RESECTION FOR SYMPTOMATIC TALOCALCANEAL COALITION

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Over a nine-year period, 20 feet with persistently symptomatic talocalcaneal coalition were treated by resection of the bar. The 17 patients were all under 16 years of age. Excellent or good long-term results were achieved in the ten feet in which preoperative coronal CT had shown that the area of coalition measured 50% or less of the area of the posterior facet of the calcaneum. In these feet heel valgus was less than 16° and there were no radiographic signs of arthritis of the posterior talocalcaneal joint. Talar beaking was present in 70% of these feet but it did not impair the clinical result.

Fair or poor results were observed in the ten feet in which preoperative CT had shown the area of relative coalition to be greater than 50%. In these feet, heel valgus was greater than 16° and most had narrowing of the posterior talocalcaneal joint and impingement of the lateral process of the talus on the calcaneum.

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In talocalcaneal coalition there is a bar of bone or fibrocartilage between the middle facet of the calcaneum and the talus. Resection of the bar has been recommended for patients with persistent symptoms unrelieved by immobilisation in a cast or the use of orthoses (Danielsson 1987; Olney and Asher 1987; Scranton 1987; Takakura et al 1991), but it is unclear whether all varieties of coalition of the middle facet are suitable for resection. Takakura et al (1991) restricted resection to children and adolescents. Scranton (1987) undertook resection both in adults and in children but limited the procedure to feet in

which the width of the coalition was less than half the width of the talocalcaneal joint. Both authors advised against resection in feet with radiographic evidence of degenerative narrowing of the talocalcaneal or talonavicular joints. Talar beaking, a common appearance on the radiographs, was thought to represent a dorsal traction spur and was not considered a contraindication to resection, although Olney and Asher (1987) found that mild symptoms often persisted after resection in such cases.

We have studied the influence of the extent of the coalition and the degree of talar beaking on the outcome in children under 16 years of age.

PATIENTS AND METHODS

Between January 1982 and January 1991, 17 children with 20 persistently painful feet due to talocalcaneal coalition were treated by excision at the Royal Children's Hospital, Melbourne. Three children had bilateral excisions. All the children were under 16 years of age at the time of surgery (Table I).

Table I. Preoperative details of 20 feet (17 patients) with talocalcaneal coalition

	Number
Clinical	
Number of feet	20
Rigid planovalgus deformity	20
Spasm of the peroneal muscles	20
Duration of symptoms (mth; range)	40 (4 to 120)
Age at operation (yr; range)	13 (9 to 15)
Radiographic (19 feet)	
Talar beak	11
Flattening of lateral talar process	1
Narrow posterior talocalcaneal joint	2
CT (17 feet)	
Coalition area (mm ²)	56 (16 to 106)
Size of coalition relative to posterior calcaneal facet (%; range)	46 (10 to 78)
Heel valgus (degrees)	17 (8 to 34)
Narrow posterior talocalcaneal joint	8
Lateral talar process impingement on the calcaneum	8

They all complained of persistent pain in the hindfoot which severely limited walking and running. These symptoms had not been improved by immobilisation in a cast or the use of orthoses. Every symptomatic foot had a

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Coronal CT of a patient with bilateral talocalcaneal coalition. On the right heel valgus was measured as 90° minus angle a. On the left the maximum widths of the coalition (b) and the posterior calcaneal facet (c) were measured.

Fig. 1

rigid planovalgus deformity, a tender prominence of the medial aspect of the calcaneum beneath the malleolus and spasm of the peroneal muscles (Table I). Radiography and CT showed that seven of the children had unilateral and ten bilateral coalition. Only three children had bilateral excision. In six of the bilateral cases one side was asymptomatic and in one arthrodesis of one foot had been undertaken after a poor result from previous resection in the other foot. Of the 20 coalitions that had been excised, two were fibrocartilaginous and 18 were osseous.

Operative technique. In 17 feet, preoperative coronal CT was used to map the extent of the coalition (Figs 1 and 2). The method of resection was based on the techniques of Olney and Asher (1987) and Scranton (1987). A curvilinear incision was made over the sustentaculum tali. After dividing the flexor retinaculum, the neurovascular bundle was retracted towards the sole and the flexor digitorum longus and tibialis posterior tendons were retracted dorsally. The anterior and posterior margins of the coalition were identified with needles and the tissue between them was resected using dental burs, rongeurs, curettes or osteotomes. The resection was considered complete when a rim of articular cartilage of the middle facet became visible and the subtalar joint was mobile. After resection of large coalitions the cartilage margin may be incomplete. The sustentaculum tali was preserved to provide support for the medial aspect of the talus.

