Comparative Outcome of Basi-Cervical Neck of Femur Fractures Fixed Using DHS with and without De-Rotation Screw

Dr. Gyan Chand[1§], Dr. Anurag Dhaker[2], Dr. Alpana Goyal[3], Dr. Mahesh Bansal[4], Dr. Rajeev Yadav[5], Priyanka Gupta[6] and Dr. Rahul Upadhyay[7]

[1]Junior Resident, Orthopedic Department, SMS Hospital, Jaipur (Rajasthan) India
[§]Email of Corresponding Author: gcgothwal15@gmail.com
[2]Associate Professor, Orthopedic Department, SMS Hospital, Jaipur (Rajasthan) India
[3]Associate Professor, Anatomy Department, SMS Hospital, Jaipur (Rajasthan) India
[4]Professor and Head, Orthopedic Department, SMS Hospital, Jaipur (Rajasthan) India
[5]Associate Professor, Department of Community Medicine, SMS Hospital, Jaipur (Rajasthan) India
[6]M.Sc. Student, Dr.B.lal institute of biotechnology, Jaipur (Rajasthan) India
[7]Senior Resident, Orthopedic Department, SMS Hospital, Jaipur (Rajasthan) India

Abstract— *Basicervical fracture necks of femur are intermediate between femur neck fracture and intertrochantric fracture. These fractures having axial and rotational instability are traditionally being treated with DHS. DHS allow solid fixation in two planes only, additional derotation screw allow stability in third plane also.*

Objective*: To compare outcome of basicervical fracture neck of femur treated with and without derotation screw.*

Material and Methods: *Patients were divided in two groups i.e. group 'A' and group 'B' each group having 30 patients. Group 'A' patients were treated with DHS with derotation screw and group 'B' patients with DHS alone.*

Results: *At 12 months postoperatively patients were clinically and radiologically evaluated. All frcture were united in Group 'A' within an average period of 12.5 week while three patients (10%) ended up in non-union in group 'B'. Mean sliding distance in group 'A' was 5.6 mm while it was 6.2 mm in group 'B'. Mean shortening of limb was 3.8 mm in group 'A' which was 4.3 mm in group 'B'. In group 'A' there was no major displacement between the fracture but in group B there was >3 mm displacement in five patients (16.66%). According to modified Harris hip score in group 'A' 26 patients (86.66%) had excellent results, two patients(6.66%)had good results, one patient(3.33%) had fair results and in one patient(3.33%)poor results was obtained.*

Conclusions: *It can be concluded from study that there were better radiological and clinical outcome in DHS with derotation screw than DHS alone in basicervical fracture neck of femur.*

Key words: Basicervical fracture, DHS, Derotation screw.

I. INTRODUCTION

Blair et al[1] defined basicervical fracture neck of femur as proximal femoral fracture through the base of the femoral neck at its junction with the intertrochanteric region. Medical dictionary[2] defined these fractures as fractures of femoral neck at the junction with trochanteric line. Traditionally, these fractures are treated with dynamic hip screw (DHS) as in intertrochanteric fractures. Compared to

intertrochanteric fractures, basicervical fractures have greater instability and poor outcome. With life expectancy increasing with each decade, our society is becoming more and more geriatric society, with a significant number of hospitalized patients suffering from femoral neck fracture.[3,4] Femoral neck fractures in young patients are usually due to high energy trauma and associated with multiple injuries. In older patients these are mostly fragility fractures due to falls.

The lifetime risk of hip fracture has been estimated as 23.3% for men and 11.2% for women.[5] Management of fracture neck of the femur is still a dilemma for orthopedic surgeons and remains in many ways the unsolved fracture as far as treatment and results are concerned. The purpose of this study was to compare the functional and clinical outcome of basicervical fractures, having axial and rotational instability fixed using DHS with or without derotation screw.

II. METHODOLOGY

A comparative prospective study was conducted on patients of basicervical fractures treated between June 2013 to June 2016 in our hospital.

Basicervical fractures cases which were included in the study, were defined as extra capsular fracture through the base of the femoral neck at its junction with intertrochanteric region, equivalent to AO type B2.1. Only those patients were included in the study who completed at least one year follow up with the availability of all medical records. Preoperatively, for all patients antero-posterior views of the pelvis and lateral view of the involved hip were obtained. Our of these cases, intracapsular femoral neck fracture, intratrochanteric fracture and patients with comorbid conditions, advance arthritis and with pathologic fractures were excluded from the study.

