

# RETROSPECTIVE ANALYSIS OF SUBTALAR ARTHRODESIS UTILIZING *IN-SITU* CARTILAGE RESECTION

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Historically, there have been many different surgical approaches to address subtalar joint (STJ) pathology. The triple arthrodesis has long been the standard treatment for isolated STJ disorders with or without midtarsal joint dysfunction. Recent studies have suggested isolated subtalar fusions as another surgical alternative to rectifying isolated STJ pathology. The first to perform isolated STJ fusions was Van Stockum in Germany in 1912. Later, Gallie in 1943 utilized this technique for post-traumatic calcaneal fractures.<sup>1</sup> It was Grice in 1955 that popularized the isolated STJ fusion by utilizing *en bloc* grafting for subtalar arthrodesis.<sup>2</sup> Russotti et al., in 1988, also described the benefits of using autogenous bone grafting for isolated subtalar joint fusions.<sup>3</sup> *En bloc* resection of the posterior facets has become popular in recent years, and is a widely accepted method for performing arthrodesis of the subtalar joint.<sup>4</sup> Simple *in-situ* resection of the cartilaginous surfaces is another method which has not gained widespread popularity among surgeons. The authors will review 15 cases where the subtalar joint was fused utilizing the *in-situ* cartilage resection technique.

## INDICATIONS

Multiple pathological occurrences of the subtalar joint warrant fusion. These include degenerative osteoarthritis (Fig. 1), talo-calcaneal coalition, aseptic necrosis of the talus, acquired pes valgo planus deformity, and severe cavo-varus deformity (Fig. 2).<sup>4</sup> Underlying neuromuscular diseases such as spina bifida, cerebral palsy, or Charcot-Marie-Tooth Disease may also warrant fusion of the subtalar joint.<sup>25</sup> Patients who have severe arthrosis of the subtalar joint following fracture of the



Figure 1. Preoperative lateral radiograph of patient M.T. Note the degenerative changes present about the subtalar joint.



Figure 2. Photo depicting an axial calcaneal projection of patient J.M. Note the calcaneal varus deformity.

calcaneus are also candidates for arthrodesis.<sup>6</sup> In essence, isolated fusion of the subtalar joint may be performed on any patient who has significant pathology in the subtalar joint, without profound arthrosis or deformity involving the midtarsal joint.<sup>6</sup>

### AUTHORS' TECHNIQUE

A ten centimeter modified Ollier incision is utilized. The incision begins just inferior to the lateral malleolus and courses distally just superior to the floor of the sinus tarsi. The incision terminates just distal to the calcaneocuboid articulation. If a triple arthrodesis is being performed, the incision is lengthened to the fourth metatarsal base in order to gain adequate exposure of the calcaneocuboid articulation. Atraumatic dissection through the subcutaneous tissues is then performed, avoiding damage to the sural nerve as it courses along the lateral aspect of the foot.

Once adequate visualization of the deep fascia is accomplished, it is incised beginning at the anterior leading edge of the lateral talar process until the floor of the sinus tarsi is visualized. The incision is then carried anteriorly between the peroneal tendon sheath and the muscle belly of the extensor digitorum brevis. Subperiosteal dissection is then performed, releasing the contents of the sinus tarsi. The interosseus talocalcaneal ligament is also transected. Once adequate evacuation of the sinus tarsi is accomplished, a lateral capsulotomy of the subtalar joint is performed. The calcaneo-fibular ligament is transected for later reapproximation. A lamina spreader is then inserted into the sinus tarsi, and the articulating facets of the subtalar joint distracted and visualized. At this point, only the cartilage is resected using a combination of curettes and periosteal elevators. It is important to realize that the subchondral bone plate is not resected, but is left intact to provide flush approximation of the arthrodesis site. In order to promote bleeding into the fusion site, the subchondral bone plate is fenestrated with a .062 inch smooth Kirschner wire or a small 1.0 or 1.5 mm drill. Once the cartilage is resected, the medial incision for placement of fixation is created.

A three centimeter incision is created just medial to the tibialis anterior tendon at the level of the talar neck. Once layered dissection is complete and the dorsal aspect of the talar neck is appreciated, the foot is then reduced to its desired

position. With the foot in its desired position, temporary fixation is then obtained. The authors' preferred method of fixation is a large self-drilling, self-tapping 6.5 mm or 7.3 mm cannulated screw. The guide wire for the screw is then driven from the talar neck, through the posterior facet, and is seated into the main tuber of the calcaneus.

Intra-operative radiographs consist of a lateral and calcaneal axial projection to evaluate the position of both the fusion site and the fixation (Figs. 3A, 3B). When adequate placement is noted, the large cannulated screw of appropriate length is then driven over the guide wire and tightened appropriately. The guide wire is



Figure 3A. Lateral intra-operative view to evaluate the position of the guide pin for the cannulated screw system.



Figure 3B. Axial view.

removed, and radiographs are once again obtained to ensure that the position of the fusion and the fixation is adequate. Copious irrigation is performed, followed by reapproximation of the calcaneo-fibular ligament. The remainder of the deep fascia is closed with 2-0 synthetic absorbable suture. Subcutaneous and skin closure is then performed. A surgical drain may be used to collect drainage from the deep tissues and bone. A short-leg cast is then applied with the foot at 90 degrees to the leg.

### POSTOPERATIVE CARE

Postoperative management consists of strict non-weight bearing for 6 to 8 weeks, or at least until radiographic evidence of consolidation has occurred. The patient is then allowed to bear weight in a removable walking cast until the 12 week mark. Gradual return to normal shoes is then encouraged, as tolerated. Hardware is removed only if it creates a problem for the patient.

