

The Mitchell Distal Metatarsal Osteotomy for Hallux Valgus – The Singapore General Hospital Experience

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ABSTRACT

Background: Fifty-five Mitchell distal metatarsal osteotomies for hallux valgus performed over a period of four years have been retrospectively reviewed. The 38 patients were followed for an average of 30 months (range 12 to 60 months).

Results: The preoperative hallux valgus angle averaged $30.9^\circ \pm 8.2^\circ$ SD (range 18° to 60°) and the postoperative angle averaged $12.2^\circ \pm 4.6^\circ$ (range 5° to 20°).

Conclusion: Ninety-two percent of the patients were satisfied with the result of the procedure. They stated that, given the identical situation, they would undergo the operation again.

Keywords: Mitchell, metatarsal, osteotomy, Hallux, valgus

INTRODUCTION

Hallux valgus is a deformity of the first metatarsophalangeal joint characterised by lateral deviation of the proximal phalanx and medial deviation of the first metatarsal.

More than 130 operations⁽¹⁾ have been described for treatment of hallux valgus, ranging from fusion, resection arthroplasty to distal first metatarsal or basal first metatarsal osteotomy. Regardless of the procedure utilised, the objective is a painless, well aligned first metatarsophalangeal joint with preservation of dorsiflexion at that joint, allowing normal progression from foot flat to toe-off in the gait cycle⁽²⁾. The preservation of dorsiflexion in the first metatarsophalangeal joint is especially important in women, as any reduction will adversely affect the patient's ability to wear high-heeled shoes.

The Mitchell procedure is a distal metatarsal osteotomy which displaces the metatarsal head slightly lateral-ward to correct the hallux valgus deformity. Overall, Mitchell osteotomy has been reported to give satisfactory correction of hallux valgus deformity in more than 80%⁽³⁻⁷⁾ of feet. This paper is a short analysis of the results of our experience with this operation.

MATERIALS AND METHODS

The study was a retrospective review of 55 operations done to correct hallux valgus in 38 patients. All the operations were performed between January 1988 and

December 1991. All 55 operations were done as primary procedure. The series included 52 feet of 36 female patients and three feet of two male patients. Seventeen patients (16 females and 1 male) underwent a bilateral procedure. The average age was 43 years, with a range of 19 to 77 years (Fig 1).

The indications for operation had been pain, cosmetic reasons and problems with shoe-fitting. Deformity and pain over the medial eminence were present in 33 patients (46 feet) before operation. Only 5 patients (9 feet) had operations for deformity alone. Six patients (including the 2 male patients) could wear any type of shoes before operation. The other 32 patients had some problems with shoe-fitting (particularly those with high heels) prior to surgery. None of the patient had functional disability before operation.

The duration of follow-up averaged 30 months, with a range of 12 to 60 months. All 38 patients returned for independent evaluation by one examiner to exclude surgeon's bias. A strict protocol was used in reviewing these patients. The patients were questioned about improvement in pain, the appearance of the foot, ability to walk, their satisfaction with range of motion of the toe, problems with wearing shoes and the degree of discomfort when they walked. The range of motion of the first metatarsophalangeal joint was measured with a goniometer.

The presence of transfer lesions or any sensory abnormalities was also noted. A transfer lesion is a diffuse, clinically symptomatic callus which develops beneath the second metatarsal head because of inadequate weight-bearing on the first metatarsal, or excessive shortening or dorsiflexion of the metatarsal as a result of osteotomy of the metatarsal.

The overall results of the Mitchell procedure were assessed as excellent when there was full relief of symptoms and deformity, good when patient was satisfied but still had some mild symptoms and unsatisfactory when there was a single marked flaw in the result such as metatarsalgia, significant recurrence, avascular necrosis, non-union or hallux varus.

