

## Original Research Article

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# Comparison between the results of proximal femur nail anti-rotation and cemented bipolar hemiarthroplasty in treatment of intertrochanteric fractures in Sanglah Hospital in 2016

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## ABSTRACT

**Background:** Hemiarthroplasty is now being considered as a primary treatment for comminuted unstable type of IT fracture in elderly on the grounds that it allows early mobilization and full weight bearing. Recently popular modality is fourth generation of intramedullary nails like the Proximal Femoral Nails. The goal of treatment is restoring mobility safely and efficiently, while minimizing the risk of medical complications and technical failure.

**Methods:** A Forty patients, having Intertrochanteric fractures treated with PFNA or cemented BH at our institution between April 2016 and April 2017. The primary outcomes measures were postoperative complication and hip function. The secondary outcome measures were intraoperative blood loss, transfusion rate, surgical time, postoperative haemoglobin and hospital stay.

**Results:** Seventeen patients in PFNA group and 23 patients in BH group were included for analysis. There were no significant differences between the two group regarding to the Harris Hip Score at 6 months follow up. Significant differences were found between PFNA and BH group in comparison of intraoperative blood loss ( $p < 0.001$ ), length of stay ( $p = 0.006$ ), surgical time ( $p < 0.001$ ), postoperative transfusion ( $p < 0.001$ ), and decrease of hemoglobin ( $p=0.001$ ).

**Conclusions:** These findings indicate that PFNA has obvious advantages over the BH in treatment of intertrochanteric fractures in case of surgical trauma and postoperative complication.

**Keywords:** Bipolar Hemiarthroplasty, Intertrochanteric Fracture, Proximal Femur Nail Anti-Rotation

## INTRODUCTION

Fractures of the Intertrochanteric (IT) region are some of the most common fracture encountered by an orthopaedic surgeon. With increase in life expectancy, the incidence of these fracture is also increasing.<sup>1</sup> This may be due to Intertrochanteric Fractures typically occurred in the elderly population. Unstable intertrochanteric fractures are a major cause of concern due to an increase in morbidity and mortality associated with such fractures.<sup>2</sup> IT fractures account for approximately 45% to 50% of all

hip fractures in the elderly and out of these, 50% to 60% are classified as unstable. Unstable IT fractures are those having comminution of the posteromedial buttress, exceeding a simple lesser trochanteric fragment or those with sub trochanteric extension. Moreover, osteoporosis and comminution often resulted in delayed full weight-bearing and high rate of complications.<sup>3</sup>

Historically, treatment of intertrochanteric fractures involved intramedullary hip screw and arthroplasty.<sup>4</sup> Hemiarthroplasty for intertrochanteric fractures has been

described as early as 1973. It is now being considered as a primary treatment for comminuted unstable type of IT fracture in elderly on the grounds that it allows early mobilization and full weight bearing. Recently popular modality is fourth generation of intramedullary nails like the Proximal Femoral Nails.<sup>5</sup>

The goal of treatment is restoring mobility safely and efficiently, while minimizing the risk of medical complications and technical failure. Restoration of mobility depends on the quality of bone and the type of implant used. The incidence of failure with unstable IT fractures is as high as 50% and the cut out rate can be as high as 8% for hip screws. Publications in the last two decades have suggested that the use of prosthetic replacement or PFN for unstable IT fractures have allowed early postoperative mobilization and prevents excessive collapse at fracture site. Patients can return to their preinjury level of activity much earlier by treatment with either of these modalities; thus, eliminating the postoperative complications caused by prolonged immobilization or implant failures.<sup>6</sup>

The purpose of this study was to primarily compare the preoperative, intraoperative and postoperative parameters using Proximal Femur Nail Anti-rotation (PFNA) and Cemented Bipolar Hemiarthroplasty (BH) for the management of Intertrochanteric fractures.

## METHODS

This study is a retrospective study with a total of 40 patients (20 males, 20 females; mean age 67.8 years; range 52 to 89 years). The population of this study is the patient with femoral intertrochanteric fractures and classified according to AO Classification of Intertrochanteric Fractures of femur who were operated in Sanglah Hospital between April 2016 and April 2017 (1). Each patient was graded according to ASA physical status score preoperatively.

Inclusion criteria of this study is patient with femoral intertrochanteric fractures, aged above 50 years old who were operated under regional anesthesia with a standard operative procedure was followed for all cases of BH and PFNA. Of the 40 patients, 23 (58%) were treated with PFNA (PFNA group), and 17 (42%) with cemented bipolar hemiarthroplasty (BH group). Patients with comminuted femoral intertrochanteric fracture were excluded from this study.

The study was conducted in accordance with the principles of the Declaration of Helsinki. These patients could walk and perform their daily work preoperatively, and who were followed-up for a minimum 6 months were included. At hospital admission; anterior-posterior radiographs, lateral radiographs of affected hip were taken to assess the fractures of trochanter minor and major. If there was no contraindication, all patients who were to undergo operation were administered low

molecular weight heparin (according to their weight) for deep venous thrombosis prophylaxis.

