

## Original Research Article

# Comparison of study of a dynamic condylar screw surgery and distal femoral locking compression plate technique in distal femoral fractures

G. Ramachandra Reddy\*, P. N. Prasad

Department of Orthopaedics, Shadan Institute of Medical Sciences and Research, Hyderabad, Telangana, India

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**\*Correspondence:**

Dr. G. Ramachandra Reddy,

E-mail: [gatturahulreddy2001@gmail.com](mailto:gatturahulreddy2001@gmail.com)

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### ABSTRACT

**Background:** An extensive soft tissue damage, intra articular extension, severe comminution and injury to the quadriceps mechanism make the management of the distal fractures of the femur a significant challenge. The advent of techniques such as dynamic condylar screw surgery and distal femoral locking compression plate technique have improved the, management of these fractures compared to the conventional methods. We in the present study have attempted to compare the outcomes of Dynamic condylar screw surgery and distal femoral locking compression plate technique.

**Methods:** 72 patients over the age of 20 years who sustained simple or compound fractures of the lower 1/3rd of femur and admitted into our hospital were included into the study. The patients were divided into 2 groups, one group who underwent Dynamic condylar screw surgery and the other groups were managed by distal femoral locking compression plate technique.

**Results:** The most common cause of fracture was road traffic accidents, involving both two wheelers as well as four wheelers (51.4%). 19.4% of the patients had a fall from height and 13.9% had a fall from standing height. The mean operative time in DCS was about 121 minutes in comparison to 118 minutes in the LCP. The average hospital stay and the no of RBCs used were comparable in both the cases. Although the mean number of days for full weight bearing as well as the average time of union of the fracture was marginally lower in LCP than in DCS, it was not significant.

**Conclusions:** It is therefore observed that both condylar screw and the locking plate are very similar in their performance and satisfaction to the patients, although distal femoral locking plate is better in comminuted distal fracture compared to the dynamic condylar screw fracture management.

**Keywords:** Femoral fracture, Dynamic condylar screw surgery, Distal femoral locking compression plate surgery

### INTRODUCTION

Trauma is one of the biggest health hazards of the recent times. This is mainly due to the increased speed of the vehicles as well as the unruly traffic with increased vehicular population on the roads. Fractures of the shaft of the femur are one of the major causes of morbidity and mortality among these patients. 7% of the total femoral fractures are reported to be distal femoral fractures.<sup>1</sup> If

the hip fractures are excluded, they account to 31% of all the distal femoral fractures. In Europe, the incidence of the distal fractures has been reported to be 10 less frequent than the proximal femoral fractures, with a rate of approximately 6%.<sup>2</sup> Often, these fractures are unstable and comminuted. They mainly occur in the elderly, especially women and in adolescent males of 15-24 years range.<sup>2</sup>

An extensive soft tissue damage, intra articular extension, severe comminution and injury to the quadriceps mechanism make the management of these distal fractures a significant challenge to the attending orthopaedic surgeon. Thin cortex, wide canal and poor bone stock make the problems of the supracondylar fracture of the femur highly difficult to repair.<sup>3</sup>

Earlier, these fractures were managed by conventional methods such as plaster casts and skeletal traction with many complications such as malalignment, joint incongruity and delayed mobilization.

With the advent of newer techniques such as dynamic condylar screw surgery (DCS) and distal femoral locking compression plate technique (LCP), many of these problems have been dealt with.

DCS is a modular, fixed angle implant for proximal or distal femur fractures. It is relatively a simple technique which requires a high degree of precision. After reducing the fracture, the condylar screw is placed over the guide wire and is fixed to lateral aspect of shaft of femur with 95 degree barrel and plate. The main advantage of this technique is that there is scope for minimal adjustment on table. However, if the fracture extends in the intercondylar region, rigid fixation may be compromised.<sup>4,5</sup> However, due to the placement of the screw, more amount of bone needs to be sacrificed, and sometimes more screws need to be placed at the distal end for more stability. Therefore, DCS needs to be at least one cm from the knee joint in order to allow the insertion of a DCS with derotation screw.