The wounds were thoroughly irrigated to remove fragments of bone and subcutaneous fat from the buttock or fat from between tendo Achillis and the deep flexor compartment was placed in the defect. The fat graft was kept in position by closure of the flexor retinaculum. The foot was immobilised in a below-knee plaster cast for three weeks followed by active exercises of the ankle and foot for a further three weeks. Weight-bearing was allowed at six weeks.

Bilateral resections were staged, the more sympto-

Fig. 2

Diagram of the three calcaneal facets and area of coalition prepared from several 5 mm coronal CT slices. The area of the coalition relative to the area of the posterior calcaneal facet was 59%. As the shapes of the coalition and of the posterior calcaneal facet are irregular, ratios of their widths yield widely varying results in different slices (compare slices 5 and 8).

matic side being operated on first and the other side 6 to 12 weeks later.

Assessment of outcome. Clinical and radiographic assessments were made preoperatively, postoperatively and at review 12 to 109 months later (Table II). A pilot study at 12 months showed that the results did not alter after this time.

The symptomatic results were rated using visual analogue pain and disability scales (Huskisson 1974; Million et al 1982; Olney and Asher 1987) graded as follows: excellent, no postoperative pain or disability; good, occasional low-grade pain but no disability; fair, improved but with persistent limitation of activity; and poor, no improvement or worse. Patients who had persistent spasm of the peroneal muscles were rated as

poor, or fair if the pain and disability were less than before operation. Foot shape, tenderness, spasm of the peroneal muscles and range of motion of the ankle, subtalar and midtarsal joints were also recorded (Olney and Asher 1987).

All but one of the pre- and postoperative radiographs were available. Seventeen patients had preoperative CT and all but one had CT at review.

Beaking of the talus, flattening of the lateral talar process and narrowing of the posterior talocalcaneal joint were recorded from the radiographs (Olney and Asher 1987). Preoperative CT with 5 mm slices was used to measure, in each slice, the width of the coalition, the width of the posterior facet of the calcaneum, the cross-sectional area of the coalition relative to the area of the posterior facet of the calcaneum, the degree of heel valgus, narrowing of the posterior talocalcaneal joint and impingement of the lateral talar process on the calcaneum (Figs 1 and 2). Similar measurements and an assessment of the adequacy of the resection were made on the postoperative CT scans in 18 feet.

Heel valgus was calculated from coronal CT as 90° minus the angle formed between a line extending from the midpoint of the trochlear surface of the talus to the centre of the plantar surface of the calcaneum (Fig. 1). The ankle was a more reliable reference plane than the top of the CT table or the skin of the heel since it did not vary with the position of the foot.

The cross-sectional area of the coalition, in the horizontal plane, was calculated from the maximum width of the coalition on each coronal slice and from the number of slices showing the coalition (Figs 1 and 2). The osseous component of fibrocartilaginous coalitions was also measured in this manner. To compensate for different foot sizes and for magnification, the cross-sectional area of the coalition was expressed as a percentage of the area

Table II. Results of surgical excision for talocalcaneal coalition

	Number
Symptomatic relief	
Excellent	8
Good	2
Fair	4
Poor	6
Objective result	
Mobile planovalgus foot	10
Rigid planovalgus foot	10
Spasm of the peroneal muscles	10
CT (18 feet)	
Incomplete resection	2
Narrow posterior talocalcaneal joint	10
Lateral talar process impingement on the calcaneum	9
Heel valgus (degrees; range)	15 (5 to 28)

of the posterior facet (Fig. 2). The ratio of the widths of the coalition and of the posterior facet of the calcaneum on a single coronal CT slice was an unreliable measure of the relative size of the coalition as it varied with the slice because of the irregular shapes of the coalition and the posterior facet (Fig. 2).

RESULTS

At review ten feet had an excellent or good symptomatic outcome (Table II). These feet rapidly regained painless subtalar motion without spasm of the peroneal muscles and the early satisfactory results persisted for up to nine years. They remained planovalgus on weight-bearing, however, and there was no significant change in heel valgus (Tables I and II). The patients were not troubled by the foot shape and shoe wear was not excessive. CT of these feet showed complete resection of the coalition in every case and a normal posterior talocalcaneal joint (Table II; Fig. 3).

Fig. 3

CT 12 months after resection on the left. Preoperatively, the relative area of the coalition was 45% and heel valgus was 14° . The symptomatic result was excellent. The right foot shows a coalition of a similar size which was not treated since it produced minimal symptoms.

