Chevron osteotomy for hallux valgus not improved by additional adductor tenotomy

A prospective, randomized study of 84 patients

Sylvia Resch[1], Anders Stenström[1], Kristbjörn Reynisson[2] and Kjell Jonsson[2]

We investigated 106 feet in 84 patients in a prospective randomized series where the clinical and radiographic results of the original chevron osteotomy were compared to the same procedure with the addition of an adductor tenotomy in patients averaging 47 years of age and with a mean follow-up of 3 years. Clinically there was no difference in the satisfaction rate of the two groups, with 58 satisfied and partially satisfied in the 62 operated by chevron osteotomy alone, and 42 of 44 in the group where adductor tenotomy was added. The hallux valgus angle decreased by 7.5° in the group operated with chevron osteotomy and by 9.8° (*P* 0.04) when an adductor tenotomy was added. The major objective factor affecting satisfaction was the attainment of a decreased ball circumference, shown by the fact that dissatisfied patients had a greater postoperative ball circumference than both satisfied and partially satisfied patients, whereas there were no radiographic correlations to satisfaction. We cannot recommend adding adductor tenotomy to the chevron osteotomy.

Departments of [1]Orthopedics and [2]Diagnostic Radiology, University Hospital, S-221 85 Lund, Sweden
Tel +46 46-171524. Fax -130732
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Among the many procedures for correcting the hallux valgus deformity there are both soft-tissue procedures and various first-ray osteotomies. They have been combined in order to enhance correction (Resch et al. 1989, Johnson et al. 1991, Krismer and Eichenauer 1991, Mann and Pfeffinger 1991, Mauldin et al. 1991).

No prospective, randomized series evaluating the contribution of adductor tenotomy to a distal chevron osteotomy for the correction of hallux valgus deformity has been published. It remains to be determined whether the combination gives clinical and correctional advantages.

Patients and methods

87 consecutive patients, scheduled for chevron osteotomy for hallux valgus (Austin and Leventen 1981) were randomized by the closed envelope method immediately preoperatively to an additional adductor tenotomy. The lateral capsule was not released. If a patient was operated on bilaterally, the same operation was used on both feet. The main reason for operation was pain and discomfort when wearing shoes (Table 1). Clinical and radiographic follow-ups were generally performed after a minimum of 2 years, but 6 patients followed up for 13–22 months were included.

106 feet (84 patients, 22 bilaterally operated) were available for follow-up at 3 (1–4) years. 1 had died of unrelated causes, 1 refused follow-up, and in 1 preoperative radiographs were not available. All but 1 were women. The average age at operation was 47 (15–74) years.

The preoperative investigation included a physical examination, unloaded lateral and standing AP radiographs with an angulation of 15° of the X-ray tube. The average hallux valgus (HV) angle was 31° and the intermetatarsal (IM) angle 15° (Table 1.). The average ball circumference of the forefoot was 25 (20–27) cm. The preoperative range of motion was from 36° dorsal to 36° plantar.There was no difference between the groups.

62 feet (46 patients) were operated by chevron osteotomy, as described by Austin and Leventen (1981). 44 feet (38 patients) were operated with the same type of chevron osteotomy combined with an adductor tenotomy through a separate incision in the first web space. The discrepancy in numbers between the 2 randomized groups is due to the greater number of bilateral cases in the chevron osteotomy group. Most operations were done under ankle block anesthesia, with a tourniquet above the ankle. The

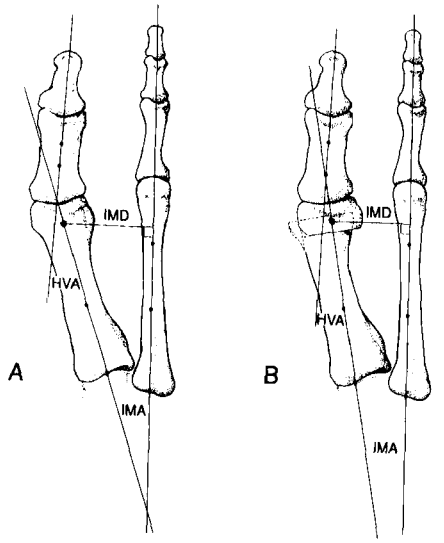

Figure 1. Radiographic measurements. A before and B after the osteotomy for hallux valgus. HVA hallux valgus angle, IMA intermetatarsal angle, IMD intermetatarsal distance.

postoperative treatment was identical for all patients. A small medial plaster slab was used for 3–5 days postoperatively. Immediate weight bearing on the heel and lateral edge was encouraged, and full weight bearing was allowed when possible.

