A SIMPLE METHOD OF ARTHRODESIS OF THE FIRST METATARSOPHALANGEAL JOINT

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Eighty-seven feet have been reviewed after arthrodesis of the first metatarsophalangeal joint stabilised by chromic catgut. Radiological union was present in 90% of patients at the mean review time of six years. Twenty-four patients had significant metatarsalgia before operation and only two failed to improve afterwards. Excellent or good subjective results were reported in 94% of patients at review. Chromic catgut is advocated as a simple and effective method of stabilising an arthrodesis of the first metatarsophalangeal joint.

A sound arthrodesis of the first metatarsophalangeal joint confers freedom from pain and a high level of functional efficiency in a very high proportion of patients who suffer from hallux valgus and hallux rigidus (Harrison and Harvey 1963). Since 1892, when Clutton initially described “anchylosis” of the great toe, many methods to attain this have been described: peg and socket fixation (Marin 1960; Wilson 1967; Wilkinson 1978), screw fixation (McKeever 1952; Moynihan 1967), a crossed wire suture (Fitzgerald 1969) and the Charnley compression technique (Harrison and Harvey 1963). The long-term follow-up of a technique using chromic catgut as advocated by the late A. M. Hendry is presented as a simple method of achieving fusion of the metatarsophalangeal joint.

METHOD

Under general anaesthesia and a tourniquet the metatarsophalangeal joint is exposed through a dorsomedial incision. The joint is opened and the metatarsal head delivered into the wound; any medial exostosis is then removed with an osteotome. Using a power-driven saw, plane surfaces of the metatarsal head and proximal phalanx are cut, removing the minimal amount of bone that will allow the required degree of valgus and dorsiflexion to be achieved. Drill holes are made from the inferomedial aspect of both bones, 1 cm from the cut surface. The drill is directed in such a manner as to emerge at the centre of the cut surface of the respective bone. Similar holes are made from the dorsolateral aspects of both bones. Chromic catgut (size 00) is threaded through the hole on the inferomedial aspect of the metatarsal to come out at the centre of the cut surface of the metatarsal; it is then passed through the hole in the centre of the cut surface of the proximal phalanx to come out at the hole on its inferomedial aspect. Similarly, another length of catgut is passed through the holes on the dorsolateral aspect of both bones. After ensuring no interposition of soft tissue, the bone surfaces are apposed and held in the correct position by tying both sutures tightly; the knots are buried in the drill holes and the incision closed. Plaster slabs are then applied to the foot. The patient is allowed to walk on his heels after three days with unilateral fusion or at two weeks with bilateral fusion; then plaster slippers, in which the patient can walk, are applied. At six weeks, mobilisation out of plaster is started.

All patients were reviewed independently, both clinically and radiologically, by GSC and TAA.

RESULTS

Follow-up examinations were made in 64 out of a possible 70 patients. Twenty-three cases were bilateral, making a total of 87 feet (Table I).

| Table I. Clinical data of 87 feet in 64 patients |
|-----------------|-----------------|
|                | Hallux rigidus | Hallux valgus |
| Male           | 7              | 6             |
| Female         | 4              | 70            |

The mean metatarsophalangeal angle, measured on pre-operative anteroposterior radiographs, was 38° (range 20° to 68°). Thirty-three feet had other associated toe problems requiring operation at the same time. The average interval before review was six years (range 1 to 18 years). All patients were then examined and had standard weight-bearing radiographs taken. Movement at the interphalangeal joint was measured with a goniometer. The average range of total movement in the
A case of bilateral hallux valgus. Figure 1—Pre-operative radiograph. Figure 2—Radiograph at review nine years after operation.

Radiograph showing bilateral pseudarthrosis four years after operation. The clinical result was excellent.

Figure 4—Radiograph showing arthrodesis in the straight position on the right side. On the left side, the joint was not united six months after operation. Figure 5—Radiograph at review, showing bony union two years after osteotomy of the proximal phalanx on the right side. The left side has now united.
joint was 50° (range 25° to 90°). Patients with very limited interphalangeal movement seemed to have few clinical problems.

