International Journal of Research in Medical Sciences
Mishra SK et al. Int J Res Med Sci. 2018 Mar;6(3):1011-1016
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20180632

Original Research Article

Study internal fixation of subtrochanteric fracture of femur with dynamic hip screw, dynamic condylar screw and proximal femoral nail-a retro-prospective study

Sandeep Kumar Mishra*, Deepak C. E., Kushal Goari, Shurendra Shukla

Department of Orthopaedics, K. J. Somaiya Hospital and Medical College, Sion, Mumbai, Maharashtra, India

Received: 07 December 2017
Accepted: 030 December 2017

***Correspondence:**
Dr. Sandeep Kumar Mishra,
E-mail: mishragmc@gmail.com

ABSTRACT

Background: Sub trochanteric fracture is commonly seen in young adult and middle age man by high velocity trauma. Present study was taken up to study fracture fixation by PFN, DHS and DCS and compare their result in view of union rate, complication, functional out come, operative risk and effectiveness of implant. This study helps to decide appropriate implant for sub trochanteric fracture. In literature comparison of these PFN, DHS, DCS commonly used implants are rare and most of the studies are done in western population by using one or two implants.
Methods: Study is done clinically, in a retro to prospective manner by comparing 75 (50 cases retro and 25 cases prospectively) cases of either sex above the age of 18years from May 2010 to May 2014. All fractures are classified by Seinsheimer classification system. Fracture is fixed with DHS, PFN or DCS in 25 cases each.
Results: Males with an average age group 21-40-year were commonly affected with right femur fracture due to high velocity RTA. Fracture pattern was commonly type IIC as per seinsheimer classification. Mean union rate and clinical outcome for PFN is high.
Conclusions: PFN attempts to combine advantage of a sliding hip screw with those of intramedullary fixation devices. Cases treated with PFN nail have shown easier rehabilitation, less blood loos, less surgical trauma, early mobilization, early rate of fracture union when compared to those cases treated with DHS and DCS barrel plate as per observation of our study. With our study PFN has given us encouraging results over conventional DHS and DCS. Hence, we recommend PFN as better implant for fixation of sub-trochanteric fracture.

Keywords: DCS (Dynamic condylar screw), DHS (Dynamic hip screw), PFN (proximal femoral nail), Sub-trochanteric fracture

INTRODUCTION

Subtrochanteric fractures are femoral fractures where the fracture occurs below the lesser trochanter upto 5cm distally in the shaft of femur.[1]

These fractures occur typically in two age groups. In young and healthy individuals, the injury results from high-energy trauma, whereas in the elderly population, most of the fractures are osteoporotic, resulting from a fall. With the increase in the aging population, there is also considerable growth in the number of pathological fractures and fractures around hip prosthesis (periprosthetic fractures).[1]

These fractures occur typically at the junction between trabecular bone and cortical bone where the mechanical stress across the junction is highest in femur, which is responsible for their frequent comminution. These fractures account for 10% to 34% of all hip fractures.[2]

Subtrochanteric region is usually exposed to high stresses during activities of daily living. Axial loading forces through the hip joint create a large moment arm, with significant lateral tensile stress and medial compressive load. In addition to the bending forces, muscle forces at the hip also create torsional effects that lead to significant rotational shear force. During normal activities of daily living, up to 6 times the body weight is transmitted across the subtrochanteric region of the femur.

As a result of these high forces, the bone in this region is a thick cortical bone with less vascularity and results in increased potential for healing disturbances. Hence subtrochanteric fracture is difficult to manage and associated with many complications.[3] The obvious advantages of operative treatment are

- Accurate reduction and anatomical alignment,
- Early mobilization and weight bearing.

