Total Ankle Arthroplasty

An Overview of the Canadian Experience

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KEYWORDS

• Total ankle arthroplasty • Salto • HINTEGRA • INBONE • Zimmer • Mobility

KEY POINTS

- Mobile-bearing total ankle arthroplasty use has decreased in favor of fixed-bearing implants in Canada.
- Ankle arthroplasty is still a technically demanding procedure despite improvement in ankle arthroplasty and design.
- Canadian intermediate-term outcome studies comparing ankle arthroplasty and ankle arthrodesis identify comparable clinical results.

INTRODUCTION

Although early results from total ankle arthroplasty (TAA) have demonstrated improved functional outcomes versus ankle arthrodesis,[1,2] complication rates with TAA insertion are still substantial and the procedure should be restricted to patients with valid operative criteria and surgeons with sufficient experience.[3] Since its inception in the 1970s, with each successive iteration or phase of TAA development has come the realization that deformity correction, soft tissue balancing, and patient education are all equally important to successful outcomes.[4]

TAA has two fundamental design concepts: fixed/constrained and mobile-bearing. Initial device designs were highly constrained, whereas second- and third-generation systems are cementless two- or three-component systems with a polyethylene insert mobile or incorporated into the tibial or talar component (fixed).[5] Early complications specific to all TAA include a potential risk for malleolar fracture secondary to bone resection from the tibia.[6] Wound complications are also an issue, although they decrease with increasing surgical experience.[3]

Multiple implant options are available in Canada including fixed- and mobile-bearing designs. Mobile-bearing implants have had Health Canada approval since 2001

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(Scandavian Total Ankle Replacement [STAR], Waldemar Link, Hamburg, Germany), and the HINTEGRA (Integra Lifesciences, Newdeal SA, Lyon, France) was approved in 2003. Fixed-bearing implant use has been increasing since 2009 with the approval of the INBONE system (Wright Medical Group, INBONE Technologies Inc, Boulder, CO) and the Zimmer trabecular metal total ankle replacement (TAR; Zimmer Biomet, Oakville, Ontario, Canada) in 2013.

INDICATIONS AND CONTRAINDICATIONS TO TOTAL ANKLE REPLACEMENT

TAR is indicated for degenerative joint disease of the tibiotalar joint caused by trauma, osteoarthritis, and rheumatoid arthritis.[7] Relative contraindications to TAR include osteoporosis, smoking, diabetes mellitus, immunosuppression, neurologic disease, vascular disease, age, severe malalignment, instability, and avascular necrosis (AVN) of the talus.[7] Absolute contraindications are active infection, Charcot neuroarthropathy, and peripheral vascular disease (PVD).[7]

SURGICAL PLANNING

Surgical planning begins with a detailed history (Hx) and physical (Px) examination including the following[2]: muscle function, ankle range of motion (ROM), tendon excursion, standing limb alignment, gait, strength, peripheral vascular examination, skin quality, and hindfoot.

Next is a radiographic assessment with full-length limb alignment radiographs covering coronal plane malalignment and extra-articular malalignment. Computed tomography scan should include bone cyst evaluation, intra-articular pathology, and adjacent joint pathology. MRI is called for when there is concern regarding AVN. Finally, ischemic index evaluation is made.

SURGICAL APPROACH

All TAA models, except for the Zimmer implant, use a standard anterior approach to gain access to the tibiotalar joint.[8] The patient should be in supine position with a hip bump so that the coronal plane is parallel to the floor. A nonsterile tourniquet is used. A midline incision is centered one fingerbreadth lateral to the anterior tibial spine. The incision is started approximately 6 to 8 com proximal to the tibiotalar joint line and carried past the joint line by 4 to 5 cm.

Sharp dissection down through the skin and subcutaneous tissue, with ample care of the soft tissues, is followed by marking of the superficial peroneal nerve (SPN) nerve with a marking pen so it may be protected during the entirety of the case. The extensor retinaculum is incised in line with the skin incision and the interval between the extensor hallucis longus (EHL) and tibialis anterior (TA) tendons is identified.

An incision is made over the extensor hallucis longus (EHL) tendon sheath, and the neurovascular bundle is retracted laterally. The TA is maintained within its sheath to prevent postoperative bowstringing. Hemostasis is achieved with electrocautery. Self-retaining retractors are inserted to retract the lateral and medial soft tissues. Excessive ROM of the ankle should be avoided with self-retainers in situ to prevent damage to the skin edges.

The joint capsule is incised in line with the skin incision creating medial and lateral flaps via periosteal elevation. These flaps should be continued until both the medial and lateral gutters can be visualized. The elevation of the joint capsule is extended just to the level of the talonavicular joint. Anterior tibial and talar osteophytes are