Pre-operative planning and surgical technique: How do I balance my ankles?

Jin Woo Lee, MD, PhD
Department of Orthopaedic Surgery, Yonsei University College of Medicine, Seoul, Korea.
E-mail: ljwos@yuhs.ac

Total ankle replacement is generally indicated for end-stage arthritis of the ankle joint refractory to conservative and other alternative surgical treatments. There is controversy regarding appropriate management of varus deformities. Varus or valgus deformity >20° have been considered a non-reconstructable malalignment and are suggested as a contraindication to TAR. Some insisted on narrowing the indication to <10° whiles others reported positive outcomes in ankles between 10 ~ 30°. Therefore, rather than establishing a definite criteria, we believe that it is more appropriate for the surgeon to be aware of his/her ability to completely correct the problems. Surgeons with little experience should be cautious when considering surgical treatment of a complex varus deformity while experienced surgeons can successfully manage greater degrees of deformity than possible in the past. Unmanageable instability and varus deformity due to neurologic disorders (e.g. hereditary motor sensory neuropathy) still remain absolute contraindications. Patients with deformed angulation in the ipsilateral limb proximal to the ankle should have the deformity corrected before TAR.

PREOPERATIVE PLANNING

Careful physical examination is necessary to assess the alignment of the ankle and hindfoot, the degree of instability and reducibility of the deformity, heel cord tightness, forefoot pronation, and adjacent joint osteoarthritis (OA). Imaging studies include weight-bearing ankle anteroposterior (AP) and lateral views, weight-bearing foot AP and lateral views, hindfoot alignment views, and long-bone lower extremity views. Varus and valgus stress views are also taken to check the degree of instability and the reducibility of the deformity. Magnetic resonance imaging scan can give additional information when associated soft tissue pathology such as peroneal or posterior tibialis tendon tear is suspected.

A malalignment of >10° in any plane in the supramalleolar or distal tibial region requires corrective osteotomy at the level of the deformity before TAR. If these are ruled out, then the degree of ankle varus and congruency of the joint is determined by measuring the tibiotalar angle (the angle between the anatomical axis of the tibia and a line drawn perpendicular to the talar dome), the tibial anterior surface (TAS) angle (the angle between the anatomical axis of the tibia and tibial plafond), and the talar tilt angle (the angle between tibial plafond and talar dome). If the TAS angle is neutral and the talar tilt angle is >10°, the joint is considered incongruent. In such cases, it is the talar tilt that causes the ankle varus. In a longstanding varus deformity, the medial structures are often contracted and bind the talus towards the medial malleolus. Therefore, sufficient release of medial contracture or tightness can bring the tilted talus parallel to the neutral plafond, yielding a neutral ankle. If there is residual talar tilt with lateral opening even after adequate medial release, or if there is minimal contracture on the medial side but laxity on the lateral side, then lateral augmentation procedures are required. Our treatment algorithm for achieving ligamentous balance in a varus ankle is shown in figure.
In a congruent varus deformity, the talus is tilted along with the varus inclined tibial plafond, yielding a talar tilt angle <10°. In such cases, medial release must be followed by a neutralizing tibial cut. Higher tibial bone cut at the level of most proximal bony defect is required to achieve a neutrally aligned articular surface. Usually, 2~4mm of additional plafond resection is enough and should not exceed 4mm since the thickest polyethylene is 9mm. Long-standing ankle varus is often associated with heel varus/valgus, heel cord tightness, and forefoot pronation. The surgeon should anticipate this before the operation, but the necessity of these additional procedures is determined intraoperatively, usually after inserting the trial component. Hindfoot arthrodesis can also be necessary in severe malalignment or instability cases.

RESULTS

Kim et al. performed various additional procedures to correct all associated deformities simultaneously with TAR in 23 ankles with preoperative varus deformity ≥10° and compared the results with 22 neutral ankles. All 23 ankles in the varus group required deltoid release, while posterior tibialis tendon lengthening was performed in one (4.3%), peroneus longus transfer to brevis in two (8.7%), lateral ligament reconstruction with modified Broström technique in two (8.7%), calcaneal valgizational osteotomy in three (13%), first metatarsal dorsiflexion osteotomy in one (4.3%), and heel cord lengthening in nine (39.1%). After a mean follow-up of 27 months (12 to 47), the varus ankles improved significantly in the visual analogue scale (VAS), American Orthopaedic Foot and Ankle Society (AOFAS) score, and range of motion (ROM). No differences were found between the varus and neutral ankle groups regarding all clinical and radiological outcomes. Furthermore, similar results were achieved when congruent and incongruent varus ankles were compared.

Possible Concerns and Future of the Technique

Currently, a major concern is the absence of long-term data of the varus ankles. Short-term and up to mid-term follow-up data showed satisfactory results in the varus ankles. However, trivial ligament imbalance and increased vertical micro-motion around the polyethylene can enhance polyethylene wear and this can affect the long-term outcomes. Also, the effects of using a thicker polyethylene and consequent elevation of the joint line in congruent varus ankles need further investigation.

TAR as a Spacer for Ankle/Subtalar Joint Instability

Beat Hintermann MD
Orthopaedic Clinic, Liestal, Switzerland

In the osteoarthritic ankle, there is evidence that the talus does often not stay in neutral position in frontal plane. Out of 829 osteoarthritic ankles that were treated with total ankle replacement, the talus was tilted into varus in 159 ankles (19%), and into valgus in 112 ankles (14%). In another 69 ankles with neutral talar position in frontal plane (8%), there was evidence of inframalleolar valgus or varus misalignment of calcaneus due to peritalar instability. These 340 ankles accounted for 41% of all 829 osteoarthritic ankles (Hintermann, intern registry, not published data). In 222 of these 340 ankles (65%), the hindfoot complex was well aligned and stable after total ankle replacement (HINTEGRA™ prosthesis) without any other procedure. One explanation may be that increasing height of the worn-out ankle with inserting components and PE insert between resected surfaces of tibia and talus may be an efficient measure to tighten the ligaments and thereby stabilizing the whole ankle joint complex. Another explanation may be that the parallelism of surfaces at primary and secondary interface of this 3-component prosthesis may have restored the intrinsic stability of the ankle in frontal plane, which has been lost by the wearing-out process before.

However, as the role of ankle prosthesis in stabilizing the ankle joint complex is not defined in detail yet, further studies are necessary to proof this hypothesis.