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Comparative Study Of Fixation Of Basicervical Fracture Neck Of Femur Using Fixed Angle Device [Dhs] Withderotation Screw Versus Three Cannulatedcancellous Screws

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I. Introduction

Blair et al defined basicervical fracture neck of femur as proximal femoral fracture through the base of the femoral neck at its junction with the intertrochanteric region[1].

Whereas Parker et al defined these fractures as fractures in which the fracture line runs along the line of anterior attachment of the capsule[2].

Basicervical fracture neck of femur is a challenging problem as compared to intertrochanteric fractures,basicervical fractures have greater instability and poor outcomes[3, 4, 5].

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.

Femoral neck fractures are often a fracture of fragility due to osteoporosis in elderly, though in younger age group, it results from high-energy trauma. In these fractures capsule gets entrapped between the fragments,so open reduction and internal fixation was considered which may further increases chance of avascular necrosis[6].

Due to this location, it represents an intermediate form between femoral neck, usually fixed with multiple cancellous screws, and the intertrochantricfractrure, fixed with a sliding screw device[7,8]. This study was conducted with the aim to assess and compare clinical and radiological outcome after fixed angle device (DHS) with derotation screw or cannulatedcancellous screws

II. Materials And Methods

This is prospective, hospital based, randomized, comparative interventional study was conducted in Department of orthopedics, SMS medical college , Jaipur, Rajasthan, India. It includes patients suggestive of basicervical fracture of femur neck of both sexes presenting with fracture basicervical neck of femur admitted from Oct 2016 to Oct 2017.and followed up for 9 months upto July 2018 .Sample size was calculated 35 subjects for each of two groups at α error 0.05 and power 80% assuming radiological union in fixed angle device with derotation screw and in cannulatedcancellous screw 60% and 33.33% in 12 weeks respectively (as per seed articles). So for study purpose 35 subjects in each group were taken.

Patients with fracture basicervical neck of femur,Patients in the age group of 18 years to 62 years..Patients of either of sex groups. Patients who are fit for surgery Patients giving informed consent for the study were included.Patient with diabetic mellitus immunocompromisedstatus,on steroid therapy, Malignancy of any types, Patients with other comorbid conditions affecting outcome variables were excluded.Randomization in either of two group was done by Chit Box Method.

III. Methodology

Patient fulfilling inclusion/exclusion criteria were recruited form OPD of Department of Orthopaedics, SMS hospital, Jaipur and was approached by investigator himself and detailed history and thorough general and systemic examination was done.

Routine & special investigation including biochemical and radiological was done to fulfill inclusion & exclusion criteria. Patient was randomised into two groups by chit box method for 1st patient and subsequent patient was allocated in alternative groups/In control group (group A) fixed angle device (DHS 135 degree) with derotation screw was done as per standard treatment guidelines by an certified orthopaedic surgeon

In case group (group B) 3 cannulatedcancellous screws was done by same orthopaedic surgeon to eliminate surgeons bias

Patient was examined for clinicoradiologicaly, union, bone, strength, weight bearing, deformity and range of motion at 2 weeks, 6 weeks, 12 weeks, 16 weeks, 6 months & 9 months.

All data thus collected was on a predesigned, semi-structured proforma.

Definition of basicervical fracture was observed as extra capsular fracture through the base of the femoral neck at its junction with intertrochanteric region, equivalent to AO type B2.1. Intracapsular femoral neck fracture, intratrochanteric fracture and patients with comorbid conditions, advance arthritis and with pathologic fractures were not included in the study. 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 anteroposterior views of the pelvis and lateral view of the involved hip were obtained. 73 patients fulfilled the inclusion criteria and were included in the study. Out of them 3 patients (1 group A & 2 group B) were lost in follow up due to change of address, contact number and were excluded from the study.

Patients were divided in Group A and group B. Group A comprised of the patients, who were treated with fixed angle device (DHS) with one cannulatedcancellous screw (6.5mm) as derotation screw(n= 35). Group B comprised of patients who were treated with 3 cannulatedcancellous screws (n=35). All patients were operated by the same surgeon (AD) and the same postoperative rehabilitation protocol was used for all patients.

