



A STUDY ON OUTCOME OF DUAL PLATING OF DISTAL FEMUR FRACTURES – MINIMUM 6 MONTHS FOLLOW UP

Orthopaedics

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ABSTRACT

Introduction: This study of 25 patients of distal femur fractures which were assessed for radiological and functional improvement at an average follow up of 18 months. In our study, all patients had LISS plate implanted laterally with additional medial/anteromedial plate with/without bone grafting. **Patients and methods:** This study was of 25 patients with distal femur fractures which were classified according to AO/OTA classification and operated for dual plating by different types of approaches and with radiological outcome assessed with X-rays and clinical outcome assessed with Hospital for Special Surgery (HSS) Knee – Rating Scale. **Results:** The fracture was united at final follow-up in 88% of our patients and the average knee range of motion (ROM) was 90°. However, there was persistent fixed flexion deformity of around 10° in 48% patients and an extension lag of around 10° in 48% of patients which was existing simultaneously in few patients. In terms of outcomes, excellent to good outcome was observed in 76% patients while poor results were obtained in 12% patients. Infection was the most common complication seen in 24% of patients. **Observation:** Dual plating for distal femur fractures is an effective and aggressive method of management of such fractures. The medial augmentation plate compared to anteromedial buttressing plate gives superior results and the choice of additional plate has no effect on the outcomes.

KEYWORDS

Dual Plating, Distal Femur, Intraarticular Fractures, Supracondylar Intercondylar Femur Fractures.

INTRODUCTION

Fractures involving distal femur are very complex injuries and pose a challenge to every orthopaedic surgeon and involves 7% of all the femur fractures. The common causes include high velocity trauma like road traffic accident in young, fall from height and trivial fall at home. Management of this fractures often pose a challenge to surgeons because of juxta-articular location of fracture, proximity of traversing neurovascular structures, badly comminuted fragments, bone loss and associated multiple systemic as well as bony associated injuries which are common with this fracture pattern.

The principles of internal fixation of this fractures include anatomical reduction of the articular surface, stable fixation, soft tissue respect and early active mobilization. Our study provides descriptive details on the management of such fractures with various implants and approaches and takes into account the patients operated for distal femur fracture with dual plating in form of a lateral locking plate with additional medial/anteromedial plate with its effect on final functional and radiological outcome.

The indications of dual plating in such fractures are Medial Supracondylar bone loss, Low trans-condylar bicondylar fractures, Medial Hoffa fracture, Peri-prosthetic Distal Femur Fractures, Non-union after failed fixation with single lateral plate [1] and in osteoporotic patients[8]. The advantage of dual plating are that it reduces chances of failure of fixation, promotes early mobilization, prevents varus collapse[2] and provides a scaffolding for bone graft if required

This study in the Indian subcontinent also takes into account the functional outcome based on the daily needs of people living here like squatting and cross-leg sitting which are of importance in country. It also takes in consideration the effect of demographic data in outcome and the effect of the trauma and the resultant surgery on the employment of the patients. The aim of this study is to assess intermediate follow-up of patients of distal femur fractures operated with dual plating in adult Indian population.

MATERIALS AND METHODS

This study includes 25 patients of distal femur fractures classified according to AO/OTA classification[10] and operated with dual plating as a part of primary surgery or revision surgery with/without bone graft operated at GGG Hospital and- Shri M.P. Shah Government Medical College, Jamnagar between 2017-2020. We have included all patients between ages 18-70 who were fit for surgery. The inclusion criteria were skeletally matured patients with all distal femur fractures and also with associated fractures in the same or other limbs. Patients with pre-operative nerve and vascular injuries and patients not fit for surgery were excluded from our study. All patients upon trauma received intensive primary care[11] in form of immobilization, fluid support and blood transfusions as well as appropriate antibiotics for hemodynamic stabilization and thorough wound wash and primary closure for open wound. Patients with other systemic life-threatening and systemic injuries and those with contaminated open wound initial stabilization of fracture was done with external fixator and later on definitive surgery was undertaken when the patient was medically fit. All the necessary pre-operative work-up was done in the form of Radiological and hematological investigations. Well written informed consent including bone graft consent was taken from all the patients enrolled in the study. Prior ethical committee approval was obtained. The HSS Knee rating score was calculated.

Surgical Technique

All patients were operated in supine position under spinal/epidural anesthesia on a radiolucent table with a rolled towel under the greater trochanter for preventing external rotation and a bolster under knee to keep it on 30° flexion.

