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Case Series

Medial open wedge high tibial osteotomy - an effective procedure for varus malunited neglected proximal tibial plateau fractures: a case series

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ABSTRACT

Varus malunited tibial plateau fracture is a disabling condition causing varus thrust gait, instability, and secondary osteoarthrosis. There are few evidence-based guidelines for the management of symptomatic varus malunion in young patients. Our case series aims to review outcomes of open wedge high tibial osteotomy for varus malunited tibial medial plateau fractures. We present case series of three patients who presented with symptomatic varus malunion of proximal tibia with Kellgren-Lawrence stage II or less arthritic changes. All presented with varus thrust. Exclusion criteria for the procedure would be complex intra-articular step malunions and severe arthritic changes. Medial open wedge high tibial osteotomy was performed and stabilized with locking plate and tricortical autograft. Patients were followed up for 12 to 20 months. All achieved deformity correction, reported significant improvement in varus thrust and were satisfied with their improvement in stability and knee function. There was no complication related to wound healing and no delayed loss of correction. The osteotomy led to correction of the coronal deformity and ensured that the collateral balance is restored benefiting the overall gait of the patient. Also, if such a patient undergoes total knee replacement in future, the bone stock will be significantly better with this procedure. Medial open wedge high tibial osteotomy for varus malunited tibial plateau fractures is effective procedure that provides excellent functional and radiologic outcomes, and carries minimal complications.

Keywords: Varus, Malunited, Tibial plateau fracture, High tibial osteotomy

INTRODUCTION

It is not uncommon to encounter neglected or inadequately managed proximal tibial fractures. Proximal tibial fractures are typically high energy injuries. Owing to the natural varus at the articular surface a larger part of the weight transmission occurs across the medial condyle which leads to a higher propensity of varus collapse particularly in Schatzker type 4 and beyond injuries.[1-3] Varus malunited tibial plateau fracture is a disabling condition causing varus thrust gait, instability, and secondary osteoarthrosis.[2,5] There are few evidence-based guidelines for the management of symptomatic varus malunion in young patients.[1-7] In this article we are presenting 3 cases of neglected proximal tibial fractures which presented with non-union or mal-union of the proximal tibia and treated with medial opening wedge high tibial osteotomy.

CASE SERIES

All patients were operated under spinal anesthesia and tourniquet control by a single team of surgeons. Through a standard medial parapatellar approach, the superficial

medial collateral ligament was elevated partly, and the medial part of proximal tibia was exposed. The surgical exposure was limited in that the knee joint was not opened; the mean incision length was 2.5 inches and extended just distal to the tibial tuberosity. The periosteum on the subarticular part of the proximal tibia was elevated. A K wire was passed 4 to 5 cm distal to medial joint line above the level of tibial tuberosity from medial to lateral direction towards tip of fibular head to mark the intended level of osteotomy. An oblique osteotomy was started distally at the level of the tibial tuberosity and ended medially at the intercondylar area with the intercondylar area acting as a hinge. An oscillating saw was used in the direction of K wire and incomplete osteotomy performed under image control. A broad osteotome was used to complete the osteotomy with care to avoid the lateral tibial condyle fracture. A tricortical piece of iliac crest (size of which depended on angle of correction) was harvested and inserted into the osteotomy site from the anteromedial aspect subperiosteally. The graft was impacted after correction in the coronal plane on the anteroposterior view and the posterior slope on the lateral view was confirmed under image intensification. Final fixation of the Osteotomy was done using a AO Synthes Tomofix plate.

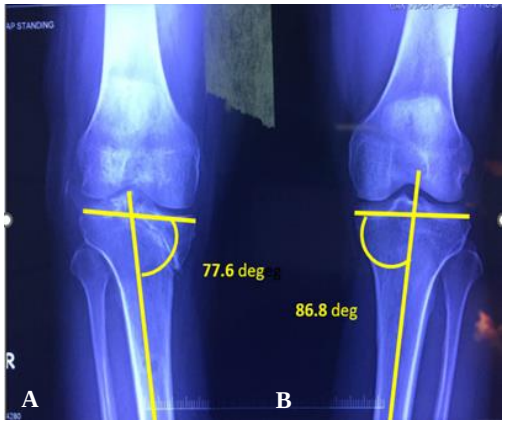

Figure 1 (A and B): The MPTA is formed between the line along mechanical axis of tibia (Y) and another line drawn along articular surface of tibia (X).

