Hallux valgus in children

A 5–14-year follow-up study of 30 feet treated with a modified Mitchell osteotomy

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ABSTRACT – Between 1985 and 1995, 30 modified Mitchell osteotomies were performed in 18 children with hallux valgus, 12 bilateral and 6 unilateral. The mean age at surgery was 15 (10–18) years. The surgical modification consisted of diverging trapezoidal cuts, plantar displacement of the head, release of the lateral collateral ligament and the adductor insertion and Kirschner wire fixation of the osteotomy. At an average follow-up of 8 (5–14) years there were no nonunions, avascular necroses or recurrences. All the patients were satisfied with the cosmetic results, could use regular shoes and had no physical restrictions. Only 2 complained of occasional pain, thought to be secondary to transfer metatarsalgia. The presence of an open physis at the time of surgery did not affect the results.

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Although many surgical procedures have been used for juvenile and adolescent hallux valgus, the results have been inconsistent and controversial (Scranton and Zuckerman 1984, Ball and Sullivan 1985, Geissele and Stanton 1990).

I reviewed the results of a modified Mitchell osteotomy in 18 children with hallux valgus.

Patients and methods

This is a retrospective analysis of 30 osteotomies in 18 (13 girls) children performed between 1985 and 1995 at Dhahran Health Centre. The criteria for inclusion were: onset of hallux valgus before the age of 10 years (juvenile hallux valgus) or between 10 and 18 years (adolescent hallux valgus) and surgery before the age of 18 years. All children who fulfilled these criteria were included—i.e., 2 with the juvenile type (1 bilateral, 1 unilateral) and 16 with the adolescent (11 bilateral, 5 unilateral). All had a positive family history. The average age at the time of surgery was 15 (10–18) years and average follow-up period 8 (5–14) years. 6 patients had an open physis (5 bilateral, 1 unilateral).

The surgical modifications of the Mitchell osteotomy were:

1. Diverging trapezoidal step-off cuts, instead of transverse, reaching 50–75% across the width of the metatarsal neck. This improved the degree of correction and maintained the length of the first metatarsal or minimized the shortening (Figure 1).
2. Plantar displacement of the metatarsal head by about 1 mm or equal to the cortical thickness.
3. Release of the lateral collateral ligament and the adductor hallucis tendon by snipping both sharply from inside the joint during tension by varus stress. No lateral soft tissue dissection was done.
4. Kirschner wire fixation of the osteotomy inserted from proximal medial to distal lateral while the osteotomy was held impacted by a small reduction clamp. The K-wire was cut short outside the skin.
5. The medial capsule was tightened to maintain straight alignment of the big toe with the first metatarsal.
6. The overhanging ledge of the proximal fragment was leveled with a dental burr.

Postoperatively, the patients wore special hard-soled shoes and walked as tolerated. The K-wire was checked weekly for infection or loosening and

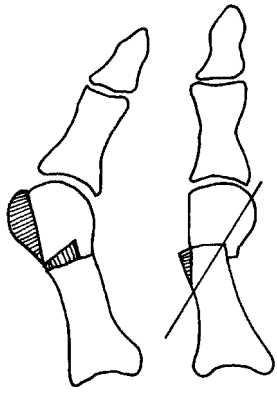

Figure 1. The modified Mitchell osteotomy and the medial bone resection of the metatarsal head.

Figure 2. Standing radiograph of both feet of patient no. 12, a 12-year-old girl, showing the method used to measure the intermetatarsal and hallux valgus angles and the width of the foot.

usually removed in the office about 5–7 weeks after surgery, when the osteotomy had healed. Patients were advised to wear comfortable shoes for 2–3 weeks after which they were free to use any shoes. A holding brace was worn for 6 months at night. In all patients with bilateral hallux valgus, both feet were operated on at the same time.

The clinical evaluation at follow-up included cosmesis, range of motion of the first metatarsophalangeal joint, shoe wear, symptoms, and overall patient satisfaction. The radiographic evaluation included pre and postoperative standing films to measure the intermetatarsal angle (IM) (angle between the long axis of the first and second metatarsals), and the hallux valgus angle (HV) (angle between the long axis of the first metatarsal and the long axis of the proximal phalanx) and the width of the foot on the standing film from the most medial to the most lateral soft tissue shadow of the forefoot (Figure 2).

Figure 3. Standing radiograph of both feet of patient no. 10, a 13-year-old girl, 7 weeks after surgery showing healing of the osteotomy.

Results

All osteotomies were healed at an average of 6 (5–7) weeks (Figure 3). There were no delayed or nonunions or avascular necroses. The average preoperative IM angle was 19 (15–22) degrees. The average postoperative IM angle was 9 (5–12) degrees.

The average preoperative HV angle was 41 (30–50) degrees and average postoperative HV angle 17 (5–25) degrees. The average preoperative foot width was 96 (90–115) mm and average postoperative width 89 (80–110) mm (Table).