The surgical approach used varied with patient and include separated lateral incision for lateral plate and medial approach for medial plate[4], the medial parapatellar approach and Swashbuckler approach. Irrespective of the surgical approach, in all cases after the exposure of fracture, first intra-articular anatomical reduction was sought, if present using cancellous screws, followed by reduction of Hoffa's fractures, if present followed by metaphyseal alignment with the help of LISS (Less Invasive Stabilization System) and finally followed by additional

medial/anteromedial plate for fracture stabilization and to augment fixation. Primary bone grafting was indicated in cases with extensive bone loss and comminution.

In patients undergoing revision surgery either same surgical approach or another separated incision was made for additional plating[9] which was frequently associated with bone grafting while few patients with dual plating in primary surgery underwent bone grafting only as a part of revision surgery.

Post-operatively, immobilization was given to all the patients with above knee slab along with limb elevation for edema. Intravenous antibiotics were continued for 5 days followed by oral antibiotics till suture removal which was usually around 15 days post-surgery. Knee and ankle mobilization was started for 3rd post-operative day provided the fracture was stable and in patients with bone grafting as a part of surgery, mobilization was delayed till incorporation of graft. All patient were kept non-weight bearing till radiological sign of union were seen.

RESULTS

The study consists of 25 cases of distal femur fractures operated with dual plating. The mean age of patient was 42±15 years, 19(76%) cases were males, and 6(24%) cases were females. Right sided involvement was more frequent in the present study 14(56%) cases. 16(64%) cases sustained fracture due to road traffic accident, 6(24%) cases had a domestic fall and 3(12%) cases had fall from height. 76% cases were of closed fracture while rest were of fractures. 56% cases were associated with other injuries with injuries in the ipsilateral lower limb were most common (28%).

Table 1

TYPE OF INCISION	PATIENTS	PERCENTAGE
LATERAL + MEDIAL APPROACH	14	56%
ANTERO-MEDIAL APPROACH	2	8%
SWASHBUCKLER APPROACH	9	36%

The most common surgical incision used was separate lateral with medial incision in 56% cases and swashbuckler approach in 36% cases with RECON plate being used most commonly in 20% cases as depicted in table 1.

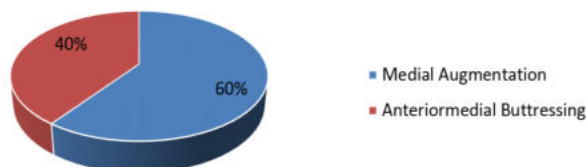


Figure 1 showing the primary purpose of additional plate as medial augmentation

Revision surgery was required in 32% cases among which bone grafting was most common in 28% of all patients and 12% patients underwent medial plating simultaneously with bone grafting.

The mean duration of follow up was 18 months in our study with fracture union seen in 88% patients and rest 12% patients didn't show union despite revision surgery in form of bone grafting.

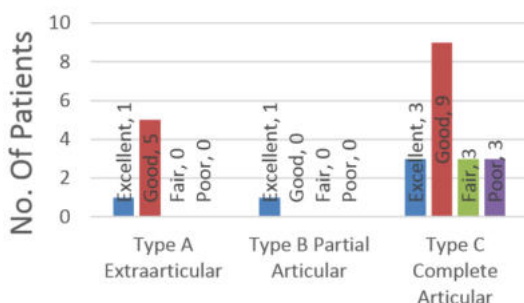


Figure 2 representing type of fracture vs outcome on HSS Knee Rating Score

According to AO/OTA classification which was used in this study, all the 7(100%) patients of AO Type A (A1-4%, A2-8% A3-12%, B2-4%) and B showed excellent to good results, while of 18 cases of AO type C (C1-36%, C2-16% C3-20%) fractures, 12(67%) patients showed excellent to good results while 3(17%) patients showed poor results on HSS Knee-Rating Scale.

DISCUSSION

Treatments of the distal femoral fractures have been a controversial subject over the decade. Close management of these fractures was the treatment of choice until 1970 due to non-availability of appropriate implants and lack of proper techniques[5]. With the advances in implants, better radiological equipment and modern instrumentation at present there are no absolute contra-indications for surgical management of distal femur fractures. Early surgical stabilization can facilitate care of the soft tissue, permit early mobility and reduces the complexity of nursing care. Dual plating has several advantages over single lateral plating especially in severe comminution and bone loss especially medial supracondylar in location, prevents varus collapse of fracture and also permits early rehabilitation in such fractures to achieve a better functional outcome and also provides a more rigid fixation in osteoporotic bones.

