



# EVALUATION OF RESULTS OF OPEN REDUCTION AND INTERNAL FIXATION WITH DYNAMIC CONDYLAR SCREW IN MANAGEMENT OF FRACTURE DISTAL THIRD FEMUR

Ramavtar Saini<sup>1</sup>, Rakesh Kumar Mishra<sup>2</sup>, Anamika Vyas<sup>3</sup>

<sup>1</sup>M.S. (Orthopaedics) Associate Professor Dept of Orthopaedics Geetanjali Medical College and Hospital Udaipur (Raj), India; <sup>2</sup>M.S. (Orthopaedics) Assistant Professor Dept of Orthopaedics Geetanjali Medical College and Hospital Udaipur (Raj), India; <sup>3</sup>M.D. (Microbiology) Associate Professor Dept of Microbiology Geetanjali Medical College and Hospital Udaipur (Raj), India

## ABSTRACT

**Introduction:** Fractures of distal third femur may present difficulties in their treatment and require careful management to obtain good cosmetic and functional results. In recent years greater advances have been made in understanding the technique of internal fixation. Over the time different type of implants angle blade plate, rush rod, enders nail have been used for the fixation of these fractures. These devices are technically demanding and none of them can provide interfragmentary compression across intercondylar fracture surface. However it is documented that dynamic condylar screw can solve these problems with added advantages of early functional rehabilitation of knee, stable internal fixation and maintenance of joint congruity.

**Aim:** The study was conducted to evaluate the results of dynamic condylar screw in management of fracture distal third femur in adults, at the same time comparing the results with other studies.

**Materials and Methods:** The study was conducted on 30 patients of fractures of distal third femur treated by open reduction and internal fixation with dynamic condylar screw with a post operative follow up of one year. Relevant parameters like time of union, range of movements at knee and complication associated with these fractures treated with dynamic condylar screw were recorded. Schatzker and Lambert criteria were used to grade the result.

**Results:** Out of 30 patients, 26 (87%) were male and 4 (13%) were female. The cause of injury was road traffic accident in 27 (90%) cases. Average time of union was 15 weeks. In 21 patients (i.e. 70%) the range of movement of knee was 110° on above. Two patients (7%) had non union. There were 4 patients (13%) with knee stiffness and two (7%) with limb shorting up to 1.5cm. Infection was also noted in 2 patients (7%). The surgical outcome was excellent in 12 patients (40%), good in 9 patients (30%), fair in 5 patient (17%) and poor in 4 patient (13%).

**Conclusion :** The dynamic condylar screw is an easy, technically less demanding and effective method for treatment of fracture distal third femur.

**Key words:** Fracture, Femur, Dynamic Condylar Screw (DCS), management

## INTRODUCTION

The incidence of distal femoral fractures is 4-7% of all femur fractures.<sup>1,2</sup> There is a bimodal distribution of fractures based on age and gender. Most high energy distal femur fractures occur in males of younger age, while most low energy fractures occur in elderly osteoporotic women. The most common high energy mechanism of injury is a road traffic accident and the most common low energy mechanism is fall at home.

Fractures of distal femur are difficult to treat because of unstable fracture pattern and comminution. These fractures are in proximity to the knee joint contributing to functional rehabilitation of knee difficult. Till 1960, these fractures used to be treated non-operatively (Traction & Cast bracing) because of lack of adequate internal fixation devices. With development of improved internal fixation devices by AO group in 1970, a new era began in which operative methods proved their significance in

### Corresponding Author:

Ramavtar Saini M.S. (Orthopaedics) Associate Professor Dept of Orthopaedics Geetanjali Medical College and Hospital Udaipur (Raj), India; Mobile: 00-91-9928075740; Email: ramsaini2108@gmail.com

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management of distal femoral fractures. Thus the trend changed towards operative management of distal femoral fractures in 1980s.<sup>3-7</sup>

While treating any fracture the goal of operative management is to restore the limb function. Anatomical articular reduction, stable fixation, gentle tissue handling and early mobilization are some key factors to achieve this goal. The limiting factors are osteoporosis, small distal fragment and amount of soft tissue damage. Open reduction and internal fixation has been advocated using various implants including Angle blade plate, Zickel device, Rush rod, Enders nail, but these devices are technically demanding and none of them can provide interfragmentary compression with good purchase in osteopenic bone.

