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Original research article

Dynamic condylar screw and locking condylar plate for distal femur fracture: Complications

[1]Dr.GururajaMeravanigi,[2]Dr. K G Ravi
Associate Professor, Department of Orthopedics, Basaveshwara Medical College and Research Institute, Chitradurga, Karnataka, India

Corresponding Author:
Dr.GururajaMeravanigi

Abstract
Most distal femoral fractures are the result of direct trauma. This could occur in elderly individual who falls directly on a flexed knee or in an occupant of an automobile who sustains a severe direct blow trauma to the knee. The majority of these fractures are either from high velocity vehicular trauma or from a fall from height resulting in a comminuted metaphysical and displaced intra articular fractures depending upon the amount and direction of application of the applied force. For the fracture to be included in this study part of the fracture line has to extend distal to horizontal line drawn on AP X-RAYS 9 cm above the distal articular surface of the femoral condyles. Thus trans condylar fractures, fractures involving the intercondylar notch and supracondylar fractures without extension in to the notch were all considered and included in the series. 1 patient treated with LCP had superficial infection treated by regular dressing and antibiotics, I patient treated with DCS had a varus angulation at the end of treatment. One patient treated with LCP went for nonunion, Which was later managed by bone graft and orthofix applicaton.
Keywords: Dynamic condylar screw, locking condylar plate, complications

Introduction

Fractures in the distal femur are not as common as in the proximal femur. It can occur in any age but are common in young adults and middle aged people as they are frequently involved in high velocity accidents. These fractures are common in males than females[1].

Most distal femoral fractures are the result of direct trauma. This could occur in elderly individual who fails directly on a flexed knee or in an occupant of an automobile who sustains a severe direct blow trauma to the knee. The majority of these fractures are either from high velocity vehicular trauma or from a fall from height resulting in a comminuted metaphysical and displaced intra articular fractures depending upon the amount and direction of application of the applied force[2].

Kirkup, after studying the distal femur fractures concluded that fractures of the femur was related to:

- Source, direction and site of violence acting on bone.
- The shape of the bone
- The quality of the bone.

Supracondylar fractures in the aged persons are usually sustained in female patients with marked osteoporosis and are usually the result of a minor fall. These fractures results from an unnatural leverage applied at the supracondylar area due to predisposing knee joint disability or in many disability of both the joints. Fractures of the condyles are due to varus ad valgus strain[3].

Locking plate technology offers improved fixation stability in osteopenic bone and for comminuted and periarticular fractures. The additional stability per screw compared with that of conventional non-locking fixation enhances the application of minimally invasive fracture techniques such as use of bridge plates and percutaneous fracture stabilization. The application of locking plates is somewhat more difficult than the placement of conventional plates[4].Fractures reductions are often done indirectly, the locking screw must be carefully aligned along the axis of the receiving hole to ensure proper tightness, and the length of the plate must be selected carefully, Despite the necessity of mastering these nuances, the use of locking plates will likely increase, particularly switch the increasing prevalence of fragility fractures in our aging population and the increase in high-energy fractures in younger patients surviving severe trauma. While substantial amount of biomechanical and animal data have been published, few series have validated the long-term advantages of fixation with locking plates, the initial results in series that included a variety of fractures are encouraging, although it is increasingly apparent that failures do occur. The causes of failure should be examined carefully in both the literature and one's own practice in order to learn from mistakes and refine our techniques[5, 6].

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Methodology

Data collection was based on patient evaluation through detailed history, clinical examination and roentgenografic examination. For the fracture to be included in this study part of the fracture line has to extend distal to horizontal line drawn on APX-RAYS 9 cm above the distal articular surface of the femoral condyles. Thus trans condylar fractures, fractures involving the intercondylar notch and supracondylar fractures without extension in to the notch were all considred and included in the series. This was followed by surgical management.

Exclusion Criteria

1. Age less than 16 years or open physeal plate, whichever is later.
2. Pathological fractures.
3. Associated neurovascular injuries/open fractures.
4. Patient lost in follow up.

As soon as patients were brought in to our cares, detailed clinical history was obtained. Then clinical assessment of general condition, skeleton and soft tissue injuries were done, peripheral vascular status was assessed and there injuries ruled out shock was treated appropriately. The injured limbs of all patients were immobilized either by Thomas splint, pop slab or skeletal traction there were no criteria to select the mode of immobilization.

Fractures were evaluated using x rays and then classified according to MULLER"s classification. Patients were subjected to routine investigations for surgical fitness.

Procedure

Under suitable anesthesia, parient was positioned over fracture table traction was applied with the traction apparatus. Traction was used during intraoperative perod to aid in reduction. Tourniquet was applied if the case permitted. Fracture was exposed using a lateral incision of appropriate length. Greater trochanter proximally and lateral femoral condyle distally were used as land mark, Incision was extended proximally depending on the fracture and the length of plate used Sub cutaneous tissue deep fascia and fascia lata were divided inline with incision. Vastuslateralis muscle was exposed throughout the length of the incision and incision was deepened between vastuslateralis and lateral inter muscular septum. Quadriceps was retracted anteriorly and fracture site was exposed. Fracture was reduced and articular surface reconstructed and provisional fixation done with k wire to maintain the reduction. In some cases inter fragmentary screws were used.

In Case of Internal Fixation with DCS

A guide wire was passed parallel to the distal articular surface in frontal plane in middle of the anterior half of the lateral condyle 2cm from the distal articular surface. Then the reaming was done with triple reamer over the guide wire. Tapping was done then the lag screw of appropriate length was put side barrel plate was attached and cortical screws were put.

