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Case Report
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Re-correction Osteotomy for Overcorrection after Medial Opening Wedge High Tibial Osteotomy: A Case Report

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Abstract

Case: We report a patient with persisting knee pain after Medial Open Wedge High Tibial Osteotomy (MOWHTO) caused by the overcorrection in the frontal plane and an unintentional increase of posterior tibial slope postoperatively. This case shows how to re-correct this two-dimensional deformity by a re-corrective HTO with varization and slope reduction.

Conclusion: This case report emphasizes the clinical relevance of unintentional increase of tibial slope combined with valgus overcorrection after MOWHTO and how it can be re-recorrected. Hence, each surgeon must know the importance of careful determination of postoperative and intraoperative alignment in the frontal and sagittal plane when performing HTO.

Introduction

Medial Open Wedge High Tibial Osteotomy (MOWHTO) is widely performed as an effective surgical treatment for medial compartment osteoarthritis of the knee (knee OA) [1-3]. However, different complication during and after the osteotomy procedure were reported, such as overcorrection in the frontal plane and patella infera [4,5]. In this case report, we discuss the problem of (mal-) alignment resulting in a valgus overcorrection combined with an increased tibial slope, and how this two-dimensional deformity can be re-corrected.

The patient was informed that data concerning the case would be submitted for publication, and agreed the data provision.

Case Presentation

The patient was a 57-year-old male with right knee pain on the medial side underwent MOWHTO in another hospital 5 years ago. Although the osteotomy showed a good bone healing, he still complained about knee pain and gait disturbance.

Clinical findings

In full weight-bearing stand, the patient demonstrated an obvious and significant valgus alignment on the operated side, and a constitutional varus on the left side. He complained about knee pain in the medial, lateral and patellofemoral compartment and an extension deficit (Range of Motion (ROM) Extension/Flexion 0-5-140°). His symptoms of lateral and patellofemoral compartment were considered to be caused by overloading of the lateral compartment and patellar maltracking due to the valgus knee, whereas the medial compartmental symptom was considered to be caused by advanced arthritis due to abnormal joint line obliquity after overcorrection.

Radiological findings and preoperative planning

The preoperative long leg X-ray revealed that Kellgren–Lawrence classification was grade 3, the Hip–Knee–Ankle (HKA) angle 6.3° valgus, the mechanical Medial Proximal Tibia Angle (mMPTA) 94.7°, the Caton-Deschamps Index (CDI) 0.79, the posterior tibial slope 14.5° (Figure 1, 2). The menisci and ligaments were intact. No torsional deformity was seen on upper and lower leg in the radiological investigation.

The re-correction for varus of the proximal tibia is planned, showing a 6.5° varus re-correction at the former osteotomy site was required to obtain the target axis of 1° valgus of HKA angle. As

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Figure 1: Preoperative anteroposterior and lateral radiographs of the knee showing valgus overcorrection and increased posterior tibial slope after medial open wedge high tibial osteotomy.

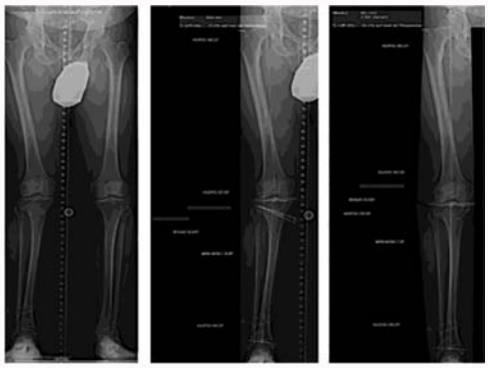

Figure 2: A preoperative full-length weight-bearing radiograph. Analysis showing the valgus alignment due to an overcorrection during the HTO. The planning of the anteromedial closed wedge HTO to restore a normal alignment and mMPTA.

Figure 3: Preoperative planning in lateral view of the knee radiograph. Notice the patella infera which will be addressed by the supratuberositary ventrally closing osteotomy.

part of the multidimensional high tibial re-osteotomy, additionally 8° of slope reduction were intended to improve the knee extension and patellofemoral complaints. The correction was planned as a ventrally closed wedge osteotomy to increase CDI and address the patella infera (reduction of maltracking and contact pressure through free extension) (Figure 2, 3).

