THE BATCHelor–GRICE EXTRa-ArticULAr SUbTALAR ARThRODeSiS

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A new technique is described for extra-articular subtalar arthrodesis; it combines the main elements of the Batchelor and the Grice procedures. Results were reviewed after a minimum of three years. Of the 25 feet treated 24 had solid fusion and had maintained the operative correction of the valgus deformity; the one non-union was due to deep infection.

In 1952 Grice introduced the concept of extra-articular subtalar arthrodesis. This was designed to correct valgus deformity of the hindfoot in children, without disturbing the growth of the foot. Grice’s procedure is technically difficult and recurrent deformity can be a problem. Batchelor’s modification of the procedure, although technically easy, has a high rate of non-union. We have combined the principles of the two procedures to develop an extra-articular arthrodesis which is technically easy, which maintains the correction obtained at operation and which has a high rate of union.

THE OPERATION

A lateral incision extends from the peroneal tendons across the sinus tarsi and the neck of the talus to the tibialis anterior tendon. The sinus tarsi is cleared of fat and the neck of the talus is exposed between the tibialis anterior and the toe extensors, avoiding the neurovascular bundle. A channel is drilled across the neck of the talus, through the sinus tarsi and into the os calcis, with the hindfoot held in the reduced position. An incision is made over the middle third of the fibula and a fibular graft is excised subperiosteally. A measured segment of this graft is inserted into the channel across the neck of the talus. A second fibular graft is now inserted across the mouth of the sinus tarsi into slots cut out of the adjacent os calcis and talus (Fig. 1). Any excess graft is replaced in the periosteal tube of the fibula, which is resutured. If the calcaneal tendon is tight it is lengthened.

An above-knee plaster cast is applied. Weight-bearing begins at eight weeks and the plaster is removed after 12 weeks.

MATERIALS AND METHODS

Nineteen patients were reviewed after an average period of five years (range 3 to 11 years). Six of them had had bilateral fusions making a total of 25 feet for review, all of which had valgus deformity of the foot before operation with lateral subluxation of the calcaneus under the talus. Ten feet had required an associated lengthening of the calcaneal tendon. The aetiology of the deformities was polio in eight patients, spina bifida in four, cerebral palsy in four, Marfan’s syndrome in one, Down’s syndrome in one and spinal muscular atrophy in one. The average age at operation was seven years (range 2 to 11 years). Radiographs taken in the weight-bearing position

Fig. 1

Diagram to show the position of the Batchelor graft (dotted) and the Grice graft (black). The channel for the Batchelor graft should begin just distal to the articular cartilage of the ankle. The Grice graft should be at right angles to the sole of the foot.
Figures 2 to 5. This boy had spastic equinovalgus deformity of the left foot treated by a combined Batchelor and Grice extra-articular arthrodesis. After treatment he could walk outdoors using crutches but without calipers. Figure 2—At the age of seven years. Note the severe displacement of the os calcis under the talus and the abnormal talocalcaneal angle. Figure 3—Four months after fusion; the talocalcaneal angle has been corrected. Figure 4—Two years after fusion; new bone is seen across the sinus tarsi. Figure 5—Five years after fusion; the subtalar joint is solidly fused and the bony architecture of the foot is normal.

were used for assessment of both union and adequacy of correction. The talocalcaneal angle was measured on the lateral radiograph before and after operation and at final follow-up.

RESULTS
Solid fusion was achieved clinically and radiologically in 24 of the 25 feet (Figs 2 to 5). The single case of non-union was the result of deep infection causing resorption of both grafts. With the exception of this case of non-union, talocalcaneal relationships were restored to within normal limits in all feet and had not changed by final follow-up.

Clinically all the heels were in mild but not exaggerated valgus. In the patient with Marfan’s syndrome, some pre-operative pes planus improved, but because of ligamentous laxity of the midtarsal joints the longitudinal arches did not re-form. In two of the spastic feet tightness of the heel cords recurred and rocker-bottom deformity developed, but these features did not alter the talocalcaneal relationship.

All the fibulae regenerated and neither instability nor valgus deformity of the ankle were seen.

DISCUSSION
In 1952 Grice introduced the concept of extra-articular arthrodesis of the subtalar joint in children. This is universally accepted and used for the treatment of valgus deformity of the foot. Fusion across the sinus tarsi leaves the articular cartilage undisturbed and allows growth of the talus and the calcaneus. Grice’s original technique of grafting a block of corticocancellous bone from the iliac crest across the sinus tarsi was, however, difficult to perform and led to a number of poor results (Pollock and Carrell 1964; Smith and Westin 1968; Tohen et al. 1969; Engström, Erikson and Hjelmstedt 1974). This is because it can be difficult to fit such grafts across the mouth of the sinus tarsi. The grafts may slip out of position postoperatively and result in recurrence of the valgus deformity; or, in order to fit the grafts tightly, the hindfoot may be forced into a varus position and result in overcorrection.
The most significant modification in the Grice technique was that devised by Batchelor. A fibular peg is inserted blindly from the neck of the talus, through the sinus tarsi into the os calcis (Brown 1968; Seymour and Evans 1968). Because the graft is not seen to cross the sinus tarsi it may not be extra-articular, and because only a single cortical graft is inserted, a high rate of non-union has been reported (Gross 1976; Hsu et al. 1976). Shearing forces may fracture the graft, which crosses the sinus tarsi obliquely.

Dennyson and Fulford (1976) modified Batchelor’s procedure by substituting a screw for the fibular graft and placing cancellous grafts into the sinus tarsi. Union was obtained in over 95% of their cases but problems relating to the screw developed and it had to be removed at a second operation.

The combined Batchelor and Grice procedure seems to have eliminated all the drawbacks of the other operations. In this procedure the Batchelor graft is used to maintain the reduction of the subtalal joint and the position of the Grice graft is therefore not critical: the problems associated with insertion of the Grice graft are therefore eliminated. Since the sinus tarsi is exposed the Batchelor graft can be inserted under direct vision and its extra-articular position can be ensured. The use of a dual graft, rather than a single one, also seems to have eliminated the problem of non-union, as in our series the rate of fusion was 96%. With the Batchelor graft there is no need for the screw used by Dennyson and Fulford (1976), and therefore the problems associated with it are avoided.

A potential drawback of removing graft from the fibula of a growing child has been reported by Hsu et al. in 1972 and in 1974. Failure of full regeneration of the fibula may lead to late valgus deformity of the ankle. They therefore recommend that the graft be taken from the middle third of the fibula and with careful preservation of the periosteal tube. This precaution was taken in our series and all the fibulae regenerated normally. To improve healing we also replaced excess graft into the periosteal tube of the fibula and used above-knee plasters for immobilisation.

This paper was read by Mr D. Jaffray at the spring meeting of the British Orthopaedic Association, held in April, 1984 at Aviemore, Scotland.

REFERENCES