Only 67 patients were found elligible after fulfilling the inclusion criteria and exclusion criteria. These 67 patients were divided in Group 'A' and group 'B'. Group 'A' comprised of the patients, who were treated with DHS with one cannulated cancellous screw (6.5mm) as derotation screw (n= 34). Group B comprised of patients who were treated with DHS alone (n=33). (Figure 1 to 6)

Figure 1
Basicervical fracture

Figure 2 & Figure 3
Basicervical fractures after correction with DHS with derotation screw

Figure 3
Basicervical fracture

Figure 4 & Figure 5
Basicervical fractures after correction with DHS without derotation screw

All patients were operated by the same surgeon (AD) and the same postoperative rehabilitation protocol was used for all patients. All patients were allowed to walk with weight bearing as tolerated with the help of crutches for the first four weeks. Range of motion and submaximal isometric hip exercises were started early in the postoperative period. Strengthening exercises were started after three months. Patients were serially followed up at 2, 6, 9, 12 weeks, 6 months and then after that yearly. Six patients were lost to follow up between 3 months to 1 year and not included in the study. Final study groups consisted of 31 patients in group 'A' and 30 patients in group 'B' who completed all follow up in each group. At serial follow ups radiological assessment using AP and lateral views of the hip joint and clinical evaluation using Harris hip score[6] was done.

The acceptable reduction criteria were taken as varus and valgus angles of the femoral neck less than 10 and 15 degrees respectively and displacement between the fragments less than 3 mm on both AP and lateral views.[7] Screw position was considered adequate in central, inferocentral and inferoposterior zones of the femoral head in both AP and lateral views.[7] Tip apex distance was taken adequate as less than 20mm.[8] Derotation screw was deemed good if inserted parallel to lag screw in both views. Conversion between lag and derotation screw was considered inadequate.[9]

Healing of fracture was defined as visible trabeculae across the fracture line.[10] Fracture was considered as non union if no progressive sign of healing was seen by 6 months in any view of the AP and lateral views.[10]

Data thus collected was recorded on a predesigned study proforma and was entered in microsoft excel sheet to prepare master chart. Master chart was subjected for statistical analysis. Continuous variable were summerized as mean and standard deviation while nominal /categorical variables as proportions. Ordinal scale variable were expressed as median and range.

Unpaired t-test was used for comparison of continuous variables while chi square test/ fisher exact test was used for nominal/categorical variables. Ordinal scale variables were compared by using Mann-Whitney U test.

P value <0.05 was taken as significant. SPSS 22.0 version (Trial version) software was used for all statistical calculations.

III. RESULTS

In present study out of 61 patients i.e. 31 patients in group 'A' and 30 patients in group 'B' were finally included in the study.

Average age was 48.23±10.31 in group 'A' and 46.80±8.89 in group 'B', which was comparable (p=0.565). Sex ratio was also comparable (p=882). (Table 1)

In group 'A' mean time lag before surgery was 5±0.27 days whereas in group 'B' mean time lag before surgery was 4.9±0.23 days. This difference in mean time lag before surgery in both the group was comparable (p<0.05) . (Table 1)

Table 1
Comparison of Study Population in Group 'A' and group 'B'

S. No.	Variables	Group 'A' (N=31)	Group 'B' (N=30)	'P' Value	LS
1	Age (in Years)	48.23±10.31	46.80±8.89	0.565	NS
2	Sex Ratio (M:F)	17:14	18:12	0.882	NS
3	Mean time lag in surgery (in Days)	5±0.27	4.9±0.23	0.125	NS

In group 'A' average hospital stay was 4.87± .68 day and in group B it was 5.07±.87 days. This variation was not found significant (P= 0.325). (Table 2)

Reduction was considered adequate in 29 (93.55%) and in 2 patients (6.45%) there was problem in group 'A'. In one the reason for inadequate reduction was loss of parallelism between lag screw and derotation screw. Convergent placement of the DHS/derotation screw is inadequate but not considered as technical failure.[11] (Table 2)