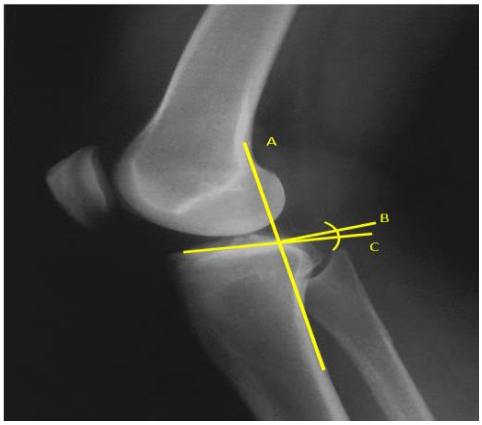

Figure 2: Preoperative planning of the open wedge osteotomy of the proximal medial tibia.

Case 1

A 38 years male presented with conservatively treated 4-month-old Schatzker type 4 injury along with an extension lag of 50 degrees without any fixed flexion deformity. Full passive range of motion was present. Both varus and valgus stress test were positive. Grade I Lachman and anterior drawer test were recorded. X-ray of the knee in antero-posterior and lateral view showed non-union of depressed medial condylar fracture, avulsion of the patellar tendon and a minimally displaced Meyer and Mckeever Grade 1 avulsion injury of the anterior cruciate ligament. The patient was treated with medial open wedge high tibial osteotomy along with reattachment of the patellar tendon with suture anchors along with a protective wire loop being passed through the patella and the tibial tuberosity. Fixation of the Osteotomy was done using AO TOMOFIX (The DePuy Synthes TOMOFIX Osteotomy System). Weight bearing was progressively allowed from six weeks onwards with full weight bearing at four and a half months once graft was found to be well united. On final follow up, range of motion was found to be 0-120 degrees, valgus and varus stress tests were found to be negative, anterior drawer test was negative and pivot shift was negative (Figure 3 and 4).

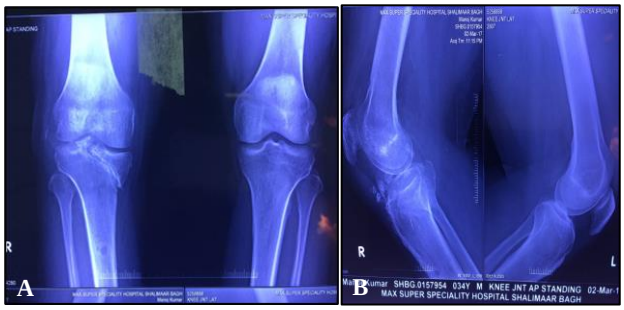

Figure 3: (A) Pre-operative AP view and (B) lateral view.

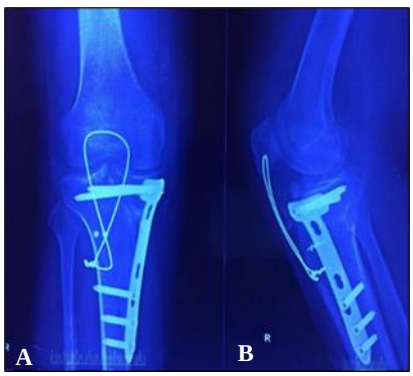

Figure 4: (A) Post-operative AP and (B) lateral view.

Case 2

A 42 years old male patient, labourer by profession, presented with a 1-year-old Schatzker type IV fracture of the left proximal tibia that was managed conservatively

and resulted in mal-union. Although the patient demonstrated full range of motion, the patient had difficulty in bearing weight on the affected lower limb and was ambulatory with help of a stick. After all radiological evaluation, medial open wedge high tibial osteotomy was performed and alignment was restored. Fixation was finally done with a Tomofix plate. Weight bearing was progressively allowed from four weeks onwards with full weight bearing at eight weeks once graft was found to be well incorporated (Figure 5 and 6).

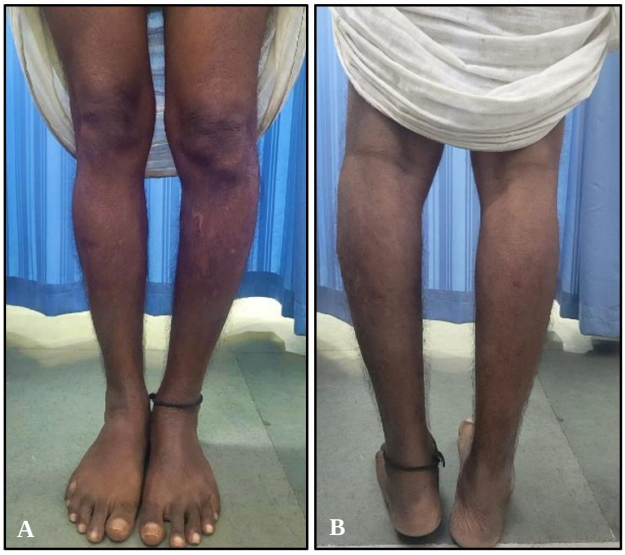

Figure 5 (A and B): Pre-operative clinical images.

