Ankle Arthrodesis

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KEYWORDS

• Ankle • Arthrodesis • Fusion • Tibiotalocalcaneal

Ankle arthrodesis was first described by Albert in 1879 as part of a knee and ankle fusion in a child suffering from palsy.[1] The early 1900s saw the use of arthrodesis in the ankle and foot for stabilization of paralysis secondary to polio. Then, in the 1950s, Charnely introduced an external fixator device for compression arthrodesis. His method was the first to use surgical hardware to place a compressive force across the arthrodesis site, thereby improving surgical outcomes. However, Charnely used a down to bone transverse incision at the level of the ankle joint, resulting in transection of tendons, nerves, and vascular structures with resulting sequelae.[2]

Building from Charnely's idea of compression across the osteotomy site, modern techniques for ankle arthrodesis now favor internal screw fixation, intramedullary nailing, arthroscopic joint preparation, plating, and improved external fixators. This resulting improvement in equipment technology and refinement of surgical technique have significantly improved fusion rates and decreased postoperative complications.

INDICATIONS

Painful arthrosis of the ankle joint with or without concurrent deformity is the primary indication for arthrodesis.[3,4] The typical candidate presents with a history of trauma, often involving articular damage to the ankle joint.[5] Specifically crushing injuries, comminuted fractures, and ankle sprains involving condylar cartilage injury are present. Other causes for ankle degeneration indicating arthrodesis may include failed implant, neoplasms, avascular necrosis, infection, Charcot, and congenital deformity.[6–9] Systemic arthritides, such as rheumatoid, show high correlations with ankle and subtalar deformities and degeneration. Michelson and colleagues[10] showed most rheumatoid patients experienced foot and ankle arthritis, 20% of whom have radiographic changes. Saltzman and colleagues[5] found 12% of patients in their study had arthritic ankles secondary to rheumatoid.

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CONTRAINDICATIONS

When considering ankle arthrodesis, adequate soft tissue quality is of the utmost importance. Comorbidities including peripheral vascular disease, lymphedema, and venous stasis may prevent a patient from tolerating more involved tissue dissection and put the patient as risk for infection and amputation.[9,11,12] Smoking tobacco merits consideration because it has been shown to have a negative impact on bone fusion.[13] Complex lower extremity deformity with recurrence or progression may result in an unfavorable outcome. Other factors such as the patient's age, activity, quality of life, and surgical risk versus benefit need to be taken into consideration.

PREOPERATIVE ASSESSMENT

The initial clinical evaluation should determine any previous traumatic events, including sprains or fracture, because these are the most common cause of ankle arthritis.[2–4] Additional historical inquiry should screen for systemic illness including obesity, osteoporosis, gout, arthritis, infection, diabetes mellitus, neuropathy, and peripheral vascular disease. The patient's medications should be carefully reviewed because immunosuppressives are a standard therapy for inflammatory arthritides. Physical examination follows standard neurovascular testing and palpation for tender locations indicating concurrent disease. Biomechanical examination follows standard protocol with walking and static evaluation and special attention paid to the alignment of the rearfoot. This assessment should be a bilateral lower extremity examination, taking into account any existing deformity that may prevent a plantigrade foot. Sometimes the patient has an extremity or postural deformity that, on placing the ankle into normal alignment, inhibits a pain-free functional surgical outcome. The ankle may be put into a more neutral position for a forefoot valgus or greater than 5° valgus to compensate for a forefoot varus.[14]

Plain film radiographs may or may not show findings consistent with the clinical pain of which the patient is complaining.[15] However, often osteophytic formation, decreased joint space, and asymmetrical joint contour are hallmarks of an arthritic ankle.[16] In addition to the standard anterior posterior, mortise, and lateral views, long leg axial calcaneal views allow assessment of the hindfoot deformity (**Fig. 1**).[17] When considering surgical fusion one should seek out adjunctive imaging in the

Fig. 1. Positioning and resultant radiograph of the long leg axial calcaneal view.