TEAR OF THE PLANTAR CALCANEONAVICULAR (SPRING) LIGAMENT CAUSING FLATFOOT

A CASE REPORT

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Acquired flatfoot deformity after injury is usually due to partial or complete tearing of the tendon of tibialis posterior, with secondary failure of the other structures which maintain the medial longitudinal arch. We describe a patient in whom the rupture of the plantar calcaneonavicular (spring) ligament resulted in a clinical picture similar to that of rupture of the tendon of tibialis posterior. Operative repair of the ligament and transfer of the tendon of flexor digitorum gave an excellent result at four years with the patient returning to full sporting activities.

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Acquired pes planus is due to a failure of the osseoligamentous complex which maintains the medial longitudinal arch of the foot. This complex consists of the deltoid, spring, plantar and talocalcaneal interosseous ligaments, together with the capsule of the talonavicular and naviculocuneiform joints.¹ These structures maintain the normal relationships between the calcaneus, talus, navicular and medial cuneiform bones. The tibialis posterior with its tendon inverts the midfoot and elevates the medial longitudinal arch. Pes planus due to dysfunction of the tibialis posterior²⁻⁷ and tears of its tendon have been well documented in athletes.^{8,9} We have been unable to find any report of isolated tears of the spring ligament causing this deformity.

ANATOMY

The plantar calcaneonavicular (spring) ligament is a broad, thick band connecting the anterior margin of the sustentaculum tali of the calcaneus to the plantar surface of the navicular. It lies below the head of the talus, forming part of the articular cavity for its head and thus limits flattening of the medial longitudinal arch of the foot. The dorsal surface of the ligament is a triangular fibrocartilaginous facet on which part of the head of the talus rests. Its plantar surface is supported by the tendon of tibialis posterior medially and those of the flexor hallucis and flexor digitorum longus laterally. Its medial border is blended with the anterior fibres of the superficial part of the deltoid ligament of the talocrural joint.

CASE REPORT

A 19-year-old college triple jumper was seen six months after an eversion injury to the left foot and ankle sustained on the 'jump' phase of the triple jump. He had been unable to continue and had immediate swelling on the medial aspect of his foot and ankle. He was thought to have an ankle 'sprain' and was treated by intensive physiotherapy after resolution of the swelling. After six months he still had pain on the medial side of the ankle and foot, was unable to jump and had definite flattening of the medial longitudinal arch.

Examination showed a pes planovalgus deformity of the left foot with a positive 'too many toes' sign⁵ (Fig. 1). The medial aspect of the foot was tender, particularly over the talonavicular joint which appeared to be deformed. The plantar fascia and deltoid ligament were intact and the tibialis posterior showed grade-5 power. The single heel-raise test was achieved only with difficulty and repetitive heel raises were impossible. The heel remained in a valgus position on heel raise.

Plain anteroposterior and lateral radiographs, taken weight-bearing, showed a moderate decrease in the height of the medial longitudinal arch at the talonavicular joint. Ultrasonography confirmed that the tendon of tibialis posterior was intact and normal in appearance. By exclu-

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Fig. 1

Photograph of both feet on weight-bearing showing valgus of the left heel and a 'too many toes' sign.

Fig. 2

Photograph taken at operation showing a normal tibialis posterior tendon (largest arrow) and an extensive tear of the spring ligament (medium arrows) extending into the talonavicular capsule (smallest arrows). The incision was extended in order to harvest the tendon of flexor digitorum longus.

Fig. 3

Photograph four years after operation showing a normal appearance on weight-bearing.

sion, a diagnosis of rupture of the spring ligament was made.

Surgical exploration and reconstruction confirmed that the tendon of tibialis posterior was normal. A tear of the spring ligament was found to extend into the talonavicular capsule (Fig. 2). Repair was by plication with the capsule of the talonavicular joint, in a 'vest-over-pants' procedure.⁷ The flexor digitorum longus (FDL) was then divided just proximal to its division into its digital slips, passed through a drill hole in the navicular from the plantar to the dorsal aspect and sutured back to itself with the foot held in about 60% of inversion. The distal end of the FDL was sutured to the flexor hallucis longus tendon. A below-knee cast was worn for six weeks and followed by six weeks of intensive physiotherapy aimed to improve inversion strength.

The patient returned to competitive sport six months after operation. Four years later he remained free from symptoms, had a normal medial longitudinal arch, and no valgus deformity (Fig. 3).

DISCUSSION

Acquired pes planus is due to mechanical uncoupling of the bones of the tarsus. The two commonest causes are lesions of the tendon of tibialis posterior and osteoarthritis of the midtarsal joint, both of which are usually seen in middle-aged and elderly patients. In younger patients, the differential diagnosis includes fracture dislocation of the midtarsal joint and tears of the tendon of tibialis posterior, the deltoid

ligament, the plantar fascia¹⁰ or the spring ligament.

It has been shown in cadaver specimens that the plantar fascia and plantar ligaments contribute more to the stability of the arch than the spring ligament,¹¹ and that tibialis posterior tendon contributes to stability only in the dynamic phase of gait.¹² Most of the lesions which may cause acquired pes planus have been well described, but we have been unable to find a description of a traumatic tear of the spring ligament which led to pes planus.

Treatment of acquired pes planus aims to reconstruct the attenuated soft tissues allowing a normal bony alignment. Experimental studies have shown that use of the tendon of peroneus longus¹³ or a superficial deltoid ligament-bone autograft¹⁴ may give a satisfactory reconstruction of the medial longitudinal arch.

In our patient repair of the spring ligament and the talonavicular capsule provided some reconstruction of the medial longitudinal arch, but since the deformity had been present for six months, further reinforcement of the soft tissues on the medial aspect of the foot was performed. Transfers of the tendons of flexor digitorum longus^{3,4,6,7} and flexor hallucis longus¹⁵ have been used with good effect in the treatment of other causes of pes planus, but restoration of deformity has not been achieved consistently.^{4,6} In our case repair and tendon reinforcement corrected the deformity and relieved pain.

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