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## Clinical results of Mitchell's osteotomy for treatment of hallux valgus. Study from a Tertiary centre in Kashmir

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### Abstract

**Background:** Hallux valgus means lateral deviation of great toe is in fact a complex deformity of the first ray. The concerns are pain over 1<sup>st</sup> metatarsophalangeal joint, difficulty in shoe wear and a cosmetically unacceptable deformity. A large number of osteotomies have been described for the correction of Hallux Valgus indicating that no osteotomy is universally acceptable for all patients.

**Patients and Methods:** A total of 56 feet of 40 patients, 6 males and 34 females with Hallux Valgus underwent Mitchell's Osteotomy and were followed up for at least 18 months. Patients' age ranged from 20 to 60 years and the duration of follow-up ranged from 18 to 40 months. Postoperative results were assessed based on the recommendations of the American Orthopaedic Foot and Ankle Society, on 5 categories: pain in the first metatarsophalangeal, deformity of the metatarsophalangeal, plantar callosity and/or metatarsalgia of lesser metatarsals, the use of commercially available shoes, and local inflammatory symptoms.

**Results:** Time duration in cast which corresponded with healing of Osteotomy was on an average 8.5 weeks (range 6 to 20 wks). Return to full employment took 15.5 weeks on an average (range 10 to 28 wks). Thirty five of our patients (48 feet) had pain as the predominant reason for surgery. Thirty three (94%) were satisfied with the surgery, two patients had pain on exertion though of less intensity than before. 37(92%) of our patients were satisfied with the appearance of their feet. 38(%) patients were satisfied with their shoe wear. First metatarsal shortening of an average of 4.5 mm (3-11 mm) was noted.

**Conclusion:** Mitchell's Osteotomy shortens the length of the first metatarsal bone and thus relieves tension in soft tissues and is a good option for treatment of patients with Hallux Valgus

**Keywords:** Hallux valgus, metatarsal bones, metatarsalgia, metatarsophalangeal joint, osteotomy

### Introduction

Hallux valgus which literally means lateral deviation of great toe is in fact a complex deformity of the first ray that frequently is accompanied by deformity and symptoms in the lesser toes. It has multi factorial etiology like valgus of greater toe, metatarsus primus varus, genetic factors, shoe wear and anatomic factors like pronated flat foot, abnormal insertion of tibialis posterior, long 1<sup>st</sup> ray, increased obliquity of 1<sup>st</sup> metatarso-medial cuneiform joint [1]. The earliest records date back to eighteenth century [2]. Its incidence was found to be 31% greater in shoe wearing than non-shoe wearing Chinese population [3]. Its main concerns are pain over 1<sup>st</sup> metatarsophalangeal joint (MTP), difficulty in shoe wear and is cosmetically unacceptable. Management is conservative to begin with like broad toe shoe wear, toe spacers, exercises and activity restriction; later on operative which attempt to correct the deformity. Hueter, 1870 suggested sub capital amputation of the metatarsal head as the treatment for Hallux valgus [4]. More than 130 surgical procedures have been described since then for it. These range from soft tissue procedures like McBride's [5] procedure to arthodesis of 1<sup>st</sup> metatarsophalangeal joint. Hawkins and associates first described an Osteotomy of distal metatarsal to correct Hallux valgus in 1945 [6]. This Osteotomy came to be known as Mitchell's Osteotomy after C. Leslie Mitchell who subsequently published an article in 1958 describing this procedure [7]. This procedure includes Osteotomy of distal 1<sup>st</sup> metatarsal with lateral and planter displacement of capital portion along with bunionectomy and medial capsulorrhaphy. The purpose of this study is to present the results and the complications of Mitchell's Osteotomy in the management of Hallux Valgus.

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### Material and Methods

Ours was a prospective study conducted at a tertiary care institution from November 2013 to December 2016. Forty patients total of 56 feet were operated, 16 bilateral and 24 unilateral. Average age of patients was 35 years (range 20 to 60 years). There were 34 females and 6 males (female: male ratio of 5.6:1). Thirty five patients (48 feet) were operated primarily for pain over bunion (1<sup>st</sup> MTP joint) of at least six months duration and five (8 feet) for cosmetic and shoe fitting problems. Exclusion criteria were osteoarthritis (OA) of 1<sup>st</sup> metatarso phalangeal (MTP) joint, rheumatoid arthritis, infection in the region, 1<sup>st</sup> metatarsus more than 3 mm shorter than 2<sup>nd</sup>, decreased sensations due to any neuropathy and peripheral vascular disease. Pre and post operative assessment was made according to the protocol of the American Orthopaedic Foot and Ankle Society [8]. All patients were evaluated prior to surgery clinically for callosities, distal sensations, vascular status and range of motion (ROM) both active and passive at 1<sup>st</sup> MTP joint (i.e. dorsiflexion and planter flexion) and radiologically by weight bearing dorso-planter and lateral views. Hallux valgus angle (angle subtended by lines bisecting the long axis of the first metatarsal and proximal phalanx [MTP] angle) and inter metatarsal angle (angle subtended by lines bisecting the longitudinal axis of the first and second metatarsal [IM] angle), first metatarsal length and OA changes of 1<sup>st</sup> MTP joint were noted.