No implant can stabilize every fracture type, but the device chosen must provide fixation rigid enough for early mobilization for best result. Dynamic Condylar Screw (DCS) is a better implant to achieve the goals of operative management of distal femoral fractures. The advantage of DCS over others are the leg screw supplies not only interfragmentary compression across the intercondylar surfaces but also better purchase in osteopenic bone. The stability provided by this device allow early aggressive restoration of knee motion and muscle power.<sup>8,9,10</sup> DCS shares many of the features of a compression hip screw. Since most of the orthopaedic surgeons are already familiar with use of a compression hip screw in the management of hip fractures, the instrumentation is easily mastered. It was against the above back drop that the present study was conducted to evaluate the results of Dynamic Condylar Screw (DCS) in fractures of distal third femur in adults.

## MATERIALS AND METHODS

The present study was conducted at Department of Orthopaedics, of a tertiary care hospital with a one year follow up post operatively. The study group consisted of 30 cases of fractures of distal third femur in age group of 18 years and above of either sex, treated with Open Reduction Internal Fixation (ORIF) with Dynamic Condylar Screw (DCS). Despite that the operative management was a part of patients treatment protocol, informed consent was taken after explaining the procedure to the patients in local language. Beside, permission was obtained from Institutional Ethics Committee for approval of the study. Fractures were classified according to the AO system (Muller et al)<sup>11</sup> and consisted of 10 type A (3A<sub>1</sub>, 3A<sub>2</sub>, 4A<sub>3</sub>) and 20 type C (7C<sub>1</sub>, 7C<sub>2</sub>, 2C<sub>3</sub>) fractures. Patients with lower diaphyseal fractures of femur, pathological fractures, active infection anywhere in body and medically unfit patients were excluded from the study.

After admission all patients were evaluated as per trauma management protocol and initial resuscitation if required was performed. Detailed history about mechanism and type of injury was obtained. Thorough physical examination of the patients was performed. Local examination of injury including nature of fracture, status, whether closed or compound, deformity, condition of proximal and distal joints and associated injuries was performed. As a part of management of open fractures, initial irrigation, debridement, intravenous antibiotic, proximal tibial pin traction and delayed wound closure was done. Radiological examination of fractured site obtaining AP and lateral views with joint above and below the fracture was performed. From the initial radiographs, the fractures were classified according to AO system (Muller et al).<sup>11</sup> All patients received prophylactic antibiotic (IV ceftriaxone) and the same antibiotic was given intravenously for three days post operatively, followed by oral form and analgesics as per ward protocol (i.e. till stitch removal on 14<sup>th</sup> day). All patients were operated under general/spinal anaesthesia and DCS was inserted as per standard protocol. In all patients passive range of motion exercises of knee joint were started on 3<sup>rd</sup> post operative day followed by active range of knee movements at 14<sup>th</sup> day after removal of stitches. Patients were instructed to only toe touch weight bearing for first six weeks. During this period patients were advised to wear hinge knee brace and to do knee bending, quadriceps and hamstrings exercises at home. Partial weight bearing was permitted after reviewing x-ray at six weeks.

After discharge from the hospital, these patients were called for follow up at fourth, sixth, twelfth week and then monthly for six month and every three months till one year post operatively. Check x-rays were taken in immediate post operative period and on follow up visits. Any complication if encountered was recorded. During follow up visits clinical and radiological union was assessed. On clinical examination if fracture site was stable and pain free, clinical union was considered satisfactory. Radiological union was considered satisfactory when plain x-ray showed bone trabeculae or cortical bone crossing the fracture site. Full weight bearing was permitted only when signs of radiological union were present. All the patients had their final assessment at one year. Assessment of results was done with the criteria laid down by Schatzker and Lambert (1979)<sup>6</sup> for Supracondylar fractures, as given below.

