ORIGINAL ARTICLE

Early experience of dynamic hip screw with spiral blade and locking side plate for the stabilization of trochanteric fractures

Akbar Jaleel Zubairi, Rizwan Haroon Rashid, Marij Zahid, Masood Umer, Pervaiz Mahmood Hashmi

Abstract

Objective: To evaluate early experience with helical hip system in osteoporotic elderly patients with pertrochanteric fractures.

Methods: The retrospective study was conducted at Aga Khan University Hospital, Karachi, and comprised records of patients having low-velocity pertrochanteric fractures who were fixed with spiral blade Dynamic Helical Hip Systemfrom July to December 2014 and were followed up for a minimum of 3 months. Demographic variables and clinical outcomes were noted from the medical records whereas operative details were recorded from the operative note. Radiological variables and outcomes were assessed by viewing appropriate pre-operative, post-operative and follow-up radiographs.

Results: Of the 32 patients in the study, 14(44%) were men and 18(56%) were women, with an overall mean age of 77.81±7.04 years and mean body mass index of 25.99±4.13 kg/m2. Of the total, 1(3.13%) patient had implant cut-out, 1(3.13%) had myocardial infarctionand 2(6.2) expired.

Conclusion: The introduction of spiral blade dynamic hip screw manifested favourable results and good clinical and radiological outcomes with low cut-out rates.

Keywords: Helical blade, Hip fractures, Osteoporosis, Pertrochanteric fractures. (JPMA 65: S-45 (Suppl. 3); 2015)

Introduction

Hip fractures are a common occurrence in the elderly and their worldwide incidence is rising, making it an alarming health problem.[1] Pertrochanteric fractures comprise a major portion of these fractures which are usually the result of trivial trauma like ground-level fall. The Dynamic hip screw (DHS) has stood the test of time as the implant of choice for these fractures. Even the recent popularity of intramedullary devices has failed to document any superiority over the conventional DHS.[2,3]

Unstable fracture patterns and poor bone quality of the patients, secondary to osteoporosis, present a significant challenge to surgeons due to the relatively high rate of fixation failure.[4] Some surgeons have recommended concurrent cementation with the implant whereas others have advocated primary hemi-arthroplasty for these types of fractures.[5] But these methods have not gained widespread acceptance yet and most surgeons still use a sliding extra-medullary or intra-medullary implant.

A recent development is the use of the helical or spiral blade instead of the conventional lag screw (Figure-1). This implant has shown promise in biomechanical studies with improved bone purchase, resistance to loading and preservation of bone stock in case of failure.[6,7] Few studies have been done to see the outcomes of this implant,[7-10] and the current study was planned to evaluate our early experience with the use of this technique.

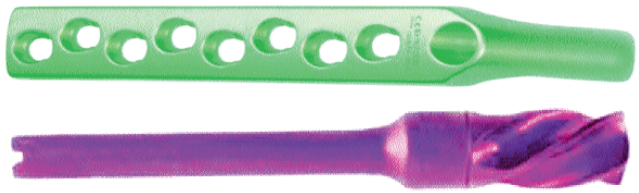

Figure-1: Spiral blade Dynamic Hip System.

Patients and Methods

The retrospective study was conducted at Aga Khan University Hospital, Karachi, and comprised records of patients having low-velocity pertrochanteric fractures which were fixed with spiral blade Dynamic Helical Hip System (DHHS) from July to December 2014.

Demographic variables and clinical outcomes were noted from the medical records whereas operative details were recorded from the operative note.

All patients aged 60 years or above with pertrochanteric fractures were included and had a minimum follow-up of 3 months. Cases related to younger patients, revision surgery and pathological fractures were excluded.

Patients underwent the procedure after necessary medical

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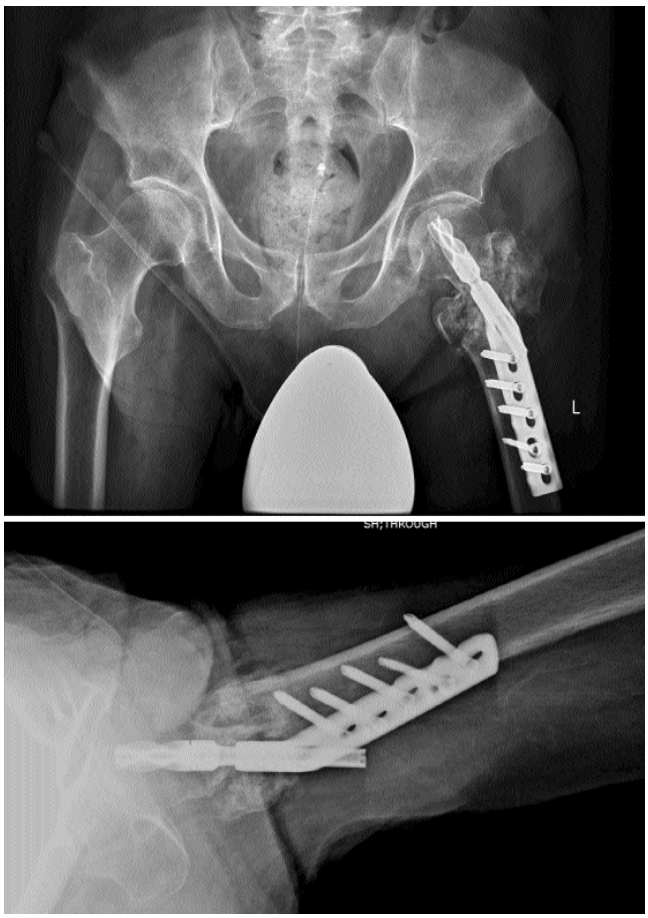