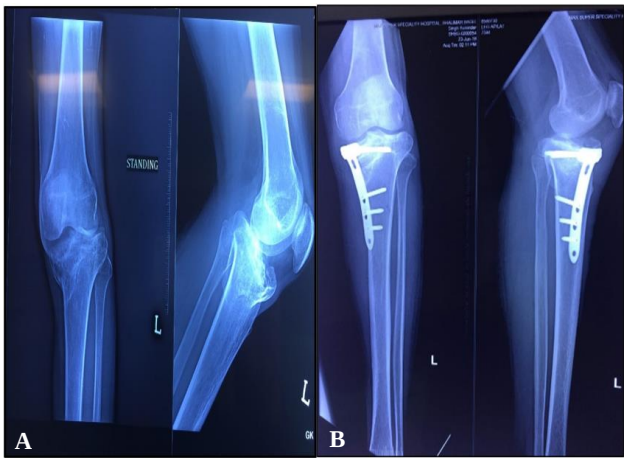

Figure 6 (A and B): Pre-operative X-rays and post-operative X-rays of the patient.

Case 3

28 y old male patient, came with 1 year old conservatively managed Schatzker type 4 proximal tibia fracture. The patient presented with a mal-united fracture with varus knee deformity. The patient had difficulty in walking and full weight bearing ambulation was difficult. Varus instability was positive. Proximal medial open wedge osteotomy was performed, deformity was corrected. On subsequent follow-up patient had no varus thrust and had no pain on ambulation (Figure 7 and 8).

Figure 7: Pre-operative clinical images.

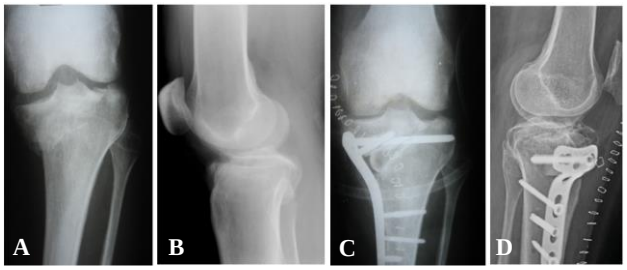

Figure 8 (A-D): Pre-operative X-rays and post-operative X-ray of the patient.

Table 1: Summary of pre- and post-operative radiological & functional assessment of the patients.

Patient details	Pre-operative mPTA	Post-operative mPTA	Pre-operative tibial slope	Post-operative tibial slope
1	73.2	81.7	17.4	10.2
2	77.6	84.8	14.3	9.8
3	72.8	80.3	16.8	11.1

DISCUSSION

The cornerstone of a well-functioning knee is the mechanical alignment of the limb. Mal-union and non - unions of the proximal tibia due to late collapse led to collapse of whole condyles which results in loss of mechanical alignment of the knee.[1,4,5,8,9] Such a process in turn leads to laxity or over-stretching of the collateral ligaments.[2,10,11] This in turn leads to coronal plane imbalance and hence the varus or valgus thrust is seen prominently in the gait. The instability and laxity produced by the malunion is disabling and conservative treatment often do not provide desirable outcomes. If the situation is left uncorrected the abnormal forces across the joint leads to arthritis and subsequent pain and loss of motion. The osteotomy aims to restore the joint line in addition to the correction of mechanical alignment.[2-5,12-13] The above-described procedure can prevent early onset arthritis

secondary to malunion particularly in young adults. The open wedge osteotomy also enables correction of medial ligamentous laxity. Up to fifteen degrees of deformity correction can be achieved through this procedure.[5,10] The osteotomy is however provides less stability as compared to closing wedge osteotomies hence stabilizing the fracture fragment with a plate becomes necessary. The procedure is preferred in young individuals with good vascular status with pain and disability of knee compromising activities of daily living.[11,12] Contra-indications for the procedure include an unstable knee (lateral tibial subluxation of >1 cm), bone loss of 2–3 mm, more than fifteen degrees of knee flexion contracture, knee flexion less than ninety degrees, and presence of any inflammatory arthropathies. We recommend this surgery in young adults (in whom resorting to total knee arthroplasty is too early) with instability of the knee joint secondary to malunited proximal tibial plateau fractures.[5]

CONCLUSION

In our small series of cases, the osteotomy led to correction of the coronal deformity and ensured that the collateral balance is also restored significantly, benefiting the overall gait of the patient. Medial open wedge high tibial osteotomy for varus malunited tibial plateau fractures is effective procedure that provides excellent functional and radiologic outcomes, and carries minimal complications.

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