

Study Comparing the Advantages of Proximal Femoral Nail Over Dynamic Hip Screw Among Patients with Subtrochantric Fractures

Shishir Murugharaj Suranigi¹, Naresh Shetty², Harshad Mohan Shah²

¹Pondicherry Institute of Medical Sciences, Pondicherry-605014, India.

²M.S.Ramaiah Medical College and Hospitals, Bangalore-560054.

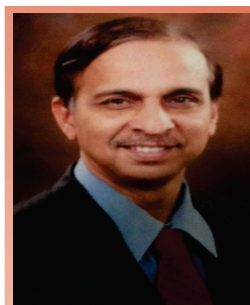
Institute at which research was conducted: M.S.Ramaiah Medical College and Hospitals, Bangalore-560054
University Affiliation of Thesis: Rajiv Gandhi University of Health Sciences, Bangalore (R.G.U.H.S), Karnataka, India.
Year of Acceptance: 2010

Address of Correspondence

Dr.Shishir.S.M,
Assistant Professor,
Department of Orthopaedics,
Pondicherry Institute of Medical Sciences,
Pondicherry-605014, India
Email: shishir100@gmail.com



Dr. Shishir S M



Dr. Naresh Shetty



Dr. Harshad M Shah

Abstract: Background: Subtrochanteric fractures are one of the common fractures encountered in today's orthopaedic practice. Choice of implant still remains with the surgeon. The advantages and disadvantages of the Gamma nail have been well established in several studies done in the past, usually by comparing the results with the Dynamic hip screw (DHS). This study deals with the comparison of Proximal femoral nailing (PFN) versus Dynamic hip screw (DHS) in treatment of subtrochanteric fractures.

Methods: This study was conducted in M. S. Ramaiah Hospitals from October 2007 to August 2009. During this period 50 cases of adult patients with subtrochanteric fractures of femur were selected according to the inclusion criteria and classified according to Seinsheimer's classification.

Results: We found that PFN was superior to DHS in many ways such as reduced intra-operative blood loss, lesser operative time, reduced radiation exposure, less amount of limb shortening, reduced hospital stay, lesser infection rates and early mobilization.

Conclusion: Nailing has the advantage of providing rotational as well as axial stability in cases of subtrochanteric fractures allowing a faster postoperative restoration of walking ability, when compared with the dynamic hip screw.

Key Words: Subtrochanteric fractures; Proximal Femoral Nailing ; Dynamic Hip screw, Reverse oblique subtrochanteric fractures.

THESIS SUMMARY

Introduction

Subtrochanteric fractures are one of the common fractures encountered in today's orthopaedic practice. The incidence of subtrochanteric femoral fractures has increased significantly during recent decades, and this tendency will probably continue in the near future owing to the considerable increase in the life expectancy leading to an increasing geriatric population. Many treatment options

are available. The goal of the treatment of these fractures is stable fixation, which allows early mobilisation of the patient. The advantages and disadvantages of the original design of the Gamma nail have been well established in several studies done in the past, usually by comparing the results with the dynamic hip screw (DHS). In this context there is inadequate data available about an alternative, the proximal femoral nail (PFN), and its merits in the management of

subtrochanteric fractures. The present study was done to compare the advantages and disadvantages of proximal femoral nail over dynamic hip screw among patients with subtrochanteric fracture.

Aims and Objectives

The main aim of this dissertation was to:
I) Study the different types of subtrochanteric fractures.
ii) Study the principles and management of

subtrochanteric fractures with proximal femoral nailing and DHS.

iii) To critically analyze both the groups for

1. Intra-operative blood loss, duration of surgery and intra-operative radiation exposure.
2. Duration from the day of surgery to mobilization.
3. Infection rates.
4. Duration of stay at hospital.
5. Implant failure rates.
6. Union rates.
7. Return to normal function.
8. Residual disability or deformity.

iv) Assessment of results based on subjective parameters, objective parameters and radiological findings.

In this study, an attempt has been made to review the literature and compare our results with other studies.

