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Trochanteric Fractures Heal Early in Patients Treated with Proximal Femoral Nail than with Dynamic Hip Screw

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Introduction

Operative treatment of hip fractures is far superior to the conservative treatment as it reduces mortality and morbidity, simplifies nursing care and thus facilitates early rehabilitation of the patient, provided secure osteosynthesis can be obtained at the time of surgery.

Dynamic hip screw is (DHS) a lag screw, which is biomechanically superior to various compression hip screw systems developed during recent years (Regazzoni 1985). The sliding mechanism creates interfragmentary contact even if resorption of the fracture ends should occur (Svenningses et al 1984).

Dynamic hip screw has been a reliable fixation method for trochanteric fractures. However, complication like failure of fixation due to plate or screw breakage resulting in pulling apart of the plate from the shaft of femur has been reported in 10-20 % of cases (Woligang G.L., Brayand M.H., O Neil J.P. 1982). The failure of fixation is attributed to the inadequacy placement of sliding screw within the neck and head, more commonly in unstable fractures.

Taking that into consideration the Gamma-locking nail, which combines an intramedullary of fixation of femoral shaft with a sliding screw through the stem into the neck and head of femur, was introduced in 1985.

Rosenblum et al (1992) did the biomechanical evaluation of Gamma nail, stating that intramedullary fixation would provide more efficient load transfer through the calcar than the sliding hip screw.

Material and Methods

From Jan 2003 to Oct 2004 a total of 48 anatomically similar traumatic trochanteric fractures were examined and treated in a prospective study. Out of which in this series even numbers were fixed by DHS and odd numbers by PFN.

The patients of this study group with similar anatomical fractures belonging to the same locality with similar matching age, body weight, height, Hb % and mid arm circumference also taking in to consideration of similar matching factors influencing early callus formation like mechanical influences, humoral and anatomical factors are taken in this study group.

It is a prospective study where in each group of 24 patients treated with PFN and DHS are analysed for fracture healing time duration.

In this study 68 % of patients were males and 32% females. The left side of femer involved in 26 (54.1 %) cases and right in 22 (45.8 %). 30 (62.5%) patients presented within one week of injury, and 18 (37.5%) presented 1-3 weeks of injury. Average age of patients was 37 (34-41) years in DHS series and 38.5 (34-42) in PFN group. The follow up was 10.2 months for DHS patients and for that of PFN 12.4 months.

Fracture Healing Results

Fracture healing time was defined as the time when it is safe to allow unprotected, painless full weight bearing without support on fractured limb, on the basis of clinical and radiological data. The clinical criteria used are (1) No pain at fracture site by manual stress (2) no pain with unaided full weight bearing. Radiologically fracture line obliteration with bridging of callus to allow unprotected limb function were required.

The ratio evaluated for observed healing time of PFN group to DHS patients were calculated and analysed to determine the effects of close nailing without opening the fracture site on fracture healing.

The average ratio of observed healing time of PFN to DHS treated patients in all 48 fracture was 0.59 indicating early fracture healing time in PFN group.

Final results were tabulated on the basis of Kyle's criteria of pain, limp, shortening, coxa vara, limitation of hip and knee movements Result as graded excellent, good, fair and poor for each category. In DHS series 12 (50.0 %) of patients and 15 (62.5 %) of PFN group had excellent results.

Table 1 : *End Results.*

Type	Excellent	Good	Fair	Poor
DHS N = 24	12 (50%)	6 (25%)	4 (16.6%)	2 (8.3%)
PFN N = 24	15 (62.5%)	7 (29.1%)	2 (8.3%)	0 (0.0%)

No statistics is applied (very small values). It is better to just talk in terms of number & percentages.

Average operative time for DHS series was 85 minutes while for PFN series it was 55 minutes. Average blood loss was 390 ml in DHS and 80 ml in PFN series.

The hospital stay for DHS group was 2-3 weeks for PFN group 6-10 days.

In this series all patients were mobilized and partial weight bearing allowed at the end of two weeks and full weight bearing at 6 weeks.

In 8 patients of PFN group the fracture healed within 8-12 weeks and 10 patients in 12-16 weeks, as against only one patient within 12 weeks and 4 patients 12-16 weeks of DHS group healed. Three patients of DHS group healed at 24-26 weeks.

