We performed distal chevron osteotomy of the second, third, or fourth metatarsal for painful plantar callosities in 19 non-rheumatoid patients (16 women, 3 men; 21 feet); their mean age was 59 years (32 to 85). The mean follow-up was four years (2 to 7).

The overall results were good in 16 feet, fair in two, and poor in three, with four patients still having painful plantar callosities. There was union in all feet, but transfer metatarsalgia developed in three and three required an orthosis.

Distal chevron osteotomy for intractable plantar callosities was successful both clinically and radiologically in most patients.

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Callosities or intractable plantar keratoses develop on the sole under a weight-bearing prominence, and are the commonest cause of metatarsalgia. They are usually found beneath a metatarsal head, but may also develop under a sesamoid. More rarely, a discrete callosity may be seen under one part of a metatarsal head such as the lateral condyle. Contributory factors include footwear, a relatively long metatarsal, a hypermobile first ray, abnormal foot posture, a short adjacent metatarsal, and rheumatological conditions.

The initial management is non-operative, by shaving the lesion, using shoes with low heels and metatarsal pads or orthoses. When this fails, metatarsal osteotomy may be indicated, and many types have been described. These include closing-wedge, transverse, oblique, and step-cut osteotomies at proximal, midshaft, or distal metatarsal levels.

Assessment of the results of these operations is often difficult because they have been combined with procedures for hammer toe or hallux valgus. In some series, more than one type of osteotomy had been used, with or without fixation. Some series have also included patients with inflammatory diseases such as rheumatoid arthritis.

We have reviewed our long-term experience with chevron osteotomy for metatarsalgia associated with intractable plantar callosities.

Patients and Methods

We reviewed the medical records of all patients who had had a chevron metatarsal osteotomy of the second, third or fourth metatarsal performed by the senior author (HBK) between December 1988 and the end of January 1995, excluding patients with osteotomies of the first or fifth metatarsal. All patients had a painful intractable plantar callosity, none had a systemic inflammatory disease, and all had failure of conservative management.

There were 16 men and three women with 24 osteotomies; one patient who could not be traced was excluded. Their mean age was 59 years (32 to 85), and osteotomies were on the second metatarsal in 14 feet, on the third in six, and on the fourth in four. Sixteen patients had a single osteotomy and three had two osteotomies, and all had been followed up clinically and radiologically until union. Long-term follow-up was by examination for ten patients (11 feet, 13 metatarsals) and by telephone for nine (10 feet, 11 metatarsals).

Operative technique (see Fig. 2). Operation is performed through a dorsal longitudinal incision over the affected metatarsal, or if two metatarsals are involved, between them. The extensor tendons are retracted and the dorsal margin of the metatarsal head and neck exposed, with minimal soft-tissue dissection from the distal metatarsal. A 1 mm vertical drill hole is made at the junction of the metatarsal head and neck to mark the apex for a V-shaped cut (Fig. 1). Osteotomy is performed with a microsagittal saw and a thin, narrow blade. The angle between cuts is 45°, with its apex distal. This angle is less than that used for chevron osteotomy of the first metatarsal for hallux valgus or the fifth for bunionette. The distal fragment is then displaced dorsally by 2 to 3 mm and gently impacted. The position is usually stable to manipulation of the metatarsophalangeal joint, but we used internal fixation with a
fine percutaneous Kirschner wire directed proximally to distally. The foot is then immobilised in a wooden-soled shoe for five to six weeks, and the wire is removed after three weeks.

Results

The clinical results were graded on a 70-point clinical scale modified from a previous report, based on the level of pain, limitation of activity and footwear, and the presence of a painful callosity (Table I). A score of 55 to 70 points was considered good, 40 to 54 fair, and fewer than 40 points poor. Patients who needed revision were recorded as poor results. At a mean follow-up of four years (2 to 7), 19 feet in 17 patients had not needed revision. Fifteen had no pain, two had mild pain, and two had moderate pain. Both revised patients had poor results with moderate or severe pain.

Of the 19 feet in 17 patients that did not need revision, 17 allowed full daily and recreational activities, one allowed limited recreational but full daily activities, and one foot limited both activities. Five of these 19 feet showed no footwear limitation, but 14 feet could not tolerate fashionable shoes, and three of these required an orthosis. No patient required a custom-made shoe, but four feet still had a painful plantar callosity.