Methods

This was a prospective randomized study conducted in M. S. Ramaiah Hospitals from October 2007 to August 2009. During this period 50 cases of adult patients with subtrochanteric fractures of femur were selected according to the inclusion criteria. Alternate patients who fulfilled the inclusion and exclusion criteria underwent PFN and DHS respectively.

INCLUSION CRITERIA

- a) Age: >18 yrs
- b) Sex: Both sexes
- c) All types of subtrochanteric fractures treated with proximal femoral nail or Dynamic hip screw.
- d) No specific duration of illness.

EXCLUSION CRITERIA

- a) Previous surgery of the proximal femur.
- b) Pathologic fractures other than osteoporosis.
- c) Ongoing chemotherapy or irradiation treatment due to malignancy.
- d) Polytrauma.
- e) Individuals who were unable to give consent.

Results

The fractures were classified according to Seinsheimer's classification. Type IIIA constituted maximum number of cases (n=20) with 12 in PFN group and 8 in DHS group; followed by Type IV (n=08) with 2 in PFN group and 6 in DHS group. Rest of 22 patients belonged to Type IIA (n=02), Type IIB (n=05), Type IIC (n=05), Type IIIB (n=05) and Type V (n=05). There were no Type I pattern of fractures in our study. Out of the 50 patients, 26 of them underwent fixation with Proximal Femoral nailing and rest 24 of them were treated with DHS irrespective of their fracture pattern. Out of the 50 patients, 48 patients were available for follow-up. In our series maximum age was 96 years and minimum of 18 years (mean age=62.36 years). Maximum patients were belonging to the 60-80 years age group (n=19). Males were 37 and females 13. Right side was affected in 24 cases and left in 26 cases. The most common mode of injury in our series were trivial fall (n=35), Road Traffic Accidents (RTA) accounting for 13 cases and followed by fall from height in 2 cases. All patients were treated on elective basis. Surgery was performed

on average of 3 days with a range of 1-11 days. The average time taken for DHS procedure was 124.58 minutes as compared to PFN which was 102.3 minutes. The average duration of radiation exposure was 56.35 seconds for nailing as compared to 96.25 seconds for DHS procedure. The average amount of blood loss was 208.7 ml for PFN procedure and 483.33 ml for DHS procedure. In PFN Series, Postero-Medial cortical defect was seen in 4 cases for which iliac cancellous bone grafting was done whereas bone grafting was required in 10 cases of DHS Series.

The intra-operative complications encountered during proximal femoral nailing are as follows:

1. Jamming of the nail in the proximal fragment while insertion was noted in one case, requiring progressive reaming of the proximal fragment and the use of a lesser diameter nail.
2. In ten cases we had to do 'free hand technique' for distal screw locking due to mismatch of the Jig and nail,
3. In one case, fixation of the fracture occurred in varus angulation.
4. In one case, iatrogenic fracture of the lateral cortex of the proximal fragment was noted, which was minimally displaced. No intervention was done for that fracture. Weight bearing was delayed post-operatively.
5. In six of our cases we had to perform open reduction, due to wide displacement of the fragments.
6. In one case, with delay in surgery of 11 days was noted as the patient was not fit to be taken up for surgery. We had difficulty in reduction of the fracture in this patient, so the fracture site had to be opened up for reduction. These were commonly seen in Type IV, V fractures and in obese individuals. No intra-operative complications were encountered during DHS procedure. In our DHS series, we had a case of wound infection at the operative site which required intravenous antibiotics for a period of 3 weeks. Wound healed without the need for any further intervention. No post-operative complications were seen in PFN series. The average time taken for mobilization from the time of surgery for PFN series was 1.5 days and for DHS series was 2.12 days. The average duration of hospital stay following surgery was 7.9 days ranging from 5-14 days in the PFN series and 12.04 days ranging from 5-20 days in the DHS series. There was no mortality in this study. The average duration of follow up was 15 months ranging from 5-26 months, of which 2 patients were lost to follow up, one in DHS series and other in PFN series. Both the patients were lost during the 2nd month of follow up. In PFN series, out of the 26 cases, 10 cases showed union at 12 weeks, 7 cases showed union at 14 weeks duration, 4 cases showed union at 18 weeks duration. 4 cases of delayed union were seen. 2 cases of delayed union required dynamization which were followed up till bony union, which took 7 months and 8 months respectively. Two other cases required bone grafting at the fracture site, which united at 6 months and 7 months respectively. One case of breakage of implant in situ at 5 months was noticed. Patient had broken the implant after a fall at home. It was treated with implant removal and re-nailing with PFN and bone grafting. Fracture united after 18 weeks of re-nailing. In DHS series, out of the 24 cases, 8 cases showed union at 12 weeks duration, 6 cases showed union at 14 weeks duration, 3 cases showed union at 18 weeks duration. 3 cases of delayed union were seen, for which bone grafting at the

