PES PLANUS IN CHILDHOOD DUE TO TIBIALIS POSTERIOR TENDON INJURIES

TREATMENT BY FLEXOR HALLUCIS LONGUS TENDON TRANSFER

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Flat foot due to rupture of the tibialis posterior tendon has not previously been described in children. We present three young patients who developed unilateral pes planus after old undiagnosed lacerations of the tendon. Transfer of the flexor hallucis longus to the distal stump of the tibialis posterior tendon achieved good results in all three cases.

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Rupture of the tibialis posterior tendon has been increasingly recognised as a cause of painful flat foot in adults (Johnson 1983). There is usually no obvious underlying pathology in athletes (Woods and Leach 1991) but patients with rheumatoid arthritis (Downey et al 1988) and degenerative disease may be at increased risk due to degeneration.

Direct end-to-end repair of the ruptured tendon is often impossible due to retraction of the proximal end and, in these cases, tendon transfer of the flexor digitorum longus has achieved good results (Mann and Thompson 1985; Funk, Cass and Johnson 1986).

Injury to the tibialis posterior tendon presenting as pes planus in childhood has not previously been described. We report three such cases which were treated by transfer of the tendon of flexor hallucis longus.

CASE REPORTS

Case 1. A healthy five-year-old boy attended an orthopaedic clinic in November 1987 for assessment of his flat feet. He had bilateral flexible pes planus more marked on the right side; a small scar was visible posterior to the medial malleolus on this side at the site of a laceration caused by broken glass 18 months previously. This wound had been sutured and dressed, but not formally explored.

No specific treatment was prescribed and the child was reviewed annually for the next three years. The left foot improved gradually but by June 1991, despite the use of heel cups and medial arch supports, there was valgus of the right hindfoot, forefoot abduction and loss of the medial longitudinal arch (Fig. 1). A diagnosis of rupture of the tibialis posterior tendon was made and in July 1991, at the age of nine years, he underwent exploration of the tendon through a curved posteromedial incision. It was found to be 90% transected with the divided ends embedded in scar tissue which tethered them to the tendon sheath and immobilised the tendon.

After excising the scar tissue there was insufficient tendon to perform end-to-end repair. The flexor hallucis longus tendon was divided and its distal end was attached to flexor digitorum longus, thus forming a common flexor for all five toes. The proximal end of flexor hallucis longus was then sutured to the distal stump of the tibialis posterior tendon with the foot held supinated and in equinus. The proximal end of the tibialis posterior tendon was sutured to the musculocutaneous junction of flexor hallucis longus (Fig. 2).

A below-knee cast was applied with the foot in supination and equinus and worn for six weeks. Two years after the operation, there was excellent restoration of the medial arch and only slight forefoot abduction. The calcaneum assumed a stable varus position when the heel was actively raised off the ground. Ankle movement was from 20° dorsiflexion to 35° plantar flexion and subtalar movements were unrestricted. There was no reduction in the range of flexion of the hallux.

Weight-bearing radiographs showed that the lateral talocalcaneal angle had improved from 52° to 40° and the lateral talus to first metatarsal angle from 11° to 4°. Anteroposterior views showed that the talocalcaneal angle had improved from 34° to 20° and the angle between the talus and the second ray was reduced from 28° to 21°.

Case 2. In July 1990, a 12-year-old girl was referred to an orthopaedic clinic for assessment of her flat feet which had not improved with the use of medial arch supports. The left foot was normal but the right foot had marked...
loss of the medial longitudinal arch and an abducted forefoot. The heel failed to go into varus when actively raised. Deficiency of the tibialis posterior was diagnosed. Plain radiographs of the lumbar spine showed spina bifida occulta at the L5 level, but a contrast lumbosacral myelogram was normal.

In October 1990, when the patient again attended the clinic, a small scar was noted behind the right medial malleolus. The parents remembered that this had been caused by a cut on broken glass at least five years previously; no medical attention had been sought at the time. An injury to the tibialis posterior tendon was then diagnosed and in November 1990 a surgical exploration revealed complete rupture of the tendon with attenuated scar tissue between the divided ends. A tendon transfer procedure using flexor hallucis longus was performed as described in case 1.

At review, 27 months postoperatively, the patient expressed her satisfaction that the foot "no longer turned out". The medial arch was well restored and the thrust at 'toe-off" was unaffected. Movements at the ankle and subtalar joints were unrestricted.