Figure-2: X-rays of fracture fixed with Spiral blade dynamic hip screw 4 months postoperatively.

optimisation in supine position on the traction table. A standard lateral approach was adopted after closed reduction of the fracture and open reduction was done where required. A 135º angle guide was used to place a 2.5-mm guide-wire centrally in the femoral head, with confirmation using image intensification. After measuring the length of the guide wire, a tapered reamer was used to ream the trochanter and lateral femoral neck. A spiral blade of the measured length was impacted into position with the insertion device which applied atorsional force to the blade as it was inserted over the guide-wire. The appropriate locking side plate was then inserted over the blade and fixed to the femoral shaft with screws. The blade was then rotationally locked within the barrel, with its torque limiting screw driver, so that it did not rotate further but allowed guidedollapse. A coupling screw was used for compression when required (Figure-2).

Radiological variables and outcomes were assessed by viewing appropriate pre-operative, post-operative and follow-up radiographs.

Data was analyzed using SPSS 20.

Results

Of the 32 patients, 14 (43.75%) were men. Overall mean

Table-1: Patient's characteristics.

Mean age	77.81±7.041
Mean body mass index	25.99±4.135
Gender	
Male/Female	14/18 (43.75%/56.25%)
Number of comorbids	
None	2 (6.25%)
1	6 (9.75%)
2	14 (43.75%)
>2	10 (31.25%)
ASA Grade - I	2 (6.25%
II	8 (25%)
III	18 (56.25%)
IV	4 (12.5%)
V	0 (0%)
Type of Anaesthesia	
General	10 (31.25%)
Spinal	22 (68.75%)

ASA: American Society of Anaesthesia.

Table-2: Classification of Pertrochanteric fractures.

AO/OTA Classification			Modified Evan's Classification		
Type	**Frequency**	**Percentage**	**Type**	**Frequency**	**Percentage**
A1	8	25%	2	8	25%
			3	4	12.5%
A2	24	75%	4	12	37.5%
			5	8	25%

AO/OTA: Arbeitsgemeinschaftfür Osteosynthesefragen/ Orthopaedic Trauma Association.

Table-3: Perioperative and follow-up findings.

Lateralization	
Right IT#	14 (43.75%)
Left IT#	18 (56.25%)
Mode of Injury	
Fall	30 (93.75%)
RTA	2 (6.25%)
Mean hospital stay (in days)	7.62±1.37
Mean Duration of surgery (in hours)	3.643±0. 359
Ambulation on Discharge	
NWB	18 (56.25%)
FWB	14 (43.75%)
Ambulation on Follow up	
NWB	6(18.75%)
FWB	26 (81.25%)

IT: Intertrochanteric. RTA: Road traffic accident. NWB=Non-weight bearing. FWB=Full weight bearing.

