

DYNAMIC CONDYLAR SCREW AND LOCKING PLATE FIXATION IN THE TREATMENT OF DISTAL FEMORAL FRACTURES- AN INTERVENTIONAL STUDY**N. G. GURURAJ^{a1}, G VINAYA^b AND S. RIYAZ AHMAD^c**^aDepartment of Orthopaedics, KIMS, Koppal, Karnataka, India^bDepartment of OBG, KIMS, Koppal, Karnataka, India^cDepartment of Community Medicine, KIMS, Koppal, Karnataka, India**ABSTRACT**

To compare clinical and radiological union in optimum position, complications encountered and to assess and compare the functions of the knee joint. Among 30 patients, 16 cases (54%) sustained A type and 14 cases (46%) suffered type C supracondylar fracture as per AO classification. 54% of patients had right sided injury and 47% of patients had left sided injury. Mode of injury in most of the patients (84%) was road side accident. Most of the patients were operated with an interval of 7 days (66%) and in rest 5 patients (34%) the delay was upto 14 days. In DCS group, 20% patients suffered immediate complications out of which 2 patients had superficial infection and one patient had deep infection. In LCP group, 2 patients (13%) suffered immediate complications, both had superficial infection. DCS group, history of knee arthrosis was present in 13% of cases before injury. In LCP group, history of knee arthrosis was present in 34% of cases before injury.

KEYWORDS : Supracondylar, Intercondylar, Knee Arthrosis, Neer Criteria, Complications

Fractures of the shaft of femur are a major cause of morbidity and mortality in patients with lower extremity fractures. Fractures of the distal part of the femur are difficult to treat and present considerable challenges in management. Severe soft tissue damage, comminution, extension of fracture into knee joint and injury to the extensor mechanism lead to unsatisfactory results in many cases whether treated surgically or non surgically (Donald AW 1996).

There is a bimodal distribution of fracture based on age and gender. Most high energy Distal femoral fractures occur in males between 15 and 50 years of age while most low energy fractures occur in osteoporotic women >50 years. The most common high energy mechanism of injury is traffic accident (53%) and the most common low energy mechanism is fall at home (33%) (Brett et al., 2008).

Diagnosis of distal femoral fractures is mainly dependent on complete clinical examination of the patient. The presence of other injuries of the same extremity needs to be ruled out, with particular attention to the hip and the leg below the fracture site. The vascular supply to the limb should be assessed by examining for the presence of the pulse at the popliteal, dorsalis pedis and posterior tibial arteries. Motor and sensory functions of the leg and foot must be assessed (Brett et al., 2008)

The deformities that result from distal femoral fractures are produced primarily by the duration of the

initial force, fracture line and secondarily by the pull of the thigh muscles. Spasm of the quadriceps and hamstrings usually lead to limb shortening and angulations at the fracture site. The typical varus deformity is usually the result of the strong pull of the adductor muscles. Contraction of the gastrocnemius muscle often produces posterior angulations or displacement of the distal fragment. In fractures with intercondylar extension, muscle attachments to the respective femoral condyles tend to produce splaying and rotational malalignment, which contributes to joint incongruity. Anterior displacement or anterior angulation seldom occurs in distal femoral fractures. (Donald, 1996)

Adequate radiographic evaluation of distal femoral fractures include plain radiographs of entire length of the femur to avoid missing of ipsilateral femoral neck or shaft fractures. Good quality knee radiographs are required to screen for intra articular extension of fracture lines. Computed Tomography scan may be required in intra articular and comminuted fractures. (Brett et al., 2008)

Successful treatment of intra articular fracture especially in weight bearing joint requires restoration and maintenance of the congruity of the two articular surfaces. The present study was undertaken to study the Dynamic Condylar Screw and Locking Plate Fixation in the treatment of distal femoral fractures with following aims and objectives: 1. To compare clinical and radiological union in

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optimum position. 2. To compare complications encountered 3. To assess and compare the functions of the knee joint (Peter et al., 1994; David 1991).