Post-operative protocol -

Patients were given intravenous antibiotics till third postoperative day. Then the patients were shifted to oral antibiotics. Third generation cephalosporin's were generally used.

Sitting up in bed was encouraged on the first post operative day. Quadriceps exercise and range of movement exercises of the hip and knee started on the first day after surgery within limits of pain. The general supportive measures were taken and stitches were removed on tenth to fourteenth post operative day.

Mobilization -

In Group A patients started partial weight bearing after 3-4 weeks and full weight bearing by 6-8 weeks depending upon the clinical and radiological progress Likewise Group B patient were immobilized for about 2-3 weeks. Then mobilization was started non weight bearing. After 4-5 weeks partial weight bearing was started, progressing to full weight bearing by 8-12 weeks depending upon the clinical and radiological progress.**Serial follow-up** Was done at 2 weeks,6 weeks, 12 weeks, 16 weeks, 6 months & 9 months. At serial follow up radiological assessment using AP and lateral views of the hip joint and clinical evaluation using Harris hip score was done.**Reduction assessment -** The goal of reduction was to obtain a position as close as possible to a garden alignment index of 160 / 180.3,4 The Garden Index is an expression of the angle of the compression trabeculae on the anteroposterior roentgenogram in relation to the longitudinal axis of the femoral shaft over the angle of the compression trabeculae on the lateral roentgenogram in relation to the femoral shaft.Garden believes that an alignment index after reduction within range of 155° to 180° on both the frontal and lateral views is an acceptable reduction resulting in a higher percentage of union and a low rate of late segmental collapse [12,13]

Data was entered in excel sheet to prepare master chart, Intention to treat analysis was done. Continuous variables was summarized as mean standard deviation while nominal/ categorical variables/proportions. Parametric test like paired & unpaired t test, repeated, measure INNOVA and pearsion correlation coefficient was done for continuous variablas whereas. Non-parametric test like chi square test, mannwhiteney test was use for nominal / categorical variables The level of significance was kept 95% for all statistical analysis. So P value < 0.05 was considered significant..Medcalc<12.0.1.0 version software was used for statistical calculation.

IV. Observations & Results

It was a prospective study between the management of fracture basicervical neck of femur by Fixed angled device (DHS, 135 degree) + derotation screw(group A) and three CannulatedCancellous Screws (group B). Total of 35 patients were studied in each group with mean age of 52.66 years for group A and 49.60 years for group B; P = 0.218NS (min 22 to 62 years). Out of 70 cases 49 were males and 21 were females. Male to female ratio is about 3:1. Fracture basal neck femur in young adults mainly occurs due to high energy trauma like accidence as the males are more involved in to outdoor activity compared to female chance of accidents are more. Most common mode of injury was history of fall in elder patients and RTA is more common in young patients

In our series 44 cases suffered from right sided fracture and 26 left side fracture. Involvement is not significant.Out of 70, 53 (74.65%) patients were operated within a week, 11 (14.67%) patients were operated in

2nd week and 6 (8%) patients operated in 2nd to 3rdweeks.In our series all cases were operated within 3 weeks.Out of 75 cases 37 were due to RTA, 33 patients were due to slip and fall on ground.

Procedure Done

In our series all cases were treated with close and internal fixation in which 35 cases were treated by fixed angle device i.e DHS (135 degree) with derotation screw (DRS) fixation and 35 cases treated by threecannulatedcancellous screws alone. No splint or traction after operation, knee mobilization, 2nd day and hip mobilization after 2nd week.

The mean Duration of surgery for Group A was 90.5 mins and for group B was 64.4 minsThe average amount of blood loss in group A was around 150 ml and in group B was around 80 ml

Out of 35 patients in each group, 91.43% showed fair to excellent result in group A while 82.86% patients in group B showed fair to excellent result , group A also has slight better range of motion as compare to group B

So group A has better functional outcome (Harris Hip Score) as well as better radiological outcome and lesser complication rates compare to group B, But has more duration of surgery and intra operative blood loss.