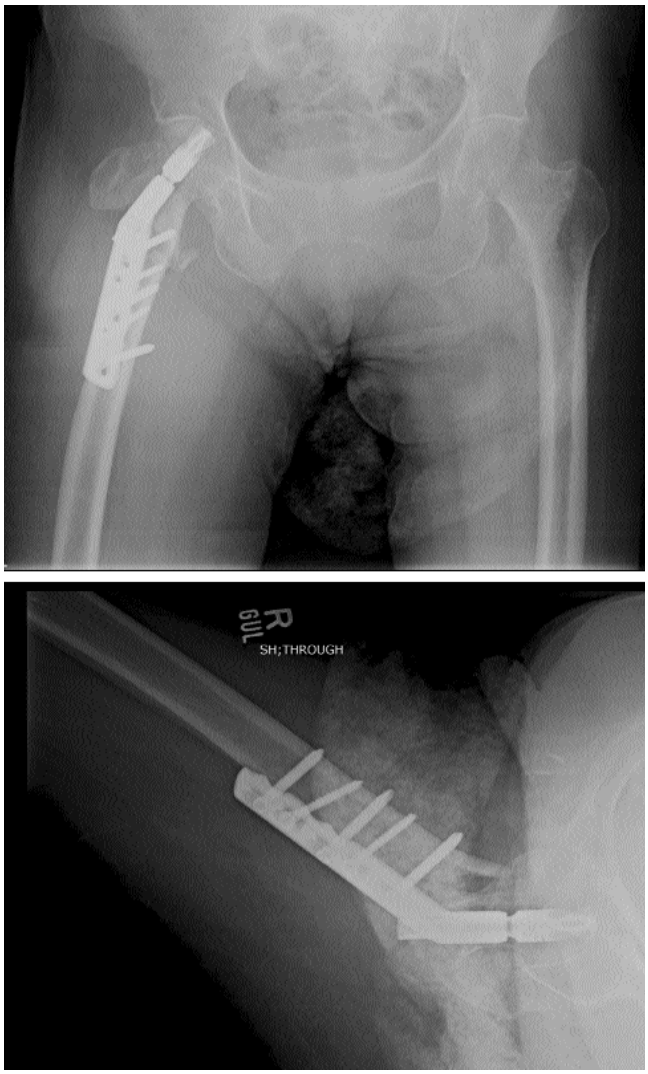

Figure-3: X-rays of implant Cut-out 4 due to infection.

Table-4: Radiological characteristics.

Mean Tip-Apex distance (in mm)	21.06±4.039
Mean Femoral Shaft angle (in degrees)	135.56±8.864
Sliding of screw (in mm)	3.8±2.5
Frequency of Varus collapse with cut through	1 (3.13%)
Frequency of Late medialisation of shaft	2 (6.25%)
Frequency of Helical blade migration	0 / 0%

age was 77.8±7 years (Table-1).

Ground-level fall was the most common mode of injury in 30(94%) patients, while with the remaining 2(6%) suffered low-speed road traffic accidents (RTAs). The left side was involved in 18(56%) patients, and 14(44%) had a right pertrochanteric fracture. According to AO/OTA classification most patients 24(75%) had a type 31 A2 fracture whereas according to the modified Evan's classification a similar number of patients had unstable fracture patterns. (Table-2). Full weight-bearing ambulatory status was achieved by 26(81%) at 6-week follow-up (Table-3).

Mena tip-apex distance was 21.06±4.03mm, with mean sliding of the blade being 3.8±2.5mm. There was a single (3%) instance of varus collapse and cut through, whereas 2(6.2%) patients developed medialisation of the femoral shaft (Table-4).

Complications included 2(6.2%) surgical site infections, 2(6.2%) mortalities and 1(3%) myocardial infarction (MI) (Table-5). Only a single (3%) octogenarian patient required a revision secondary to infected non-union leading to varus collapse and cut-through of the blade 3 months after the index surgery (Figure-3). This patient was managed with debridement and Girdle stone hemi-arthroplasty.

Discussion

Pertrochanteric fractures are one of the most common fractures in orthopaedic trauma. Management of choice has been controversial for a long time. Many implants have been designed to strive for a better outcome. The helical blade DHS has shown promising results for repair of pertrochanteric fractures in elderly and osteoporotic bone. The shape of the helical blade is so designed that it enhances the contact surface area between the femoral head and the device, has a better locking capacity and biomechanical anchorage.[1]

Strauss et al. carried out a biomechanical study comparing the stability of helical blade with sliding hip screw system and found helical blade dynamic hip system to be less prone to inferior displacement and a better substitute for elderly and osteoporotic bone than conventional sliding hip screw.[11]

Table-5: Complications.

Mortality	2 (6.25%)	Secondary to Cardio-pulmonary arrest on 6th and 8th post op day. Both patients were ASA IV.
Myocardial Infarction	1 (3.13%)	On 5th post op day, recovered with medical intervention
Revision surgery	1 (3.13%)	Secondary to implant infection in an immuno-compromised patient.
Infection	2 (6.25%)	-

ASA: American Society of Anaesthesia.

Stern et al. compared the Dynamic Helical Hip System (DHHS) implant with trochanteric entry nail and reported that in Arbeitsgemeinschaftfür Osteosynthesefragen/ Orthopaedic Trauma Association (AO/OTA) 31-A1 and 31-A2 pertrochanteric fractures, the DHHS and intramedullary nail both had comparable outcomes.[12]

Fitzpatrick et al. compared quality of surgery, tip-apex distance, fracture reduction and screw-tip location in DHS (24 patients) and DHHS groups (27 patients). Both groups had comparable mean tip-apex distance, but there were 2 failures in the DHHS group by central cut-out.[13]

Even though biomechanical studies have shown superior stability of this implant, it has not translated into better clinical outcomes when comparing it with other implants, opening a gateway for further research.

Recently, DHHS manufactured by Double Medical was introduced in our institution and has shown encouraging results. This study highlights its functional and radiological outcomes and shows low cut through rates (3.1%), medialisation of the shaft (6.3%) and lesser requirement for revision surgery (3.1%) even in unstable fracture types compared to other studies.

Conclusion

Even though our study design does not permit us to draw definitive conclusions, we believe that the helical blade hip system may be a superior implant for fixation of pertrochanteric fractures in elderly and osteoporotic patients. However, prospective clinical trials are required to confirm the suggestion.

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