In group 'B' 25 patients (83.33%) undergo adequate reduction and 5 patients (16.66%) undego inadequate reduction. Reason for inadequate reduction was displacement between the fragment was >3mm. (Table 2)

In group 'A' 2 patients (6.45%) had complications whereas in group 'B' 6 patients (20%) some of the other type of complications. (Table 2)

Table 2
Comparison of Outcomes in Group 'A' and group 'B'

S. No.	Variables	Group 'A' (N=31)	Group 'B' (N=30)	'P' Value	LS
1	Mean hospital stay (in Days)	4.87± .68	5.07±.87	0.565	NS
2	Adequate Reduction	29 (93.55%)	25 (83.33%)	0.396	NS
3	Complications	2(6.45%)	6(20%)	0.235	NS

IV. COMPLICATIONS

In group 'A' none of the patient was in non-union. There was penetration of derotation screw in two patients (6.66%) whereas 3 (10%) cases in group 'B' went into nonunion. One of these patients healed with cancellous bone grafting. In one patient of non union implant was removed and valgus osteotomy was done along with bone grafting. (Table 3)

In group 'A' none of the patient had developed avascular necrosis whereas in group 'B' one (3.33%) has developed avascular necrosis and presented with persistant pain in the hip joint at 9 months. DHS was removed and total hip replacement was done in this patient. (Table 3)

In each of both groups 2 patients had developed cutting through of screw. Two patients in group 'B' returned at 9 months with pain in the hip joint. X rays of hip joint showed screw cutting through the head of the femur. Implant was removed in these patients at 9 months but one patient continued to have pain in hip joint at latest 2 year follow up. (Table 3)

Table 3
Comparison of Complications in Group 'A' and group 'B'

S. No.	Variables	Group 'A' (N=31)	Group 'B' (N=30)	'P' Value	LS
1	Non union	0	3(10%)	0.225	NS
2	Avascular Necrosis	0	1(3.33%)	0.878	NS
3	Cutting through of screw	2 (6.45%)	2 (6.66%)	0.629	NS

V. DISCUSSION

Management of Basicervical fractures is a continuing challenge because of difficulty in achieving stable fixation and its Biomechanical significance. Improvement of the biomechanical capacity of the implant through additional device therefore seems to be an attractive option.

Because basicervical fracture occurs at an area of differentiation of the femoral neck to the trochanteric region, there is no classification system that gives appropriate detailing to this fracture. But being a Ball & Socket joint, all movements have a rotational component and most of the studies that were concerned with neck fracture reported rotational instability for the proximal fragment. Furthermore, Basicervical fractures lack the cancellous interdigitation seen with fractures through the intertrochanteric region and are more likely to sustain roation of femoral head during implant insertion. In brief, basicervical fracture is an axial and rotary unstable fracture.

The DHS conventionally has been commonly used implant for fixation of the extracapsular femoral neck fractures .Nevertheless; the lag screw has potential to rotate the rotationally unstable femoral head during its insertion. This may increase the incidence of aseptic necrosis and non-union across the fracture site. A derotation screw (DRS) was used in order to control this rotational instability. Post operatively in basicervical fracture neck femur DHS alone does not control rotation of femoral head – neck fragments derotation screw does.[12,13,14,15] and reduction could not be maintained if DHS was used alone.[16] There is shear force in high fracture angle which lead to inferior translation of the femoral head neck fragment in basicervical fracture neck of femur. Derotation screw with DHS increase the axial stability of fracture and control the inferior translation of the femoral neck ragment.

Present study included 60 patients with basicervical fractures, 30 with DHS alone and 30 with DHS+DRS. The clinical outcomes were graded according to Harris Hip Score, Radiological assessment and patients own satisfaction.

There is no excessive shortening of the limb and femoral neck in this study. Mean sliding distance in DHS was 6.2mm and DHS with derotation screw was 5.6mm. According to Mattssan et al sliding distance less tan 6.7mm did not affect the level of the mobility.[17] Mean shortening of the limb was 3.8mm in group A and 4.3mm in group B.Pajarinen et al an average of 4.7mm shortening of limb in a group of patients (n=41) treated with DHS.[16]

Use of DRS with DHS gave more biomechanical stability to the construct. There is 100% union, no complaints of significant limb shortening and significantly better Harris Hip Score with less pain, better ROM, ability to climb stairs and doing activities of daily living.