Postoperative complications

There was no post operative infection no hematoma. 35 cases treated with CRIF with DHS with derotation screw. 3 cases treated with CC screws alone went into non union. There was no non union cases treated with DHS with derotation screw. Postoperative complications occurred in 14 patients i.e. 20 % of total 70 patients. 4 patients in group A showed complications while 10 patients in group B showed complications.
Average time taken by fracture to unite in group A was about 13 weeks and in CC screw group it was 15.5 weeks Patients were made to walk with partial weight bearing after six weeks in group B and 3 weeks in group A, while full weight bearing allowed at 9-12 weeks in group B and 6 weeks in group A (with considering the clinical and radiological status of each individual patients).

Group A has significantly less (11.43%) complication rate than group B(28.57%). Specially none of patient in group A has nonunion while 3 (8.57%) cases in Group B has nonunion

Functional results on the basis of Modified Harris Hip Score (Grading)

Out of 35 cases of group A , 22 cases (63%) had excellent, 10 (29%) had good, and 3 cases (9%) had poor results.Out of 35 cases of group B, 11 cases (31%) had excellent, 14 cases (40%) had good and 4 cases (11%) had fair results and 6 cases (17%) had poor results.
Out of 70 cases 33 had excellent, 24 had good, 4 had fair and 9 had poor results.CRIF with DHS + DRS i.e. group A had about 63% excellent results.as compared to group B had about 31% excellent results.

Radiological Assessment

All 35 cases of group A of DHS + DRS fixation united, out of them 25 cases the union occurred within 12 weeks and 10 cases union occurred in 16 weeks on in average union occurred at 13.14 weeks.

In 35 cases of group B of CCS fixation, 28 cases union seen on 16 week and 4 cases on 12 week and in 3 cases no union till 9 month follow-up. **Patient Own Assessment**

Patient define their results according to activities of daily living and returning to the same job. Thus patients own assessment is the best assessment.On patients own assessment Out of 70 patients 61 patients were return to their same job and having no problem in pursuing routine activities. But 3 patients in group A and 6 patients in group B had their activities limited to indoor only and couldn't return to the same job

V. Discussion

The treatment of femoral neck fractures has been debated for many years. The main question is whether to fix or replace the femoral neck. Many published papers have shown that a primary hip replacement is superior to internal fixation for the treatment of femoral neck fractures when performed in a relatively healthy and mentally competent elderly patient. However, the treatment for patient under 60 years old is controversial, as the younger the patient is, the more the surgeon is obliged to pursue internal fixation.

Internal fixation are association with high rates of failure due to loss of fixation, osteonecrosis, and nonunion but the patient has the chance of regaining his physiologically normal hip. Tronzo et al [9] identified more than 100 different available implants for osteosynthesis of femoral `neck fractures.

However, if a surgeon chooses osteosynthesis, he must choose between two techniques: multiple cannulatedcancellous screws (CC screw) or a dynamic hip screw (DHS).

Management of the fracture neck of femur is still a dilemma for orthopedic surgeon, and remains unsolved fracture as far as treatment is concerned. Basal fracture neck of femur represents an intermediate form

between femoral neck and intertrochanteric fractures these are more complicated in comparison to other type of proximal femur fractures.

Basal neck fracture of femur are located just proximal to or along the intertrochanteric line, thus are at greater risk for osteonecrosis (ON) than the more distal intertrochanteric fractures. Furthermore, basicervical fractures lack the cancellousinterdigitation seen with fractures through the intertrochatneric region and are more likely to sustain of the femoral head during implant insertion.

The present study has been conducted in the Department of Orthopaedics, SMS Medical College and Hospital, Jaipur during the period of Oct. 2016 to July 2018 . It is a prospectiverandomised study on patients with basicervical fracture of neck femur. 70 fresh cases of closed basicervical fracture neck of femur (22 - 60 yrs, either sex) were included in this study. All patients were divided randomly into 2 groups. Group A treated by fixed angled device i.e DHS with Derotation screw and group B treated by CC screws alone. The clinical outcomes were graded according to modified Harris Hip Score, Radiological assessment and patients own satisfaction. No splint or traction after operation, knee mobilization, 2nd day and hip mobilization after 2nd week.

Youngest patient in our series was 22 years old at the time of operation. Our oldest patient was 62 years of age at the time of surgery. Most of the patients in this study were 40 to 62 year group.