The two primary options for treatment of subtrochanteric fractures are intramedullary fixation and extramedullary fixation. Many internal fixation devices have been recommended, but because of high incidence of complications like non-union and implant failure, a series of evolution in designing a perfect implant has begun. Only recently because of better understanding of biology, reduction techniques and biomechanically improved implants like Gamma nail, Russell Taylor nail, Proximal femoral nail these fractures have been addressed with consistent success. Closed management of these subtrochanteric fractures thus possed difficulties in obtaining and maintaining a reduction, making operative management the preferred treatment. The goal of operative treatment is restoration of normal length and angulation to restore adequate tension to the abductors.[3]

Patient treated with severely comminuted fractures in which stability cannot be obtained by internal fixation, as well as those with open fractures, are considered candidates for such treatment. treatment with preliminary traction followed by an ambulatory cast-brace with a pelvic band resulted in a shorter period of treatment, an excellent range of motion of the hip and knee, and no non-unions in the fifteen comminuted or open fractures. shortening, angulation, and rotational deformity were not significant complications. it must be emphasized that this treatment regimen requires exacting attention to detail by the treating physician. the amount of time needed from the physician in this form of treatment is considerably greater than that after open reduction and internal fixation.[4]

METHODS

Study area

Study done in K. J. Somaiya Medical College, Hospital and Research Center, Sion Mumbai in orthopedic department, retro-prospectively from May 2010 to May 2014. All patient with subtrochantric fracture coming in out-patient and casualty, in patient are included in study. Last follow up is done up to May 2015.

Study population

Young population of 18 year or above, both male and female, coming from rural/urban area, having subtrochanteric fracture and treated in our hospital from May 2010 to May 2014.

Inclusion criteria

- Age:>18yrs
- Sex: both sexes
- All type of subtrochantric fracture
- No specific duration of illness.

Exclusion criteria

- Pathological fractures other than osteoporosis
- Fractures in children
- Old neglected fractures
- Open fractures/ polytrauma
- Previous surgery of proximal femur
- Ongoing chemotherapy or radiotherapy for malignancy
- Individuals who were unable to give consent.

Sample size

Total 75 cases were selected in which 50 cases from retrospectively and 25 cases prospectively. Three group were made, each containing 25 case of particular implant.

Sample technique

The present study is, clinical retrospective to prospective comparative study. Implant chosen for each case randomly, irrespective of Seinsheimer's fracture classification. Patients operated after May 2010, were collected from operation theater record book, patients operated in our hospital after May 2013 to May 2014, with subtrochanteric fracture by either method were recorded at the time of discharge. Patients were called by telephonic/email/postal address for follow up and record maintained and proforma prepaired. Total 50 patients are collected retrospectively from operation theater record book from May 2010 to May 2013. 25 patients were collected prospectively from May 2013 to May 2014. Cases operated in our hospital are followed at regular interval for this study after explaining the method of study and proper consent of patients was taken.

Study duration

From May 2010-May 2014, of traumatic subtrochanteric fractures of femur, out of which 25 patients are treated with Dynamic Hip Screw and barrel plate and 25 patients

are treated with Proximal femoral nail and the rest 25 with dynamic condylar screw in the Department of Orthopedic surgery, K. J. Somaiya medical college and hospital and research center Sion Mumbai. Last follow up is done up to May 2015.

Method of measurement of outcome

Every patient is interviewed at regular intervals of 3weeks, 6 weeks or 8 weeks or depending on the signs and symptoms, compliance of patient up to 1 year. Patients were assessed by using kyles clinical out come criteria and radiologicaly for signs of healing, any complication, etc. Pathological fracture, fractures in children, old neglected fracture are not included in the study. Data was recorded and proforma chart is prepared.

Data collection technique and tools

Patients detail was taken from operation theater orthopedic surgery record book and at the time of discharge. All these 75 patients, who were available for study, were followed at regular intervals upto fracture union.

Once the patient was admitted to the hospital, all the essential information was recorded in the proforma prepared for this study. They were regularly observed during their hospital stay and were discharged with the advice to come to the outpatient department regularly. Those who did not come were reminded by post. One patient, who could not come for subsequent follow up answered the necessary questions. The patients were followed up for one year after surgery at regular intervals and if necessary subsequent follow ups were done.

RESULTS

Age distribution

In our series maximum aged patient was 84 years. Most of the patients were in the age group of 21 to 40 years. The distribution of cases in various age groups is shown below.

Table 1: Age distribution.

Age group	Frequency	Percentage
21-40	30	40
41-60	28	37.3
61-80	15	20
81-100	2	2.7
Total	75	100

Sex distribution

In this series 45 patients were male and 35 were female. This shows preponderance of males over females.