An open physis had no effect on the results. All patients were satisfied with the cosmetic results using regular shoes and could participate in physical activities. Only 2 patients complained of occasional pain. A satisfactory first metatarso-phalangeal joint range of motion was present in all (flexion 15 degrees or more, extension 30 degrees or more). No recurrence of the hallux valgus defor-

Table. Clinical data and radiographic results of all 18 patients. All patients had preoperative complaint of cosmesis and difficulties with shoes

A	B	C	D	E	F	G		H		I		J	
						pre	post	pre	post	pre	post	pre	post
1	M	13	R	–	6	45	15	20	10	9	8	25/35	20/35
			L	–	6	45	15	20	10	9	8	25/35	20/35
2	M	16	R	–	8	48	20	20	8	9.5	9	25/35	20/30
			L	–	8	48	20	20	8	9.5	9	25/35	20/30
3	F	16	R	–	5	45	20	18	10	9	8.5	25/35	20/30
		16	L	–	5	45	20	18	10	9	8.5	25/35	20/30
4	F	14	R	–	9	38	20	15	8	9.5	8.5	30/40	25/35
			L	–	9	38	20	15	8	9.5	8.5	30/40	25/35
5	M	14	R	–	7	50	20	22	12	9	8.5	25/40	25/35
			L	–	7	50	20	22	12	9	8.5	25/40	25/35
6	F	18	L	–	5	35	15	18	10	9.5	9	25/35	15/30
			R	–	5	35	15	18	10	9.5	9	25/35	15/30
7	M	17	L	–	11	30	10	18	8	11.5	11	30/40	25/35
			R	–	11	30	10	18	8	11.5	11	30/40	25/35
8	F	10	L	–	10	45	20	20	5	10	9	40/50	30/40
			R	–	10	45	20	20	5	10	9	40/50	30/40
9	F	18	L	–	6	40	15	17	8	10	9	25/35	15/30
			R	–	6	40	15	17	8	10	9	25/35	15/30
10	F	13	R	–	9	50	15	20	9	9.5	8.5	35/45	30/40
			L	–	9	50	15	20	9	9.5	8.5	35/45	30/40
11	F	18	R	–	8	30	10	20	8	10	9	30/40	30/45
			L	–	8	30	10	20	8	10	9	30/40	30/45
12	F	12	R	–	7	40	20	17	10	9.5	9	35/50	30/45
			L	–	7	40	20	17	10	9.5	9	35/50	30/45
13	F	18	R	+	7	50	25	20	9	9	8.5	20/35	15/30
14	F	18	R	–	12	35	15	18	8	9	8.5	25/35	20/35
15	F	10	L	–	14	50	25	20	8	10.5	9.5	40/50	35/45
16	F	18	R	–	10	30	5	18	8	9.5	9	25/35	15/30
17	M	15	R	+	5	35	15	20	10	10.5	10	20/35	20/30
18	F	17	L	–	5	40	20	20	8	10	9.5	25/40	20/35

A Patient no.
B Sex
C Age, years
D Side
E Complaint of occational pain at review
F Follow-up period, years
G Hallux valgus angle
H Intermetatarsal angle
I Width of foot, cm
J Range of motion (flexion/extension) in the first metatarsophalangeal joint

mity occurred. The 2 patients with occasional pain were found to have a short first metatarsal (5 mm shorter than the second metatarsal on the preoperative radiographs). Surgery increased the shortening by 2 mm and may have caused secondary transfer metatarsalgia.

Discussion

The results of hallux valgus surgery in juvenile and adolescent patients have often been disappointing. Bad results, several complications and a high recurrence rate have been reported (Bonney and McNab 1952, Scranton and Zuckerman 1984, Ball and Sullivan 1985). The main causes of bad results have been:

1. Inadequate correction.
2. Too much shortening of the first metatarsal.
3. Dorsal tilt of the head (2. and 3. can induce transfer metatarsalgia) (Das de 1984).
4. Poor fixation, by a suture or a K-wire across the joint (Weiner et al 1997).
5. Delayed or nonunion—e.g., too proximal an osteotomy, poor fixation, too much soft tissue stripping laterally when trying to reach the lateral collateral ligament and adductor tendon.

I modified the Mitchell osteotomy to avoid these problems. Shortening was reduced by making the cuts diverge instead of parallel and therefore in a trapezoidal shape similar to the modification of the Hammond technique (Das de 1984, Weiner et al. 1997). The cut was 50–70% across the width of the metatarsal and the head was deliberately dis-

Figure 4. Patient no. 15, showing the method of fixation.

placed plantarward, about 1 mm or the thickness of the cortex. The aim was to prevent lateral transfer metatarsalgia, which can be caused by slight shortening. The fixation of the osteotomy with K-wire rather than a suture maintained the position and permitted early motion (Figure 4). The good outcome in my patients is similar to those reported by Das de (1984), Luba and Rosman (1984) and Geissele and Stanton (1990), and shows that this modified Mitchell osteotomy can successfully correct juvenile and adolescent hallux valgus.

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