In Case of Locking Condylar Plate

As it was a precontoured plate, it was applied to the lateral femoral condyle plate was fixed to the bone with k wires distal part ofthe plate was screws to the bone with locking screws applied in various directions determined by the design of plate.

Once the distal fixation is complete, proximal fixation is being done with regular screws in neutral or compression mode or locking screws or combination of these. In case of osteoporosis bicortical locking screws were used. This plate was useful as in some cases it avoided the use of inter fragmentary screw application, being a fixed angle device allowed more no of screw purchase in distal fragments in various dissections, and minimal soft tissue dissection. After the fixation wound was closed in layers over a drain.

Postoperatively limb was immobilized either in Thomas splint or above knee pop slb, post op antibiotics and analgesics were given, the suction drains were removed after 418hrs and intensive physiotheraphy was started as tolerated by the patient static quadriceps followed by active assisted range of motion of knee was initiated. Sutures were removed on 10 or 12^{th} post-operative day. It was noted that patients treated by LCP tolerated the physiotherapy well xompared to the patients treated by DCS. In cases where stability of fractures was found to be uncertain, the limb was immobilized for longer time and exercises started later. Partial weightBearing was advised on 6^{th} or 10^{th} week. Full weight bearing ws permitted when radiographs revealed sufficient callus to suggest early union.

Fracture was considered to be united if there was no pain on palpation or attempted motion at the fracture site no discomfort on full weight bearing and serial roentgenograms demonstrated bony trabeculae crossing the fracture site.

Results

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Table 1: Gender

	Group		Total
	Dynamic Condylar Screw	Locking Condylar Place	
Sex Female	2 11.8%	5 31.3%	7 21.2%
Male	15 88.2%	11 68.8%	26 78.8%
Total	17 10.0%	16 100.0%	33 100.0%

X2= 0.888, p=0.346, NS.

Age Distribution: the age range was 18yr to 80yr. 45.45% of cases were in the age group of 40-49 years.

Table 2: Age

Group		N	Mean	Std. Deviation	
Age	Dynamic Condylar Screw	17	39.18	10.996	t=1.678, p=0.103, NS
	Locking Condylar Place	16	46.19	12.983	

Patient underwent surgery after an average 12.5 days within a range of 1-24 days. Time delay was mainly due to patients overload dand restriction number of surgeries performed on ot day. All parients were operated under spinal anaesthesia. Average duration of surgery for DYNAMIC CONDYLAR SCREW was 80 min and for LOCKING CONDYLAR PLATE was 100 min. Tournique was used in selective cases.

Complications during Surgery
No difficulties were encountered intraoperatively.

Postoperative Complications
1 patient treated with LCP had superficial infection treated by regular dressing and antibiotics, I patient treated with DCS had a varus angulation at the end of treatment.

Delayed Complication
One patient treated with LCP went for nonunion. Which was later managed by bone graft and orthofixapplicaton.

Table 3A: Complications

		Group		Total
		Dynamic Condylar Screw	Locking Condylar Place	
Complications	Absent	15 88.2%	14 87.5%	29 87.9%
	Present	2 11.8%	2 12.5%	4 12.1%
Total		17 10.0%	16 100.0%	33 100.0%

X^2= 0.004,p=0.948, NS

Table 3B: Complications

		Group		Total
		Dynamic Condylar Screw	Locking Condylar Place	
Complications	Nonunion	0 .0%	1 50.0%	1 25.0%
	Shortening	0 .0%	1 50.0%	1 25.0%
	Skin Infection	1 50.0%	0 .0%	1 25.0%
	Varus Collapse	1 50.0%	0 .0%	1 25.0%
Total		2 100.0%	2 100.0%	4 100.0%

Discussion

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Current fracture patterns veer towards complex comminuted types due to the prevalence of high speed vehicles, improved healthcare results in a longer lifespan and subsequently present us with more osteoporotic fractures which were previously treated using conservative methods [7].

Angle blade plates have been reported to give good results but the technique is demanding and the need to hammer the implant in to position risks separating the femoral condyles. The dynamic condylar screw dynamic the reduction accurate and easier, particularly when the fractures are intraarticular. The lag screw held well, even in osteoporotic bone and was easy to place in good position over a guide wire inserted under a image intensification, since most surgeons are already familiar with use of compression screw in the treatment of hip fractures, the instrumentation is readily mastered [8].

In our study out of 33 patients 17 treated with dynamic codylar screws 1 patient went for varus collapse because of fracture comminution(c2) and early weight bearing. Time take for radiological union was 18.82 weeks which was more compared to earlier studies (11.3 wks) (400. The range of knee motion was 0-95.29 degrees which was less compared to the earlier studies (112 degrees). Earlier studies considered the type “a” fractures without the intraarticular extension in relatively yound patients. In out studies out 17 patients treated with DCS 12 patients hadc2 and one patients had c1 tupe of fracture and most of the patients were in the older agegroup. The advantages of DCS which we observed in this study was the less operative time (80 min), familiarity of the instrumentation, so DCS can be safely used for the supracondylar fracture femur without any intraarticular extension[9].

LCP is a single beam construct where the strength of its fixation is equa to the sum of all screw-bone interfaces rather than a single screw’s axial stiffness and pullout resistance in unlocked plates. Its unique biomechanical function is based on splinting rather than compression resulting in flexible stabilization, avoidance of stress shielding and induction of callus formation. When applied via a minimally invasive[10].

Conclusion

One patient treated with LCP had superficial infection treated by regular dressing and antibiotics, I patient treated with DCS had a varus angulation at the end of treatment.

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