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Case Report

Hemi-high tibial osteotomy: technical note and case report

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ABSTRACT

High tibial osteotomy (HTO) is a widely performed procedure, with several surgical techniques described to treat varus mal-alignment and medial compartment arthrosis of the knee. In our case report, we present a new surgical technique for performing a medial open wedge HTO in a young patient with proximal varus deformity of the right knee to avoid the clinical complications of HTO. A longitudinal medial incision was made medially over the proximal tibia, the medial collateral ligament (MCL) split, and an osteotomy was made from the medial cortex exiting into the "lateral tibial spine". The osteotomy was then opened. A wedge measured 12.5 mm, and a bone graft harvested from the right iliac crest was used to fill the defect, followed by a Puddu plate placement. We had planned to have the osteotomy exit in the centre of the knee. Two years postoperatively, complete osteotomy healing and full range of right knee movement with no pain were observed. Radiographs confirmed deformity correction. Many surgical techniques have been described for HTO, including closing wedge osteotomy, opening wedge osteotomy, dome osteotomy, progressive callus distraction, and chevron osteotomy. We believe that in this technique, the risk of nonunion is less, the construct is more stable, and the patient will have a faster rehabilitation program with early weight-bearing. Hemi-HTO is a new surgical technique that can be used to treat proximal varus deformity of the knee, especially if the lateral tibial plateau appears radiologically normal.

Keywords: Varus deformity, Unicompartmental arthritis, High tibial osteotomy

INTRODUCTION

High tibial osteotomy (HTO) is a widely performed procedure, achieving good results with appropriate patient selection and precise surgical technique. The clinical indications for HTO include knee varus mal-alignment associated with medial compartment arthrosis, knee instability, medial compartment over load following meniscectomy, and osteochondral lesions requiring resurfacing procedures. Many techniques have been described for HTO whether alone or in combination with other procedures. Appropriate clinical indication, preoperative planning and surgical technique selection are essential to achieve satisfactory outcomes. Primary or secondary medial knee compartment arthrosis is the most common indication for HTO.

The ideal candidate for HTO is aged less than 65 years, with isolated medial knee arthrosis, satisfactory range of motion (ROM), and no ligamentous instability. HTO is contraindicated in patients with severe articular cartilage damage of the medial compartment (Ahlbäck grade III or higher), tri compartmental arthrosis, patellofemoral arthrosis, or markedly decreased ROM (arc of motion <120° and flexion contracture >5°), as well as in patients older than 65 years.[1-6] The importance of body mass index in determining whether to perform HTO remains controversial.[7]

Many surgical techniques have been described for the treatment of varus mal-alignment and medial compartment arthrosis of the knee. Both opening and closing wedge HTO are the most common.[7]

In our case report we presented a new surgical technique in performing a medial open wedge HTO in a young patient with proximal varus deformity of the right knee to avoid the clinical complications of HTO.

CASE REPORT

A 28-year-old male patient presented to our clinic complaining of three months history of right knee pain following a history of fall and twisting injury during military training. The pain was progressive with time, increasing with standing and heavy duties. There was no history of locking nor giving way at the knee. On physical examination, the patient had a varus deformity of his right knee, tenderness over the medial tibial plateau and full range of motion. Lachmann test, anterior drawer test, posterior drawer test and McMurray's tests were all negative. Imaging studies showed bilateral deformity in the medial tibial plateau with the right worse than the left (Figures 1 and 2).

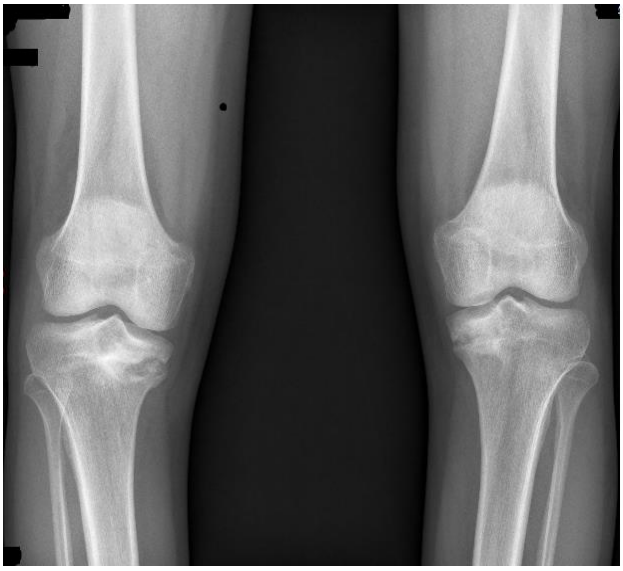

Figure 1: AP X-ray showing bilateral knee varus deformity in the medial tibial plateau with the right worse than the left.

Surgical procedure

Under spinal anesthesia, prophylactic antibiotic was given intravenously and tourniquet was applied and inflated to 275 mmHg for 130 minutes. After scrubbing and draping of the right lower limb and iliac bone crest, a diagnostic right knee arthroscopy was performed that showed normal anterior cruciate ligament, posterior cruciate ligament, both meniscus, both medial and lateral compartments and patellofemoral compartment.

A longitudinal medial incision was then made medially over the proximal tibia, the MCL splitted and an osteotomy made from the medial cortex exiting into the "lateral tibial spine" with a saw. The osteotomy was then opened. A wedge measured 12.5 mm and bone graft harvested from the right iliac crest was used to fill the defect. A 12.5 mm Puddu plate with two screws proximal and two screw distal was utilized.

