

Original Article

Not all Garden-I and II femoral neck fractures in the elderly should be fixed: effect of posterior tilt on rates of subsequent Arthroplasty

Kong Taotao^{1*}, Cao Xu-yang¹, Dong Ruifang¹, Zhang Xiao¹, Jia Kefeng¹, Zhang Yifei¹, Wang Junjiang¹

Abstract

Background: Internal fixation is the best method for the treatment of Garden I and II in elderly patients. However, there is a chance of failure due to the more than 20° tilt, as measured in the radiography.

Objective: This work aims to identify the correlation between the posterior tilt and the consecutive arthroplasty risk in elderly patients who had undergone Garden I and II neck fractures.

Methods: This research is a secondary analysis of data collected in the FAITH trial, which compared the cannulated screw with the sliding hip screw in the treatment of the femoral neck fracture. This study included patients in the fifty year age group. All the patients had Garden I or II neck fractures (femoral) from the posterior tilt, which amounted to above 20° or <20°. The multivariate proportional analysis was utilized for assessment of the rear tilt and consecutive arthroplasty correlation for the 24 month follow up period.

Result: Out of the 555 patients, 67 patients had a 20° tilt, and 488 had <20° tilt. About 73 out of 555 patients had undergone consecutive arthroplasty in the two year follow up duration in the multivariate analysis with the posterior tilt <20° which are at a lesser risk of consecutive arthroplasty as compared to the posterior tilt with 20° (p value= 0.008; CI(95%)=1.24). In contrast, the other factors that are linked with the consecutive arthroplasty are the 8p year age group (p value=0.03).

Conclusion: Patients with the Garden I and II neck fracture analysis posterior tilt of 20° is correlated with the significant risk of consecutive arthroplasty. Patients with the Garden I and II neck fracture (femoral) with 20° tilt are reconsidered for the primary arthroplasty. [*Ethiop. J. Health Dev.* 2022; 36(1):00-00]

Keywords: Garden I; Garden II; Neck fracture; FAITH; Arthroplasty

Introduction

Standard care of the femoral neck fracture patients has been provided by the internal fixation using the fixation method. The internal fixation result is only about 23% (1) as per previous reports. The following procedure of the internal fixation is arthroplasty. There are also questions about the Garden I and II neck features, as to whether arthroplasty is a better treatment. Posterior tilt degree has been regarded as an essential factor for the Garden I and II internal fixations based on radiography prior to surgery. Research suggests that posterior tilt leads to the failure of the procedure (2,3). But some reports, have not detected any links between the posterior tilt and femoral neck treatment.

Additionally, the previous research considered cannulated fixation of the screw of non displaced femoral neck fractures and not the use of a sliding screw. So, there is no general agreement on the posterior tilt effect before operation radiography. The present study aims to identify the posterior tilt value on the lateral radiography after the operation, predisposed to failure followed by Garden I and II femoral neck fractures in elderly patients (4, 5, 6).

Material and methods

This research is based on data collected from previously published work. The data was collected from the FAITH trial, which compared the sliding screw use and the cannulated screw in the low energy femoral neck fractures of below 50 years old patients. The study was conducted with 1,079 patients, surgery

was performed at 81 clinics in different countries like Canada, the USA, Germany, Netherlands, India. The surgeon's decision related to the fracture reduction was solely taken by the surgeon, and was not based on the study protocol. A central committee was used to decide on the fracture reduction, which is accepted in maximum cases (97.8%). Patients were clinically assessed at a period of three month after the operation. The central committee revised all procedures. The trial was approved by the HIREB and by review boards of all clinical participants. The results and trial protocol was previously published. This analysis was done among the FAITH trial enrolled patients who had femoral back fractures Garden I and II. Anteroposterior radiography results were used for classification of these two types of fracture; valgus impacted incomplete fracture which was classified as the Garden I fracture, and the non-displaced fracture was classified as the Garden II fracture. At the same time, complete fractures were classified as Garden III and complete displacement and Garden IV was classified as trabeculae orientation. Those without adequate preoperative lateral radiographs, were removed from the present analysis. Preoperative lateral radiographs have been checked for each patient. The categorized value of the tilt was <20 degrees as suggested by palm et al. Radiographs review was duplicated, which was solved by the third reviewer. The significant result was subsequent arthroplasty in the last 2 years during the follow up duration.

A multivariate cox regression model was done to assess the association between arthroplasty and the

¹ General Hospital of Jizhong Energy Xingtai Mining Group Co., Ltd. 202 Beiyi Street, Xingtai City, Hebei Province, China

posterior tilt. Based on the previous studies, confounders were selected. It has been assured that there were ten events for each variable to avoid an unstable model in this way, confounders included sex, age, preoperative status and implant placement quality. Patients were categorized as either the "independent Ambulator" or "dependent ambulator". Central committee implant placement was categorized as either acceptable or unacceptable. As per the FAITH trial, implant placement is improper if the lag screw was found to be high in the postoperative radiography or if there was a central screw in the lateral femoral cortex. The results are reported with a 95% confidence interval, Hazard ratio, p values, and all the tests are two-tailed and done with the 0.05% significance level.