### MATERIALS AND METHODS

Eighteen patients underwent nineteen subtalar joint fusions utilizing the *in-situ* cartilage resection technique. All charts were objectively reviewed and preoperative and postoperative data were compiled. The average patient age at the time of surgery was 47.0 years, with a range of 17 to 77 years. Average follow-up at the time of this study was 32.4 months, with a range of 5 to 96 months. Eight of the eighteen patients underwent an isolated subtalar joint fusion, while nine others underwent a triple arthrodesis. Two patients had a concomitant ankle arthrodesis performed.

Eight patients underwent the arthrodesis for tibialis posterior dysfunction. Five of the patients suffered from a tarsal coalition. These two diagnoses accounted for 68.4% of the indications. The remaining six fusion cases consisted of Charcot arthropathy (1), post-traumatic arthritis (2), pes cavus (2), and Charcot-Marie-Tooth (1). All patient information is listed in Table 1.

Table 1

### PATIENT INFORMATION

Name	Sex	Age	Diagnosis	Follow-up	Other Fusions	Fusion Time
C.P.	F	48	Charcot	24 mos.	Midtarsal fusion, N-C fusion	8 wks.
E.L.	F	77	T.P.D.	36 mos.	Midtarsal fusion	7 wks.
M.G.	M	35	Tarsal Coalition	12 mos.	None	4 wks.
D.F.	M	17	Tarsal Coalition	18 mos.	None	3.5 wks.
S.S.	F	45	T.P.D.	18 mos.	None	5 wks.
J.M.	F	58	Pes Cavus	12 mos.	None	6 wks.
T.S.	F	55	T.P.D.	36 mos.	Midtarsal fusion	4.5 wks.
T.S.	F	55	T.P.D.	24 mos.	Midtarsal fusion	6 wks.
M.T.	F	55	D.J.D.	5 mos.	None	5 wks.
A.S.	F	25	Tarsal Coalition	7 mos.	Midtarsal fusion	4 wks.
B.B.	F	30	Tarsal Coalition	12 mos.	Midtarsal fusion	5 wks.
V.C.	F	32	Tarsal Coalition	84 mos.	None	6 wks.
J.C.	F	48	T.P.D.	72 mos.	Midtarsal fusion	5 wks.
B.B.	F	62	T.P.D.	36 mos.	None	6 wks.
G.M.	M	47	T.P.D.	36 mos.	Midtarsal fusion	4 wks.
J.L.	F	42	Pes Cavus	28 mos.	Ankle arthrodesis	5 wks.
M.H.	F	48	D.J.D.	36 mos.	None	5 wks.
J.H.	F	52	T.P.D.	96 mos.	Midtarsal fusion	7 wks.
L.H.	M	62	C.M.T	24 mos.	Ankle arthrodesis	4 wks.

## RESULTS

All nineteen fusion cases achieved 100% consolidation. The average time to fusion was 4.6 weeks, with a range of 3.5 to 8 weeks. All postoperative positions were within acceptable ranges in all three planes. There were no major infections, hematomas, or delayed unions in all fifteen cases. Two patients developed a superficial wound dehiscence with a superficial infection. The infections were resolved with a seven-day course of intravenous antibiotics and went on to heal uneventfully.

## DISCUSSION

Fusion of the subtalar joint is a well-described procedure for the treatment of several pathologies. Many different techniques have been described in the literature. The concept of *in-situ* cartilage resection is not a new one, although the authors feel it is under-utilized. *In-situ* resection of the cartilaginous surfaces of the subtalar joint maintains the anatomical configuration of the facets to allow for maximal bone on bone apposition. It is important to remember that the subchondral bone plates must be fenestrated to allow for bleeding within the fusion site. Failure to do so could result in a delayed union or nonunion. One of the drawbacks to resecting the entire joint in an *en bloc* fashion is that when the talus is drawn posteriorly to meet with the calcaneus, it creates a fault in the talo-navicular joint which could lead to early arthrosis.<sup>4</sup> The authors' technique minimizes this possibility.

The authors recommend utilizing this technique for cases where mild to moderate amounts of deformity exist. If a severe deformity does exist, then wedge resection of the joint surfaces may be indicated, although the authors have yet to revert to this technique. The authors have found that a significant amount of frontal plane correction may be obtained after resection of the cartilaginous surfaces alone (Figs. 4, 5) The authors have shown that *in-situ* cartilage resection is a viable technique when pain and deformity necessitate fusion of the subtalar joint.



Figure 4. Postoperative lateral radiograph of subtalar fusion. Note the complete consolidation present.

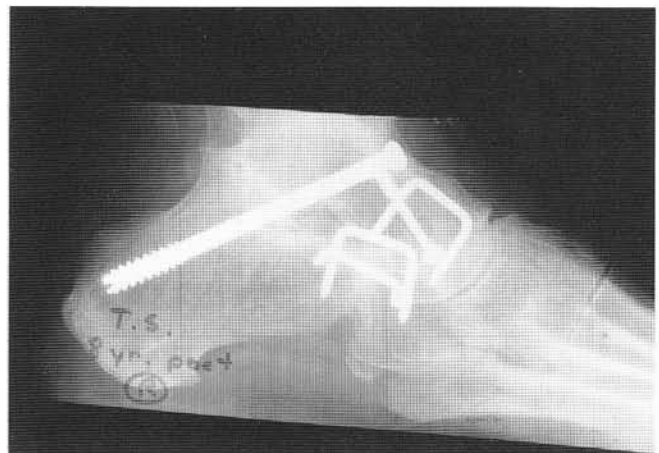


Figure 5. Lateral x-ray showing solid arthrodesis of the subtalar joint in conjunction with fusion of the midtarsal joint complex (triple arthrodesis).

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