Schatzker and Lambert Criteria

### Excellent:

1. Full extension
2. Flexion loss less than 10 degree
3. No varus, valgus or rotatory deformity
4. No pain
5. Perfect joint congruency

<b>Good:</b> Not more than one of the following: 1. Loss of length not more than 1.2 cm. 2. Less than 10 degree varus or valgus deformity. 3. Flexion loss not more than 20 degree. 4. Minimum pain.
<b>Fair:</b> Any two of the criteria in good category.
<b>Failure:</b> any of the following 1. Flexion to 90 degree or less. 2. Valgus or varus deformity exceeding 15 degree 3. Joint incongruency. 4. Disabling pain no matter how perfect the x-ray.

### RESULT

In the present study fractures were more common in age group 18-40yrs and males (87%) out numbered females (Table 1). 22 patients had fractures on right side and 8 patients on left side. 21 fractures were closed and nine were open fractures. In 27 cases (90%) the mode of injury was road traffic accidents, remaining 3(10%) sustained injuries due to domestic fall. 13 cases (43%) were with associated injuries.

The range of movement was more than 110° in 21 cases i.e. (70%) (Table 2). 22cases (73%) achieved union between 12-16 weeks (Table 3). The average time taken for union in all cases was 15 weeks. The most common complication was knee stiffness (13%), followed by loss of length (< 1.2 cm) (10%) (Table 4). To assess the outcome of treatment criteria laid down by Schatzker and Lambert et.al 1979<sup>6</sup>were used (Table-5). Excellent to good results were obtained in 21cases (70%).

**Table 1: Distribution of fractures by age and gender in the study group**

Age in years	Male	Female	No. of Patients (n = 30)
18-40 years	15	0	15
41-60 years	8	2	10
61-80 years	3	1	4
> 80 years	0	1	1
	26 (87%)	4 (13%)	30 (100%)

**Table 2: Showing range of movements (ROM)**

Range of movements at knee joint	No. of Patients (n = 30)	Percentage (%)
130° and above	10	33
110° and above	11	37
90° – 110°	5	17
Less than 90°	4	13

**Table 3: Showing time for radiological union**

Duration in weeks	No. of Patients (n = 30)	Percentage (%)
12-16	22	73
17-20	5	17
21-24	1	3

In two cases nonunion occurred as a complication.

**Table 4: Showing complications**

Complication	No. of Patients (n = 30)	Percentage (%)
Vascular compromise	0	0
Infection	2	7
Nonunion	2	7
Malunion/angular deformity	3	10
Loss of length (< 1.2cm.)	3	10
Knee stiffness	4	13

**Table 5: Outcome according to schatzker criteria**

Result	No. of Patients (n = 30)	Percentage (%)
Excellent	12	40
Good	9	30
Fair	5	17
Poor	4	13

### DISCUSSION

Fractures of distal femur are always regarded with great concern because of their proximity to knee joint. These fractures demand expertise and sound judgement on the part of surgeon. 12 Non operative methods of treatment have been used traditionally for these injuries, using tibial traction. As a consequence of non operative management, confinement to bed for prolonged periods resulted in complications in the form of mal-union, shortening and stiffness of knee joint. 13 Dissatisfied with the results of traditional methods of treatment orthopaedic surgeons started looking for newer ways of treatment. Over the time, with the introduction of various implants (fixation devices) along with surgical principals for fixation techniques as outlined by AO/ASIF group the results of operative management for fracture distal third femur has improved significantly. Operative treatment attains restoration of limb length, rotation and axial alignment, stable fixation, and early motion<sup>14</sup>. Multiple surgical treatment options exist for fractures of distal third femur but controversy remain regarding the optimum fixation device.<sup>6,15,16</sup> Selection of appropriate implant is determined on the basis of the fracture pattern, the condition of soft tissues ,the need of the patient, and the preference of the surgeon.

