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High Tibial Osteotomy For Varus Deformity Correction In A Post-Traumatic Malunion Of Proximal Tibia Fracture- A Case Report

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Abstract:
High tibial osteotomy (HTO) is a joint-preserving procedure used to correct malalignment following a malunited proximal tibia fracture. It aims to restore mechanical axis alignment, redistribute load, and alleviate pain, particularly in cases of post-traumatic varus deformity. Various osteotomy techniques, including medial opening wedge and lateral closing wedge, are employed based on patient-specific factors. Proper preoperative planning, accurate execution, and appropriate fixation are crucial for optimal outcomes. HTO can delay the progression of osteoarthritis and improve knee function, making it a viable alternative to early joint replacement in select patients.
Here we discuss a case of High Tibial Osteotomy done for varus deformity correction in a malunited proximal tibia fracture in a 49-year-old male.
Key Word: *High tibial osteotomy, malunion,*

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I. Introduction

Malunion of proximal tibia fractures can result in varus deformity, leading to altered knee biomechanics, medial compartment overload, and progressive osteoarthritis. High tibial osteotomy (HTO) is a well-established surgical technique to realign the mechanical axis, relieve pain, and restore joint function. By redistributing load across the knee, HTO can delay the need for total knee arthroplasty in younger, active patients.

HTO techniques include medial opening wedge and lateral closing wedge osteotomies, each with specific indications based on the degree of deformity and bone quality. Advances in preoperative planning, including weight-bearing radiographs and computer-assisted methods, enhance surgical accuracy and outcomes. Despite its benefits, HTO requires careful patient selection, precise execution, and appropriate rehabilitation to ensure long-term success. This review discusses the role of HTO in correcting varus malalignment due to proximal tibia fracture malunion, its indications, surgical techniques, and expected outcomes.

We are reporting a case of varus deformity in malunited proximal tibia fracture in a 49-year-old male. The patient was treated with high tibial osteotomy after radiological investigations.

II. Case Presentation

49 years old male, complaints deformity in his right knee since 14 months after alleged history of RTA. Deformity was insidious in onset, gradually progressive in nature, associated with difficulty in walking.

On examination :
• 49 year old Male , moderately built and nourished , BMI = 26 kg/m2
• Antalgic gait over right lower limb
• On inspection - No visible wounds.
-old surgical scars over proximal part right leg
-Varus deformity seen
• On palpation – right knee, no local rise of temperature,
Range of movements: right knee flexion and extension is restricted
• Measurements – 3cm shortening in right lower limb compared to left lower limb

III. Investigations

Xray right knee ap and lateral shows malunited proximal tibia fracture

IV. Management

-high tibial osteotomy was done and deformity was corrected
-Post operative check xray was satisfactory

V. Discussion

Malunion of proximal tibia fractures can result in significant varus deformity, leading to altered knee joint biomechanics, progressive medial compartment osteoarthritis, and functional impairment. High tibial osteotomy (HTO) is an effective realignment procedure that corrects the mechanical axis, redistributes load across the knee, and improves joint function. It is particularly useful in younger, active patients as a joint-preserving alternative to total knee arthroplasty.

Indications and Patient Selection

HTO is indicated in patients with symptomatic varus malalignment due to post-traumatic proximal tibia fracture malunion, provided that the lateral compartment cartilage is well-preserved and knee ligament stability is adequate. Preoperative evaluation using full-length weight-bearing radiographs, mechanical axis deviation analysis, and joint line obliquity assessment is crucial. Excessive varus deformity or associated femoral malalignment may necessitate a double-level osteotomy to prevent oblique joint lines and maintain optimal biomechanics.

Surgical Techniques

Two primary techniques are used for HTO in post-traumatic malunion cases:

1. Medial Opening Wedge High Tibial Osteotomy (OWHTO):
• Preferred for its ability to provide controlled correction and maintain bone stock.
• Requires bone grafting or bone substitutes to fill the osteotomy gap.
• Higher risk of delayed union or nonunion compared to CWHTO.

2. Lateral Closing Wedge High Tibial Osteotomy (CWHTO):
• Involves resecting a lateral bone wedge to realign the mechanical axis.
• Offers faster healing due to direct bone contact but sacrifices some bone stock.

In cases with severe deformity (>10° varus), a double-level osteotomy (DLO) combining distal femoral osteotomy (DFO) with HTO is recommended to prevent excessive obliquity of the joint line.

Biomechanical Considerations and Complications

HTO shifts the weight-bearing axis laterally, reducing medial compartment stress and potentially delaying osteoarthritis progression. However, complications such as nonunion, overcorrection, undercorrection, implant failure, and deep infection can occur. Careful intraoperative assessment and proper fixation techniques (e.g., locking plates) can improve outcomes.

A key biomechanical challenge in post-traumatic cases is the altered soft tissue envelope, which may affect correction accuracy. Studies suggest that intraoperative alignment adjustments under valgus stress can minimize postoperative alignment outliers.

Clinical Outcomes and Prognosis

Long-term studies show that HTO provides significant pain relief and functional improvement, with success rates exceeding 80% at 10 years. However, outcomes depend on patient factors such as age, body mass index, and cartilage status. In patients with advanced osteoarthritis or suboptimal correction, conversion to total knee arthroplasty may be required in the future.

VI. Conclusion

HTO is a valuable joint-preserving procedure for varus correction in post-traumatic proximal tibia fracture malunion. Proper patient selection, precise surgical execution, and postoperative rehabilitation are crucial to achieving favorable long-term outcomes. While OWHTO is more commonly used, CWHTO or double-level osteotomy may be necessary in complex cases to optimize joint mechanics and prevent secondary complications.

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