MATERIALS AND METHODS

The present study was include the patients of distal femoral fractures admitted to Department of Orthopaedics, at Government Medical College, Rajindra Hospital, Patiala.

Only those cases were selected where ORIF is indicated like in patients with displaced intra-articular fractures, multiple injuries, severe ipsilateral limb injuries, displaced extra-articular supracondylar fractures, pathological fractures and most open fractures.

Patients were evaluated in the emergency with attention to ABC of trauma care i.e. Airway, Breathing and Circulation. Primary survey of the patient will be conducted regarding the presence of other associated injuries and complications.

Primary treatment was given in the form of splintage, antiseptic dressing, antibiotics, analgesics, anti-inflammatory drugs and intravenous fluids.

Complete biodata of the patients were recorded and detailed history was taken. Routine investigations were done and initial radiographs taken in anteroposterior and lateral directions.

Tibial pin traction was given in the emergency, till the patient is fit for surgery after complete medical and cardiology checkup.

After giving pre-anaesthetic medication, patient was given general, spinal or epidural anaesthesia. Under all aseptic conditions, under tourniquet control, fracture site was exposed through lateral or anterolateral approach and internal fixation was done with either dynamic condylar screw or locking plate Fixation. Dynamic condylar screw was inserted proximal to joint line at junction of anterior one-third and posterior two-third taking into account the 25-degree inclination of medial wall of medial condyle. Guide wire was inserted initially from lateral femoral condyle to medial femoral condyle making it sure that it does not protrude medially. Dynamic condylar screw reamer was sat at 10 mm less than the measured length from guide wire and reaming done over guide wire. Dynamic condylar screw of

appropriate size will then be inserted after tapping 5 mm less than the length of screw. Dynamic condylar screw was inserted and additional 5-mm to increase purchase into the condyles. Appropriate dynamic condylar screw plate was gently seated with impactor. After closing the wound, compression bandage was applied.

RESULTS

In our study of 30 cases, we have two peaks at 41-50 years and more than 61 years with age range 21-60 years. of 30 cases, there were 25 males and 5 were females (5:1). 71% cases were literate and 29% were illiterates and they were evenly distributed in both the groups. In our study, 54% of patients had right sided injury and 47% of patients had left sided injury. In our study, mode of injury in most of the patients (84%) was road side accident and in rest 16% of cases the mode of injury was fall from height in both the groups.

In DCS group, most of our patients were in age group 41-60 years with 46% of patients in 41-50 years age group and 40% in 51-60 years age group. In LCP group, 40% of the patients were in age group more than 61 years. Out Most of the patients in both the DCS group (80%) and LCP group (87%) were males, which can be attributed to more outdoor activity of males. Most of the patients in both the groups were of lower middle socioeconomic status. In DCS group, 26% of the patients had associated medical conditions, 2 patients out of 4 had diabetes mellitus and 2 patients had hypertension. In LCP group, 33% of the patients had associated medical conditions, 2 patients out of 5 had diabetes mellitus and 3 patients had hypertension. In DCS group, 87% patients had simple fractures and 13% patients had compound fracture. In LCP group, 60% patients had simple fractures and 40% patients had compound fracture

In our case series of 30 patients, 16 cases (54%) sustained A type and 14 cases (46%) suffered type C supracondylar fracture as per AO classification. In DCS group, most (80%) of the patients had A type of fracture. Among A type of fractures, 8 patients were in A1 subtype and 2 patients in each A2 and A3 and the rest 3 cases were of C type of fractures and all the fractures were of C1 subtype.