Preoperative and postoperative anteroposterior and lateral radiographs of the feet were made with the patient in the weight-bearing position. The hallux valgus angle (subtended by lines bisecting the long axis of the first metatarsal and proximal phalanx), the

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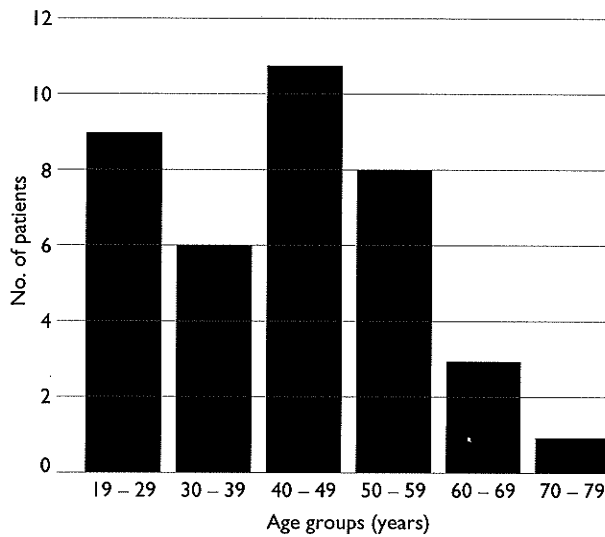


Fig 1 - Age

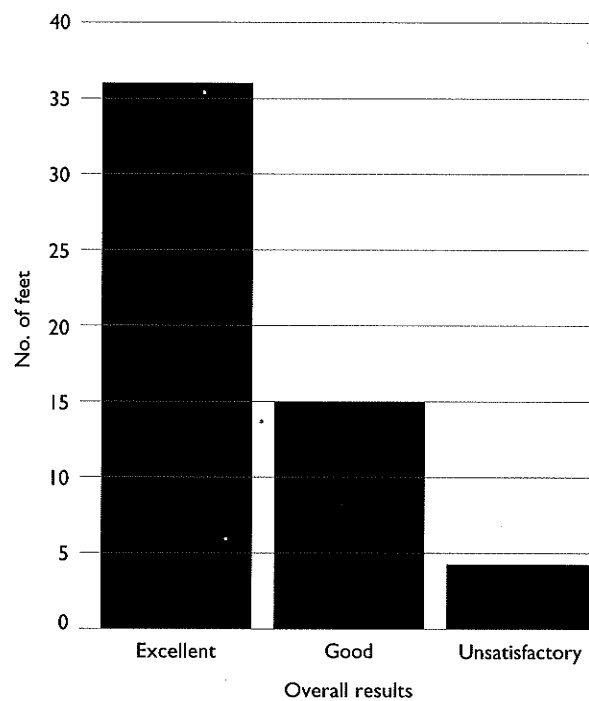


Fig 2 - Overall results

intermetatarsal angle (subtended by lines bisecting the longitudinal axis of the first and second metatarsals) and the lengths of the first and second metatarsals were measured with the methods recommended by the American Orthopaedic Foot and Ankle Society⁽⁸⁾. The relationship of the lengths of the first and second metatarsals would indicate the amount of post-operative shortening accurately.

Degenerative disease of the first metatarsophalangeal joint was classified as Grade I (mild sclerosis of adjacent surfaces of the joint) Grade II (narrowing of the cartilage space in addition to sclerosis of the surfaces of the joint), Grade III (narrowing of cartilage space, with osteophytes and cystic changes) or Grade IV (complete loss of cartilage space with increase in degree of sclerosis and cystic changes).

Operative technique

The operation is performed through a dorsomedial approach, exposing the capsule of the first metatarsophalangeal joint. A distally based capsular flap⁽⁹⁾ is created over the medial aspect of the metatarsophalangeal joint. The medial eminence is exposed and osteotomised in line with the shaft of the first metatarsal. An incomplete osteotomy is performed through a transverse cut in the metatarsal neck, leaving a lateral piece of cortex about 3 mm wide. The second osteotomy cut is made completely through the metatarsal, approximately 2 mm proximal to the initial cut and diverging plantar-ward, with removal of approximately 1 to 2 mm more bone on the plantar aspect. A lateral step-off in the distal fragment is thus created. The capital fragment is then displaced lateral-ward and slightly plantar-ward. The site of osteotomy is then fixed with Kirschner wire^(10,11). The metaphyseal capsule is plicated with interrupted sutures.

Postoperatively, a gauze-and-tape compression dressings is applied in the operating room⁽⁹⁾. A slipper cast to maintain adequate immobilisation of the osteotomy site is applied a week after the operation. The cast is kept for 4 weeks.

RESULTS

The results were categorised as subjective, objective and radiographic.