fracture site was done at 8 weeks, 10 weeks and 12 weeks. Fracture subsequently united after 10 weeks, 10 weeks and 14 weeks respectively from the time of bone grafting. Three cases of breakage of implant in situ were noticed at 12 weeks, 20 weeks and 25 weeks. Two of which were treated by implant removal and repeat DHS application with bone grafting. They united after 14 weeks and 16 weeks respectively. Other case was treated by implant removal and nailing with gamma nail and bone grafting, which united after 20 weeks from the second surgery. Bony union was achieved in 24 out of the 26 cases (92.3%) in PFN series as compared to 20 out of 24 cases (83.33%) in DHS series. 69.33% of the cases had good results in PFN series as compared to 70.8% in DHS series.

Conclusion

In our series we found that PFN was superior to DHS in many ways such as reduced intra-operative blood loss, lesser operative time, reduced radiation exposure, less amount of shortening, reduced hospital stay, lesser infection rates and early mobilization. We have concluded that all reverse oblique fractures are to be managed by PFN only as the chances of failure of fixation are very high with extra-medullary devices.

Clinical Message

Nailing has the advantage of providing rotational as well as axial stability in cases of sub-trochanteric fractures allowing a faster postoperative restoration of walking ability, when compared with the DHS. The nails are load-sharing implants, whereas extra-medullary devices are load-bearing. Proximal femoral nailing creates a shorter lever arm, which translates to a lower bending moment and a decreased rate of mechanical failure⁵².

Key Words

Subtrochanteric fractures; Proximal Femoral Nail; Dynamic Hip screw; reverse oblique subtrochanteric fractures.

Bibliography

1. Robert W Bucholz, James D Heckman, Charles M Court-Brown, Rockwood and Green's "FRACTURES IN ADULTS"; volume 2, 6th edition; pages 1827-1844.
2. G S Kulkarni, Rajiv Limaye, Milind Kulkarni, "Intertrochanteric Fractures – Current Concept Review" *Ind J Orth*, 2006, Vol 40, 16-23.
3. David G. Lavelle. *Fractures and dislocations chapter-52 in CAMPBELL'S OPERATIVE ORTHOPAEDICS*, tenth edition. VOL-3 pages; 2897-2908.
4. The association of age, race and sex with the location of proximal femoral fractures in elderly'. *J BJS* 1993; 75(5), 752-9.
5. Boyd HB, GRIFFIN "classification and treatment of trochanteric fractures" *Arch surgery*, 1949; 58; 853-866.
6. Fielding JW: *Subtrochanteric fractures*, *Clin Orthop* 92:86, 1973
7. Pelet S, Arlcttaz Y, Chevalley F. "Osteosynthesis of pertrochanteric and subtrochanteric fractures with 900 blade plate versus Gamma nail-A randomized prospective study". *SWISS-SURG* 2001; 7(3); 126-33.
8. Klemm K, Schellman D: *Dynamische und statische Verriegelung des Marknagels*, *Mschr Unfallheilk* 75:568, 1972