The patients' opinion with regard to pain, appearance, and mobility was graded as satisfied, satisfied with reservation, or dissatisfied. The use of shoes was evaluated. The plantar and dorsal range of motion of the great toe was measured with a goniometer while weight bearing, using the floor surface as reference. The greatest ball circumference of the bare foot was measured with the patient standing. Sick leave was recorded.

Radiographs were taken preoperatively, 6–12 weeks postoperatively and at a minimum of 13 months postoperatively. All but 8 patients were radiographically examined more than 2 years postoperatively and angles were measured by a radiologist. The axis through the first metatarsal was drawn through the center of the head and the center of the proximal shaft (Figure 1). The axis in the second metatarsal was drawn through the mid-shaft, as was the axis through the proximal phalanx of the great toe. The HV angle is the angle between the first metatarsal axis and the axis through the proximal phalanx of the great toe, the IM angle is the angle between the first and second metatarsals, and the intermetatarsal (IM) distance is the distance between the center of the first metatarsal head and the second metatarsal axis on a line drawn perpendicular to the second metatarsal. The lengths of the first and second metatarsals were measured on an AP film from the distal articular surface to the proximal articular surface on the axis of the metatarsal. To compensate for the radiographic magnification factor, the relative lengths of the first and second metatarsal were calculated. Shortening is then defined as the change in length of the first metatarsal in percent.

The results were analyzed with the Student's *t*-test, Spearman non-parametric test and Wilcoxon ranking test, and with multivariant regression analysis, taking into consideration age, sex, preoperative radiographic angles, if the patient was bilaterally operated, and length of follow-up.

Results

There were 7 complications. In the group with adductor tenotomy there was 1 reoperation because of medial dislocation of the first metatarsal head, 1 neuroma requiring operation, 1 intractable plantar keratosis under the first metatarsal head and 1 case with inexplicable pain at the great toe nail. In the group without adductor tenotomy 2 patients (3 feet) were reoperated because of inadequate correction; the bilaterally operated patient had developed rheumatoid arthritis. The reoperated patients were graded as dissatisfied.

In the group operated with the additional tenotomy the correction of the HV angle was 9.8°, versus 7.5° in the group without tenotomy (P 0.04). No other radiographic differences were found. The corrections of the intermetarsal angle and distance were 3 degrees and 3 mm, respectively, in both groups. There was no difference in the satisfaction of the 2 groups with regard to pain, mobility, appearance, shoe comfort, or the ball circumference (Table 1). There was no difference in radiographic correction or clinical satisfaction of the bi-or unilaterally operated. The sick leave was 8 weeks for unilaterally operated and 7 for patients operated bilaterally at the same session.

In the total material, 11 patients expressed satisfaction with reservation and 5 dissatisfaction with regard to pain. No differences were found in these groups preoperatively. The postoperative ball circumference of the dissatisfied patients was greater than that in both the satisfied patients and the partially satisfied patients (P 0.005, P 0.0001). The decrease of the ball circumference was 1.0 cm in the satisfied patients and 0.6 cm in the dissatisfied patients (P 0.03). There was a tendency (P 0.07, P 0.09) to smaller correction of HVA in partially satis-

Table 1. Clinical data

	Chevron osteotomy n 62 feet	Chevron osteotomy with adductor tenotomy n 44 feet
Preoperative		
Pain		
Sports only	3	4
Daily, no restriction	49	35
Daily, restricted	5	5
Barefoot	2	0
At rest	3	0
Shoes		
Any shoes	0	1
Narrow, with pain	16	12
Wide standard	45	31
Orthopedic	1	0
Ball circumference, cm	25	24
Postoperative		
Satisfaction		
Pain		
Satisfied	54	35
Satisfied w/reservation	4	7
Dissatisfied	4	2
Appearance		
Satisfied	53	32
Satisfied w/reservation	7	10
Dissatisfied	2	2
Mobility		
Satisfied	53	42
Satisfied w/reservation	7	2
Dissatisfied	2	0
Shoes		
Narrower	34	24
Same ,but no pain	24	16
Same as preoperative	3	3
Wider	1	1
Ball circumference, cm	24	23
Sick leave, weeks	7	8

fied and dissatisfied patients. The satisfied patients showed greater shortening than the partially satisfied (P 0.01).

