Correction of Post-traumatic Deformity of Lower Limb: A Case Report

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ABSTRACT

Mal-union with leg length discrepancy is a known complication in open femoral shaft fractures, particularly when associated with vascular injury. Neglected conditions lead to further deformities due to soft tissue contractures which can cause significant disability with compromise in activities of daily living. Thorough history taking, clinical and radiological evaluation helps to identify the problems. Leg length discrepancy, bony deformities and soft tissue contractures can be effectively corrected through osteotomy, acute femoral lengthening and posteromedial release in single admission. Excellent functional outcome can be achieved cost-effectively in short duration.

Keywords: acute femoral lengthening, leg length discrepancy, soft tissue contractures

Introduction

Femoral shaft fracture is common in patients of all ages with an annual incidence of approximately 2.9%.[1] Open diaphyseal fractures of femur are often associated with vascular injury. In resource limited countries, the inadequately treated form is frequent and presents as a malunion. Malunion is a condition of broken bones that have undergone union with the fracture fragments in an abnormal position. The abnormality may be in the form of shortening, rotational or angular deformity.[2] The main cause of femoral malunion is inadequate fracture reduction and fixation which causes instability to the fracture area during healing.[3] Generally, a femoral shaft malunion includes either angular deformity of more than 10 degrees, a rotational mal-alignment greater than 10 degrees, or a shortening by more than two centimeters. Osteotomy is necessary and is performed in an open procedure together with soft tissue release for contractures. The aim of treatment is to achieve pain and limp free mobility.

Case Presentation

A 29-year-old gentleman presented with complaints of difficulty in walking and pain over left lower limb since 11 years with alleged history of road traffic accident 11 years ago. He had sustained open fracture of left femur with vascular injury and was managed with external fixator application and compartment release. He has been walking with painful limp since his initial treatment. On focused examination, leg length discrepancy of 5cm with flexion contractures of toes, equinus contracture of ankle, healed surgical scar mark of left lateral thigh and leg was present (Figure 1).

The gait was antalgic with absent heel strike and weight bearing on lateral border of foot. (Figure 2A). X-ray revealed varus malunion with 23.5° angulation, an anteroposterior translation and bayonet apposition. (Figure 2B and 2C)

Diagnosis

Based on clinical examination and x-ray evaluation, he was diagnosed as malunited left shaft of femur fracture with leg length discrepancy of 5cm with contracture of posterior compartment muscles with equinus contracture of left ankle and flexion contracture of toes.

Treatment

Two stage deformity correction surgery was planned. In first step, leg length discrepancy was corrected via an osteotomy performed at the center of rotation and angulation of the malunion site by making multiple drill holes and use of osteotome via lateral approach.

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Figure 1: A. positive galeazzi sign. B. flexion contractures of toes C. equinus contracture of ankle. D. healed surgical scar mark of left lateral thigh and leg