Fig. 4

The ten feet which had a fair or poor symptomatic outcome (Table II) remained painful with spasm of the peroneal muscles and rigid planovalgus deformity. The unsatisfactory outcome was evident within a few months of the removal of the cast and commencement of mobilisation. In two of these feet, CT showed an extension of the coalition into the anterior facet which had not been resected. All had degenerative narrowing of the posterior talocalcaneal joint and nine had impingement of the lateral talar process on the calcaneum (Table II; Fig. 4).

We then looked for predictors of the symptomatic outcome. Inadequate resection was one factor but it only accounted for two of the ten feet with unsatisfactory results. The age at operation, gender, duration of symptoms and previous non-operative treatment did not correlate with the symptomatic outcome. An unsatisfactory result was consistently found, however, in feet in which preoperative CT showed a relative coalition area of greater than 50%, heel valgus of more than 16°, narrowing of the posterior talocalcaneal joint and impingement of the lateral talar process on the calcaneum (Table I; Figs 5 and 6). Talar beaking on preoperative radiographs did not correlate with outcome (Fig. 7). It was present preoperatively in 33% of feet with a relative coalition size of more than 50% and in 70% of feet with smaller coalitions.

DISCUSSION

Our findings confirm that good results can be obtained after resection of small areas of coalition of the middle facet of the talocalcaneal joint (Scranton 1987) and that fair or poor results followed resections of larger coalitions.

To select suitable feet for resection, coronal CT is necessary as plain radiographs provide insufficient detail. Careful assessment of radiographs and transverse CT

CT 12 months after resection on the right which preoperatively had a relative area of coalition of 61% and heel valgus of 18°. The posterior talocalcaneal joint is narrow indicating osteoarthritis. The clinical result was poor.

Fig. 5

Histogram relating the symptomatic outcome of 17 feet to the severity of heel valgus determined from preoperative coronal CT. The horizontal 16° line separates feet with an excellent outcome from those with a poor or fair outcome.

scans is also required to exclude other deformities such as a calcaneonavicular coalition (Mosier and Asher 1984; Wiles, Palladino and Stavosky 1989; Warren et al 1990). MRI has been used to assess the type and extent of coalition (Masciocchi et al 1992). It provides more detail about fibrocartilaginous bars and about the state of the

Fig. 6

Histogram relating the symptomatic outcome of 17 feet to the area of the coalition expressed as a percentage of the area of the posterior facet of the calcaneum. The 50% line separates feet with an excellent outcome from those with a poor or fair outcome. The relative areas of coalition in the two feet with poor results (*) were underestimated as the scans did not extend to the front of the coalition. Postoperative CT showed that there was coalition of the anterior facet.

Fig. 7

Histogram relating the symptomatic outcome of 19 feet with talar beaking on the preoperative radiographs.

posterior talocalcaneal joint but was not used in the present study.

If coronal CT is used to measure the area of the coalition the scans should extend beyond the anterior and posterior boundaries of the coalition as we underestimated the size of two coalitions which extended into the anterior facet.

Coalitions with a relative area of 50% or less were associated with less than 16° of heel valgus, normal thickness of the posterior talocalcaneal joint and absence of impingement of the lateral talar process on the calcaneum. Resection of such coalitions produced satisfactory long-term clinical and radiographic results. The feet remained planovalgus but were mobile with little or no pain and no disability. Talar beaking, which was present in 70% of such feet, did not impair the clinical outcome. This observation supports the suggestion that the talar beak is a traction spur rather than an osteoarthritic osteophyte (Scranton 1987; Takakura et al 1991). We do not know whether resection of small coalitions in adults would also produce satisfactory results, as reported by Scranton (1987), since our patients were all less than 16 years old at the time of surgery.

Coalitions with a relative area of more than 50% were associated with heel valgus of more than 16° and there was often mild narrowing of the posterior talocalcaneal joint and impingement of the lateral talar process on the calcaneum. They proved unsuitable for resection and arthrodesis is therefore recommended for such cases. Our observations confirm the opinion of Scranton (1987) that resection should be restricted to feet with small coalitions. We also agree with the recommendations of Scranton (1987) and Takakura et al (1991) that degenerative narrowing of the posterior talocalcaneal joint is a contraindication. Mild narrowing of the posterior talocalcaneal joint, as seen in the present study, should be regarded as early osteoarthritis since it progressed postoperatively to obvious osteoarthritis.

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