Result

Out of the 1,079 patients, 734 patients had FAITH trials with Garden I and II fracture. Those without proper lateral radiographs were removed from the trial. 555 patients were included in the analysis. The average

patients' age was 74.8. 380 patients were female. About 12.1 % of patients had fractures with the 20° posterior tilt (table I). Substantial posterior tilt was assessed as per the reviewers agreement (89.8% agreement; kappa = 0.61). In the follow-up period of 2 years, about 73 patients out of 555 had undergone arthroplasty. Patients with the 20° posterior tilt have found a significant risk of arthroplasty comparatively with patients having <20° tilt (HR, 2.2; 95% confidence interval 1.24, p-value =0.008) as per the multivariate analysis. Factors linked with arthroplasty was old age. Patients with more than 80 years of age had arthroplasty in the 24 months comparatively than those aged 29 to 50 (HR, 3.8; 95% Confidence Interval= 1.17 to 12.91; p value= 0.02). For female patients there was an increased risk of arthroplasty (HR value=1.72; 95% Confidence Interval= 0.98) (Table II). Patients with all three risk factors like age >80, tilt 20°, and female gender, the failure rate was 42.8%. Whereas in the patient's without all these complications the failure rate was 5.7%.

Table 1: **Patients demographics data**

Patient Demographics	No. of Patients
Age (yr)	
80	229
60 to 79	256
50 to 59	70
Ethnicity	
White	512
Nonwhite	42
Sex	
Male	175
Female	380
ASA classification	
1	70
2	238
3	224
4	23
BMI (kg/m ²)	
Normal (18.5-24.9)	300
Underweight (<18.5)	46
Overweight (25-29.9)	154
Obese (≥30)	48
Diabetes	
Yes	87
No	464
Smoking	
Non-smoker	272
Pre smoker	187
Smoker	95
Living before fracture	
Non- institution living	529
Institution living	26
functional status before fracture	
Independent ambulator	413
ambulatory aid used	142
Characteristics of fracture	
Garden classification for femur	
Garden I	375
Garden II	180
Pauwels classification	
I	129
II	376

III	51
Fracture level	
Sub capital fracture	395
Midcapital fracture	145
Basicervical fracture	14
Posterior tilt	
Posterior tilt <20°	487
Posterior tilt 20°	68
implant placement quality	
Unacceptable	18
Acceptable	520
Unable to assess	17
Type of reduction	
Open reduction	26
None	284
Closed reduction	246
Surgical factors	
Surgical delay	
24-48 hr	208
<24 hr	157
>48 hr	182
Implant type	
Cannulated screws	277
Sliding hip screw	278
Total	555

Table 2: Associated factors with consecutive Arthroplasty

Variable	Crude Rate of Subsequent Arthroplasty	MEHR	P-Value
Sex			
Female	(57/380)	1.72 (0.97, 3.05)	0.06
Male	(16/175)	1	—
Age in yr			
60-79	(35/256)	3.06 (0.94, 10.01)	0.06
50-59	(3/70)	1	—
80	(35/229)	3.88 (1.16, 12.90)	0.03
Quality of implant placement			
Unacceptable	(5/19)	1.95 (0.77, 4.93)	0.16
Acceptable	(66/521)	1	—
Unable to assess	(2/15)	1.39 (0.34, 5.69)	0.65
Pre-fracture functional status			
Using ambulatory aid	(20/141)	1.09 (0.63, 1.89)	0.76
Independent ambulator	(53/414)	1	—
Posterior tilt			
<20°	(58/488)	1	—
20°	(15/67)	2.22 (1.24, 4.00)	0.008

Discussion

The fracture fixation method is the present standard procedure for the Garden I and II fracture, though this procedure is not always positive, as previous reports indicate that the reoperation rate is between 8% and 23%.

From the data analysis, we obtained that 20° tilt (posterior) was linked with the failure of the consecutive internal fixation of the Garden I and II fracture in the neck. The results are matched with the studies performed by other researchers (3,4). An

analysis from 113 patients of age group 60 years have Garden I and II fractures in Denmark with 2 Hansson pin described as the most recognized procedure of posterior tilt measurement in the lateral radiography. The tilt of 20° is linked with the increasing risk of the reoperation than the risk associated with <20°tilt (p<0.001). A research analyst with the 321 patients with age group 54 to 96 years age group with the Garden I and II neck fracture in Norway also found the posterior tilt with 20° is a failure compared to the tilt <20°(HR value= 2.4; 95% Confidence interval 1.2; p-value is 0.03)(3). In a publication using 162 patients in

the 66 years age group with the Garden I and II fractures having AO cannulated treatment in clinics of Scotland, observed 10° tilt is linked with the increased fixation failure relatively than the tilt <10° ($p < 0.001$). According to Lapidus et al., about 378 patients who have fixation in the Garden I and II femoral neck fractures in Sweden do not correlate with the posterior tilt and the reiteration (p value = 0.05) (2). All these previous reports mainly regarded fractures settled by cannulated screws, not with the hip screw. Other factors which are found to be associated with consecutive arthroplasty is patients who are 80 years old. Parker and Conn also support this result. According to Parker and Conn, an increased age group predicts fracture healing (7). However, other studies did not find correlation for the femoral neck fracture and the age group (8). The positive side of this analysis is the large database used, which included previous publications and trials. This study also reports the sliding hip screw and cannulated screw treatment of the fracture as compared to earlier research. Additionally, all reiterations are adjudicated by a central committee of FAITH.

There is also some limitation in this study. The present analysis is not randomized, and also this analysis is taken as the correlation, not causation. This study did not analyze the potential factors like osteoporosis, which are not mentioned in the FAITH trial. Lastly, all FAITH trial patients are not included in this analysis due to omission and low-quality radiography.

Conclusion

Out of eight patients, one patient with two types of neck fracture needed arthroplasty in the 24 months follow up duration. There is a very high risk for patients who have 20° tilt, according to the lateral radiography. The 80 years old patients managed better with the arthroplasty.

Abbreviation

FAITH: Fixation using Alternative Implants for the Treatment of Hip fractures

HIREB: Hamilton Integrated Research Ethics Board

MHR: Multivariable Hazard Ratio

Reference

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