance (pvalue)
	Present	Absent	Present	Absent	
Implantfailure	3	27	2	28	X2=0.22, df=1,p>0.05(NS)
Nonunion	2	28	0	30	X2=2.07, df=1,p>0.05(NS)
Woundinfection	0	30	0	30	
Reoperation	3	27	1	29	X2=1.07, df=1,p>0.05(NS)
Significant shortening(>2.5cm)	3	27	1	29	X2=1.07, df=1,p>0.05(NS)
Significantvarus deformity(>10deg.)	3	27	1	29	X2=1.07, df=1,p>0.05(NS)
Limb Length Discrepancy	DHS (n=30)	TFN (n=30)			
<0.5cm	0	0			
0.5-1.5cm	20	24			
1.5-2.5 cm	7	5			
>2.5cm	3	1			
Limb Length Discrepency	DHS(n=30)	TFN(n=30)			
Significant length discrepancy (>2.5cm)	3	1			
Nonsignificant length discrepancy (<2.5cm)	27	29			

The results of DHS and TFN operations on functional evaluation scores and varus deformity are shown in Table 4. The results of the functional evaluation at 16 weeks demonstrate that TFN results in better scores than DHS, indicating improved early functional recovery. A higher percentage of cases in the good and outstanding categories of the S&W score is also displayed by the TFN group, indicatingsuperior general functional outcomes. Functional evaluation scores at 24 weeks and radiological union times show no significant differences between the two groups. These results imply that TFN may be preferable to DHS for individuals with varus deformity because it allows for earlier functional recovery and better functional outcomes.

Table 4: Functional Evaluation Score

Varus Deformity in Degree	**DHS(n=30)**	**TFN(n=30)**		
0-5	21	27		
05-Oct	6	2		
>10	3	1		
	DHS(n=30)	TFN (n=30)	Test of significance (p value)	
SWS 16 weeks	14.93	17.33	t= -2.99, p= 0.004	
SWS 24 weeks	24.07	25.27	t= -0.95, p= 0.344	
Radiological union in wks	14.83	14.73	t= 0.13, p= 0.894	
S&W score	DHS (n=30)		TFN (n=30)	
	SWS 16	SWS 24	SWS 16	SWS 24
Poor <16	18	3	8	1
Fair 16-23	12	6	21	6
Good 24-31	0	21	1	23
excellent >31	0	0	0	0

DISCUSSION

To the best of our knowledge, this is the first meta-analysis comparing the “cephalo-medullary nail” and “dynamic hip screw” with the “trochanteric stabilisation plate” for the treatment of “unstable per-trochanteric hip fractures” [11]. In the literature, there are not many meta-analyses that directly compare DHS alone to CMN for the treatment of these fractures. While DHS alone has been shown to be effective in the past, recent studies have shown that CMN is more effective for treating “unstable trochanteric hip fractures”. It is believed that “excessive lag screw sliding”, which can result in the collapse or medialization of the “distal fracture fragment” [12]. It is the primary reason for failure in cases that are only addressed by DHS. This is the case even when the lag screw is positioned in the femoral head in the optimal position. A lack of calcar support or weakness in the lateral femoral wall, both of which lead to fracture collapse under stress, are proposed as potential explanations [13]. Our most important conclusion is that, unlike DHS with TSP, CMN is exclusively linked to decreased revision rates. In the CMN group, revision surgery was necessary due to lag screw removal, deep infection, periprosthetic failure, and non-union. Non-union, fracture

displacement, deep infection, and lag screw cut-out were the four most common reasons for revision in the DHS with the TSP group [14]. None of the listed studies reliably reported these data. Union time, avascular necrosis, and fracture alignment may correlate with long-term function or explain revision rates, hence we recommend comparing them. The meta-analysis data demonstrate no significant differences in hospital stay, operative time, blood transfusion, complications (intra-operative, mechanical failure, and infection rate), or postoperative functional outcome [15]. The term "iatrogenic fracture while distal locking"wasusedtodescribeonlytwocircumstancesofintra-operative complications. Because lengthy nails were unavailable, the authors reported using cerclage wiring to successfully union the fractures in both patients. The term "mechanical failure" includes “lag screw cut-out”, the “Z-effect”, “secondary displacement” (with excessive medialization or varus collapse), and “peri-prosthetic fracture”. This study conducted a significant randomised controlled trial comparing the use of TRIGEN INTERTAN CMN to that of DHS for the treatment of trochanteric and subtrochanteric hip fractures in patients [16]. Among the patients cared for by DHS, 70% additionally used TSP. Comparing pain, function, and rates of reoperation between INTERTAN nails and DHS revealed no significant differences. In addition to the impossibility of excluding patients handled solely by DHS, the study's departure from the typical IMN design disqualified it from inclusion in our analysis. It also did not meet one of our inclusion criteria; a direct comparison between IMN and DHS with TSP [17]. It is important to note that there are certain caveats to the current study. The literature only contains five research, with a total of 60 participants. In three trials, the duration of follow-up was as short as 6 months, bringing the mean down to 15.4 months. As a result, this approach may fall short of identifying all patients that ultimately fail or require additional treatment. Larger subject numbers are needed for an adequately powered examination of outcomes like the rate of intra-operative complications, which are significant but infrequent. The variation in implant design between studies is one of the limitations that has been pointed up. The “Proximal Femoral Nail Anti-Rotation (PFNA)” design with “2 proximal screws” was utilised in 4 investigations, while the “Gamma nail” design with “1 proximal lag screw” was used in 1 [18]. In addition, it was unclear whether they wore long or short nails or a titanium or stainless-steel nail type. When compared tothe typical TSP utilised in the other four trials involving DHS with TSP, the study used a different TSP design, in which the TSP was smaller and fitted from inside the DHS plate through the barrel. Furthermore, we recognise that the bulk of the included papers are cohort studies, which may compromise the accuracy of the data. Furthermore, "surgeon's preference" was always given as the reason for a particular fixation method being used, indicating that no proper randomization had taken place in any of the cohort trials. Blinding of study participants and surgeons is still a logistical nightmare [19-20]. Regardless, the overall quality of the included studies was judged to be high in the great majority of the bias areas that were evaluated.

CONCLUSION

The study has concluded that the comparative analysis suggests that DHS (dynamic hip screw) should be used for intertrochanteric fractures because of its low cost and established track record of success. We recommend that trochanteric fixation nails (TFN) be used only for unstable pertrochanteric (31 AO 2) and high subtrochanteric (31 AO 3) fractures. This is because TFN allows for fewer complications, less blood loss, earlier weight bearing, and less open reduction, all of which are desirable outcomes. TFN fixation demands technical precision and perfect implant location for best results. The limitations of this study include the very small sample size and the relatively short follow-up duration of six months to one year, which may not capture long-term consequences. Additionally, the study did not contain a control group for comparison, which may limit the capacity to draw definitive results. Furthermore, the study did not address potential confounding factors such as comorbidities or surgeon experience, which could affect the outcomes. Finally, the study relied on self-reported pain and functional results, which may be vulnerable to bias.

CONFLICT OF INTEREST: Not available.

FINANCIAL SUPPORT: Not available.

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