The postoperative range of motion was 38° dorsal in the chevron group and 40° dorsal in the group with an adductor tenotomy, and 31° plantar in the former and 27° plantar in the latter (NS).

Discussion

This study shows that the addition of adductor tenotomy to chevron osteotomy improved the correction of the HV angle by only 2.3 °. However, this represents approximately 20–25 percent increase in correction. Nevertheless, the additional correction was small and probably irrelevant.

Satisfaction with surgery did not correlate to the type of operation, uni-bilaterality, or age. Most recent articles evaluating hallux valgus surgery have reported satisfaction rates in the same range, 85–97 percent (Hattrup and Johnson 1985, Johnson et al. 1991, Mann and Pfeffinger 1991, Mauldin et al. 1991, Gebuhr et al. 1992, Rossi and Ferreira 1992, Resch et al. 1993). The bilaterally operated patients who had surgery on both feet at the same time as opposed to two separate procedures differed in no way from the other patients with regard to severity of the deformity. It seems to be a matter of personal preference. Postoperative sick leave after bilateral operation was the same as after unilateral operation.

We cannot in this study show that there is more than a small correlation between objective factors of success, such as the radiographic measurements, and subjective factors, such as relief of pain and shoe comfort. This is a common finding in evaluation of hallux valgus procedures (Romash et al. 1990, Mann and Pfeffinger 1991). In fact, normal IM angles can range from 4° to 23° and HV angles from 0° to 32° (Steel III et al. 1980). This wide normal range makes recommendations as to the size of correction in individual cases difficult. Since shoe-fitting is a major concern, other factors, such as the ball circumferance are undoubtably of at least equal importance as shown by the fact that this parameter is the only objective measurement, except lack of shortening which correlates to lack of satisfaction. One of our studies (Resch et al., unpublished data) showed that this measurement was the most accurate of the clinical parameters.

It is difficult to explain why some patients were not completely satisfied. Age, size of preoperative deformity and range of motion did not differ from the satisfied. There was only a tendency towards less correction of the HV angle in the dissatisfied patient and, as in our previous study (Resch et al. 1993), less shortening. Not unreasonably, patient satisfaction seems to be a matter of being able to use normal shoes without discomfort and pain.

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References

Austin D W, Leventen E O. A new osteotomy for hallux valgus: a horizontally directed "V" displacement osteotomy of the metatarsal head for hallux valgus and primus varus. Clin Orthop 1981; 157: 25–30.

Gebuhr P, Soelberg M, Larsen T K, Niclasen B V, Laursen N O. McBride's operation for hallux valgus. A 2–11-year follow-up of 46 cases. Acta Orthop Scand 1992; 63 (2): 189–91.

Hattrup S J, Johnson K A. Chevron osteotomy: analysis of factors in patients' dissatisfaction. Foot Ankle 1985; 5 (6): 327–32.

Johnson J E, Clanton T O, Baxter D E, Gottlieb M S. Comparison of Chevron osteotomy and modified McBride bunionectomy for correction of mild to moderate hallux valgus deformity. Foot Ankle 1991; 12 (2): 61–8.

Krismer M, Eichenauer M. Die Operation nach McBride mit und ohne zusätzliche Basisosteotomie des Metatarsale I. Z Orthop Ihre Grenzgeb 1991; 129 (1): 51–6.

Mann R A, Pfeffinger L. Hallux valgus repair. DuVries modified McBride procedure. Clin Orthop 1991; 272: 213–8.

Mauldin D M, Sanders M, Whitmer W W. Correction of hallux valgus with metatarsocuneiform stabilization. Foot Ankle 1991; 11 (2): 59–66.

Resch S, Stenström A, Egund N. Proximal closing wedge osteotomy and adductor tenotomy for treatment of hallux valgus (see comments). Foot Ankle 1989; 9 (6): 272–80.

Resch S, Stenström A, Reynisson K, Jonson K. Results after chevron osteotomy and proximal osteotomy for hallux valgus: a prospective randomized study. Foot 1993; 3: 99–104.

Romash M M, Fugate D, Yanklowit B. Passive motion of the first metatarsal cuneiform joint: preoperative assessment. Foot Ankle 1990; 10 (6): 293–8.

Rossi W R, Ferreira J C. Chevron osteotomy for hallux valgus. Foot Ankle 1992; 13 (7): 378–81.

Steele III M W, Johnson K A, DeWitz M A, Ilstrup D M. Radiographic measurements of the normal adult foot. Foot Ankle 1980; 1 (3): 151–8.