Assessment of the post operative outcome, both functional and radiological, supports our view with better outcome and union rate being achieved with DHS+DRS.

Present study found significant better using DHS with derotation screw as compare to DHS alone in basi-cervical fracture neck of femur. Which is consistant with KBL et al[11] and EM Toh et al[18]

VI. CONCLUSION

Therefore it is conclude that basicervical fracture neck of femur is an unstable fracture. Treating this with DHS alone leaves a possibility of rotation and displacement of proximal fragment. Using a DRS along with DHS prevented this rotation and displacement of proximal femoral fragement. DHS allow solid fixation of the two major fragments in two planes and derotation screw in third plane.

Additional advantage rendered is the low cost of the DHS/ DRS combination compared to nails which renders this technique beneficial for patients in developing countries.

CONFLICT

None declared till date.

REFERENCES

[1] Blair B, Koval KJ, Kummer F, Zuckerman JD. Basicervical fractures of the proximal femur. A biomechanical study of 3 internal fixation techniques.ClinOrthopRelat Res. 1994;306:256–263

[2] http://medical-dictionary.thefreedictionary.com/basicervical+fracture

[3] Johnell O, Kanis J. Epidemiology of osteoporotic fractures. Osteoporos Int. 2005 Mar;16Suppl 2:S3-7. [PubMed] [CrossRef]

[4] Sambrook P, Cooper C. Osteoporosis. Lancet. 2006 Jun 17; 367(9527):2010-2018. [PubMed] [CrossRef].

[5] http://www.orthopaedicscore.com/scorepages/harris_hip_score.html

[6] Kanis JA, Johnell O, Sembo I, Sembo I, Redlund-Johnell I, Dawson A, et al. Long term risk of osteoporotic fracture in Malmo. Osteoporosis Int. 2000; 11:669-674. 3

[7] Mattsson P, Alberts A, et al. Resorbable cement for the augmentation of internally fixed unstable trochanteric fractures. J Bone Joint Surg [Br] 2005;87-B:1203-1209. [PubMed]

[8] Baumgaertner MB, Solberg BD. Awareness of tip-apex distance reduces failure of fixation of trochanteric fractures of the hips. J Bone Joint Surg [Br] 1997;79-B:969–971. doi: 10.1302/0301-620X.79B6.7949. [PubMed] [Cross Ref]

[9] Gurusamy K, Parker MJ, Rowlands TK. The complications of displaced intracapsular fractures of the hip: The effect of screw positioning and angulation on fracture healing. J Bone Joint Surg [Br] 2005;87-B:632–634. [PubMed]

[10] Miedel R, Ponzer S, Tornkvist H, et al. The standard gamma nail or the Medoff sliding plate for unstable trochanteric and subtrochanteric fractures.A randomised, controlled trial. J Bone Joint Surg [Br] 2005;87-B:68–75. [PubMed]

[11] KBL Lee, TS Howe,HC Chang. Cancellous Screw Fixation for Femoral Neck Fractures: One Hundredand Sixteen Patients. Ann Acad Med Singapore. 2004;33:248-51

[12] DeLee JC (1996) Fractures and dislocations of the hip. In: Rockwood and Green's fracture in adults, 4th ed. LippincottRaven, Philadelphia

[13] Müller ME, Allgöwer M, Schneider R, et al (eds) (1992) Proximal femur. In: Manual of internal fixation: techniques recommended by the AO-ASIF Group, 3rd edn. Springer, Berlin

[14] Ort PJ, LaMont J (1984) Treatment of femoral neck fractures with a sliding compression screw and two Knowles pins. Clin.Orthop 190:158–162

[15] Swiontkowski MF (1994) Intracapsular fractures of the hip. J Bone Joint Surg Am 76:129–138

[16] Pajarinen J, Lindahl J, Michelsson O et al (2005) Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail. A randomized study comparing post-operative rehabilitation. J Bone Joint Surg [Br] 87-B:76–81

[17] Mattsson P, AlbertsA et al (2005) Resorbable cement for the augmentation of internally fixed unstable trochanteric fractures. J Bone Joint Surg [Br] 87-B:1203–1209

[18] E.M Toh,VSahni, A Acharya. Management of intracapsular femoral neck fractures in the elderly; is it time to rethink our strategy? Injury. 2004; 35:125–129