



Influence of Tip-apex Distance in Intertrochanteric Fracture Fixation in Malaysian Population

Goh K.L., Zamzuri Z., Mohamed Azri M.A., Mohd Afri S.
 Department of Orthopaedics, Traumatology & Rehabilitation, Kulliyah of Medicine, International Islamic University Malaysia, Jalan Hospital Complex, 25100 Kuantan, Pahang, Malaysia.
 Correspondence: z.zamzuri@iiu.edu.my

Introduction

Fracture fixation with dynamic hip screw (DHS) has been viewed as the gold standard of treatment as it provides strong fixation with low rates of complications and allow early mobilization.^{1,2} The tip-apex distance (TAD), which is a measure of the position of the tip of the lag screw in the femoral head and neck, has been shown to be a predictor of femoral head cutout when the value is more than 25mm. The objective of this study is to determine whether the TAD has a significant outcome in the local population. The value of TAD is evaluated in terms of screw migration and cut out comparing post-operative and one-year post-operative radiographs.

Materials and Methods

Thirty-three patients admitted between 2005 and 2010 treated with DHS were analyzed. All patients above 18 years old were included and exclusion criteria were multiple long bone fractures, segmental femur fracture, pathological hip fracture and previous hip surgery. The immediate post-operative and one-year post-operative TAD were compared to look for screw lip migration, screw cut out, acetabular penetration, implant migration, implant failure, fracture malunion and nonunion. Statistical analysis was done using PASW/SPSS version 18. For all tests, statistical significance was taken at $p < 0.05$.

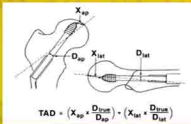


Figure 1: Method for measuring tip-apex distance; Xap = distance of screw tip to deepest part of the femoral neck axis on AP view; Xlat = distance of screw tip to deepest part of the femoral neck axis on lateral view; Dap = diameter of lag screw on AP view; Dlat = diameter of lag screw on lateral view; Dhru = true diameter of the lag screw

Result

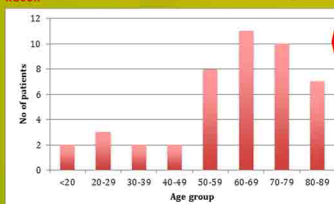


Figure 2: Mean age = 59. Fifty-two percent failed to achieve TAD ≤ 25 mm. Age was found to be a significant factor where older patients (mean = 68) have higher likelihood to achieve TAD ≥ 25 mm compared to younger patients (mean = 50) ($P = 0.007$).

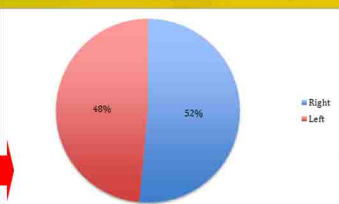


Figure 3: Distribution of patients according to the side of injury. Left-sided fractures were noted to be a risk factor for complications although not statistically significant. Screw lip migration and cut out (n=2) were seen when TAD is > 25 mm and overall rate of complication was 6%.

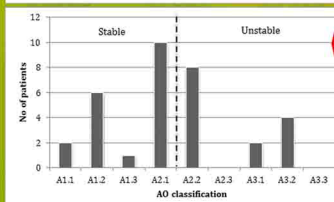


Figure 4: Distribution of patients according to the AO classification. Fifty-eight percent were stable fractures and 42% were unstable fractures. All the fractures united. No cases of acetabular penetration or broken implant were identified.

Table 1: Statistical analysis *Fisher's exact test, exact sig. (1-sided), computed for2x2 table (Malay vs Non-Malay)

	TAD		P
	≤ 25 mm (n=16)	>25 mm (n=17)	
Age	68.3 (33.7%)	50.3 (21.3)	0.007
Race			
Malay	8 (36%)	14 (64%)	
Chinese	7 (38%)	1 (22%)	0.054 [†]
Indian	1 (5%)	1 (5%)	
Others	0 (0%)	1 (6%)	
Sex			
Male	7 (35%)	13 (65%)	0.058 [*]
Female	9 (45%)	4 (21%)	
Side			
Right	7 (41%)	10 (59%)	0.387
Left	9 (56%)	7 (44%)	
Fracture stability			
Stable	10 (53%)	9 (47%)	0.579
Unstable	6 (43%)	8 (57%)	
Complications			
Yes	0 (0%)	2 (100%)	0.48 [*]
No	16 (52%)	15 (48%)	

Discussion

Intertrochanteric fracture is a common "disease" of the elderly population with an increasing incidence due to increase in the aging population.^{3,4} The most common mechanism of injury in this study was due to fall, attributed by the number of elderly patients in the study population. Other study has shown that most fractures in the elderly occur at home with more than 75% fractures resulted from a fall while standing or walking associated with increased activity of meal preparation. Left-sided fractures were found to be equally common as the right side in this study but complications mainly occurred in the left-sided fractures. Study has shown that unstable left-sided fractures tend to displace during clockwise rotation of lag screw and on the other hand, compresses the fracture site and increases the stability of the right-sided fractures during dynamic hip screw fixation.⁵ However there is no proven solution to address this problem other than to be aware of the greater potential for failure of fixation. Predictive outcome of dynamic hip screw by radiographic measurements has been extensively studied. Tip-apex distance as described by Baumgaertner et al⁶ has been recommended as the gold standard of fixation method. However, in this study, only 48% of patients managed to achieve TAD ≤ 25 mm and older age group were found to have higher likelihood to achieve the recommended TAD as compared to the younger age group. The reason for this is unclear but could be on the premise that deeper placement of the lag screw tip has a better purchase on the osteoporotic bone in the elderly. This study has also found that all the complications due to fracture fixation occurred when TAD > 25 mm with overall complication rate of 6%. Study by Pervez et al⁷ showed that lower rate of screw cut out were found when the TAD is less than 20 mm and additionally, fracture should be reduced in valgus position to reduce the risk of cut out.⁷ Similar results were highlighted by Chua et al⁸ where there was a direct relationship between increased TAD and higher risk of screw cut out when TAD > 20 mm in Asian patients.⁸ The screw cut out rate was found to be more than 20% if the TAD > 25 mm. Other factor such as fracture stability was not found to influence the final outcome in this study.

Conclusion

A good outcome of intertrochanteric fractures can be satisfactorily achieved with dynamic hip screw fixation. The principle of TAD should be adhered to when placing the lag screw. The problems with left-sided fractures should be borne in mind when addressing this fracture due to the higher rate of complications.

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