Out of 70 cases 49 were males and 21 were females. Male to female ratio is about 3:1. Fracture basal neck femur in young adults mainly occurs due to high energy trauma like accident as the males are more involved in to outdoor activity compared to female chance of accidents are more.

In our series 44 cases suffered from right sided fracture and 26 left sided fracture. Involvement is not significant.

Out of 70, 52 (74.29%) patients were operated within a week, 11 (15.71%) patients were operated in 2nd week and 7 (10%) patients operated in 2nd to 3rd weeks.

Out of 70 cases 38 were due to RTA, 32 patients were due to slip and fall on ground. RTA is more common cause in young patients while elder patients suffer mostly from slip and fall.

Most of the elder patients had history of fall in both the groups. Factors responsible for this was reported by Cummings and Nevitt[10] in 1994 are inadequate protective reflexes, diminished soft tissue shock absorbers e.g. muscle and fat, inadequate bone strength at the hip account of osteoporosis or osteomalacia.

Average hospital stay for DHS group was 4.31 days while in CC group was 4.2 days. There was no post operative infection no hematoma. In our study there were less complication who were treated with DHS with derotation screw in comparison to treated by CC screw alone. In group A, 2 cases of screw backout i.e. loosened screw were noted while 3 cases of screw backout were noted in group B. 1 case of screw penetration was noted in A group and 2 cases were noted in group B. Out of 70 cases 1 case in group A and 2 cases in group B developed avascular necrosis.

3 (8.57%) cases went to nonunion in CC group while none in the DHS group. Nonunion was probably due to improper implant fixation and early weight bearing in CC group. It is comparable to incidence by KBL Lee et al [11] and E.M. Toh et al [12] studies but far less than K Guruswamy et al [13]study however it was more than reported by J.S.

The clinical outcomes were graded according to Harris Hip Score, radiological examination and patients own satisfaction, we achieved 33 excellent, 24 good, 4 fair and 9 poor results.

According to Modified Harris Hip Score, Group A ; 22 (62.86%) achieved excellent results, 10 (28.57%) had good and 3 (8.57%) cases had poor results & Group B ; 11 (31.43%) had excellent, 14 (40%) had good, 4 (11.43%) had fair and 6 (17.14%) had poor results.

The mean Duration of surgery for Group A was 91.14 mins and for group B was 64.42 mins. The average amount of blood loss in group A was around 150 ml and in group B was around 80 ml. Average time taken by fracture to unite in group A was 13.1 week and in CC screw group it was 15.5 weeks. The difference between final functional outcomes in group A and group B are comparable with the previous studies comparing conventional DHS and CCS by various authors i.e Lee YihShiunn et al. [14], Jaiveer et al [15], A S Sidhu et al [16]Razik et.al. [17].

Osteosynthesis with DHS with Derotation screw and CC screws preserve a living femoral head that is better than a replacement, furthermore these procedures are less invasive than arthroplasty. Total joint replacement or hemiarthroplasty can be performed with similar results if osteosynthesis fails.

Squatting and cross leg sitting was possible in 57 cases (81.42%). 3 cases in group A and 10 cases in group B , squatting and cross leg sitting was not possible.

There is no excessive shortening of the limb and femoral neck in this study. Mean sliding distance in DHS with derotation screw was 5.6mm. According to Mattssan et al sliding distance less than 6.7mm did not affect the level of the mobility[18]. 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[19].

In our series total Harris hip score at the end of nine months ranged from 40% to 100%.Thus 91.43% and 82.86 % of the hips were classified as having a fair to excellent result and 8.57% and 17.14% of the patients

had a poor result for group A and B respectively. The poor results in this series were due to mild to moderate pain in the hip or thigh and limp after internal fixation, were found more commonly in patients who had penetrating screw, non union& backing out of the screws.

The success of internal fixation no doubt depends on preoperative planning and proper attention to surgical details to achieve the optimum biomechanical condit

In conclusion, osteosynthesis with fixed angle device i.e. DHS with derotation screw and CC screws alone fixation preserve living femoral head that is better than a replacement. Though the blood loss, soft tissue trauma, duration of surgery and cost of treatment are more in the DHS group than the CC screw group, but keeping in mind, the early weight bearing, early fracture union, lesser number of complications specially nonunions and a better Harris hip score as compared to CC screw group, we recommend fixed angle device i.e. DHS with derotation screw as a better and more stable implant for treatment of basicervical fracture neck femur.