Table 2 : *Fracture Healing Time Duration.*

Fracture Healing Time (In Weeks)	DHS	PFN
< 12	1 (4.1%)	8 (33.3%)
12-16	4 (16.6%)	10 (41.6%)
16-20	16 (66.6%)	6 (25.0%)
> 20	3 (12.5%)	0 (0.0%)
Total	**24**	**24**

Pooled data $x^2 = 26.2$ d.f. $p < 0.05$, Stat significant

Shortening was seen in 6 patients of DHS group as against only 2 patients of PFN group. Coxa vara was seen in 10 patients of DHS group as against only in 3 patients of PFN group.

	DHS	PFN	
< 16 wks	5 (11.5)	18 (6.71)	23
> 16 wks	19 (12.5)	6 (7.29)	25
	24	**14**	**48**

X^2 cal = 3.67 + 18.99 + 3.38 + 0.23

$X^2 = 26.27$

X^2 tab = 3.84

(Please Refer Table 3)

Table 3 : *Complications.*

Mode of Treatment	Pain	Limp	Shortening		Coxa Vara		
			< 2.5 cm	> 2.5 cm	0 - 10^0	11 - 20^0	> 21^0
DHS	4 (16.6%)	5 (20.8%)	4 (16.6%)	2 (8.3%)	4 (16.6%)	4 (16.6%)	2 (8.3%)
PFN	1 (4.16%)	1 (4.16%)	2 (8.3%)	0 (0.0%)	2 (8.3%)	1 (4.16%)	0 (0.0%)

Discussion

DHS allows not only fixation of anatomically reduced trochanteric fracture but also a guided collapse and impaction of the fragments in the unstable fracture. Then screw will slide distally and laterally until a new area of bony support is reached. The implant will therefore act, as a load sharing instead of load bearing device and the fracture will usually unite by this "Impaction". The implant failure due to metal fatigue and nail migration are prevented in most instances (Regazzoni et al 1985).

In the treatment of unstable intertrochanteric fractures, control of axial telescoping and rotational stability is essential. PFN is a new cephalomedullary device and has proven advantageous over DHS in unstable fractures. It is a close, quick and less traumatic procedure and is a biomechanically better implant. Medial placement of the implant reduces the bending stress and axial torque by reducing the distance between the hip joint and mechanical axis of the implant. It results in better transfer of stresses thus reducing the incidence of implant failure.

Early mobilization and weight bearing reduces muscle wasting, post-immobilization osteoporosis, joint stiffness etc. And also allows axial micromotion at the fracture site leading to early union.

Bridle et al (1991) and later Leung et al (1992) compared the results of Gamma nail with a sliding hip screw in a prospective randomised and controlled trial and observed that Gamma nail required time and lesser intraoperative blood loss than sliding hip screws. There was no significant difference in the final clinical outcome. They also stated that patients of Gamma nailing could achieve full weight bearing in a significantly shorter time.

Radfored et al (1992) stated that the shape of the standard Gamma nail caused pressure on the medial cortex in the subtrochanteric region and on lateral cortex near the tip of the nail. These findings inspired Leung (1992) to modify dimensions of standard Gamma nail to the Gamma A.P. (Asia Pacific) nail. It was found in a multicentre study that this nail reduced the complication rate of Gamma nail fixation.

In conclusion in very unstable fractures of the intertrochanteric region, PFN is superior to DHS in stability, elasticity of fixation, load sharing and early return to function with minimal operative trauma.