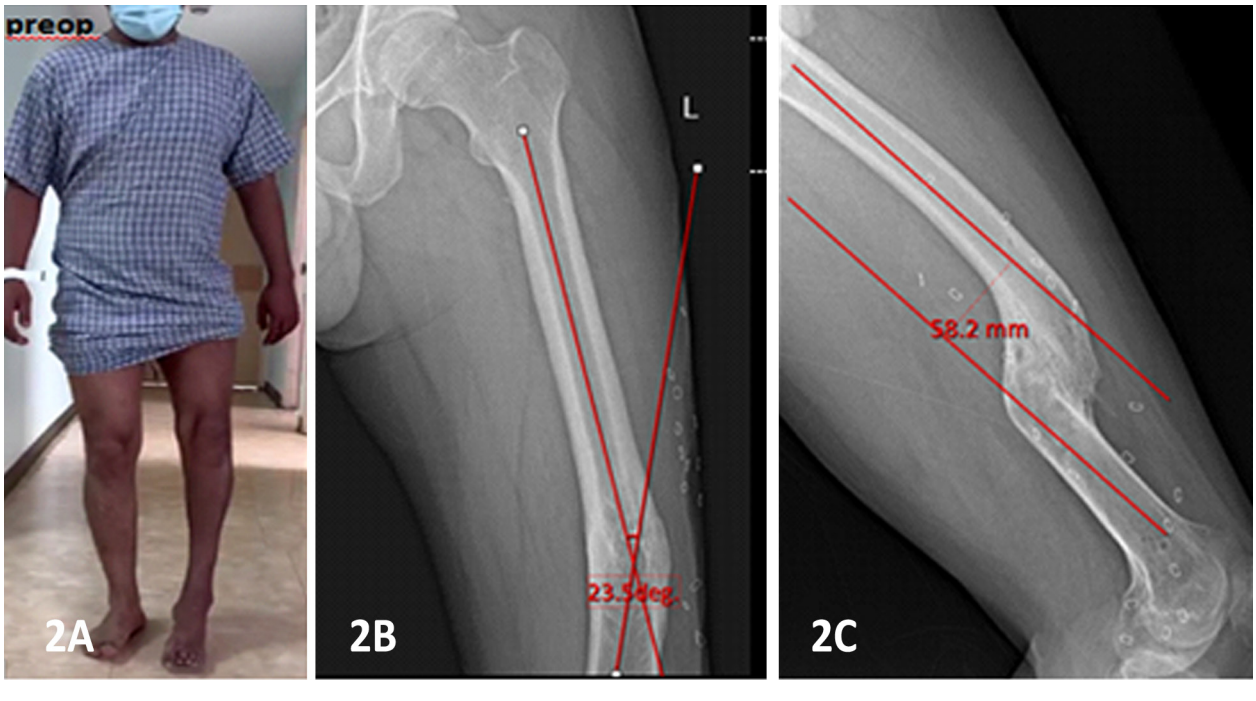

Figure 2: A. Leg length discrepancy with weight bearing on lateral border of foot B. varus angulation of 23.5° in diaphysis. C. antero-posterior translation with bayonet apposition.

