Original Research Paper

Volume-10 | Issue-2 | February - 2020 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Orthopaedics

TO STUDY THE OUTCOME OF FIXATION AND RECONSTRUCTION OF DISTAL FEMORAL (SUPRACONDYLAR) OPEN FRACTURES WITH BONE LOSS USING DISTAL FEMORAL LOCKING PLATES AND AUTOLOGOUS, NON VASCULARIZED FIBULAR STRUT AND CORTICO-CANCELLOUS BONE GRAFTING

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ABSTRACT

Objectives: To study the outcome of Fixation and reconstruction of distal femoral (supracondylar) open Fractures with bone loss using Distal femoral locking plates and autologous, non vascularized fibular strut and cortico-cancellous bone grafting.

Introduction: Distal femur fractures are difficult, complex injuries that can result in devastating outcomes. The intra-articular injury can vary from a simple split to extensive comminution. Articular involvement can lead to posttraumatic arthritis. These fractures constitute 4% to 7% of all femur fractures. There is a bimodal distribution defined by the mechanism of injury. They are complex injuries that are difficult to manage; despite advances in technique and improved implants, treatment remains a challenge in many situations. The goal of any treatment is to maintain or restore the congruity of the articular surface and restore the length and alignment of the femur and subsequently the limb.

Methods and material: 15 patients(30-35 Years, all Male) involved in high velocity road traffic accident and Fall who presented to emergency department at Government Medical College Jammu, India, between June 2018 to June 2019, with open fracture of the distal femur with bone loss (severe bone loss in 11 patients and moderate loss in 4) were included in the study. All were managed with initial wound debridement and above knee slab/external fixator. Subsequently fractured femur was reconstructed with distal femoral locking plate stabilization, along with autologous non vascularised fibular Strut graft and cortical-cancellous graft bridging the bone defect. Single free fibular strut was used in all patients with autologous cortico-cancellous bone grafting in all. Clinical union, radiological union, and knee function were assessed.

Results: The period of follow up was 12 months. The average duration of hospital stay was 10 days. The time taken for radiological union in our study ranges from 14 weeks to 19 weeks with a mean of 13.5 weeks. 9 patients had more than 100° of knee flexion and 6 patients had less than 100 degree. The minimum flexion obtained was 70° and maximum being 120° There were 2 patients with varus angulation of 10 and 15°. Mean limb shortening was 2 cms . No limb shortening was observed in five patients. Patients were pain free and had no significant graft or donor site morbidity. Complication included 1 case of non-union and 1 case of superficial wound infection which subsided with antibiotics. 3 cases with extensor lag with an average of 6°. Functional assessment after union revealed two patient with excellent knee function, 11 good, and two poor function according to Sanders scoring.

Conclusion: Staged fibular strut grafting and cortico-cancellous bone grafting appears to be a good treatment option for traumatic open supracondylar femoral fractures with significant bone loss.

KEYWORDS : Supracondylar fracture femur, bone loss, free fibular reconstruction; fibular struts; cancellous bone grafting, Sander scoring.

INTRODUCTION

Supracondylar area represents the distal 9-15 cm of distal femur. Distal femur fractures are difficult, complex injuries that can result in devastating outcomes. These fractures are the result of severe axial load with varus, valgus or rotational force. The intra-articular injury can vary from a simple split to extensive comminution. Articular involvement can lead to posttraumatic arthritis. These fractures constitute 4% to 7% of all femur fractures. . Associated ligament injury of knee has been reported in 20% cases . Because of these reasons it is difficult to regain full knee motion and function. The femur is the common site of bone loss amounting 22% of all traumatic skeletal losses. As the distal femur has very few muscular attachments, especially on the anterior surface, it is more prone for expulsion of the fragments leading to bone loss. The wound of exit at times will be very small but large fragment will be ejected and the wound shrinks because of the elasticity of tissues. The goal of any treatment is to maintain or restore the congruity of the articular surface and restore the length and alignment of the femur and subsequently the limb. In our Institute, we used a single stage reconstruction with autologous, free, non-vascularized fibular graft and autologous cortico-cancellous bone grafting followed by lateral plate application for these injuries and evaluated the outcome.

MATERIAL AND METHOD

15 patients(30-35 Years, all Male) involved in high velocity road traffic accident and Fall who presented to emergency department at Government Medical College Jammu, India, between June 2018 to June 2019, with open fracture of the distal femur(Supracondylar with intercondylar extension) with bone loss (about 4-8 cms) were included in the study. There was no distal neurovascular deficit. All the cases were of type 3A according to modified Gustilo and Anderson classification with extruded bone fragments and comminution at meta-diaphyseal region of femur.

