

Intra-articular Gap Non-union of Tibial Condyle Treated with Osteochondral Allograft: A Case Report

ABSTRACT

Proximal tibial gap non-union after fractures is a challenging clinical scenario for reconstruction due to the intraarticular nature as well as metaphyseal nature of the defect, further complicated by varus deformity. We report a novel technique of successful management of the non-union and reconstruction of the proximal tibial articular surface with a customised osteochondral allograft with correction maintained by a C shaped Titanium plate and screws.

Key words: Allograft, Osteochondral, Non-union, Intra-articular

INTRODUCTION

Proximal tibial plateau fractures constitute 1% of all fractures and 8% of the fractures in the elderly.^[1] Isolated injuries to the lateral tibial condyle constitute 55–70% of tibial plateau fractures. Of the total number of proximal tibial plateau fractures, 1–3% are open injuries, resulting in a loss of osteoarticular fragment with a possibility of consequent development of an intra-articular gap non-union. Loss of osteochondral articular surface along with metaphyseal bone loss results in a severe defect with further reduction of the joint function compounded due to infection. This will require surgical intervention in order to correct the deformity, prevent future development of osteoarthritis of the knee joint as well as to ensure pain-free mobilization for the patient.

CASE REPORT

The patient was a 38-year-old male farmer who is known case of post-polio residual paralysis in the left lower limb with limited mobility prior to accident with walking on the right normal limb, who was involved in a road traffic accident in 2014 sustaining a fracture of the right lateral tibial condyle. An open reduction and internal fixation was done by local orthopaedic surgeon. Post-operative wound infection led to implant removal with a medial gastrocnemius flap performed for wound coverage in 2014. He presented to us in December 2017 with complaints of local pain and inability to stand or walk. Patient was bed bound for the past 3 years since injury with severe restriction of activities of daily living. The gastrocnemius flap had incorporated well with no local signs of indolent infection. Imaging (X-rays Figures 1 and 2; computed tomography images Figures 3 and 4) was suggestive of a loss of articular surface with a gap in the metaphysis and varus deformity.

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The necessary pre-operative workup was done showing inflammatory markers Erythrocyte sedimentation rate and C-reactive protein within normal limits and the patient was taken up for surgery. The new incision was taken medial to the previous scar and the medial gastrocnemius flap was raised to visualize the non-union. The site was thoroughly cleared of fibrous tissue and the bone edges were freshened. A femoral head allograft shaped according to the size of the cavity was inserted into the gap non-union site after measuring the cavity with the limb kept in neutral mechanical axis. The non-union was fixed with a C plate over the bone graft with two cancellous screws proximally as well as two cancellous screws distally with Calcium Sulfate beads (impregnated with Vancomycin) *in-situ* to prevent any recurrence of infection [Figure 5].

The patient was kept in an above knee slab for 4 weeks post-operatively. Post-operative period was uneventful (Post-operative X-rays Figures 6 and 7). On 3 year follow-up in December 2020, the patient can ambulate full weight bearing with the support of a walker. He has no pain or tenderness at the fracture site [Figures 8 and 9].

DISCUSSION

A lot of literature study has been done on the management of proximal tibial non-unions with modalities such as iliac crest autograft, fibular strut autograft, Ilizarov method, and joint