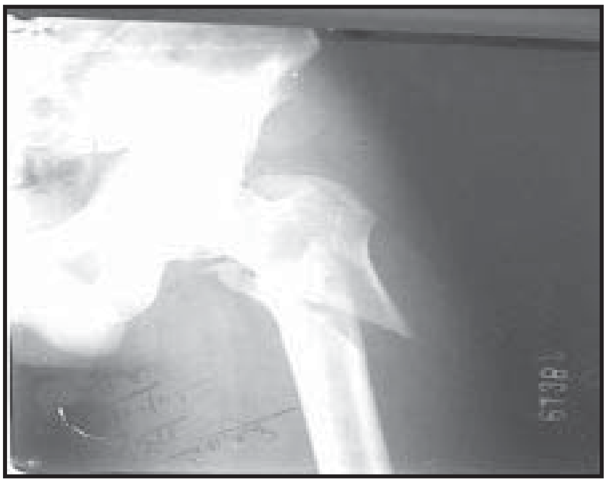

Fig. 1

Fig. 2

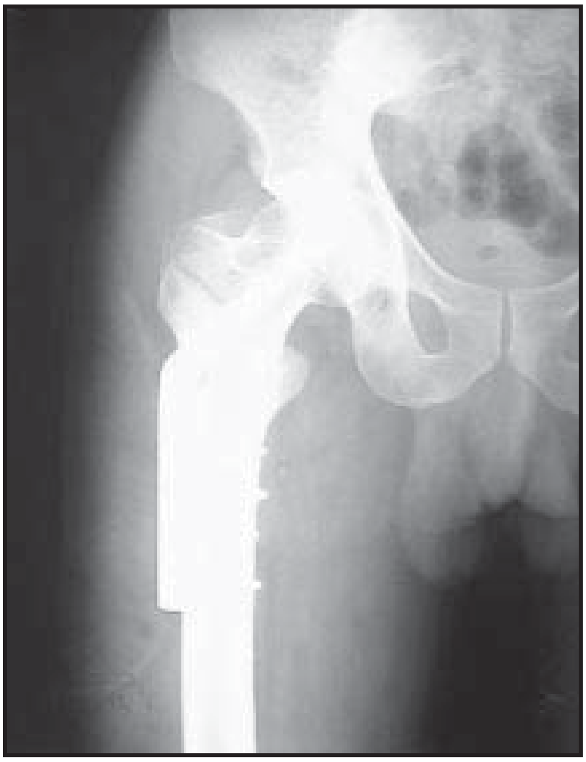

Fig. 3

Fig. 5

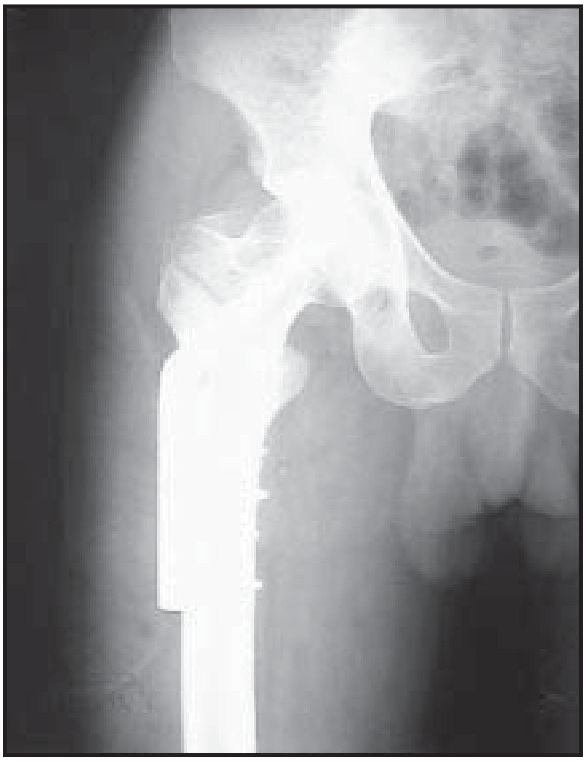

Fig. 4

Fig. 6

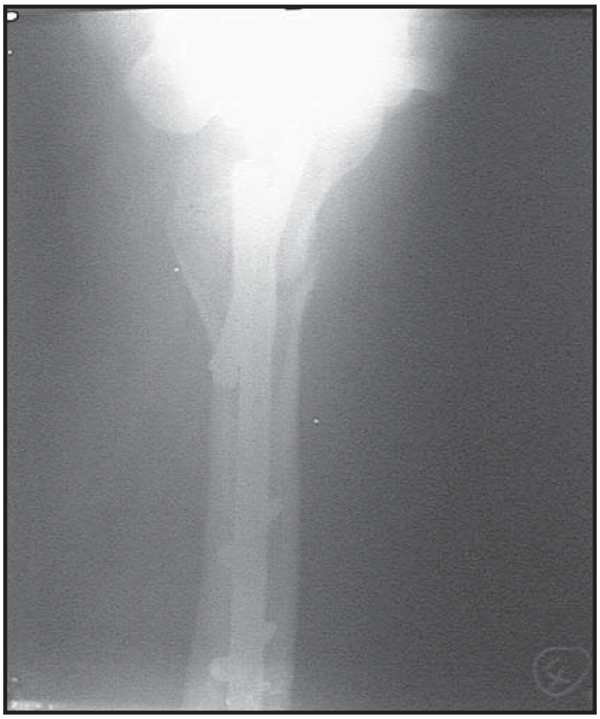

Fig. 7

Fig. 8

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