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Table No1 Descriptive statistics of the study population

		Group A		Group B		Total		P Value
		No	%	No	%	No	%	LS
Age(yrs.)	<30	0	0	2	5.71	2	2.86	0.218NS
	31 to 40	5	14.29	6	17.14	11	15.71	
	41 to 50	10	28.57	14	40	24	34.29	
	51 to 60	15	42.86	12	34.29	27	38.57	
	>60	5	14.29	1	2.86	6	8.57	
	Mean ± SD	52.66	8.44	49.6	9.26	51.13	9.159	
Sex	Female	10	28.57	11	31.43	21	30	1.0NS
	Male	25	71.43	24	68.57	49	70	
Side	Lt.	15	42.86	11	31.43	26	37.14	
	Rt.	20	57.14	24	68.57	44	62.86	0.45NS
	<1 week	27	77.14	25	71.43	52	74.29	0.856
	1to 2 week	5	14.29	6	17.14	11	15.71	
	2 to 3 week	3	8.57	4	11.43	7	10	
MOI	RTA	15	42.86	23	65.71	38	54.29	0.093NS
	Slip & Fall	20	57.14	12	34.29	32	45.71	

Table No2 Movements among the groups

	Group A			Group B			Total			P Value LS
	N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation	
Flexion	35	103.86	13.72	35	97	15.44	70	100.43	14.91	0.054
Abduction	35	36.86	5.83	35	34.86	7.12	70	35.86	6.54	0.203
Adduction	35	29.57	5.2	35	28	5.84	70	28.79	5.55	0.239
Internal Rotation	35	23.43	5.39	35	21.14	5.43	70	22.29	5.5	0.082
External Rotation	35	27.29	6.22	35	25	5.56	70	26.14	5.97	0.11
"ROM scale"	35	221.57	29.62	35	206.29	34.41	70	213.93	32.79	0.05
ROM	35	4.69	0.53	35	4.46	0.7	70	4.57	0.63	0.128

Table No 3 Postoperative complications among the groups

Postoperative complications	Group A		Group B		Total		P Value LS
	No	%	No	%	No	%	
Complication present	**4**	11.43	**10**	28.57	**14**	20	0.135NS
Complication Absent	**31**	88.57	**25**	71.43	**56**	80	
1.Loosening of screw	2	5.71	3	8.57	5	7.14	0.45NS
2. Screw penetration	1	2.86	2	5.71	3	4.29	0.34NS
3. Non union	0	0	3	8.57	3	4.29	0.23NS
4. Osteonecrosis	1	2.86	2	5.71	3	4.29	0.34NS
	35	**100**	**35**	**100**	**70**	**100**	

Table No 4 Outcome Variables among the groups

Modified Harris Hip Score	Group A		Group B		Total		P Value lS
	No	%	No	%	No	%	
Excellent	22	62.86	11	31.43	33	47.14	0.032S
Good	10	28.57	14	40	24	34.29	
Fair	0	0	4	11.43	4	5.71	
Poor	3	8.57	6	17.14	9	12.86	
Mean ± SD	91.29	11.02	83.43	15.74	87.36	14.06	
Radiological Assessment							
Non Union	0	0	3	8.57	3	4.29	0.238NS
Union	35	100	32	91.43	67	95.71	
Patients own assessment							
Excellent	22	62.86	11	31.43	33	47.14	0.032S
Good	10	28.57	14	40	24	34.29	
Fair	0	0	4	11.43	4	5.71	
Poor	3	8.57	6	17.14	9	12.86	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Intra operative blood loss (ml)	148.57	30.60	79.14	27.26	113.86	45.28	<0.001S
Duration of surgery (min.)	90.57	14.64	64.43	13.05	77.50	19.05	<0.001S
Fracture union (weeks)	13.14	1.83	15.50	1.34	14.27	2.00	<0.001S

Figure No1 Outcome Variables among the groups