The most common mode of trauma is road traffic accident which is a high velocity injury and often leads to associated multiple bony and systemic injuries. In elderly population, a trivial trauma may also lead to these fractures but fracture pattern is much less complicated compared to young population. A separate medial and lateral incision offers advantage of lesser need of retraction and thus better soft tissue respect and avoid the need to open the joint necessary compared to other approaches but has the disadvantage of more soft tissue stripping compared to other approaches.

The medial augmentation is particularly helpful in cases with medial supracondylar loss and it also provides additional scaffolding for bone graft incorporation if required. This can be achieved with the help of a wavy arrangement of a low profile plate over medial femoral surface. Anteromedial buttressing is useful in cases with gross comminution where they provide a 90° 90° configuration which provides fracture stability in two planes making the fixation more stable[3]. The choice of additional plate has no effect on the final outcome however care must be taken between a low profile and high profile plate and between a locking and non-locking plate as per fracture pattern and purpose of medial plate.

The average knee range of motion in our study was 90° with 52% patients having knee ROM >100°. Early mobilization followed by aggressive knee bending and quadriceps strengthening exercise and rehabilitation helps in achieving a better knee ROM

Table 2

Knee Movements (Degrees)	Patients	Percentage (%)
>120	5	20%
110-120	1	4%
100-110	7	28%
90-100	4	16%
80-90	1	4%
<80	7	28%
TOTAL	25	100%

The knee range of motion also depends on the type of fracture pattern with better and earlier knee ROM is achieved in type A fractures as compared to intra-articular type C fractures as depicted in Figure 3.

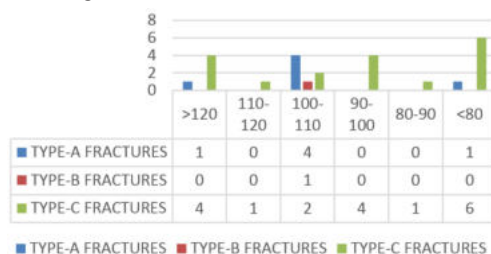


Figure 3

Extension lag and Fixed Flexion Deformity was much more common in this study than anticipated with both accounting for 48% patients. The severity of the above deformities was not much and often went unnoticed by patients but was evident on clinical examination. The main reason for such deformities is probably the mechanism of high velocity trauma which leads to severe muscular and capsular injury and extensive adhesions of the quadriceps mechanism. Another reason which may be contributing to such deformities is possible the additional plate which requires additional medial/anteromedial dissection which may lead to contractures thereby limiting knee range of motion.

Owing to the lifestyle, population in India need to sit cross leg and squat on daily basis and this study demonstrated less favorable results in terms of squatting and cross leg sitting with only 40% patients able to squat and sit cross leg. Since our study was conducted in a government hospital, majority of patients were labourers and thus required to switch to a more sedentary employment (16%) while 44% patients were able to return to their pre-injury lifestyle.

Distal femur fractures are much more prone to complications owing to complexity of fracture, long duration of surgery, more incidences of open wound, extensive blood loss and poor general condition of patient owing to associated injuries. The most common complication encountered in this study was infection seen in 6 cases which in majority was in form of a discharging sinus over stichline despite thorough debridement and infection also contributed to non-union and implant failure. Another common complication encountered was knees stiffness seen in 20% of patients owing to lack of adequate physiotherapy and intra-articular adhesions. No any malalignment was noticed in patients of the study but shortening of less than 2.5 cm was seen in 2 patients which was compensated by shoe raise.

The results were favorable in majority of patients which were assessed on the basis of HSS Knee-Rating Scale which takes into account pain status, walking distance, muscle power, flexion deformity and extension lag, knee ROM, deformity and use of cane/crutches into account. Based on this score, 20% patients showed excellent result, 56% i.e. majority of patients showed a good outcome while fair and poor outcome was seen in 12% patients each.



Figure 4 showing pre-op x rays of a patient with type C3.2 fracture operated with dual plating with medial plate and bone grafting at 6 months of primary surgery and x rays at 17 months follow up with fracture union.



Figure 5 showing excellent results of this patient with more than 120° knee ROM with able to sit cross leg and squat with ease.

It can be concluded with this study that dual plating in distal femur fractures is an efficient modality of treatment especially in comminuted cases and osteoporotic bones and offers advantage of early mobilization and no risk of varus collapse with no

significant decline in functional and radiological outcome.

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