Journal of Cardiovascular Disease Research

ISSN:0975-3583,0976-2833 VOL14, ISSUE12,2023

Original research article

Comparison between dynamic condylar screw and locking condylar plate for various types of distal femur fracture

[1]Dr.GururajaMeravanigi,[2]Dr. K G Ravi

[1,2]Associate Professor, Department of Orthopedics, Basaveshwara Medical College and Research Institute, Chitradurga, Karnataka, India

Corresponding Author:
Dr.GururajaMeravanigi

Abstract

The goals of operative treatment are anatomical alignment, stable internal fixation, and rapid mobilization and early functional rehabilitation of knee.. Many implants are available for internal fixation like 95 degree condylar plate, condylar buttress plate and dynamic compression plate, dynamic condylar screws, and locking condylar plate. The series include the treatment of 33 cases of distal femoral fractures with satisfactory follow up in all the patients. 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. Patients were treated discharged at an average of 22 days with a range of 10-34 days. Average time taken for union with DCS was 18.8 weeks and LCP was 17.2 weeks which was statistically significant. Average range of movement of knee was found to be 0-95.29 degrees with DCS and 0-104.66 degrees with LCP.

Keywords: Dynamic condylar screw, locking condylar plate, distal femur fracture

Introduction

Fractures of the distal femur present considerable challenges in management. Severe soft issue damage, comminution, fracture extension in to the knee joint, injury to the quadriceps medhanism lead to unsatisfactory results in many cases regardless of treatment[1].

Before 1970 majority of supracondylar fractures were treated non-operatively however difficulties were often encountered including persistent angular deformities, knee joint incongruity, loss of knee motion, delayed mobilization.

During the past two decades as technology and implants have improved most orthopaedicians have advocated some form of internal fixation in the management of distal femoral fractures, however osteosynthesis of the supracondylar region of the femur can be difficult for several reasons, thin cortices, comminution, osteopenia, wide medullary canal make internal fixation difficult to achieve even for an experienced surgeons[2].

The goals of operative treatment are anatomical alignment, stable internal fixation, and rapid mobilization and early functional rehabilitation of knee. Many implants are available for internal fixation like 95 degree condylar plate, condylar buttress plate and dynamic compression plate, dynamic condylar screws, and locking condylar plate[3, 4].

The purpose of the study was to compare between dynamic condylar screw and locking condylar plate for various types of distal femur fracture. The rating system of Neer*et al*. was employed to determine the functional outcome.

Methodology

The series include the treatment of 33 cases of distal femoral fractures with satisfactory follow up in all the patients.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 considered and included in the series. This was followed by surgical management.

Following patients were excluded from the study

1. Age less than 16 years or open physeal plate, whichever is later.

ISSN:0975-3583,0976-2833 VOL14, ISSUE12,2023

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. Following investigations were carried out routinely.

- Blood tests, haemoglobin, RBS.
- Urine analysis.
- Blood grouping and cross matching.
- ECG.

Other investigations when found necessary were done, consent taken, case was prepared for surgery. Pre-operative procedure included.

- Improvement of general condition.
- Preoperative antibiotics.
- Preparation parts.
- Enough blood was arranged.

Internal fixation devices were arranged depending upon the fractures and surgeons preference.

Procedure

Under suitable anesthesia, patient 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 inserted.

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 of the plate was fixed 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 directions, 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 slab, post op antibiotics and analgesics were given, the suction drains were removed after 48 hrs 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 compared 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 weight Bearing was advised on 6^{th} or 10^{th} week. Full weight bearing was 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

ISSN:0975-3583,0976-2833 VOL14, ISSUE12,2023

crossing the fracture site.

Results

Table 1: Treatment results

VAR00003		Group		Total
		Dynamic Condylar Screw	Locking Condylar Place	
Results	Excellent	0 .0%	10 66.7%	10 31.3%
	Satisfactory	9 52.9%	5 33.3%	14 13.8%
	Un satisfactory	8 47.1%	0 .0%	8 25.0%
Total		2 100.0%	15 100.0%	32 100.0%

X^2= exact test p=0.000, HS

Time of Discharge
Patients were treated discharged at an average of 22 days with a range of 10-34 days.