Table 1: Time Between Injury and Surgery in Both Groups

Time Between Injury and Surgery	DCS Group	LCP Group
Within 24 hrs	-	-
2-7 days	10	8
7-14 days	5	7
>14 days	-	-
Total	15	15

Table 2: Postoperative Complications in Both Groups

Postoperative Complications	DCS group	LCP group
IMMEDIATE	3	2
Neurovascular injury	-	-
Superficial infection	2	2
Deep infection	1	-
Failure of reduction	-	-
Thromboembolic complication	-	-
LATE	3	-
Late infection	-	-
Delayed union	2	-
Non union and implant failure	1	-
Malunion	-	-
Painful internal fixation	-	-

In LCP group, most (75%) of the patients had C type of fractures. Among the C type of fractures 4 cases were of C3 subtype, 5 cases were of C2 subtype and 1 case was of C1 subtype the rest 4 cases had A type of fractures. Out of 4 patients, 2 cases were of A2 subtype and 1 case was in each A1 and A3 respectively. In DCS group, 2 patients (13%) were having osteoporosis. In LCP group, 5 patients (34%) were having osteoporosis.

Most of the patients were operated with an interval of 7 days (66%) and in rest 5 patients (34%) the delay was upto 14 days to stabilise the associated medical conditions and in treating compound fractures. No patient was operated within 24 hours to avoid hemodynamic instability. Most of the patients were operated within an interval of 7 days (54%); however in 7 patients (46%) the delay was up to 14 days to stabilise the associated medical conditions and in treating compound fractures. No patient was operated within 24 hours to avoid hemodynamic instability (Table1).

In DCS group, 20% patients suffered immediate complications out of which 2 patients had superficial infection and one patient had deep infection. None of the patient had neurovascular injury, thrombo embolic complications.

Late complications were seen in 21% cases out of which 2 patients had delayed union and 1 patient had non union with implant failure. In LCP group, 2 patients (13%) suffered immediate complications, both had superficial infection. None of the patients had neurovascular injury, thrombo embolic complications or failure of reduction. Late complications were not seen in LCP group (Table2).

In DCS group, 54% patients were allowed partial weight bearing in 9-11 weeks, 34% patients started partial weight bearing in 12-14 weeks, 7% patients were allowed partial weight bearing in 14- 18 weeks and 7% of patients were allowed partial weight bearing in more than 18 weeks. In LCP group, 40% patients were allowed partial weight bearing in 9-11 weeks, 32% patients started partial weight bearing in 12-14 weeks and 28% patients were allowed partial weight bearing in 14-18 weeks table 3.

Table 3: Time for Partial Weight Bearing In Both Groups

Weight Bearing	DCS Group	LCP Group
9-11 weeks	8	6
12-14 weeks	5	5
14-18 weeks	1	4
>18 weeks	1	-
Total	15	15

Table 4 : Knee Arthrosis Before Injury and Post Operative in Both Groups

Knee Arthrosis	DCS Group		LCP Group	
	Before Injury	Post Operative	Before Injury	Post Operative
Present	2	3	5	8
Absent	13	12	10	7
Total	15	15	15	15

In DCS group, 60% patients had sufficient callus formation and rest had callus present in follow up x-rays. Three patients had insufficient callus formation. In LCP group, 66% patients had sufficient callus formation and 34% had callus present but not all around.

In DCS group, history of knee arthrosis was present in 13% of cases before injury, as suggested by the history of pain in knee which increases on squatting and climbing stairs. In LCP group, history of knee arthrosis was present in 34% of cases before injury, as suggested by history of pain in knee which increases on squatting and climbing stairs.

In DCS group, knee arthrosis was found in 20% in post operative period. Among these 3 patients, 2 patients were already having history of knee arthrosis in the pre operative period. In LCP group, knee arthrosis was found in 55% of the patients in post operative period. Among these 8 patients, 5 patients were already having history knee arthrosis in the pre operative period (Table 4).

In DCS group, most of the cases(47%) had excellent results according to Neer criteria, 33% cases had good, 13% of cases had fair results and 7% cases landed in failed procedure. In LCP group, most of the cases (45%) had good results according to Neer criteria, 28% cases had excellent and 27% of cases had fair results.