Subjective findings

Thirty-three patients with 46 feet (83.6% of the feet) complained of pain over the bunion prior to surgery. Post-operatively, pain around the first metatarsophalangeal joint was absent in 27 of the 46 feet. In 10 patients (16 feet), the intensity of pain was much reduced after surgery. In three patients with three feet, the pain remained unchanged. One of these three patients had avascular necrosis of the first metatarsal head. These three patients were dissatisfied with the result of the operation. None of 5 patients who stated cosmesis as the only reason for undergoing the Mitchell procedure developed pain over the metatarsophalangeal joint after operation.

Thirty-two patients with 48 feet (87.3% of the feet) had problems with shoe-fitting before the operation. After the operation, 32 patients with 47 feet (85.5% of the feet) including the 6 patients who had no preoperative problems with footwear, stated that they could wear any type of shoes. The remaining 6 patients with 8 feet (14.5% of the feet) still had some problem with shoes, particularly those with high heels.

Postoperative cosmetic appearance of the foot was considered to be satisfactory for 51 feet (92.7% of the feet). The reason for dissatisfaction in all the 4 feet was recurrence of hallux valgus. Hallux varus was not a problem in this series.

Twenty-two patients (57.9%) responded to the question about ability to walk without discomfort by saying that they could walk further after the operation. The remaining 16 patients said that their pattern of walking had not changed. None of the patients had a decrease in walking ability.

When asked about the level of satisfaction with the results of the Mitchell osteotomy, 19 patients (50%) were very pleased with the result and 16 patients (42.1%) were satisfied. These 35 patients stated that, given the same circumstances, they would select the same type of operative intervention. The other 3 patients were dissatisfied because of persistent pain over the first metatarsophalangeal joint and recurrence of the valgus deformity.

Objective findings

The transfer lesions which were noted preoperatively in 27 feet disappeared in 17 feet. The callus in 9 feet were unchanged after the operation but caused very minimal discomfort. One foot continued to have painful callus on palpation. No painful transfer lesion developed after the operation in any patient who had not had such a lesion prior to operation.

Sensation was diminished over the dorsal or plantar aspect of the great toe in 7 feet. The numbness did not cause any problems related to footwear.

Postoperative active dorsiflexion of the first metatarsophalangeal joint averaged 52°, with the range of 20° to 85°. In 49 feet, the dorsiflexion of the first metatarsophalangeal joint was 30° or more. The remaining 6 feet with less than 30° of dorsiflexion of the first metatarsophalangeal joint, had problems with wearing high-heeled shoes. Postoperative active plantar flexion averaged 8°, with a range from 0° to 30°. No symptoms were attributed to limitation of plantar flexion.

Of the 55 operations performed, 36 (65.4%) were graded as excellent, 15 (27.3%) good and 4 (7.3%) unsatisfactory (Fig 2).

Radiographic findings

The hallux valgus angle was corrected an average of 18.7° after the procedure. The average preoperative hallux valgus angle was 30.9° ± 8.2° SD (range 18° to 60°). Analysis of the immediate postoperative radiographs revealed that the hallux valgus angle was 12.2° ± 4.6° (range 5° to 20°). The immediate postoperative hallux valgus angle was more than 15° in 8 feet. During the survey, averaged 33 months after operation, the hallux valgus angle was increased by 2° to 30° (average 7.9°) in 19 feet. In the other 36 feet, the correction of hallux valgus angle was maintained.

The intermetatarsal angle was corrected an average of 6.2° after the procedure. The average preoperative intermetatarsal angle was 12.1° ± 2.8° SD (range 5° to 20°). The average postoperative intermetatarsal angle was 5.9° ± 2.1° (range 2° to 15°).

In one of the feet, there was evidence of avascular necrosis of the first metatarsal head; this patient experienced persistent pain over the first metatarsophalangeal joint.

After Mitchell osteotomy, the amount of metatarsal shortening averaged 6.8 mm (range 5 mm to 10 mm). No patient complained of having a short hallux.

Pre-operatively, osteoarthritis of the first metatarsophalangeal joint was graded as 0 in 49 feet (89.1%); I in 4 feet (7.3%) and II in 2 feet (3.6%).

Post-operatively, osteoarthritis of the first metatarsophalangeal joint increased by one grade in 5 feet and 2 grades in 2 feet. The patients who developed postoperative degenerative joint disease noted increased joint stiffness postoperatively although the range of motion was clinically satisfactory. These patients did not have more postoperative pain over the metatarsophalangeal joint and the overall satisfaction was not affected.

