A REVIEW OF ELONGATION OF OS CALCIS FOR FLAT FEET

G. E. PHILLIPS

From the Prince of Wales Orthopaedic Hospital, Cardiff

Between 1959 and 1974 the late Dillwyn Evans treated severe symptomatic flat feet by elongating the os calcis. The long-term follow-up of 20 of these patients with a total of 23 feet is presented 7 to 20 years after the operation. At review 17 of the 23 feet showed very good or good results and it was concluded that this is a useful procedure for severe cases of flat feet which appears to stand the test of time.

The operative treatment of symptomatic flat foot has proved to be extremely difficult and this is well illustrated by the fact that no single technique has been accepted universally.

The statement of J. Albert Key that he had not been "favourably impressed by the various operative procedures for the correction of flat foot" stimulated Crego and Ford (1952) into studying the results of five different types of operation for this condition. They came to the conclusion that whatever operation was performed it should include arthrodesis of the subtalar joint. Although other operations are available, the most popular procedures still appear to embody some form of arthrodesis of the hindfoot with inevitable loss of movement and consequent difficulty in negotiating uneven ground (Williams and Menelaus 1977).

In 1975 Dillwyn Evans described an operation for the treatment of flat foot which he had used since 1959: the principle of the procedure was the reverse of that underlying his earlier procedure for uncorrected talipes equinovarus (Evans 1961). In the latter condition, he considered the outer border of the foot to be too short, whereas in flat foot he regarded the lateral arch, which he saw as the foundation of the foot, to be too short and the operation was designed to lengthen this by inserting a tibial bone graft immediately behind the calcaneocuboid joint.

Although Dillwyn Evans' results were mostly gratifying in the short term, it is important to know that such improvement can be maintained. The literature abounds with accounts of the short-term results of a whole variety of procedures for this condition, but long-term reviews are much less common and in some of those which have appeared (Seymour 1967) early promise has not been maintained, largely due to the development of osteoarthritis in the hindfoot. It was therefore decided to review the cases which Evans reported, some of whom had had their operations performed over 18 years earlier, paying particular attention to the question of deterioration and the development of osteoarthritis.

OPERATIVE TECHNIQUE

An oblique incision is made over the lateral surface of the calcaneus, above, and parallel with, the peroneal tendons. The sural nerve is protected and the anterior end of the calcaneus is divided through its narrow part in front of the peroneal tubercle using an osteotome. The osteotomy is made parallel with, and 1.5 centimetres behind, the calcaneocuboid joint (Fig. 1). The cut surfaces of the calcaneus are prised apart by means of a spreader specially designed for the purpose (Evans 1975). A graft of cortical bone taken from the ipsilateral tibia is inserted between the blades of the spreader to maintain separation of the two pieces of calcaneus. The spreader is removed and more bone grafts are inserted above and below the initial graft (Fig. 2). Correction of the deformity is assessed at this stage. Where difficulty is found in opening the spreader it may be necessary to elongate the peroneal tendons.

Fig. 1

Diagram to illustrate site of insertion of the bone graft into the calcaneus.

Fig. 2

Radiograph of the left foot to show the bone graft in position.
The wound is dressed and the foot immobilised in a plaster cast in a position of slight equinovarus for four months to allow consolidation of the new calcaneus. Weight-bearing is allowed at four weeks. No after care is needed when the plaster is removed.

CLINICAL MATERIAL AND METHOD

Twenty patients were traced for review providing a total of 23 flat feet that had undergone elongation of the os calcis. All the patients had initially presented with pain, severe deformity and significant disability as described by Evans in his original account (1975). Fifteen patients had suffered from severe idiopathic flat foot while in four patients the condition had been secondary to poliomyelitis. One case had been caused by division of the tibialis posterior tendon and three other cases by over-corrected talipes equinovarus. The average age at operation was 15 years, range from 9 to 42 years. The average period of follow-up was 13 years, range 7 to 20 years.

At review an overall assessment of each foot was made using the following criteria: relief of symptoms; clinical appearance—unsatisfactory features included the persistence of a flattened longitudinal arch, a prominent talar head and a valgus heel; function—ability to walk normally and free of pain over uneven ground; mobility of joints; and radiographic evidence of correction of deformity on anteroposterior and lateral views, maintenance of correction, and the development of any osteoarthritic changes. The patient's own assessment of the value of the operation was also elicited. The patients were asked specifically to comment on whether they thought that their feet had been improved with regard to pain, shape and function, had been made worse, or whether there had been no change. They were also asked whether they experienced pain on exertion, whether they could wear standard shoes comfortably or if they needed arch supports, and whether any of the symptoms they experienced affected their ability to work or participate in sporting activities.