Another latest revolutionary technique is the distal femoral locking compression plate technique, which provides good and stable internal fixation. In this case, the intercondylar fracture with intercondylar extension can easily be fracture fixed with cannulated cancellous screw, over which the plate can be attached.<sup>4,6</sup> These plates can be easily used in the case of osteoporotic and periarticular bones, as these locking screws provide greater resistance to pullout. Moreover, these locking plates are easier to apply and slide percutaneously than a DCS.<sup>7</sup>

We in the present study have attempted to compare the outcomes of dynamic condylar screw surgery (DCS) and distal femoral locking compression plate technique (LCP).

## METHODS

This observational study was performed in the department of Department of Orthopaedics & Traumatology of Shadan Institute of Medical Sciences and Research, Hyderabad, Telangana, India from August 2014 to March 2017. 72 patients over the age of 20 years who sustained simple or compound fractures of the lower 1/3<sup>rd</sup> of femur and admitted into our hospital were

included into the study. Children and those below 20 years were excluded from the study.

All the patients, on admission, were subjected to thorough general and clinical examination. X-rays, antero-posterior and lateral views of the affected areas were taken for all the patients to classify the fracture. Written informed consent was taken from all the patients prior to the examinations.

First aid was given where necessary in the form of plaster of paris (POP), traction (skeletal), pain relievers, wound cleaning, dressing etc. Immunization with tetanus toxoid and antibiotics was also given where required.

Randomly, the patients were divided into 2 groups. One group underwent dynamic condylar screw surgery (DCS) and the other groups were managed by distal femoral locking compression plate technique (LCP).

For DCS surgery, at the junction of anterior 1/3<sup>rd</sup> and posterior 2/3<sup>rd</sup> of the longest AP dimension, a K-wire was inserted perpendicular to the lateral condyle of the femur. K-wire in the joint and the patellar groove was used as a guide. A lag screw, with the required length was inserted over the guide K-wire. Once in place, a side plate was applied in the distal fragment, with at least 8 holes. In the anatomical reduction, plate was then fitted to the shaft of femur with 4.5 mm cortical screws and a couple of cancellous screws were attached into the intercondylar region.

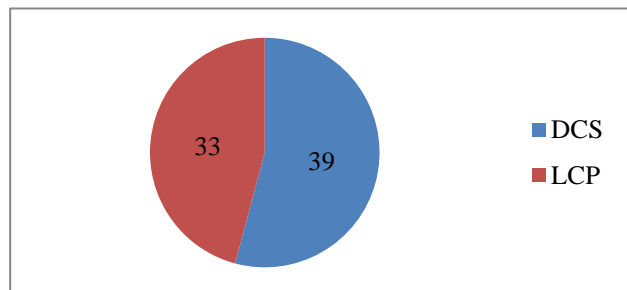
For distal femoral locking compression plate, the mode of approach was a lateral parapatellar with significant intercondylar comminution, coronal plane fractures or both. Temporary fixation was done by 2 mm K-wire. Inter-fragmentary lag in the articular fragments was achieved by 6.5 cm cannulated cancellous screws placed anterior and posterior to the plate, which was then slid to lace and fixed with locking screws to the articular block. Stab incisions at the screw sites were given and the plate was secured to the diaphyseal portion.

For the next 5 days, antibiotics were given and the POP back slab was applied initially for 3-4 days, until the first dressing. It was then discarded for active range of motion exercises. As soon as possible, the quadriceps strengthening exercises were started. As soon as some strength was gained in the muscles, the patients were allowed to walk with a walker or crutches and bear partial weight. X-rays were then taken to confirm the union of the fracture, and the same was continued till the complete union. Follow up was done with reference to range of motion, quadriceps power and the ability to bear complete weight, after 3 weeks, 6 weeks, 3, 6, 9 and 12 months.

The statistical method used was simple proportion of data and presentation in Microsoft excel.

**RESULTS**

Out of the 72 distal femoral fracture surgeries that were undertaken in our hospital, 39 (54.2%) of them were performed by DCS and 33 (45.8%) were by LCP as shown in Figure 1.