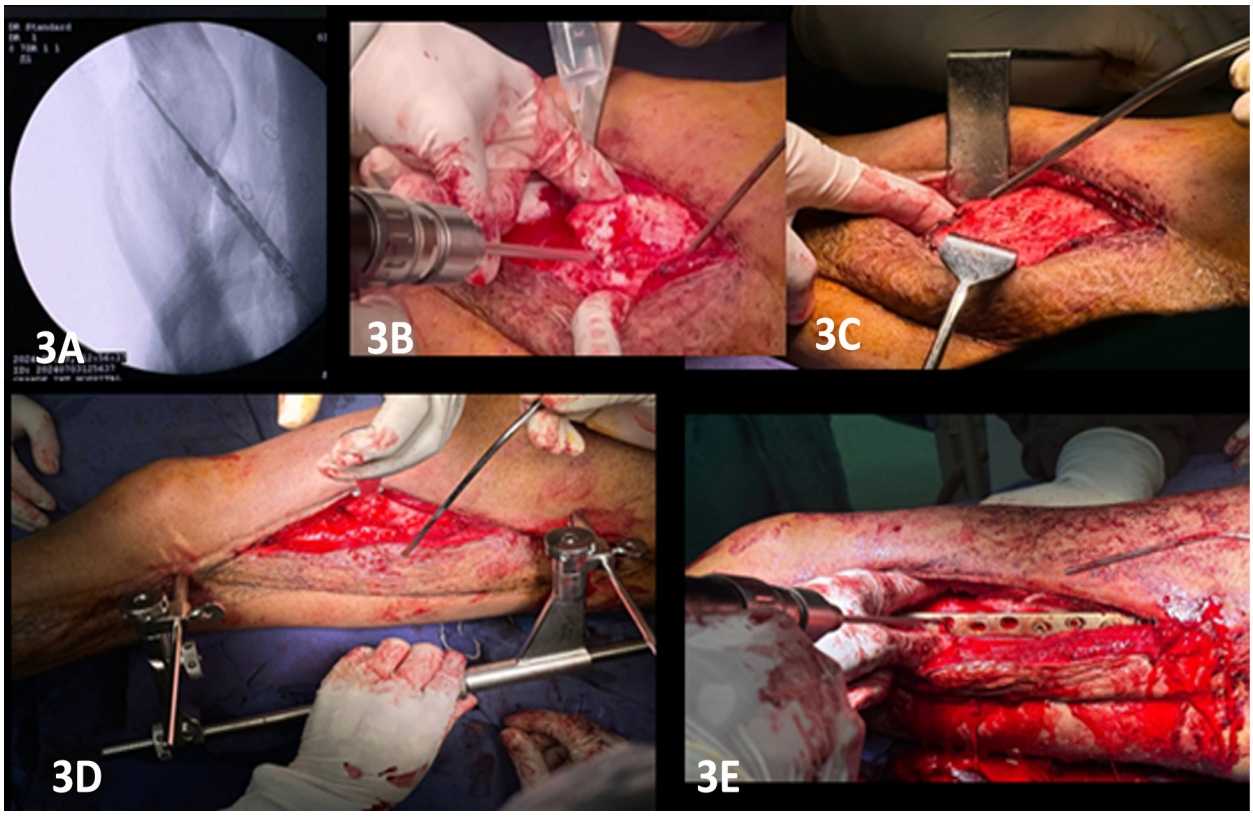

Figure 3 A. marking of osteotomy site under fluoroscopy. B. making drill hole at malunion site. C. proximal fragment after osteotomy. D. use of femoral distraction device. E. application of broad dynamic compression plate

Figure 4 A. preoperative deformities as described in figure 1. Corrected leg length discrepancy, ankle equinus and toe flexion contractures in knee flexion (4B) and extension (4C) after surgery.

Acute femoral lengthening was done over 45 minutes using femoral distraction device and fixed with broad dynamic compression plate and screws (Figure 3). Autologous bone graft harvested from the surgical site was used at the osteotomy site.

On 4th postoperative day second surgery was done to correct ankle and foot deformity via posteromedial release. Z-lengthening of achilles tendon, along with release flexor halluces longus, flexor digitorum longus, tibialis posterior and posterior capsule was carried out via posteromedial approach. Postoperatively there was no leg length discrepancy and ankle equinus and claw toe deformities were also corrected (Figure 4). He was discharged on 7th postoperative day and kept under intensive physiotherapy. He was followed up regularly. On 9 months follow up, bony union was seen on x-ray (Figure 5 A and B). Though there was remaining varus deformity of 9°, he was pain free and gait was normal (Figure 5C).

Discussion

In developing countries, malunion after diaphyseal femur fractures initially treated by external fixation is a common complication leading to leg length discrepancies along with coronal, sagittal and axial deformities.[4] Neglected cases lead to soft tissue contractures due to compensatory mechanisms. Soft tissue contracture is also contributed by index soft tissue trauma. Acquired clawing of the toes can also occur after compartment syndrome of the deep posterior muscles of the leg which produces a fixed length phenomenon of the long flexors of the toes.[5] In our case, the foot and ankle deformities could also be a result of compensation for leg length discrepancy. Evaluation of gait helped to identify the static and dynamic problems. The surgeon's ultimate goal in managing these deformities is to correct malalignment and bone fusion without complication.[6] Different options are described for leg length discrepancies depending on its measurement. While difference up to 2cm mostly goes unnoticed, shoe raise is usually sufficient for up to 5cm. Surgery is indicated if difference is more than 5cm which may be either ipsilateral lengthening or contralateral shortening.[7] Callotasis is a lengthening technique that involves ilizarov apparatus for slow and controlled distraction after subperiosteal-submetaphyseal osteotomy.[8] One-stage leg lengthening for correction of deformity and leg-length inequality of up to 7cm can be effected safely with a relatively short rehabilitation.[9] Time should be taken to lengthen acutely to avoid neurovascular injury. Posteromedial release is an established and effective technique for correction of ankle equinus and claw toe deformities[10]

