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Operative Techniques in
Orthopaedics

Salto Talaris Total Ankle Replacement

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Total ankle replacement is the subject of renewed interest in modern orthopedics because of advancements in implant design. The Salto Talaris total ankle replacement is a fixed-bearing implant approved for use in the United States, the design for which is based on a mobile bearing prosthesis used in Europe. The main indications for ankle replacement include pain relief in severe end-stage ankle arthritis. The surgical technique for the Salto Talaris uses an extensile anterior approach to gain access to the ankle joint, followed by multiple tibial and talar cuts using alignment guides. Proper precautions must be taken to avoid complications such as wound problems, iatrogenic fracture of the malleoli, and nerve injury. This article aims to describes the surgical technique for the Salto Talaris total ankle replacement.

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History

Total ankle arthroplasty, which was developed as an alternative to ankle arthrodesis, was plagued with initial complications and failures. First-generation implants were overly constrained, did not account for the significant rotational forces about the ankle, and were associated with radiographic loosening. In contrast to other total joint replacements, clinical series of the first-generation implants did not lead to predictable patient satisfaction.[1] The unconstrained first-generation prosthetic designs relied on the inherent stability of the ankle ligaments and soft tissue. However, results were still poor and stability was sacrificed for multiaxial motion.[1,2]

The second generation of total ankle implants featured improved designs and better fixation approaches. Modern ankle prosthesis designs now feature 3 components, consisting of the polyethylene bearing and the tibial and talar components. In addition, the overall understanding of physiological ankle motion has improved both implant design and implantation.[2] The newer implants also use improved osseous integration materials with in-growth characteristics that require no cement, allowing greater preservation of bone. Some second-generation implants include a mobile bearing between the tibial and talar component, whereas others use a fixed bearing. These bearings are made of ultra–high molecular weight polyethylene (UHMWP). The actual amount of relative motion that the mobile component provides in vivo compared to a fixed component is controversial.

In the United States, the only companies to offer FDA-cleared total ankle systems are DePuy, Wright Medical, and Tornier. In other regions of the world, however, a greater variety of prostheses are available. The Salto (Tornier, Saint Ismier, France) mobile-bearing ankle prosthesis has been used in Europe since 1997 and the Salto Talaris (Tornier, Stafford, TX) (Fig. 1) ankle replacement was recently approved for use in the United States. The fixed-bearing design includes a titanium tibial component with a tibial post, a highly conforming polyethylene articulating insert, and a talar component that resurfaces the anterior/posterior as well as lateral surfaces.

Indications

Total ankle arthroplasty is indicated for patients with severe, end-stage degenerative, rheumatoid or post-traumatic tibiotalar joint arthritis who have failed conservative management. In addition, patients with ipsilateral hindfoot (ankle and subtalar) arthritis who also require a triple arthrodesis would benefit from a total ankle replacement. Ankle arthroplasty is typically performed in older patients, although there

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Figure 1 Example of a Salto Talaris (Tornier, Saint Ismier, France).

is no specific age requirement, with lower demands and multiple-joint osteoarthritis or inflammatory arthropathy to relieve the unrelenting pain. Rheumatoid arthritis has been shown to be a predictive factor for a better outcome in total ankle replacement cases.[3] Contraindications for total ankle replacements include sepsis or joint infection (current or prior), large areas of avascular necrosis of the talus, skin lesion or deficit, absence of muscular function in the lower leg and foot, a Charcot or neuropathic joint, severe coronal plane deformity (>10°) or malalignment, deficient soft tissues, vascular insufficiency, severe loss of bone stock, severe osteoporosis, and marked ankle instability. Relative contraindications include diabetes, inability to follow postoperative regimen, morbid obesity, and heavy labor activity.

Surgical Technique

Preoperative Planning and Positioning

Preoperative planning is performed using 3 standard radiographic views of the ankle, with contralateral comparative films as needed. These views will help determine the implant size and the amount of anterior osteophyte resection needed to expose the tibial joint surface. More advanced imaging, such as CT to evaluate bone stock or MRI to evaluate talar necrosis, can be performed on an individual basis. After preoperative planning, the procedure is performed with the patient supine on a radiolucent table with a bump under the ipsilateral hip to correct external rotation of the extremity. It is important to have the patient's heel near the edge of the table and to use a bump under the calf to facilitate access to the surgical site. Use of a thigh tourniquet can also greatly aid visualization.

Approach

The surgical approach is an extensile anterior approach to the ankle joint using the interval between the anterior tibial and extensor hallucis longus tendons. Throughout the procedure, soft-tissue handling should be done delicately to lessen the chance of skin complications postoperatively. Subcutaneous dissection should be handled with care to avoid injury to the superficial peroneal nerve, and the extensor retinaculum can be divided between the tendons. After protecting the neurovascular bundle, retraction of the tendons should provide visualization and access to the ankle joint (Fig. 2). Overexuberant or prolonged retraction of the skin flaps should be avoided.

Bone Resection and Implantation

The anterior distal tibia and osteophytes should be removed to expose the roof of the pilon with an osteotome (Fig. 3). This will serve as the reference for tibial resection, so it is imperative to remove sufficient bone anteriorly. The tibial cut is performed first and the cutting guide uses the tibial shaft as a reference. After verifying that all adjustments on the guide are set to neutral, a pin is placed through the neutral hole of the proximal guide into and perpendicular to the tibial tubercle. The tibial alignment guide is then placed parallel to the tibial shaft and a pin is placed into the distal tibial shaft. The tibial alignment guide is adjusted 9 mm proximal to the tibial plafond and the tibial alignment jig is attached. The rotational alignment is adjusted to be in line with the axis of the talar body. The medial/lateral positioning is adjusted and the sizing hole that provides the largest size without compromising the malleoli is determined (Fig. 4). On the basis of previous measurements, the appropriate tibial cutting guide is used and all 6 holes in the guide are predrilled. Two short pins are placed in the superior holes to protect the malleoli, and a saw is used to cut the tibia. An osteotome is used to connect the predrilled holes, and care should be exercised to avoid and/or recognize any fracture in the tibia that may created during this step. The anterior distal tibia may then be removed.

The talar pin is next placed using the talar pin-setting guide positioned on the tibial guide with the ankle in neutral after drilling into the talus. The tibial guide is removed, but the settings as well as the tibial pins are preserved in the event that further tibial resection is required. The talar dome resection guide (Fig. 5) is placed onto the talar pin with the paddles resting flush on the articular surface of the talus, and the appropriate holes are drilled and pins placed into the posterior talar cortex (Fig. 6). Using ribbon retractors to protect the malleoli, a saw is used to cut flush on the surface of the pins until the top surface of all pins is visible. After removal of the talar bone, the remaining tibial bone can also be removed. The anterior chamfer guide is placed as posteriorly as possible on the talus and stabilized with 2 pins. A reamer is used to prepare the anterior chamfer. The talar position spacer (Fig. 7) is then used to confirm proper alignment, which is demonstrated by the spacer resting flush on the talar resected surface and the anterior tibial cortex is aligned with the appropriate calibration line. If the calibration line alignment is incorrect, further anterior chamfer resection may be needed. The lateral