Table 2: Sex distribution.

Sex	Frequency	Percentage
Male	45	60
Female	30	40
Total	75	100

Side affected

In 54 cases Right side was affected and in remaining 21 cases left side was affected.

Table 3: Side affected.

	Frequency	Percent
Right	54	72
Left	21	28
Total	75	100.0

Mode of injury

Out of 75 cases 47 cases gave history of road traffic accidents, 28 cases gave history of slip and fall. In our series road traffic accidents contributed to 62.6% of the injuries.

Table 4: Mode of injury.

	Frequency	Percent
Road traffic	47	62.6
Domestic	28	37.4
Total	75	100.0

Fracture pattern

Subtrochanteric fractures are classified according to Seinsheimer classification. In our study majority of fractures are type 2C and least number of cases are from type 3B and no cases from type 1 and type 5 are reported.

Table 5: Fracture pattern.

Type of fracture	Number of cases	Percentage
I	0	0
IIA	10	24
IIB	17	29.3
IIC	28	37
IIIA	8	10.6
IIIB	5	6.6
IV	7	20
V	0	0

Associated injuries

Out of 75 cases only 15 showed associated injuries i.e., 4 had fracture femoral condyle, 3 had Colle's fracture and 5 had fracture ribs and 3 had compression fracture of D8 vertebral body.

Table 6: Associated injuries.

Associated injuries	Total number of cases	%
Fracture ribs	5	33.3
Colles fracture	3	
Compression fracture D8	3	20
Fracture femoral condyle	4	20

Duration between trauma and surgery

Majority of the patients i.e.,56.7% were operated during the first week after trauma soon after patient is stabilized and medically fit.

Table 7: Duration between trauma and surgery.

Duration between Trauma & surgery	Number of cases	%
0-7 days	42	56.7
8-14 days	23	36.7
More than 14 days	5	6.6

Singhs osteoporotic index

The patients were classified radiologically based on Singhs osteoporotic index.

Table 8: Singhs osteoporotic index.

Grade	Number of patients	Percentage
I	O	0
II	13	16.7
III	13	20.0
IV	8	16.7
V	16	20.0
VI	25	26.7
Total	75	100.0

Blood loss and transfusion

Blood loss was counted intraoperatively by number of mops used during surgery. One mop equal to 50ml blood loss approximately. 10 patients required intraoper the mean blood loss among those fixed with dynamic condylar screw and barrel plate was 425ml and 400ml in case of dynamic hip screw, amongst those fixed with proximal femoral nail it was 300ml. The blood loss in patients operated with proximal femoral nail was less than those operated with dynamic hip screw and dynamic condylar screw with barrel plate. Active blood transfusion and 14 posts operatively, as their pre-operative hemoglobin was less.

Table 9: Blood loss and transfusion.

	DHS	DCS	PFN
Mean blood loss in ml	400	425	300

Complications

Infection: There were 4 cases of infection seen in the study. all were superficial infection and were treated with antibiotics; none required implant removal and healed.

Shortening and varus angulation: In one case fixation of fracture in varus angulation took place. One case of non union due to PFN was encountered and was presumed to be due to over distraction at fracture site.

Figure 1: Complication.

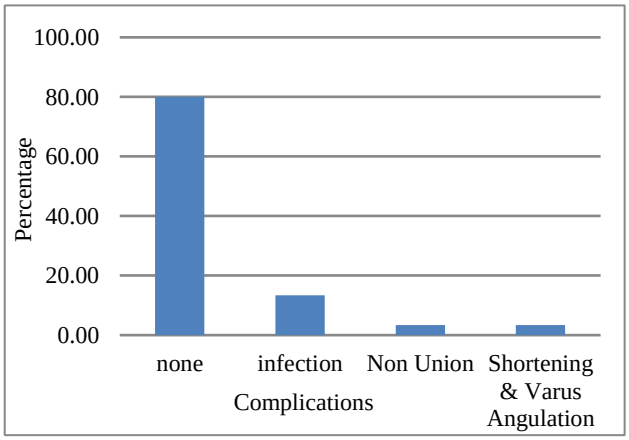

Figure 2: Complication from surgery.