Surgical procedure

First, arthroscopy was performed to detect intraarticular pathologies. In the patellofemoral compartment, Outerbridge grade 2 to 3 cartilage damage was found, in the lateral compartment grade 1 to W2 cartilage lesion, and 1 to 3 cartilage damage in the medial compartment, respectively (Figure 4).

The preexisting approach from the former MOWHTO was used (oblique longitudinal incision on the medial plateau of the tibia). The pes anserinus and the superficial band of the medial collateral ligament were released. Two size 2.0-mm Kirschner wires were inserted with an angle of 6.5° according to the preoperative planning (Figure 5). The hinge point was placed equal to the former hinge point. First, the biplanar cut of the tibial tuberosity was performed at 110°-angle to the main osteotomy, tapering distally in the sense of a slope correctional osteotomy, whereby an 8° ventral open wedge was cut out (ventral closing osteotomy). Then, the main osteotomy was performed along the Kirschner wire from caudal to lateral to the hinge point. Approximately 0.5 cm of cortical bone remained as a lateral hinge. To address the sagittal plane simultaneously the saw blades were opened ventrally for 8° during the main osteotomy. Hereby, after removing the ventral open wedge, the osteotomy could be closed ventrally resulting in a decrease of the tibial slope. The main osteotomy was performed with protection of the dorsal soft tissue using a radiolucent retractor. The osteotomy was carefully and slowly closed, which worked very well anteriorly and medially. For achieving desired correction, the knee extension was adjusted (slight hyperextension) lifting the distal lower leg while simultaneously applying axial pressure to the knee. The internal plate fixator

Figure 5: Intraoperative image. Two Kirschner wires were inserted accurately at an angle according to the preoperative planning.

Figure 4: Arthroscopy findings. (A) patellofemoral compartment (B) lateral compartment (C) medial compartment.

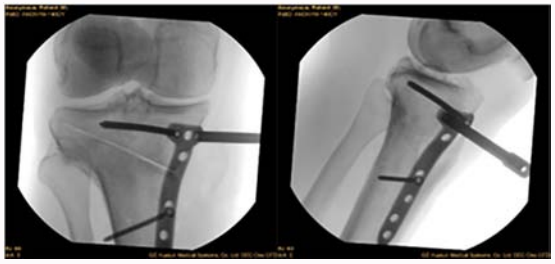

Figure 6: Intraoperative image. The plate is placed at anteromedial side. The comprssion screw closes the osteotomy anteromedial, look at the pressure this technique provides (proximal screw is bending).

Figure 7: Intraoperative image. Target axis is controlled well.

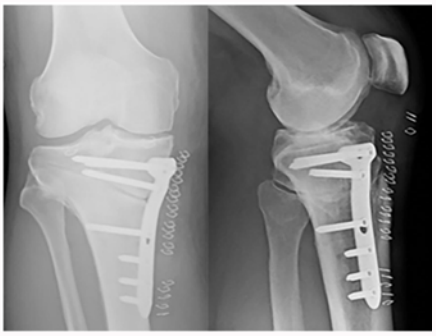

Figure 8: Postoperative anteroposterior and lateral radiographs of the knee showing successful valgus and slope re-correction.

(Tomofix, DePuy Synthes) was placed on the anteromedial side in order to give compression force to the medial and ventral aspect of the osteotomy. At first, the plate was fixed with 1 locking screw proximally and 1 compression screw distally under complete closure of the osteotomy site (Figure 6). Then the remaining plate holes fastened with locking screws and finally replacing the compression screw with a locking screw. Frontal alignment was controlled using an alignment rod passing slightly lateral to the knee joint center documenting the aimed valgus angulation (HKA angle of 1° valgus) (Figure 7).