Figure 1: Pre-op AP X-ray

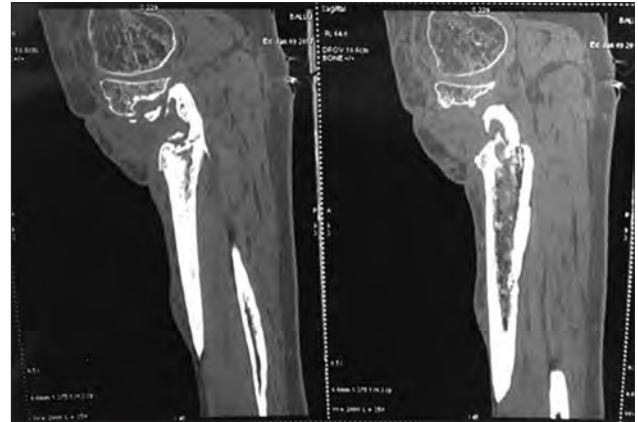


Figure 4: Pre-op Sagittal CT



Figure 2: Pre-op Lateral X-ray



Figure 5: Intra-operative Image

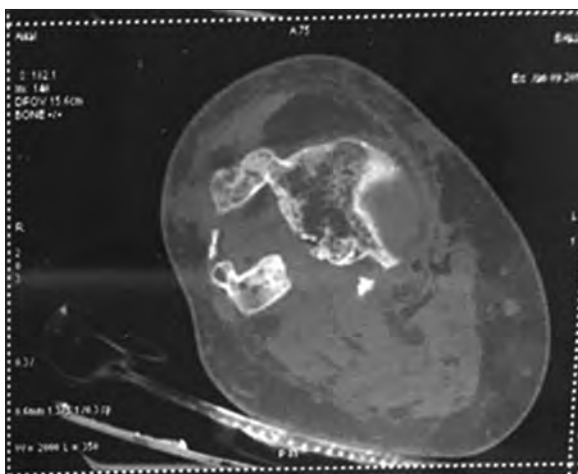


Figure 3: Pre-op Axial CT



Figure 6: Immediate Post-op AP X-ray

replacement surgery.^[2] Each of these alternatives has their own merits and demerits.

Osteochondral allograft containing cancellous bone as well as overlying cartilage has several advantages in the repair of



Figure 7: Immediate Post-op Lateral X-ray



Figure 9: Follow-up Lateral X-ray



Figure 8: Follow-up AP X-ray

osteocondral defects of the proximal tibial condyles.^[3] No donor site morbidity as this is an allograft harvested from deceased organ donors or retrieved femoral heads after hip replacement surgery. Chondrocyte viability is maintained up to 92 months after transplantation as per studies.^[4] The shape and size of graft can be contoured as required as per pre-operative radiological or intraoperative measurements. Studies have documented satisfactory clinical and radiological outcomes at 10 years follow-up.^[5] Unipolar osteochondral defects report better outcomes.^[6]

Here we present a biological joint preserving surgical line of treatment in a post-traumatic proximal tibial lateral condylar bone loss with gap non-union in a patient with a single ipsilateral functional limb. An online literature review of osteochondral allografts for articular surface reconstruction shows good survival rates on mid-to-long term follow-up of patients treated with similar management using cadaveric osteochondral allografts for post-traumatic defects of the knee joint with graft survivorship of approximately 95 % at

5 years follow-up of both tibial and femoral type defects.^[7-11] We have used a femoral head allograft shaped and customised intra-operatively to the corresponding defect according to pre-operative CT scan measurements of the bony defect. Mechanical limb axis alignment was confirmed after graft was packed in place to ensure physiological loading across the reconstructed articular surface and avoid deformities or limb length discrepancy. Patient on 3 years follow-up is pain free having satisfactory full weight bearing mobilisation with walker support, resuming his level of mobility and activities of daily living before the injury, hence achieving the primary goals of our surgery. This is comparable to the results published previously about extensive follow-ups of patients treated with the same modality by Gross *et al.* who have documented tibial osteochondral allograft survivorship of 95% at 5 years and 80% at 10 years after surgery.^[5,10] We eagerly look forward to the follow-up of our patient beyond these 3 years and further assess the clinical improvement over a longer period.

CONCLUSION

Post-traumatic proximal tibial non-union with metaphyseal bone loss is a difficult clinical entity to treat satisfactorily, with multiple surgical modalities being mentioned in literature with varying outcomes. Osteochondral allograft transplantation with internal fixation by an implant provides a viable alternative to the management of this challenging condition with satisfactory long-term functional outcomes.

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