Radiographs and CT scans with 3d images was done to assess the fracture type and intraarticular extension, and to know the amount of displacement, depression, angulation and aid in surgical planning. The fractures were all AO/OTA type-C2 supracondylar fractures of the femur. All were managed with initial wound debridement and above knee slab/external fixator. During optimization of the patient, the wound was periodically examined every 24 hours. In case of wound infection, further wound debridement was performed or antibiotics modified. Wound cultures were done twice,48 hours after admission and another on 5th day, both were free from any organisms.The antibiotics were changed from intravenous to oral route on the seventh day and continued for another three more days, or till the definitive surgery. Intravenous antibiotics were continued for five days post definitive surgery and then changed to oral antibiotics.

DEFINITIVE SURGERY

The definitive surgery was performed when the patient was optimized medically and psychologically (14-21 days). Patients were positioned supine.A pneumatic tourniquet is applied in the upper thigh. Graft harvested from ipsilateral iliac crest and contralateral leg is also prepared. Standard Lateral approach is used. After 14-21 days when the debrided wound healed with negative cultures the fracture was approached laterally and reduced.The fibular graft was inserted into the medullary canal both proximally and distally bridging the defect. Fixation done with a distal femoral locking plate bridging fracture and locked distally and proximally.Cortico-cancellous graft from the ipsilateral iliac crest were packed into the fracture site to fill the defect and the wound was closed in layers over a negative suction drain.

Follow up

After the surgery, Vitals of the patients are monitored. Intravenous antibiotics are continued in the postoperative period for 5 days and oral antibiotics till suture removal. static quadriceps exercises were started on the first post-operative day. Knee mobilization was started gradually over third week after the surgery, initially gently active and then assisted. Partial weight bearing allowed only after 2½-3 months postoperatively. All patients are followed up at 2 weeks, 6 weeks, 2 months, 3 months, 6 months and 1 year and were assessed both clinically and using radiographs.

RESULTS

The mean radiological union time was 18± 2.6 weeks. Functional outcomes were assessed at the follow up taking into consideration the following: knee flexion-extension, angulation, shortening, pain, walking ability, staircase climbing and return to work. All patients were pain free at the final follow up.The post-procedure limb shortening was calculated from anterior superior iliac spine to medial malleolus using a tape. It was between 1- 2 cms and was addressed with shoe rise. Five patients had no limb shortening. Three patients had an extensor lag of about 6 degree. Regarding radiological union, all the fractures went into union, since there was significant bony discontinuity between the condyles and the shaft there was quite a degree of malunion in these patients. Two patients had varus deformity of 10 degree and 15 degrees, respectively. Eight patients achieved a knee range >100 degree and rest Five <100 degree(Normal upto 135) .One patient developed a sinus, which was a deep infection which drained consistently and healed after implant removal. The mean duration of hospital stay was 10 days. The patients became symptom free and had unassisted gait at the end of 18 weeks. None of the patients developed vascular occlusion, deep vein thrombosis or had donor site morbidity at either fibular or iliac crest site.Eight patients had normal unassisted gait pattern requiring a shoe lift. Three patients had a altered gait pattern. Two patient uses a standard walking frame for ambulation.

DISCUSSIONS

Our study showed that single stage reconstruction of large bone defects in the distal femur fractures with the problem of the damaged extensor apparatus. Reconstruction using strut grafts autologous fibular struts and cortico-cancellous bone grafts is feasible and offers favourable outcomes. We believe this is due to stable fibular fixation to the columnar bone loss along with adequate addition of bone volume to the entire length of the fibular graft. The fibula is the strongest and longest autologous bone graft available. It can be harvested with minimal donor site morbidity. Anchoring the fibula in the defect with intramedullary K wires helps to replace the lost supracondylar ridges. Sinking the fibula into the soft cancellous bone of distal metaphysis of the femur aids in maintaining the length. This arrangement also provides good nutrition and promotes early revascularization of the fibular graft and enhances union. When a lateral plate is used compression can be used to further enhance union. Because isolated free fibular grafts are prone to stress fractures, the addition of adequate volume of autologous cortico-cancellous bone graft to the entire length of the graft avoids this complication. Regarding stability of the construct, alignment and knee range, we concur with other authors that internal fixation in the form of locked lateral plate gives better stability over external fixation. As most of the cases have articular comminution with articular bone loss, even the best articular reconstruction leaves some void because of the crushing of articular cartilage. This is compounded by injuries to patella which adds to ad a lateral plate minimizes this problem to a certain extent as the knee can be put to mobilization by early weight bearing. Adequate replacement of bone loss was provided, good limb alignment achieved and patients were pain free. More importantly, stability of the knee was achieved which made activities of daily living possible. The study sample is small. The assessment of bone loss was solely based on the length lost and not by bone mass. Replacement of bone volume is extremely important in the prevention of stress fractures.

CONCLUSION

The use of autologous, free, non-vascularized fibular grafts with autologous cortico cancellous bone grafts is a useful method in the treatment of significant bone loss due to acute, massive traumatic metaphyseal bone loss of the femur. It has an acceptable short and long term outcome and can be a good alternative to the staged procedures and expensive prosthetic grafts which also have inherent drawbacks.

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