Based on preoperative hallux valgus angle, the patients were divided into three groups: mild deformity (less than 20°); moderate deformity (21° to 40°) and severe deformity (more than 40°). The degree of improvement of the hallux valgus angle after Mitchell osteotomy was directly proportional to the severity of the hallux valgus angle. With regard to the subjective and objective findings, no difference was detected between the groups.

Complications

One of the feet developed superficial wound infection which subsided with antibiotics. The patient did not have pain or stiffness of the first metatarsophalangeal joint. He was satisfied with the result and had excellent overall result. There was no case of deep infection or pin-track infection necessitating removal of kirschner wires.

One of the patients who underwent bilateral procedure had avascular necrosis of the first metatarsal head of the left feet. She not only experienced persistent pain but also recurrence of valgus deformity over that metatarsophalangeal joint. The patient was dissatisfied and the overall result was unsatisfactory. There was no non-union in this series.

The valgus deformity recurred in 4 feet. None of them underwent another corrective procedure. Three of the recurrences were associated with persistent pain over the first metatarsophalangeal joint and the patients were dissatisfied with the operation.

There was sensory loss over the medial aspect of the great toe in 7 feet. This numbness did not affect the clinical result and none of the patients was dissatisfied.

DISCUSSION

Of the 55 Mitchell distal metatarsal osteotomies performed for hallux valgus in our unit in 4 years. Fifty-one (92.7%) were graded as excellent or good (Fig 2). This overall figure compared favourably with other reported series such as Hawkins et al (1945)⁽⁵⁾ 97%. Mitchell et al (1958)⁽⁶⁾ 82%; Cars and Boyd (1968)⁽¹²⁾ 93%; Hammond (1972)⁽¹³⁾ 84%; Miller (1974)⁽¹⁴⁾ 90%; Shapiro and Heller (1975)⁽¹⁵⁾ 76%; Hart and Bently (1976)⁽¹⁶⁾ 78%; Glynn et al (1980)⁽⁴⁾ 92%; Blum (1994)⁽³⁾ 91% in which the Mitchell procedure was used.

Re-establishing the normal relationship in the foot is important; otherwise transfer metatarsalgia often develops. The hallux valgus and intermetatarsal angles were corrected an average of 18.7° and 6.2°, respectively in this series. These values were similar to the average reported corrections of 10° to 25°^(3,4,7,9,17)

for the hallux valgus deformity and 5° to 10° ^(3-5,7,9,17) for the intermetatarsal angle.

During the survey, 18 feet had a postoperative hallux valgus angle of more than 15° but the overall satisfaction of these patients did not differ from that of the patients who had an angle of less than 15° . This was because some of the patients were more concerned with relief of pain than with cosmetic result. In some other patients, correcting the hallux to neutral position was undesirable because it would result in an unacceptable gap between the first and second toes as these patients had secondary digital valgus.

The two major pitfalls to be avoided are excessive shortening of the first metatarsal and failure to adequately depress the metatarsal head. Both these complications can result in metatarsalgia and transfer lesion^(5,10) beneath the second metatarsal head. The mean amount of metatarsal shortening in our series was 6.8 mm, similar to that reported by Merkel et al⁽¹⁰⁾ (7 mm). None of our patients had more than 10 mm of metatarsal shortening, which according to Merkel et al⁽¹⁰⁾, was associated with a higher degree of patient's dissatisfaction and an increased frequency of metatarsalgia. Plantar displacement advocated by Mitchell et al⁽⁶⁾ and plantar angulation recommended by Wu⁽⁷⁾ and Merkel et al⁽¹⁰⁾ have both been proposed to reduce the ill effects of shortening of the first metatarsal. Glynn et al⁽⁴⁾ stressed that failure to depress the capital fragment will predispose to eventual metatarsalgia.

The symptomatic callus which had been present beneath the head of the second metatarsal of 27 feet disappeared from 17 (63.0%) after the Mitchell procedure. Only 10 feet (18.2%) continued to have the callus after correction of the hallux valgus deformity; this rate compared favourably with that reported by Hawkins et al⁽⁵⁾ (31%).

The most common complication was recurrence of the deformity which was seen in four feet (7.3%); similar to the 10% reported by Coughlin⁽¹⁸⁾. These feet showed little or no overall improvement. Three of the feet were associated with persistent pain over the bunion.

CONCLUSION

Mitchell osteotomy is a technically straightforward operation. The results, as indicated by this series, are very satisfactory. These results can only be obtained by careful attention to detail and by careful postoperative management.

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