Follow Up
Average duration of follow up for treated with LCP was14.19 months, and DCS was 11.64 months.

Table 2: Follow up

Group		N	Mean	Std. Deviation	
Follow UP	Dynamic Condylar Screw	17	11.65	1.902	t=2.83, p=0.008,
	Locking Condylar Place	16	14.19	3.146	HS

Radiological Union
Average time taken for union with DCS was 18.8 weeks and LCP was 17.2 weeks which was statistically significant.

Table 3: Radiological union

Group		N	Mean	Std. Deviation	
Time for Union	**Dynamic Condylar Screw**	17	18.82	1.015	t=3.66, p=0.001,
	Locking Condylar Place	16	17.20	1.474	HS

Range of Movements
Average range of movement of knee was found to be 0-95.29 degrees with DCS and 0-104.66 degrees with LCP.

Table 4: Range of movements

Group		N	Mean	Std. Deviation	
Knee ROM	**Dynamic Condylar Screw**	17	0-95.29	7.174	t=3.28, p=0.003,
	Locking Condylar Place	16	0-104.66	8.958	HS

Functional Outcome: At the end of the study functional results were evaluated using NEER"S rating system. This rating is specifically used for distal femoral fractures among the 17 patients treated with DCS, 8 patients had un satisfactory rating and remaining 9 patients had a satisfactory rating.
Among the 16 patients treated with LCP 9 patients had excellent results, 6 patients had satisfactory results and in 1 patient could not be assessed due to non-union.

Table 5: Functional outcome

VAR00003		Group		Total
		Dynamic Condylar Screw	Locking Condylar Place	
Results	Excellent	0 .0%	10 66.7%	10 31.3%
	Satisfactory	9 52.9%	5 33.3%	14 13.8%

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	Un satisfactory	8 47.1%	0 .0%	8 25.0%
Total		2 100.0%	15 100.0%	32 100.0%

X^2= exact test p=0.000, HS

Discussion

The distal femoral LCP is a further development from the LISS, which was introduced in the mid to late 1990's.The main difference between the distal femoral LCP and the LISS is that the LISS utilizes outrigger device for shaft holes, functioning essentially as a locking guide jig, which is attached to the distal part of the plate and guides the placement of the proximal locking screws. The shaft holes on the distal femoral LCP are oval allowing for the options of a compression screw or a locking screw. This lends to a more precise placement of the plate, as it is able to be compressed more closely to the bone[5].

Although the follow-up period of our series was short, studies have shown that early function is comparable AOT final long term outcome. The outcome seems to correlate with fracture severity, anatomic reduction, aetiology, bone quality, length of time elapsed from injury to surgery, concomitant injuries and exact positioning and fixation of the implant[6].

In our studies out of 16 patients treated with LCP time taken for the radiological union was 17.2 weeks and average range of knee motion was 0-105 degrees both were comparable to earlier studies. One patient treated with LCP went for non-union because of infection.We observed that by combining locked fixed angle screw plate construct with options for screw plate fixation the locking condylar plate provides a number of benefits over current devices including improved fixation over osteoporotic bone[7].Multiple screw fixation in femoral condyle allows fixation of many distal fractures not treatable with other type of implants. The locked construct addresses the biomechanical data that demonstrates standard buttress plate failure due to screw pullout and toggle at the screw plate junction. Less bone is requires for the LCP compared to the other implants which is tremendous advantage in a extremely comminuted fractures and patients with osteoporotic bone[8].

Conclusion

Among the 17 patients treated with DCS, 8 patients had un satisfactory rating and remaining 9 patients had a satisfactory rating.

Among the 16 patients treated with LCp 9 patients had excellent results, 6 patients had satisfactory results and in 1 patient could not be assessed due to non-union.

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