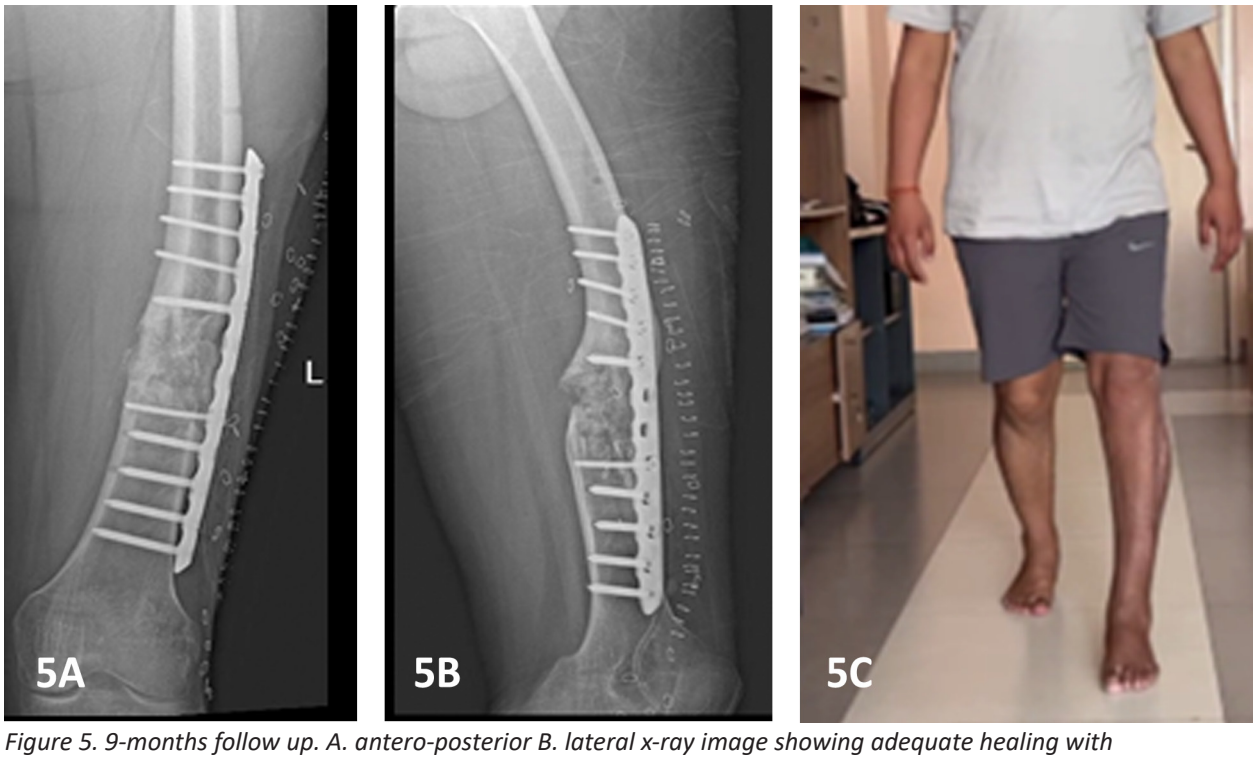

Figure 5. 9-months follow up. A. antero-posterior B. lateral x-ray image showing adequate healing with plate and screws in situ. C. Plantigrade foot with corrected preoperative deformities.

Conclusion

Thorough history taking and clinical examination is needed in patients with posttraumatic mal-union. Problem identification can be aided with gait evaluation. Femoral distraction device is an effective tool to achieve limb length equality in single stage increasing compliance of patients. Sequential deformity correction has to be carried out for soft tissue contractures. Complete correction of radiological deformity is not always essential for functional recovery, that is, to achieve with pain and limp free mobility. Prior to deformity correction surgery, surgeon and patient should set common goals to be achieved for optimal patient satisfaction.

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