9. Seinsheimer "subtrochanteric fractures of the femur". *J BJS*, 1978, 60(A), 300-306.
10. David A, Von Der heyde D, Pommer A. *Therapeutic possibilities in trochanteric fractures* orthopaedics 2000;29(4);294-30
11. Harper MC, Walsh T: *Ender nailing for peritrochanteric fractures of the femur: an analysis of indications, factors related to mechanical failure, and postoperative results*, *J Bone Joint Surg* 67A:79, 1985
12. Kinast C, Bolhofner BR, Mast JW, Ganz R: *Subtrochanteric fractures of the femur: results of treatment with the 95-degree condylar blade-plate*, *Clin Orthop* 238:122, 1989.
13. Robert j Medoff "A New Device for the fixation of unstable pertrochanteric fractures of the hip" *J BJS*, 1991, 73(A), 1192-1199.
14. Halder SC: *The gamma nail for peritrochanteric fractures*, *J Bone Joint Surg* 74B:340, 1992.
15. K S Leung, W S SO, W Y Shen, P W Hui" *gamma nails and dynamic hip screws for peritrochanteric fractures*" *J BJS (Br)* 1992; 74(B):345-51.
16. Shepherd F. Rosenblum, Joseph Zuckerman" *A Biomechanical evaluation of the gamma nail*" *J BJS (Br)* 1992; 74(B):352-7.
17. Philip J. Radford, Maurice needoff, john k Webb" *a prospective randomized comparison of the dynamic hip screw and the gamma locking nail*" *J BJS*, 1993; 75(B) 789-793.
18. Martyn J. Parker" *a new mobility score for predicting mortality after hip fracture*" *J BJS*, 1993; 75(B); 797-799.
19. "Treatment of subtrochanteric fractures with AO dynamic condylar screw". *J Injury* 1993 Feb, 24(2); 90-2.
20. "Subtrochanteric fractures of the femur treated with Zickel nail" *Arch-ortho.Belg*, 1994; (60); 129-33.
21. Taglang G, Favrel E, "77 patients ,mean age 75 years, one year follow up". *Paper presented to advanced course in Intramedullary locking nailing, Courchel, France.* 1991.
22. Vanderschof P. et al. 1995. "A review of 161 subtrochanteric fractures- risk factors influencing outcome: age, fracture level and fracture pattern". *Unfallchirurg*, 98(5):265-71.
23. Simmermacher RK, Bosch AM, Van der Werken C: "The AO/ASIF proximal femoral nail (PFN): A new device for the treatment of unstable proximal femoral fractures". *Injury* 30:327-332, 1999.
24. Hardy DCR, Descamps PY, Krallis P, et al: *Use of an intramedullary hip screw compared with a compression hip screw with a plate for intertrochanteric femoral fractures*, *J Bone Joint Surg* 80A:618, 1998.
25. L J Domingo" *trochanteric fractures treated with a proximal femoral nail*" *international orthopaedics (SICOT)* 2001, 25:298-301.
26. Christian Boldin" *the proximal femoral nail-a minimal invasive treatment of unstable proximal femoral fractures*" *Acta Orthop Scand* 2003;74(1); 53-58.
27. Ramakrishnan M, Prasad SS, Parkinson RW, Kaye JC: "Management of subtrochanteric femoral fractures and metastases using long proximal femoral nail". *Injury* 35:184-190, 2004.
28. Ely L Steinberg, Nehemia Blumberg, Shmuel Dekel "The fixation proximal femur nailing system: biomechanical properties of the nail and a cadaveric study" *Journal of biomechanics* 38 (2005) 63-68.
29. Daniel F A Menezes, Axel Gamulin, and Bruno Noesberger. "Is the Proximal femoral nail a suitable implant for treatment of all trochanteric Fractures?" *clin ortho and rel research* 2005 439, 221-227.
30. Pajarinen J, "pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail. A randomized study comparing post operative

rehabilitation" *JBJS (Br)* 2005, 87(1); 76-81.

31. Gray's Anatomy, 16th Edition, pages 151-153.

32. DeLee JC: *Fractures and dislocations of the hip*. In Rockwood CA Jr, Green DP, eds: *Fractures in adults*, ed 2, Philadelphia, 1984, JB Lippincott.

33. Müller ME, Allgöwer M, Schneider R, Willenegger H: *Manual of internal fixation: techniques recommended by the AO-ASIF group*, ed 3, Berlin, 1991, Springer-Verlag.

34. Jesse C Delee. *Rockwood and Green's Fractures in Adults*. Chapter 18, 3rd Edition 1991, Charles A. Rockwood, David P. Green and Robert W. Bucholz JB(eds), Lippincott Company, Vol 2, 1481-1651.