Operative time

The average operating time was 76.5mins (45min-108min) after anaesthesia.

Weight bearing

Mobilization of patient from strict non-weight bearing to full weight bearing is done earlier in patients treated with proximal femoral nail at 4week than those treated with DHS, DCS and barrel plate at 17weeks. i.e., those fixed with PFN were allowed early weight bearing.

Time of union

The mean time to union among patients treated with dynamic hip screw and barrel plate is 19.68weeks, 20.4 weeks amongst those treated with dynamic condylar screw and is 17.04 weeks in those treated by proximal femoral nail.

Table 10: Time of union.

	DCS	DHS	PFN
Mean union time (wk)	20.8	19.68	17.o4

Functional outcome

In our study, clinical outcome was assessed based on Kyle's criteria. 36% of patients treated with dynamic hip screw, 40% of patients treated by dynamic condylar screw and 76% of patients treated with PFN nail showed excellent results. Good results were 32% in dynamic hip screw group and 28% in dynamic condylar screw nail group and 16% in PFN. Fair results were 32% in dynamic hip screw group, 32% in dynamic condylar screw group and 8% in PFN group.

None of our patients showed poor results. On the whole 50% showed excellent and 25% showed good results. 24% showed fair results.

Table 11: Functional outcome.

	Excellent	Good	Fair
PFN	19	4	2
DHS	9	8	8
DCS	10	7	8
Total	38	19	18

Fracture type and Implant of choice:

Table 12: Fracture type (seinsheimer type) and implant chosen.

Types of fracture	PFN	DHS	DCS
IIA	4	4	2
IIB	8	7	2
IIC	11	9	8
IIIA	0	5	3
IIIB	0	0	5
IV	2	0	5
Total	25	25	25

DISCUSSION

The characteristic anatomy, the biomechanical stress and forces acting at the subtrochanteric region makes it difficult to manage these fractures (Cech O; Fielding JW; Seinshemier). Young patients usually sustain high energy trauma, which results in communited fractures whereas in older patients usually communited fractures are seen after minor fall.[2]

At present it is generally believed that all subtrochanteric fractures should be internally fixed to reduce the morbidity and mortality by early ambulation. Because of communition and high incidence of complications reported after surgical treatment (Fieldeing JW; Delec JC, Claton TO and Rockwood CA, surgeons are compelled to give a second thought regarding the selection of proper fixation device. The most common current methods of fixation are blade plate systems, sliding nail plate systems and intramedullary devices.

In our study, the common age group for subtrochanteric fractures is 21 to 40 year which is comparable to those of other Indian authors but was less than most of the studies of western authors.[5] Males contributed major share in our series which was comparable with other studies.[5,6] Right side was more common than left side as seen in other series.[5] High velocity injuries due to road traffic accidents was the main cause of these fractures seen in our studies similar to other studies Associated injuries such as fracture ribs, Colle's fracture, compression fracture of D8, fracture shaft tibia was seen in our study similar to other studies (Bermon et al) also other injuries like fracture pelvis, fracture calcaneum and visceral injuries as noted in other studies.

In the study group, majority of fractures belonged to class IIC of Seinsheimer's classification i.e.,37% and majority of the fractures were unstable, similar to other studies.[7] Mean blood loss was significantly more in those fixed with dynamic hip screw and dynamic condylar screw with barrel plate compared to those fixed with proximal femoral nail i.e., 425ml in DCS, 400ml in DHS and 300 ml in PFN. Our results matched with other studies.[8] The period of hospital stay was almost the same in either group and was statistically insignificant. Shortening was seen in 1 patient treated with dynamic hip screw and barrel plate. Postoperative quadriceps exercises were started on second day in all cases.