All patients were administered prophylactic third generation cephalosporin (according to their weight) 30 minutes preoperatively. Patients in PFNA group underwent operation after application of closed reduction with fluoroscopy on traction table, in supinated position. Patients in hemiarthroplasty group underwent operation in supinated or lateral decubitus position according to lateral or posterolateral approach. All patients were mobilized with a walker on full weight bearing in first day postoperatively and started passive exercises on bed.

Patients in both groups were compared according to age, gender, duration of operation, amount of intraoperative blood transfusion, transfusion rate, functional outcome of Harris hip score, postoperative complications, hospital stay.

SPSS version 15.0 (SPSS Inc., Chicago, IL, USA) program was used to assess the data statistically. Statistics of percentage frequency were used for categorical data. Chi-square test and Mann-Whitney U was used for group comparisons. Also, means for data that were collected by measurement, standard deviation, minimum-maximum statistics, and T-Test for independent samples were used.

## RESULTS

Patients in both groups had the same fracture type (A2) according to Orthopaedic Trauma Association classification. Operations were performed by orthopaedic surgeon in Lower Division in Sanglah Hospital. There's no mortality during the operation in both groups. Physical status classification of preoperative patients for anaesthetic risk assessment (ASA Score) for PFNA was 2 patients ASA 2, 15 patients ASA 3, and 1 patient ASA 1, 7 patients ASA 2, 15 patients ASA 3 for BH (Table 1), there was no significant difference between two groups ( $p=0.229$ ).

Mean durations of operation were 85,63 minutes (range 40-110 minutes) and 180 minutes (range 85-300 minutes) in the PFNA and hemiarthroplasty groups, respectively (Table 2). There was a significant difference in durations of operation between PFNA and hemiarthroplasty groups ( $p<0.05$ ), with duration of operation being shorter in PFNA group (Table 2).

There was a significant difference in amount of intraoperative blood transfusion between the groups ( $p<0.05$ ), with PFNA group requiring lower amount of blood transfusion (Table 1). Mean durations of hospital stay were 6,56 days (range 7-20 days) and 10,13 days (range 6-20 days) in the PFNA and hemiarthroplasty groups, respectively. There was a significant difference in durations of hospital stay between the groups ( $p<0.05$ ), with PFNA group staying in hospital for a shorter period

of time (Table 2). Harris hip scores of patients were calculated by physical examination and anamnesis. Harris hip scores were 72 and 69 in PFNA and hemiarthroplasty

groups, respectively. There was no significant difference between two groups ( $p>0.05$ ) (Table 2).

**Table 1: Demographic and preoperative data.**

Character	PFNA		Bipolar		Statistic	Significance
Jumlah	17		23			
Gender	<b>Male</b>	<b>Female</b>	<b>Male</b>	<b>Female</b>	Chi-square	1,000
	9 (52,9%)	8 (47,1%)	11 (47,8%)	12 (52,2%)		
Age (Mean) (Sd)	67,8 (6,5)		68,4 (11,4)		T test	0,844
Side fracture	<b>Right</b>	<b>Left</b>	<b>Right</b>	<b>Left</b>	Chi-square	0,264
	5	12	12	11		
Energy trauma	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	Fisher's exact test	0,250
	12	5	20	3		
Hipertensi	7		12		Chi-square	0,713
DM	7		11		Chi-square	0,923
COPD	7		3		Fisher's exact test	0,066
Cardiovascular	3		9		Chi-square	0,264
Renal Failure	3		0		Fisher's exact test	0,69
Cerebrovascular	2		1		Fisher's exact test	0,565
	ASA1	0	ASA1	1		
ASA	ASA2	2	ASA2	7	Chi-square	0,229
	ASA3	15	ASA3	15		

**Table 2: Data of patients during and after operation.**

Characteristic	PFNA		BH		P
	Range	Mean (SD)	Range	Mean (SD)	
Duration of operation (min)	40-110	85,63 (1,5)	85-300	180 (9,18)	0.000
Transfusion (units)	1-2	1	1-4	3	0.000*
Duration of hospital stay	7-20	6,56 (1,79)	6-20	10,13 (3,35)	0.006
Decrease of hemoglobin		1,02 (0,26)		4,97 (0,22)	0.001
Bleeding during operation	50-500	182,63 (30)	100-1000	933 (49,94)	0.000
Harris hip score	60-79	72	61-86	69	0.99*

PFNA: Proximal femoral nail antirotation; \* Mann Whitney U Test.

