SIMULTANEOUS CALCANEOCUBOID AND TALONAVICULAR FUSION
LONG-TERM FOLLOW-UP STUDY

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We examined 16 feet, 33 to 133 months (mean 83) after simultaneous calcaneocuboid and talonavicular fusions performed for a variety of painful disorders of the hindfoot. Objectively, four feet were rated excellent, eight good, four fair and none poor. There was one asymptomatic nonunion of the talonavicular joint. Progressive degenerative arthritis of the ankle was seen in six patients and of the naviculocuneiform joint in seven.

Biomechanically, simultaneous calcaneocuboid and talonavicular arthrodesis is better than an isolated talonavicular fusion and is a simple and effective alternative to triple arthrodesis.

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Although triple arthrodesis was for long the procedure of choice for the painful and deformed hindfoot, there has been a trend in recent years to perform limited hindfoot arthrodeses for certain indications. Subtalar arthrodesis is now widely accepted as a treatment for post-traumatic talocalcaneal arthritis (Gallie 1943; Hall and Pennal 1960; Mann and Baumgarten 1988; Scarraton 1991) and isolated talonavicular fusion is used for post-traumatic arthritis or early peritalar subluxation in rheumatoid arthritis (Elbar et al 1976; Fogel et al 1982).

The senior author (DEB) was introduced to the concept of simultaneous calcaneocuboid and talonavicular fusion by Dr Henri DuVries in the 1970s. In an early edition of DuVries’ Surgery of the foot, Inman (1973) reported the good results of the operation in 40 patients with ‘‘symptomatic flexible flat foot’’, but to our knowledge there are no other reports in the literature of the results of this procedure. We do not advocate its use for symptomatic flexible flat foot but believe that the operation has other indications.

PATIENTS AND METHODS

Between January 1980 and June 1988, 19 patients had 20 simultaneous tarsal arthrodeses, all performed by the senior author (DEB). There were 16 patients (16 feet) available for review; one patient (the bilateral case) had died and two others had been lost to follow-up. The patients were interviewed and examined by MRC. Their average age at the time of operation was 45 years (14 to 78); there were eight men and eight women. The average duration of follow-up was 83 months (33 to 133). The usual indication for surgery was pain, often associated with deformity. The subtalar joint was not arthritic, and the principal deformities were in the talonavicular and calcaneocuboid joints. During the same period, DEB performed triple arthrodeses for severely deformed feet, and for those with a varus hindfoot.

The causes of the pain and deformity were chronic rupture of the posterior tibial tendon (7), post-traumatic arthritis of the talonavicular joint (3), rheumatoid arthritis (2), planovalgus deformity after poliomyelitis (1), Charcot-Marie-Tooth disease (1), peroneal palsy (1) and symptomatic adolescent planovalgus foot (1). There had been one case of superficial postoperative wound infection and one patient had required a later removal of osteophytes and loose bodies from the ankle which had been arthritic before the tarsal fusion.

Operative technique. The surgical procedure involves two incisions, the first medial to the talonavicular joint and the second laterally over the calcaneocuboid joint. If necessary, exposure of the subtalar joint is achieved by extending the lateral incision proximally. The articular surfaces are denuded, using osteotomes and curettes. Deformities are corrected, but not overcorrected, by appropriate bone cuts. For instance, in a valgus abducted foot, more bone is removed from the medial and plantar than from the lateral and dorsal aspects. Several methods of fixation are used: bone staples, 6.5 mm cancellous screws, and temporary percutaneous pins, sometimes in combination. The aim is to achieve absolutely rigid fixation. Bone grafts are not used. Postoperatively, the foot is immobilised in a cast for ten
weeks, non-weight-bearing for five weeks and weight-bearing for five. Six of the patients had other forefoot procedures performed at the same time.

**Evaluation.** Patients were asked to assess their pre- and postoperative levels of pain on a pain scale (Table I; Mann and Baumgarten 1988) and were rated for subjective function on the scale advocated by Johnson, Johnson and Unni (1988) (Table II). They were questioned on the effect of the operation on their gait, lifestyle, occupation and shoe wear, and all feet were examined for alignment and callosities. The range of motion and stability of the ankle were noted. Radiographs were taken to evaluate the fusion and to detect the presence or absence of degenerative changes in other joints of the foot.

The criteria of Patterson, Parrish and Hathaway (1950) and Wetmore and Drennan (1989) were used for the objective evaluation (Table III).

**RESULTS**

On average the patients graded their pain as 3.3 preoperatively and 0.8 postoperatively (see Table I). Nine patients had no pain postoperatively, three had pain after heavy use, two after light use and two on weight-bearing. Twelve patients wore normal shoes, two wore modified shoes, one wore a custom-made shoe and one required an ankle-foot orthosis (for a pre-existing condition). One of the two patients whose injuries had been sustained at work returned to his original occupation seven months postoperatively; the other retired from his occupation, but is currently working and has settled his compensation case.

