Osteotomies for Managing Varus and Valgus Malalignment with Total Ankle Replacement

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KEYWORDS

• Ankle • Joint replacement • Varus • Valgus • Osteotomy

KEY POINTS

- Advances in total ankle replacement (TAR) surgery in recent years allowed expansion of indications to include deformed ankles.
- Accurate preoperative planning and individualization of the procedure, is essential. Staged procedures are sometimes needed.
- Medial malleolus, fibula, supramalleolar, calcaneus, first metatarsal and proximal tibia osteotomies, can be performed to neutrally align a TAR.
- The choice of the procedure depends on the level of the deformity (intra-articular vs extra-articular; proximal, within, or distal to, the ankle).
- Equally good outcomes to nondeformed ankles can be obtained, if the TAR is well-aligned, but only short-term results have been published.

INTRODUCTION

Given that ankle arthritis is usually posttraumatic and a result of chronic instability, coronal plane (varus more frequently than valgus) malalignment is a common feature of degenerate ankles. Significant varus or valgus alignment (>10°, according to most investigators) has been considered a risk factor for early failure, and therefore a

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relative contraindication for total ankle replacement (TAR).[1,2] Malalignment and imbalance of the TAR should be avoided, as it would lead to abnormal distribution of contact pressures, polyethylene wear, osteolysis, and early failure.[3–9] Some surgeons have, however, expanded the indications of TAR to include ankles with preoperative deformity of 15° or more, performing adjunctive procedures to correct coronal plane alignment and stability (eg, subtalar or triple arthrodesis, osteotomies, soft tissue releases, and ligament reconstructions).[10–26] We present the rationale, surgical techniques, and outcomes of re-alignment osteotomies that have been described (ie, medial malleolus, fibula, distal or proximal tibia, calcaneus, first metatarsal) as adjunctive procedures performing TAR for deformed ankles. This article focuses on coronal plane deformities, but one has to bear in mind that ankle deformity rarely occurs in one plane only.

GENERAL CONSIDERATIONS AND PREOPERATIVE EVALUATION

It is generally acceptable, but also evidence proven, that surgical outcomes after TAR are better in experienced hands.[27] Therefore, it is essential that the surgeon has gained enough experience performing TARs in nondeformed ankles, before extending his or her indications. Nevertheless, it is not only the surgical skills and expertise, but also patients' selection and accurate preoperative evaluation of the problem and planning of the procedure that are key issues for success when performing these demanding operations. Appropriate preoperative patient counseling, assessment of patients' comorbidities (eg, diabetes mellitus), and also of their functional needs and expectations, are important issues that can guide decisions regarding a patient's suitability for a complex TAR. In other words, "treat the patient, and not just the ankle," or "patient's selection is important." In the era of increasing incidence of litigation against surgeons, it is essential to make the patient aware of the risk of early failure of the TAR, especially if preoperative deformity is present.

Careful clinical examination is required, to assess the following:

- Condition of the skin
- Scars from possible previous operations
- Circulation and sensation in the lower leg and foot
- Alignment of the whole extremity (knee, patellofemoral joint, and hip)
- Gait pattern
- Range of movement of the ankle and the surrounding joints
- Presence of soft tissue contractures (eg, Achilles tendon, gastrocnemius muscle, deltoid ligament)
- Function of the peroneal tendons (insufficiency in varus ankles, muscle spasm in valgus ankles)
- Function of tibialis posterior tendon (tendinopathy, insufficiency in valgus ankles and feet)
- Presence of clinical deformity (static and/or dynamic)
- Possibility of ligamentous instability (lateral or medial)
- Condition of the shoes (for increased wear on the lateral/medial heel)

Appropriate imaging is, obviously, essential. Weight-bearing (WB), anterior-posterior (AP), and lateral radiographs of the ankle and foot should be obtained. The foot/ankle lateral WB view reveals how flat the foot is and helps identifying degenerative changes in the other hindfoot joints. The talocalcaneal axis and talonavicular joint congruity (affected in planovalgus feet) are checked on the foot AP WB radiograph. Ankle AP WB and mortise views may be indicative of subfibular impingement