## DISCUSSION

Intertrochanteric Fractures of the femur are relatively common injuries among the elderly individuals. In the last few decades, treatment of intertrochanteric fractures has evolved significantly. Various methods of fixation has developed. Our study included 40 patients randomized for these two modalities of treatment (Proximal Femoral Nail Anti-Rotation and Cemented Bipolar Hemiarthroplasty) and were followed-up for a minimum 6 months, with the total duration of study being 18 months. Total number patients were treated by PFNA is 23 (58%) (PFNA group), and 17 (42%) treated with cemented bipolar hemiarthroplasty (BH group).

The mean duration of surgery in the BH (180 minutes) was much more than PFNA (85,3 minutes), was significant ( $p$ -value 0.000). There was a significant

difference in amount of intraoperative blood transfusion between the groups ( $p$  value 0.000), with PFNA group requiring lower amount of blood transfusion. The mean duration of hospital stay in PFNA was shorter than BH, also significant difference ( $p$ -value 0.006). No significant difference in Harris Hip Score ( $p$ -value 0.99).

A prospective study done by Mansukhani et al, compared the use of dynamic hip screw (DHS), proximal femoral nailing (PFN) and hemiarthroplasty bipolar (HAB). PFN surgery was shown to have a lower mean blood loss ( $252 \pm 146,0$  PFNA group and  $573 \pm 152,2$  BH group) during

surgery, also shorter hospitalization time ( $17,72 \pm 4,14$  PFNA group and  $18,27 \pm 4,43$  BH group), and mean blood transfusion unit ( $1,14 \pm 0,38$  PFNA group and  $1,6 \pm 0,52$  BH group). Both of the results were statistically significant. This finding was also supported by Xu YZ et

al, which also found a significantly lower blood loss in the PFN group.<sup>5</sup> Harris hip score (HHS) at 12 months showed a higher percentage of excellent and good scores for PFN as compared to HAB but similar numbers for DHS.<sup>6</sup>

Another study by Suh Y-S et al, showed application of PFNA, DHS and HAB in management of comminuted intertrochanteric fractures. They found no significant differences in clinical outcome at 12 months between the three groups using HHS for functional outcome, the Koval Score for evaluation of mobility and Visual Analogue Scale (VAS) for pain measurement. However, they found significant differences in radiologic limb discrepancy shown in plain radiographs at 12 months follow up, with higher discrepancy in the DHS group.<sup>7</sup>

A study by Saha, PK. showed better results with HAB as compared to PFNA in unstable trochanteric fracture in patients over 75 years old, in terms of associated surgical complications, as well as in the Parker and Postel Merle d'Aubigné (PMA) functional scores. The average blood loss of HAB patients were twice as high as those of internal fixation patients. The study also showed that arthroplasty was not associated with greater post-operative mortality and that general complications rate such as thromboembolism, cardiorespiratory, neurological and infections, was similar between the two groups (21.7% in nailing vs. 21.4% in arthroplasty).<sup>2</sup>

However, a case series by Luo et al, showed no significant differences between the PFNA and HAB group in the treatment of senile intertrochanteric fractures with regards to the orthopaedic complications, reoperation rate and surgical time. HHS at 12-month follow-up showed no statistically significant differences between the two groups ( $81.3 \pm 8.2$  for the PFNA group and  $79.1 \pm 10.2$  for the hemiarthroplasty group,  $P = 0.240$ ). Significant differences were only found in comparison of intraoperative blood loss, transfusion rate, medical complications and hospital stay. Patients treated with HAB had a trend of higher postoperative 1-year mortality than those who underwent PFNA (21.2% vs. 11.3%,  $P = 0.134$ ). The study revealed one potential reason for such trend, noting a relative greater surgical trauma associated with HAB on aging patients.<sup>8</sup>

HAB allow for initial stabilization and long-term fixation even in osteoporotic bone and a significantly shorter time to mobilization. However, HAB is associated with longer operation time and higher intraoperative blood loss compared to internal fixation.<sup>9</sup> Intramedullary fixation using PFNA reduces the risk of implant failure but its main drawback is the possibility of femoral shaft fracture, especially at the site of the distal locking screw hole.<sup>10</sup> PFNA has shown to be more biomechanically stronger because they can withstand higher static and several fold higher cyclical loading than dynamic hip screw. The implant compensates for the function of the medial column. Proximal femoral nail also acts as a buttress in

preventing the medialization of the shaft. PFNA is better than BH in Type II intertrochanteric Fractures of femur in terms of decreased blood loss, reduced duration of surgery, reduced hospital stays, decreased risk of complication. The most important determinant of treatment of intertrochanteric fracture is the degree of stability of such fractures and the different advantages of the implant designs available to treat the fractures. Stable fractures may be treated with intra or extra-medullary implants while treatment of unstable fractures need good intra-operative reduction and the use of intra-medullary implants.<sup>11</sup>

Arthroplasty and PFN are commonly used for their advantages in allowing for early mobilization. However, it should also be noted that patient's general health condition may play a part in postoperative mobility. The higher incidence of intertrochanteric fractures in elderly population carried forward probable complications due to systemic problems and play a significant part in their quality of life.

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