**Figure 1: Type of surgery.**

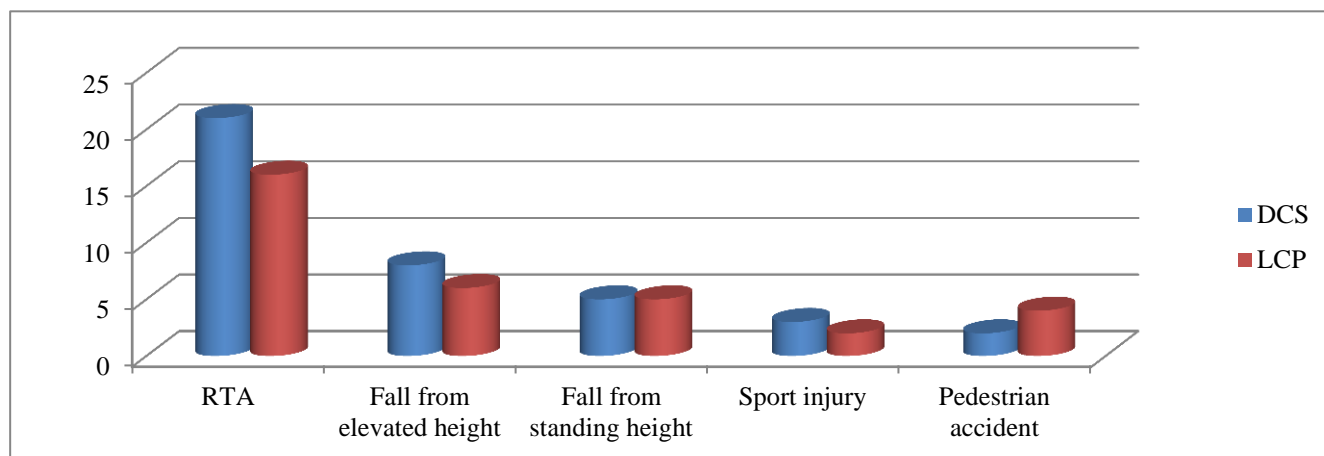
There were 35 males and 37 females who were treated. Of the women, most of them were elderly above the age of 50. However, there was no significance in the gender in the study (Table 1).

**Table 1: Demographic details of the patients.**

Parameter	DCS	LCP
<b>Mean age (in years)</b>	59.4	64.2
<b>Sex</b>		
Male	23 (60%)	12 (36.4%)
Female	16 (40%)	21 (63.6%)
<b>BMI</b>	22.7	23.9

The most common cause of fracture was road traffic accidents, involving both two wheelers as well as four wheelers (51.4%). 14 (19.4%) of the patients had a fall from height. Most of these were men with occupational hazard. All of the 10 patients (13.9%) who had a fall from standing height were elderly, both men and women as in Figure 2.

The mean operative time in DCS was about 121 minutes in comparison to 118 minutes in the LCP. The average hospital stay and the no of RBCs used were comparable in both the cases. Although the mean number of days for full weight bearing as well as the average time of union of the fracture was marginally lower in LCP than in DCS, it was not significant (Table 2).