Seven patients were completely satisfied with the postoperative function of the foot, six were satisfied but had minor reservations, and three were satisfied but with major reservations. None was dissatisfied. The average range of ankle motion was 46° (10 to 70), 9° of dorsiflexion (0 to 20) and 37° of plantar flexion (0 to 60). In every case there was less motion on the operated than on the non-operated side and hindfoot (subtalar) motion was eliminated in all cases. One patient had lateral ankle instability in inversion. Fifteen had a valgus hindfoot and one had a 5° varus hindfoot. Five patients had required removal of staples or screws under local anaesthesia. All patients had normal or only slightly diminished mid-foot motion.

Nine patients had normal postoperative alignment of the foot, four had slightly pronated feet, and one had 5° of ankle varus and a small callosity at the base of the fifth metatarsal.

One patient with rheumatoid arthritis had a severe valgus deformity of the foot and ankle secondary to a malunited fracture of the distal fibula and progression of the ankle arthritis. The other patient with rheumatoid arthritis had a pronated abducted foot with severe ankle degeneration. The gait was normal in 11 patients and abnormal in five (for causes unrelated to the foot in two). No patients used a stick when walking.

The radiographs showed non-union of one talonavicular joint in a cavus foot but the patient was asymptomatic. In the two patients with rheumatoid arthritis, the ankles showed severe arthritis. In three patients there were moderate degenerative changes and in one minor changes. The naviculocuneiform joint showed moderate degenerative changes in three feet and minor changes in four. Several of the subtalar joints showed slight degeneration compared with the appearance on preoperative radiographs. Examples of long-term results are shown in Figures 1 and 2.
Fig. 1b
Post-traumatic talonavicular arthritis. Preoperative and ten-year postoperative radiographs.

Fig. 1c

Fig. 2a
Posterior tibial tendonitis. Preoperative and five-year postoperative radiographs.

Fig. 2c
DISCUSSION

Overall, our results with simultaneous tarsal fusions have been satisfactory. Objectively, 75% of patients had good or excellent results and none had a poor result. Subjectively, 81% of patients were satisfied. Radiographically, only the subtalar joint developed mild degenerative changes which were asymptomatic.

Most feet requiring hindfoot fusion today are painful but not severely deformed. This is in contrast to most reports in the literature in the past on the indications for triple arthrodesis (Patterson et al 1950; Wilson et al 1965; Howorth 1974; Adelaar et al 1976; Williams and Menelaus 1977; Angus and Cowell 1986; Bennett, Graham and Mauldin 1991). Thus, the Lambrinudi triple arthrodesis (Lambrinudi 1927; MacKenzie 1959; Tang, Leong and Hsu 1984) is now rarely indicated. The use of more limited arthrodeses has been facilitated by CT and MRI which can demonstrate precisely which joints are damaged, and by improved methods of internal fixation. Isolated subtalar arthrodesis is now often indicated for post-traumatic arthritis, a large talocalcaneal bar, or a ruptured posterior tibial tendon (Gallie 1943; Hall and Penhal 1960; Mann and Baumgarten 1988; Johnson 1989; Scranton 1991). Some motion is retained at the talonavicular and calcaneocuboid joints resulting in a less rigid foot. Arthrodesis of the talonavicular joint alone has been recommended for peritalar subluxation in rheumatoid arthritis and for isolated talonavicular arthritis (Elbar et al 1976; Fogel et al 1982; Scranton 1991). We are concerned, however, about the 9% rate of nonunion reported in one series of talonavicular arthrodeses. It is well known that fixing the transverse tarsal joints eliminates talocalcaneal motion (Lapidus 1955), and therefore simultaneous tarsal arthrodesis produces the same mechanical construct as does a triple fusion, or, for that matter, a talonavicular fusion.

Although Inman (1973) originally described the operation for symptomatic flexible flat foot that is not, in our opinion, a good indication for this procedure. We believe that the calcaneocuboid arthrodesis should be added when an isolated talonavicular fusion is found not to be rigidly stable intraoperatively. The medial side of the joint, for instance, tends to open up because it has been denuded of its articular surfaces while the lateral side has been left intact. Simultaneous tarsal arthrodesis should also be considered when the full versatility of a triple arthrodesis is not required. If the deformity can be corrected without excising the subtalar joint, we see little advantage in doing so.

Isolated talonavicular arthritis and peritalar subluxation in rheumatoid arthritis are also better treated by a simultaneous tarsal rather than a single arthrodesis. The added morbidity is minimal and stability is maximised by securing both the medial and lateral columns of the foot. Where foot deformity is principally at the transverse tarsal joint (as is often seen from chronic posterior tibial tendon rupture), we also prefer simultaneous talonavicular and calcaneocuboid arthrodesis, proceeding to triple arthrodesis only if the deformity proves not to be completely correctable intraoperatively.

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REFERENCES


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