Various accepted methods of treatment have their pros and cons and all the problems associated with management of distal femur fracture cannot be solved by a single method of treatment. The DCS is an effective method of treating supracondylar & intracondylar fractures of femur with a wide range of advantages.<sup>17, 18</sup>

In our study the fractures were more common in age group 18-40 years. As these are the most active and productive years of life, people in this age group are involved in outdoor activities and therefore more prone to road traffic accidents and other injuries. Males (87%) outnumbered females (13%) in our study. This is because of male dominated society with less active participation of females in day to day activities especially outside the house in our region. Road traffic accidents (RTA) were responsible for most of the cases (90%). Similar finding was also reported by Marya et al.<sup>19</sup> Advances in mechanization, acceleration of travel, increase in number of high velocity automobile vehicles, over populated cities are few reasons for increased RTA. In present study 13 (43%) patients had associated injuries. This is because RTA was the major cause of fractures in which there are more chance of associated injuries. None of the patients were operated in first 24 hours because of non availability of implant in emergency, financial issues and heavy work load in orthopaedic unit.

According to Schatzker and Lambert criteria, results were graded as excellent in 12 (40%) patients, good in 9 (30%), fair in 5 (17%), and poor in 4 (13%) patients. Christodoulou et al.<sup>20</sup> reported excellent results in 19 (51%), good in 11 (30%), moderate in 4 (11%) and poor in 3 (8%) in total 37 patients. M. Ayaz et al.<sup>21</sup> reported excellent results in 18 (60%), good in 6 (20%), fair in 5 (17%) and poor in 1 (3%) in total 30 patients. In a total of 35 patients Ali I et al.<sup>22</sup> reported excellent results in 20 (57.14%), good in 6 (17.14%), moderate in 3 (8.07%) and poor in 6 (17.14%) patients. Preponderance of comminuted (type c) fractures in the study group, improper fixation due to complexity of comminution, delay in surgery, poor compliance of patients for post operative physiotherapy were few culprits for poor result.

Average time of union in our study was 15 weeks. Few other studies reported the average time of union ranging between 12-20 week<sup>17, 18, 20, 22, 23</sup>. This variation reported might be due to differences in post operative mobilization protocol and criteria for union. In 22 patients (77%) complete weight bearing was allowed between 12-16 weeks, in 6 cases between 17-20 weeks. Sherwing et al.<sup>18</sup> showed better result by early weight bearing in third week of operation. Present study did not follow this protocol, complete weight bearing was permitted only after radiological union.

2 cases (7%) of non union were observed in our study which were treated by autologous bone grafts without

exchange of implants. Fu et al.<sup>23</sup> and Christodoulou et al.<sup>20</sup> reported 7% and 6% non union rate. The rate of infection in our study was 7% (2 cases). Both the cases were open fractures managed by debridement and antibiotics. The reported rate of infection is 0-8%, in other studies.<sup>17, 18, 20-24</sup> There were 3 cases of limb shortening (10%) up to 1.5cm. The shortening was intentional, in order to get stable fixation in comminuted fractures.

Although much attention was given to the range of knee movements in the follow up period still knee stiffness (less than 90° of flexion of knee joint) was observed in 4 cases (13%). Two of these patients were having degenerative changes due to osteoarthritis and were reluctant to do exercises due to pain and rest two did not follow instructions regarding knee exercises and were lost to follow up for first three months. The overall union rate was 93% which is comparable with other studies.<sup>17, 20, 21, 23</sup>

## CONCLUSION

From the present study it was concluded that Dynamic condylar screw is an easy, technically less demanding method of treatment of supracondylar and intracondylar fracture of femur in adults if followed by controlled rehabilitation programme. The problems encountered in the study also focuses on importance of thorough preoperative planning, meticulous attention to intra operative details such as careful handling of soft tissue, anatomical reduction of articular surfaces and bone grafting where needed and correct application of stable internal fixation.

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