35. Kaufer H, Matthews LS, Sonstegard D: *Stable fixation of intertrochanteric fractures: a biomechanical evaluation*, *J Bone Joint Surg* 56A:899, 1974.

36. Kulkarni G S. *Treatment of Trochanteric fractures of the hip by Modified Richard's Compressing and Collapsing screw*. *Indian Journal of Orthopaedics* 1984; 18(1): 30-34.

37. Kenneth J. Koval and Joseph D. Zuckerman: *Rockwood and Green's Fracture in Adults*, Chapter 39, 5th Edition, 2001-edited by Robert W. Bucholz and James D. Heckman, J.B. Lippincott Company, Vol 2, 1635-1663.

38. Iraqi A A. "External fixation in Trochanteric fractures in the Elderly". *Indian Journal of Orthopaedics* 2001, 35(2): 31-33.

39. Watson Jones, "Injuries of the thigh", chapter 30 in *Watson-Jones Fractures and Joint Injuries*, 6th Edition; vol 2; 999-1003.

40. Michael R. Baumgartner and Thomas F. Higgins. Chapter 38 in *Rockwood and Green's "Fractures in Adults"* 5th Edition; vol 2; 1579-94.

41. Russell TA, Taylor JC: *Subtrochanteric fractures of the femur*. In Browner BD, Jupiter JB, Levine AM, Trafton PG, eds: *Skeletal Trauma*, ed 2, Philadelphia, 1992, WB Saunders,

42. Waddell JP: *Subtrochanteric fractures of the femur: a review of 130 patients*, *J Trauma* 18:513, 1978

43. Kyle Richard F, Campbell Sara J. *Intertrochanteric Fractures*, Chapter-40 in

Michael W Chapman Operative Orthopaedics. Vol 1, pages 600-603.

44. Habernek H, Wallner T, Aschauer E, Schmid L: *Comparison of Ender nails, dynamic hip screws, and Gamma nails in the treatment of peritrochanteric femoral fractures*, *Orthopaedics* 23:121, 2000.

45. Mohamed M N, Harrington J, Heam TC. "Biochemical analysis of Medoff's sliding plate" *J Trauma* 2000; 48(1); 93-100.

46. Bridle SH, Patel AD, Bircher M, et al: *Fixation of intertrochanteric fractures of the femur: a randomised prospective comparison of the gamma nail and the dynamic hip screw*, *J Bone Joint Surg* 73B:330, 1991.

47. Mc Kibbin B. *The Biology of fracture healing in long bones*. *JBJS(Br)* 1978; 60; 150-62.

48. Valverde J A, Alonso M G, Porro J G, Rueda D, Larrauri P M, Soler J J. "Use of the Gamma nail in the treatment of fractures of the proximal femur". *Clin Orthop* 1998; 350; 56-61.

49. Pavelka T, Kortus J, Linhart M. "Osteosynthesis of proximal femoral fractures using short proximal femoral nails". *Acta Chir Orthop Traumatol Cech*, 2003; 70(1); 31-8.

50. DeLee JC, Clanton TO, Rockwood CA Jr: *Closed treatment of subtrochanteric fractures of the femur in a modified cast-brace*, *J Bone Joint Surg* 63A:772, 1981.

51. Adams CI, Robinson CM, Court-Brown CM, McQueen MM: *Prospective randomized controlled trial of an intramedullary nail versus dynamic screw and plate for intertrochanteric fractures of the femur*, *J Orthop Trauma* 15:394-400, 2001.

52. *Fractures Kuzyk et al : Intramedullary Versus Extramedullary Fixation for Subtrochanteric fractures*, *Journal of Orthopaedic Trauma: July 2009 Volume 23 - Issue 6 - pp 465-470*.

Conflict of Interest: Nil
Source of Support: None

Full Thesis and Master Chart available on
www.journalmedicalthesis.com

How to Cite this Article:

Suranigi SM, Shetty N, Shah HM. Study comparing the advantages of proximal femoral nail over Dynamic hip screw among patients with subtrochanteric fractures. *Journal Medical Thesis* 2014 Jan-Apr; 2(1): 35-38