We had planned to have the osteotomy exit in the center of the knee (Figures 3a and b).

Figure 2: Lateral X-ray of the right knee.

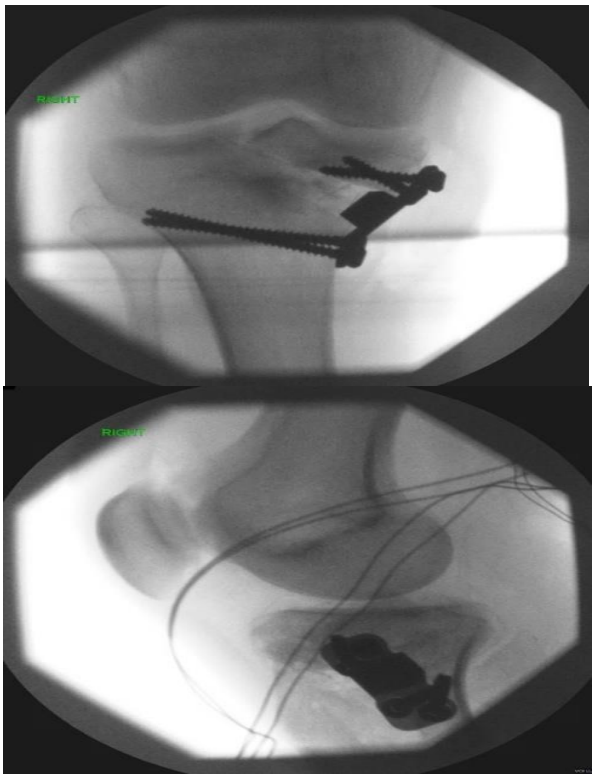

Figure 3: AP and lateral intraoperative X-rays showing osteotomy line exiting in the center of the knee fixed with 12.5 mm Puddu plate.

Figure 4: AP postoperative X-ray.

Figure 5: Lateral postoperative X-ray.

Figure 6: AP full length lower limb standing postoperative X-ray showing satisfactory deformity correction.

Figure 7: AP X-ray after 2 years of follow up showing complete healing of osteotomy site.

Intraoperative fluoroscopy confirmed satisfactory reduction and hardware placement. Closure was done in layers. No drain was used.

The patient made uneventful postoperative recovery and started physiotherapy on day one post-operatively with range of movement and non-weight bearing ambulation. Postoperative radiographs were satisfactory (Figures 4-6).

The patient was followed in our clinic for two years post-operatively. He had complete healing of the osteotomy, full range of movement of right knee with no pain. The standing lower limb radiographs confirmed normal "right" lower limb alignment with varus deformity of the "left" side (Figures 7 and 8).

Figure 8: AP full length lower limb standing X-ray after 2 years of follow up showing complete healing of osteotomy site and deformity correction.

DISCUSSION

High tibial osteotomy effectively manages a variety of knee conditions, including gonarthrosis with varus or valgus malalignment, osteochondritis dissecans, osteonecrosis, posterolateral instability, and chondral

resurfacing. The fundamental goals of the procedure are to unload abnormal articular surfaces and correct angular deformity at the tibiofemoral articulation. Although the clinical success of total knee arthroplasty has resulted in fewer high tibial osteotomies being performed during the past decade, the procedure remains useful in appropriately selected patients with unicompartmental knee disease, particularly in young patients.

Many surgical techniques have been described for HTO, including closing wedge osteotomy, opening wedge osteotomy, dome osteotomy, progressive callus distraction, and chevron osteotomy. Opening and closing wedge HTO are the most common.[7] Lateral closing wedge HTO was once considered to be the standard of care. However, this technique is associated with fibular osteotomy or proximal tibiofibular joint disruption, peroneal nerve injury, more demanding subsequent total knee arthroplasty (TKA) and loss of bone stock.[7] In addition, lateral closing wedge HTO has been associated with a high incidence of post-operative patella Baja.[9,10]

Medial opening wedge HTO has become the primary surgical technique. Disadvantages associated with medial opening wedge HTO include the need for bone graft and the risk of collapse or loss of correction.[8]

In our case, the surgical technique used to correct the varus deformity of the proximal tibia was incomplete medial wedge open osteotomy. In this technique, the osteotomy was done from the medial tibial cortex to the lateral tibial spine avoiding the risk of fracture of the bone all the way to the complete osteotomy that may cause destabilization of the proximal fragment.

The lateral tibial plateau was healthy, and only the medial tibial plateau appeared abnormal. Hence, a hemi-HTO was made to address the pathological (medial) side and leave the normal (lateral) tibial plateau alone.

The incidence of intra-articular fracture during medial opening wedge HTO has been reported to be as high as 11%, compared to 10% to 20% for lateral closing wedge HTO.[11,12] In our case, intra-articular osteotomy was planned and fixed with a plate used for open wedge osteotomy.

This technique might be associated with a lower risk of nonunion, a more stable construct, and a faster rehabilitation with early weight-bearing.

CONCLUSION

Hemi-HTO is a new surgical technique that can be used in the treatment of proximal varus deformity of the knee especially if the lateral tibial plateau appears radiologically normal.

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