Table I. Seventy-point scoring system for grading clinical results after chevron metatarsal osteotomy

<table>
<thead>
<tr>
<th>Feature</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain, 45 points</td>
<td></td>
</tr>
<tr>
<td>0 = none</td>
<td>45</td>
</tr>
<tr>
<td>1 = mild, occasional</td>
<td>35</td>
</tr>
<tr>
<td>2 = moderate, daily</td>
<td>25</td>
</tr>
<tr>
<td>3 = severe, almost always present</td>
<td>0</td>
</tr>
<tr>
<td>Activity limitations, 10 points</td>
<td></td>
</tr>
<tr>
<td>0 = no limitations of daily or recreational activities</td>
<td>10</td>
</tr>
<tr>
<td>1 = no limitation of daily activities; limitation of recreational activities</td>
<td>7</td>
</tr>
<tr>
<td>2 = limited daily and recreational activities</td>
<td>4</td>
</tr>
<tr>
<td>3 = severe limitation of nearly all activities</td>
<td>0</td>
</tr>
<tr>
<td>Footwear limitations, 10 points</td>
<td></td>
</tr>
<tr>
<td>0 = no or mild limitation of footwear, fashionable shoes</td>
<td>10</td>
</tr>
<tr>
<td>1 = comfort shoes, no fashionable shoes, shoe insert</td>
<td>5</td>
</tr>
<tr>
<td>2 = custom shoes</td>
<td>0</td>
</tr>
<tr>
<td>Painful callus, 5 points</td>
<td></td>
</tr>
<tr>
<td>0 = not present</td>
<td>5</td>
</tr>
<tr>
<td>1 = present</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
</tr>
</tbody>
</table>

Fig. 1

Distal chevron lesser metatarsal osteotomy with dorsal displacement of the distal metatarsal (by permission of the Mayo Foundation).

Fig. 2a Fig. 2b Fig. 2c Fig. 2d

Radiographs of a patient with painful intractable plantar keratosis under the third metatarsal head: a) anteroposterior view before operation, b) oblique view before operation, c) anteroposterior view 3.5 years after osteotomy of the third metatarsal with a good result, and d) oblique view after operation. There is dorsal displacement of the head of the third metatarsal.
The overall clinical results were good in 16 feet, fair in two, and poor in three, because of painful plantar callosities. Three patients had plantar pain consistent with transfer metatarsalgia. One patient had osteotomy of the second metatarsal after a previous third metatarsal osteotomy and another had a second osteotomy of the third after previous second and third metatarsal osteotomies.

There was union in all 21 feet. We measured metatarsal length on standard weight-bearing radiographs from mid-way between the medial and lateral margins of the base to the distal margin of the metatarsal head. The mean length of the involved metatarsals was 75.8 mm before and 73.2 mm after operation, and this difference of 2.6 mm was significant (p < 0.05). No foot developed degenerative arthritis of the metatarsophalangeal joint or avascular necrosis of the metatarsal head.

The clinical results were good in 14 of 18 feet in patients of 50 years of age or older and all three feet in those under 50 years of age; the results were good in 14 of 17 female feet and three of four male feet.

Discussion

The primary treatment for painful plantar callosities is non-operative, and this is usually successful. When this fails, selected patients may benefit from operation. Many operations have been reported. Meisenbach and later Thomas advocated a closing-wedge osteotomy performed 3 cm proximal to the metatarsophalangeal joint. Thomas reported pain relief in 90% of 73 osteotomies performed in 39 feet of patients with rheumatoid arthritis. Wolf described a V-shaped osteotomy 4 to 6 cm proximal to the metatarsal head. Of 25 patients (42 osteotomies), at a mean follow-up of 21 months, 35 had excellent results, but three with recurring callus had poor results. Leventen and Pearson reported dorsal closing-wedge osteotomies on 45 metatarsal necks in 21 feet, of which 15 had good or excellent results.

Giannestras described a proximal step-cut osteotomy to shorten the affected metatarsal in 89 patients (111 osteotomies) with 87% good or excellent results. The procedure is technically difficult, and has a long postoperative convalescence. Helal and later Helal and Greiss described an oblique osteotomy of the three central metatarsals to relieve metatarsalgia by shortening and angulating the bones. A retrospective study of 508 feet in 310 patients found that 84% of the patients had no pain and 92% had no plantar callosities. Winson et al reviewed a consecutive series of 113 patients at a mean three years after Helal osteotomy and found disappointing results in 66 of 124 feet. Pedowitz reported the results of 69 distal oblique osteotomies in 49 patients at a mean follow-up of 16 months; results were good in 83%, but there was a 25% incidence of transfer lesions or residual callosities.

All these reports describe considerable variability in the clinical results for lesser metatarsal osteotomies, with some failures to relieve metatarsalgia. Our findings show that a distal chevron osteotomy has a high rate of union, with reasonable clinical success. The chevron has some inherent stability, but the relatively high incidence of malunion in previous studies lead us to advise stabilisation of the osteotomy by percutaneous wire fixation.

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References


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