Full weight bearing is allowed early amongst the patients fixed with proximal femoral nail group compared to those fixed with dynamic hip screw and barrel plate, dynamic condylar screw and barrel plate i.e. 4weeks in proximal femoral nail group to 17weeks in dynamic hip screw and barrel plate and dynamic condylar screw and barrel plate. Our results matched other results. Mean union rate was faster in those treated with proximal femoral nail 17 weeks than those treated with dynamic hip screw 19 week and barrel plate and dynamic condylar screw and barrel plate 20 weeks. None of the patients in our series showed implant failure, only 5 patients of those fixed with dynamic hip screw and barrel plate and 3 patients fixed with dynamic condylar screw showed superficial infection. One mortality was seen in our series, treated with PFN, the patient succumbed to cardio respiratory complication.

In our study implant is chosen randomly, in type IIA, IIB, IIC fracture type PFN and DHS is used more commonly than DCS. where as in IIIA, IIIB fracture pattern DCS and DHS is preferring to PFN. So, result of PFN, DHS and DCS are not comparable for individual fracture type.

Overall, we had 76% good to excellent results in those treated with Proximal femoral nail, 36% good to excellent results in those treated with dynamic hip screw and barrel plate. 40% good to excellent results in those treated with dynamic condylar screw and barrel plate. Our results were comparable to results of other studies.

Summarizing the impression about the devices used and desirable, we feel that subtrochanteric fractures could be fixed either with dynamic hip screw and barrel plate, dynamic condylar screw and barrel plate or with proximal femoral nail with outcomes being better for those fixed with proximal femoral nail.

CONCLUSION

PFN attempts to combine advantage of a sliding hip screw with those of intramedullary fixation devices. Cases treated with PFN nail have shown easier rehabilitation, less blood loos, less surgical trauma, early mobilization, early rate of fracture union when compared to those cases treated with DHS and DCS barrel plate as per observation of our study.

With our study PFN has given us encouraging results over conventional DHS and DCS. Hence, we recommend PFN as better implant for fixation of sub-trochanteric fracture.

ACKNOWLEDGEMENTS

Authors would like to thank Dr. Surendra Shukla for their prudent and authoritative retrospection, direction, discussion, incessant guidance.

Author would like to appreciate the constant encouragement and help by my fellow resident doctor Dr. Deepak CE, Dr. Kushal Gori who have given their time and energy in completing this paper.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Marsh JL, Saltzman CL, Bucholz R, Heckman J. Rockwood and Green's fractures in adults. 2001;2(6):827-1844.
2. LaVelle DG. Chapter 52-Fractures and Dislocations of the Hip. Campbell's Operative Orthopaedics. 11th ed. Philadelphia, PA: Mosby. 2007;3:3237-3308.
3. McLaurin TM, Lawler EA. Treatment modalities for subtrochanteric fractures in the elderly. Techniques in Orthopaedics. 2004;19(3):197-213.
4. DeLee JC, Clanton TO, Rockwood CA Jr. Closed treatment of subtrochanteric fractures of the femur in a modified cast-brace. J Bone Joint Surg Am. 1981;63(5):773-9.
5. Baumgaertner MR, Curtin SL, Lindskog DM, Keggi JM. The value of the tip-apex distance in predicting failure of fixation of peritrochanteric fractures of the hip. J Bone Joint Surg Am. 1995;77(7):1058-64.
6. Vanderschot P, Vanderspeeten K, Verheyen L, Broos P. A review on 161 subtrochanteric fractures--risk factors influencing outcome: age, fracture pattern and fracture level. Der Unfallchirurg. 1995;98(5):265-71.
7. Boldin C, Seibert FJ, Fankhauser F, Peicha G, Grechenig W, Szyszkowitz R. The proximal femoral nail (PFN)-a minimal invasive treatment of unstable proximal femoral fractures: a prospective study of 55 patients with a follow-up of 15 months. Acta Orthop Scand. 2003;74(1):53-8.
8. Roberts CS, Nawab A, Wang M, Voor MJ, Seligson D. Second generation intramedullary nailing of subtrochanteric femur fractures: a biomechanical study of fracture site motion. 2002. J Orthop Trauma. 2003;17(8 Suppl):S57-64.

Cite this article as: Mishra SK, Deepak CE, Goari K, Shukla S. Study internal fixation of subtrochanteric fracture of femur with dynamic hip screw, dynamic condylar screw and proximal femoral nail-a retro-prospective study. Int J Res Med Sci 2018;6:1011-6.