DISCUSSION

The present study does show a biphasic age distribution of the patient population. In DCS group, most of our patients were in age group 41-60 years with 52% patients in 41-50 years age group and 32% in 51-60 years age group. In LCP group, 40% of the patients were in age group more than 61 years. Age distribution in two groups is statistically significant (p 0.039**).

Most of the patients in both DCS group (80%) and LCP group (87%) were males which can be attributed to

more outdoor activity in males. our results are very close to the study by Muller et al., 1995. Statistically when both groups were compared, p value is not significant.

Mode of injury in most of the patients in DCS group (87%) and LCP group (94%) was road side accident. Most of the studies agree with us that road side accident is the major cause of supracondylar fracture.

In DCS group, 87% of the fractures were of simple type and 13% were compound type while in LCP group, 60% of the injuries were of simple type and rest 40% were compound type. Among A type of fractures 13% cases were of A2 subtype and 7% cases were in each A1 and A3 subtype. AO classification intergroup comparison is statistically highly significant (p 0.010).

This discrepancy in distribution in both groups can be explained as LCP is useful for fixation of supracondylar fracture with intraarticular extension and with comminution, hence more useful in C type of supracondylar fractures (Grieve et al., 2007; Neer et al., 1967).

Medical conditions (diabetes mellitus and hypertension) were responsible for the delay in surgery. Moreover, diabetes mellitus lead to superficial infections in 2 of our patients which was treated with antibiotics and the control of diabetic status. But in one case which belong to DCS group due to deep infection assembly had to be removed and wound debridement was done with control of diabetic status. Statistically when both groups were compared p value is not significant Nicholls et al., 1982.

In our study, 7 out of 30 patients (20%) had osteoporosis out of which 3 were old postmenopausal females and 4 patients were elderly male patients. Out of these 7 cases, fracture fixation in 2 cases was done with the help of DCS as the fractures were of A type and additional screws were put in distal fragment for additional support. However in 5 cases, fracture fixation was done by using LCP and multiple cannulated screws John, 1993; Marcus et al., 1993; He et al., 2005.

Patients with history of knee arthrosis before injury reported slight worsening of pain in both the groups. When both groups were compared they found to be statistically significant with p value 0.025. So it can be said development of knee stiffness is more in C type of supracondylar fractures.

Knee stiffness and knee arthrosis when compared in preoperative and postoperative conditions in both the groups were found to be statistically significant. A study by Ha, Lee et al 2005 suggests that stiff knee is a complication of a fracture of the femur, particularly in the supracondylar area. Despite improvement in techniques of internal fixation and early rehabilitation, adequate knee flexion may not be regained. This is especially so with associated gross soft-tissue injuries, multiple fractures, comminuted fractures and if rehabilitation is delayed.

In DCS group in postoperative cases, 1 patients (7%) developed knee stiffness. The case was of C type fracture and there surgery was performed through an anterolateral quadriceps splitting skin incision and his compliance in post operative rehabilitation was not up to the mark.

In LCP group, fracture site was approached with anterolateral quadriceps splitting incision as per the study of Leggon et al 2001 in which he stated that anterolateral quadriceps splitting incision leads to knee stiffness. Similarly, 3 patients (21%) developed knee stiffness that is why intergroup statistical difference is statistically significant (p 0.025) as far as postoperative knee stiffness is concerned.

CONCLUSION

It was concluded that LCP is the implant of choice in comminuted fractures of distal end of femur and in elderly patients with osteoporotic bone. The screw head gets locked to the plate and it acts as one construct, thus increasing the holding power of the implant, making it an implant of choice in osteoporotic bone and in comminuted fractures with little bone stock. In spite of the worst fracture anatomy of the comminuted fracture of distal femur and the

poor quality of bone in elderly patients, this can provide better post operative range of knee motion with overall better Neer score, achieving bony union in all the cases. In contrast, DCS can be used in distal femur fractures only when there is an uncomminuted bone stock of at least 4 cm above the intercondylar notch.

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