**Figure 2: Cause of fracture.**

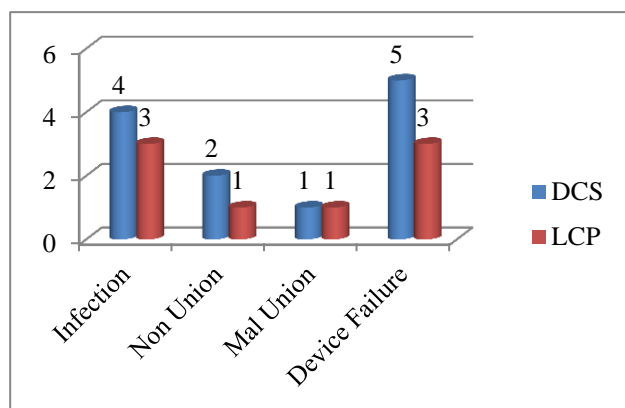
**Table 2: Operative data.**

Parameter	DCS	LCP
<b>Mean operating time (in min)</b>	121	118
<b>Average blood loss</b>	250 ml	270 ml
<b>No. of RBC units used</b>	1.3	1.7
<b>Average hospital stay</b>	14 days	13 days
<b>Quadriceps mobilization</b>	8 days	8 days
<b>Full weight bearing while walking</b>	15 days	14 days
<b>Average time of union</b>	14.4 weeks	13.1 weeks
<b>Range of motion</b>	108.2	107.9
<b>Complications</b>	9	5

Of the complications that were seen in the study, infection was observed in 4 cases in the DCS while it was

seen in 3 cases in the LCP. One case each had malunion of the fracture while nonunion was seen in 2 cases in the

DCS and in 1 case in the LCP surgeries. Device failure was observed in 5 cases in the DCS and in 3 cases in the LCP as given in Figure 3.



**Figure 3: Complications.**

## DISCUSSION

Distal femur fractures were of a significant challenge in management for a very long time, due to the inadequate fixation of the fracture fragments. The main causes of the failure for treatment included the age of the patients, amount of intra articular involvement and the longer time for joint motion.<sup>8,9</sup>

Many implants have been designed for distal femur fracture fixation such as ABP, CBP, DCS, cancellous screws, LCP, retrograde interlocking nail and antegrade interlocking nail IMN. For last 30 years, DCS and ABP has been most favored implants, but at present locking plates and less invasive stabilization system (LISS) are being used more commonly.<sup>10</sup> DCS which is the fixed angle device was being used in fixation of these fractures. However, with the emergence of minimally invasive locking plate technology, the management of these fractures has improved the fixation strength of distal fracture segment due to less bone destruction and more screws secured on the bent plate.<sup>11</sup>

In the present study, we compared the efficacy of DCS with LCP on 72 patients. Most of the patients, though were males, there was no statistical difference among the two. In a study by Gururaj et al, more than 80% of the patients were males.<sup>12</sup>

The main causes of fractures were road accidents involving both male and female patients. The most cases of fall from standing height were elderly women. In a similar study by Chander et al, most of the patients were young males, with most of them involved in road traffic accidents.<sup>13</sup>

The average union time in our study was around 14.4 weeks in the DCS and 13.1 weeks in the LCP groups. These results were comparable with a study by Malik et al, who reported a union time of 14.25 weeks in the DCS

group and 13.88 weeks in the LCP group.<sup>14</sup> Shewring et al in 1991 reported a time of 11.3 weeks among the LCP patients while Iftekhar et al observed 15 weeks on an average.<sup>15,16</sup> Among the LCP patients, in a study by Schandelmeir et al, 14.3 weeks and Markmiller et al 13.8 weeks were observed.<sup>17,18</sup>

The number of complications were very few in our study, with 7 (9.7%) of the patients having deep infections out of which 4 (10.2%) were in the DCS group and 3 (9.1%) in the LCP group. Malunion and nonunion were seen in 1 (2.6%) and 2 (5.1%) in DCS and 1 of each (3%) in LCP group respectively. Device failure was observed in 5 (12.8%) cases in DCS and 3 (9.1%) cases in the LCP group. In a similar study by Jalili et al, deep infections was observed in 11.1% cases in the locking plate group and 14.7% in the nonlocking plate group. 4.4% and 5.9% of nonunions, 4.4% and 11.8% of malunions were observed in the locking and nonlocking groups respectively.<sup>19</sup> These results corroborated with those of Chander et al, in their study.<sup>13</sup>

## CONCLUSION

It is therefore observed that both condylar screw and the locking plate are very similar in their performance and satisfaction to the patients, although distal femoral locking plate is better in comminuted distal fracture compared to the dynamic condylar screw fracture management. However, since the LCP is an easier and a more user friendly technique to perform, most orthopaedic surgeons prefer this method compared to DCS.

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