The lateral talocalcaneal angle had improved from 57° to 47° and the lateral talus to first metatarsal angle from 6° to 0°. The talocalcaneal angle had improved from 35° to 19° and the angle between the talus and the second ray was reduced from 26° to 9°.

Case 3. An eight-year-old boy attended the orthopaedic clinic in August 1990 with a painful left foot and was found to have a pronated abducted forefoot. A diagnosis of peroneal spastic flat foot was made. Radiographs of the foot, an isotope bone scan and CT of the subtalar joint were all normal and the patient was given a course of physiotherapy. No improvement ensued and in November 1990 the foot was examined and manipulated under a general anaesthetic. During this procedure a small scar was noted below and behind the medial malleolus and the possibility of a tendon injury was raised. On subsequent questioning neither the patient nor his parents could recall an injury at that site. The foot was immobilised with the forefoot in supination and the hindfoot in equinovarus but when the cast was removed after six weeks the deformity rapidly recurred.

In February 1991 the tibialis posterior tendon was explored and found to be completely ruptured. Its ends were retracted and attenuated scar tissue filled the gap.
between them. A tendon transfer procedure using flexor hallucis longus was performed as already described.

At review 25 months postoperatively the foot was painfree, all activities were unrestricted and the medial arch was well restored. There was no weakness of halluc flexion and ankle movements were from 25° dorsiflexion to 40° plantar flexion.

The lateral talocalcaneal angle had improved from 44° to 40° and the lateral talus to first metatarsal angle from 6° to 0°. The talocalcaneal angle had changed from 22° to 16° and the talus second metatarsal angle from 14° to 8°.

**Pedobarographic assessment.** All three patients had pedobarographic assessment of both feet at least two years postoperatively using the Musgrave Pressure Plate System (W. M. Automation and Preston Communication Ltd, Llangollen, Clwyd, UK). Three trials were performed on each patient using the non-operated foot as a control. We recorded peak forefoot pressures in each case and the trials were averaged. In all three patients the centres of load and the pressure distribution during the stance phase were similar in the operated and the non-operated feet, as was the percentage of the gait cycle occupied by the propulsion phase. There was no prolongation of the midstance phase, and loading of the hallux during push-off was equal in both feet. These findings indicate that the flexor digitorum longus had effectively replaced the flexor hallucis longus as a flexor of the great toe and that tibialis posterior function had been restored.

**DISCUSSION**

Rupture of the tibialis posterior tendon in adults is usually a closed injury and occurs in degenerate tendons of middle-aged or older patients (Mann and Thompson 1985; Funk et al 1986) or those with rheumatoid arthritis (Downey et al 1988). Our three patients all had scars in the region of the medial malleolus, indicating old open injuries to the tibialis posterior tendon. The tendon is tightly bound down by the tendon sheath in this area and is therefore particularly vulnerable to injury. The presence of unilateral pes planus in a child should prompt an inspection of the skin over the medial malleolus for evidence of an old injury. The absence of pain in the foot does not exclude the diagnosis as only one of our three patients had pain. Adult feet with tibialis posterior ruptures are usually painful (Johnson 1983).

Previously, tendon transfers for the repair of old injuries of the tendon have used flexor digitorum longus as the motor (Jahss 1982; Mann and Specht 1982; Mann and Thompson 1985; Funk et al 1986) because flexor hallucis longus was thought to play an important role at push-off and in stabilising the medial longitudinal arch. All three of our patients, however, regained normal push-off, and the combination of flexor digitorum longus (attached to the stump of flexor hallucis longus) and flexor hallucis brevis gave adequate flexion of the hallux. Furthermore, the use of flexor hallucis longus may have advantages. It is a much larger muscle than flexor digitorum longus (Sutherland 1966) and approximates more closely to the size of tibialis posterior. It can therefore counter more effectively the pull of peroneus brevis.

Radiographs of the foot have been found to be unreliable in diagnosing rupture of tibialis posterior tendon. The talocalcaneal angle on lateral and anteroposterior weight-bearing views of the foot is sometimes increased but this is not a constant feature (Funk et al 1986). Radiographs may be more useful in assessing the results of surgery. In all three of our patients the postoperative radiograph showed that the lateral talocalcaneal, anteroposterior talocalcaneal, and talus to second metatarsal angles had improved.

Unlike open wrist wounds, injuries around the ankle do not always raise the suspicion of a tendon injury. The possibility of tibialis posterior tendon injury in lacerations around the medial malleolus should be borne in mind.

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**REFERENCES**