The sural nerve, the site of the donor bone and the tightness of the calcaneal tendon were also assessed. The range of movement of the ankle and midtarsal joints was measured using a goniometer and the range of subtaloid movements measured by McMaster's method (McMaster 1976). Photographs of the feet were taken and compared with those taken before operation.

RESULTS

On the basis of the overall assessment the results of operation were classified as very good, good, fair or poor. Very good results. The results of operation in two feet were very good; the feet were symptomless and of clinically normal appearance (Figs 3 to 8). The function was very good, the patients having no difficulty in walking over uneven ground and no problem wearing normal shoes. Mobility was also very good. These patients had a good painfree range of movement of all foot and ankle joints with at least 25 degrees of subtaloid movement.

Anteroposterior radiographs revealed full correction, but a partial correction on the lateral view was considered acceptable (Figs 9 to 14). There was no evidence of osteoarthritic changes.

Good results. Fifteen feet were classified as good; they were symptomless and of clinically normal appearance, with good function and mobility, and without evidence of loss of correction clinically or radiologically. Correction of the deformity was seen on anteroposterior radiographs but not on lateral views, although a partial improvement was seen to have been obtained. Mild osteoarthritic changes were present but confined to the calcaneocuboid joint.

Fair results. Three feet were classified as fair. The patients had mild symptoms with some pain on exertion only which did not interfere with work or sport; all joints

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A boy aged 11 years with asymptomatic flat feet from birth developed increasing deformity and painful medial arches. He underwent bilateral operations in 1970. Figures 3 and 4—Before operation. Figures 5 and 6—Clinical photographs taken in 1972 to show correction. Figures 7 and 8—Clinical photographs taken in 1979 to show that correction has been maintained.
were mobile and free of pain with at least 20 degrees of subtaloid movement. Full correction had not been obtained clinically or radiologically but the position had been improved considerably. Deterioration in position had not been shown radiologically at review but mild osteoarthritis had occurred at joints other than the calcaneocuboid, mainly in the talonavicular joint.

**Poor results.** Three feet (three patients) were classified as poor. One foot had improved postoperatively but later showed regression with a break at the talonavicular joint. All patients were symptomatic and thought the operation unsatisfactory. Clinically and radiologically the feet were of poor shape with a valgus heel. Additional osteoarthritic changes were present in joints other than the calcaneocuboid. Movements of the subtaloid joint were 10 degrees or less.

Seventeen of the 23 feet reviewed showed an undoubted improvement which had stood the test of time, the results had been fair in three and there were only three feet which could be regarded as outright failures.

**DISCUSSION**

Undoubtedly the most contentious issue in the treatment of severe flat foot is the need to operate at all. Many individuals can function satisfactorily throughout their lifetime in spite of marked deformity and, therefore, any procedure which might further reduce the mobility of the foot by arthrodesis of joints in the hindfoot is not to be contemplated lightly. It is probably considerations of this kind which have led to diminishing enthusiasm for operative treatment and indeed the topic does appear to figure much less prominently in the literature than was formerly the case. Nevertheless, some cases are very severe, particularly if secondary to a neurological condition, and the operation proposed by Dillwyn Evans would appear to be a satisfactory solution (Figs 15 and 16). Its outstanding advantage is that it does not result in significant stiffness in any of the joints of the hindfoot and the patient is therefore unlikely to be made worse.

From the nature of the procedure it might have been expected that secondary stiffness might well develop as a result of osteoarthritis, but from this review it would appear that these changes are in fact relatively slight and mainly confined to the calcaneocuboid joint where the effect on movement is not great.

Only three of the patients in this study were disappointed with the procedure but their unsatisfactory results may have been due to the inevitable progression of symptoms due to the underlying disorders.

The majority of cases were idiopathic but their results did not appear to be significantly different from those of the small group of patients who had developed flat feet secondary to some other condition. Evans himself felt that the procedure was contraindicated in spina bifida where the poor quality of the recipient bone led to
sinking of the graft with loss of contour. He also thought that in his hands the operation was unsuccessful in cases of cerebral palsy because there was a tendency to over-correct the flat foot. However, his pessimism has not been shared by other surgeons in Cardiff where the operation is still being used to treat flat feet associated with cerebral palsy. It must be noted that in this series no patients with cerebral palsy or spina bifida came for review. It is concluded that, with the exception of the above, elongation of os calcis is a useful procedure for severe cases of primary and secondary forms of flat feet which appears to stand the test of time.

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REFERENCES