Postoperative findings

Postoperatively, knee ROM exercise, as tolerated, was started at the first day after the surgery. 10 kg partial weight-bearing with crutches was allowed for 4 weeks and then additional load with 10 kg per week to full weight-bearing. At the latest follow-up 12 months after surgery, the patient was asymptomatic with an improvement of knee extension range to Ext/Flex 0-0-140°. Radiographs revealed a HKA angle of 1.1° valgus, mMPTA 90.4°, CDI 0.9, and a posterior tibial slope of 6.7° (Figure 8, 9).

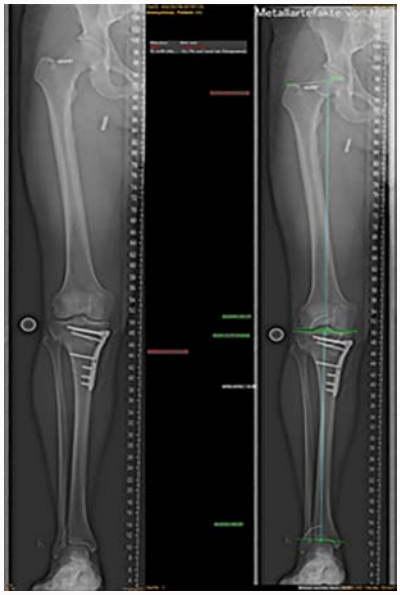

Figure 9: A postoperative full-length weight-bearing radiograph showing the mechanical axis of the right knee corrected to the neutral alignment.

Discussion

Conventional MOWHTO recommends valgus alignment to prevent recurrence of varus, as Fujisawa et al. recommended the aimed 62% of the weightbearing line ratio to unload the medial compartment of the knee adequately [1]. However, some reports have indicated unexpected overcorrection after MOWHTO [4,5].

The excessive alignment change to valgus position may lead to increased cartilage pressure on the lateral compartment and accelerate the lateral compartment knee OA [6,7]. Moreover, some reports have shown abnormal increases in mMPTA and joint line obliquity stress, affecting the functional and clinical outcomes after over correction in MOWHTO [8-10]. Therefore, excessive valgus correction should always be avoided. Recent studies have reported the target angle to a few degrees of valgus (1-2°) when performing MOWHTO, which is our approach when performing MOWHTO [11].

MOWHTO is also known to affect not only coronal alignment changes but also sagittal alignment changes such as patellar height and posterior tibial slope. Conventional MOWHTO involve coronal osteotomy of the tibial tuberosity and translocation distally, resulting in patellar infera and alteration of patellar tracking [12,13]. Therefore, in patients with patellofemoral problems, the biplanar osteotomy, in which the tibial tuberosity does not shift are recommended [14,15]. Several methods have been proposed, whereby all methods require additional screw fixation for tibial tuberosity.

Various studies have shown that MOWHTO may increase the posterior tibial slope, which increases stress on anterior cruciate ligament and patellofemoral joint pressure [16,17]. To avoid this change of tibial slope the hinge point should be lateral (not ventral or dorsal), and the opening angle should be equal between ventral and dorsal, meaning that the opening distance should be smaller ventrally and larger dorsally due to the triangular shape of the tibia at this location. This has to be controlled intraoperatively with an image intensifier on the lateral view. Additional Pins (or think Kirschner-wires – at least 2.5 mm, otherwise the K-wires easily bend) from the ventral aspect of the tibia may be helpful to control the sagittal plane.

The correction-osteotomy should be performed slowly and carefully due to bone sclerosis of the prior osteotomy. Problems with patellofemoral joint and posterior tibial slope are often complicated, therefore the tibial slope and patellar height correction should be aimed together. In the demonstrated case, the slope correction was performed by the biplanar distal tapering wedge-shaped cut of the tibial tuberosity and the ventral opening cut when performing the main osteotomy. As a result, the tibial slope correction could be achieved simultaneously with the valgus correction. The patella infera was also improved due to proximal and medial displacement of the tibial tuberosity accompanied with close wedge osteotomy. If an adequate correction cannot be obtained adequately with this technique, a tibial tuberosity osteotomy should be considered.

In the current case, a successful result was obtained. However, when performing MOWHTO, post-correction varus/valgus alignment should be carefully determined right away, and the risk for multidimensional unintentional effects should be kept in mind.

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