**Postoperative course.** Five patients had wound infections; these settled after treatment with antibiotics. The average period of return to normal activity in 60 patients was 11 weeks (range 6 to 17 weeks). Four patients, however, took approximately one year: two had pre-existing metatarsalgia which required a further operation and two had incorrectly positioned arthrodeses, one requiring a further operation. All patients returned to their previous occupations, on average at three months.

Sixty of the 64 patients (94%) reported excellent or good subjective results, the four poor results being the two incorrectly positioned arthrodeses, one pseudarthrosis and one persisting metatarsalgia.

**Bony union.** Seventy-eight of the 87 feet (90%) had achieved bony union by the time of review (Figs 1 and 2). In 26 feet radiological union had not been achieved at the time of discharge from the clinic, usually at three months, but this was of no clinical significance. Nine of these 16 failed to fuse, but at review eight were clinically and subjectively excellent and the pseudarthrosis was only detectable radiographically (Fig. 3).

One pseudarthrosis drifted into unacceptable valgus; it was revised using the same method of fusion and resulted in bony union. This patient had, 20 years earlier, had an exostosis removed, and had an initial hallux valgus of 68°.

**Position of bony union.** Twenty-five patients had an immediate postoperative anteroposterior film taken; apart from the pseudarthrosis already mentioned, no measurable change in position occurred from then up to the time of final bony union. Four arthrodeses were positioned incorrectly. In two patients the toe was too straight, causing problems with footwear; one of these (Fig. 4) required osteotomy of the proximal phalanx to correct the position (Fig. 5). In one patient, with a unilateral fusion, the toes were arthrodesed in differing angles of dorsiflexion, causing problems with shoes. In the fourth patient there was malrotation distal to the fusion causing plantar callosities. One male patient who had been arthrodesed bilaterally in 15° of dorsiflexion, indicated at review that he would have preferred arthrodesis in the neutral position.

### Table II. Effect of metatarsophalangeal fusion on metatarsalgia

<table>
<thead>
<tr>
<th>Metatarsalgia</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-operative</td>
<td>—</td>
<td>4</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Postoperative</td>
<td>16</td>
<td>6</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

**Metatarsalgia** (Table II). In 22 out of 24 patients metatarsalgia was markedly reduced by metatarsophalangeal fusion, although the severe cases also had other appropriate operative procedures. In the two patients who had severe symptoms postoperatively, metatarsalgia resolved after a Helal osteotomy. No patient developed metatarsalgia after metatarsophalangeal fusion.

**DISCUSSION**

The ideal arthrodesis should have a high incidence of bony union, be technically easy, require a minimum period of hospital inpatient treatment, allow early weight-bearing and permit a rapid return to full function. Subsequent procedures to remove metal should not be necessary. Metatarsophalangeal fusion using chromic catgut fulfils all these criteria; in addition, the 10% incidence of pseudarthrosis does not affect the final clinical result. Fitzgerald and Wilkinson (1981) considered that the ideal method of arthrodesis should also allow easy adjustment during operation and immediately afterwards. With chromic catgut stabilisation, the intra-operative position is the definitive one and no adjustment after operation is possible.

Harrison and Harvey (1963) recommended that in the anteroposterior plane fusion should be in the straight position, but Fitzgerald suggested fusion in at least 20° of valgus to prevent late subluxation and osteoarthritis of the interphalangeal joint. In our series 3 out of 14 patients with a 10-year follow-up developed radiographic osteoarthritis of the interphalangeal joint with significant narrowing of the lateral joint space. All had been arthrodesed in less than 20° of valgus, supporting Fitzgerald's contention. Interphalangeal joint movement was as little as 30° in some patients, but this caused no clinical problems, probably because some compensation occurs at the tarsometatarsal joint.

**REFERENCES**