**Fig 1(a):** preoperative deformity



**Fig 1(b):** postoperative correction and healthy scar



**Fig 1(c):** preoperative X- ray osteotomy



**Fig 1(d):** post operative Xray healed

Patients were operated under spinal/epidural anaesthesia and pneumatic tourniquet. Dorso- medial incision centred over 1<sup>st</sup> MTP joint beginning from middle of proximal phalanx to middle of 1<sup>st</sup> metatarsal was used. Due care was taken to preserve the terminal branches of the medial division of superficial peroneal nerve. Capsule of 1<sup>st</sup> MTP joint was opened in Y shaped manner with base distally. Soft tissues over lateral part of first metatarsus which carry blood supply were preserved as far as possible. Medial eminence was removed and two holes drilled in metatarsal shaft, the distal hole being 1.5 cm proximal to the distal margin of the articular surface. Distal cut was made, leaving 3—6 mm of lateral shaft intact. The amount of intact shaft varied with the severity of the deformity. Proximally a complete osteotomy was done, 3-4 mm proximal to distal hole, and the intervening segment of bone removed. The distal fragment was shifted laterally and planter wards. This is the most important step to prevent post operative metatarsalgia. The osteotomy was held by No. 1 suture (vicryl). Medial capsulorrhaphy was done in V-Y fashion and wound closed. Boot cast was given for two weeks. At two weeks sutures were removed and short leg walking cast given for further 4 to 6 weeks. Partial weight bearing was started in walking cast and full weight bearing encouraged after one month. Cast were usually removed at 6 to 8 weeks depending on signs of union on x-rays. In cases where union was delayed cast period was extended. Patients were assessed three monthly with particular attention on cosmetic correction, callosities, recurrence of deformity, ROM at 1<sup>st</sup> MTP joint, pain over 1<sup>st</sup> MTP joint, shoe wearing problems and metatarsalgia. Weight bearing X rays to see for valgus angle and IM angle were taken once union was achieved. All patients were followed for minimum of 18 months [range 18 to 40].

## Results

The patients were assessed prior to surgery and at a follow-up of at least 18 months (range 18 to 40) after surgery based on the recommendations of the American Orthopaedic Foot and Ankle Society. Time duration in cast which corresponded with healing of osteotomy was on an average 8.5 weeks (range 6 to 20 wks). Return to full employment took 15.5 weeks on an average range (10 to 28 wks). Thirty five of our patients (48 feet) had pain as the predominant reason for surgery. Most of them 33(94%) patients (45 feet) were satisfied with the surgery; two patients (3 feet) had some pain on vigorous exertion though their pain was much lesser than before the surgery. 37(92%) of our patients were satisfied with the appearance of their feet. 38(95%) out of 40 patients were satisfied with their shoe wear. First metatarsal shortening of an average of 4.5 mm (3 to 11 mm) was noted.

**Table I:** Clinical results

Results	Satisfied	Satisfied with reservation	Dissatisfied
Pain	33	2	0
Appearance	37	3	0
Shoe wear	38	2	0

**Table II:** Functional grading (adapted from the assessment proposed by the American Orthopaedic Foot and Ankle Society).

Grade	Pain	Pre-op	Post-op
0	None		
1	During sports and other vigorous activities	35	2
2	With conventional shoes in daily walking	35	0
3	Walking bare footed	15	0
4	At rest	10	0

**Table III:** Movements, in degrees, of the first MTP joint (mean and average).

Dorsiflexion	Pre operative	Post operative
Active	25(10 -50)	20(0- 35)
Passive	30 (10-55)	22 (0-35)
Plantar flexion		
Active	25(10-45)	20(0-45)
Passive	35(15 to 50)	25(0-50)

## Complications

Main complications encountered were delayed union, infection, residual deformity, and pain at 1<sup>st</sup> MTP joint, decreased sensations over medial aspect of Hallux, tight plaster and metatarsalgia.

**Table IV:** Complications

Complication	No. of feet
Delayed union	3
Infection	4
Pain at MTP	3
Residual deformity	2
Metatarsalgia	3
Decreased sensation	8
Plaster complications	4

Three feet which showed delayed union after 12 weeks of surgery did unite in cast within 20 weeks. Superficial infection occurred in four cases. All of them settled with parenteral antibiotics except one who needed suture removal

and wound debridement. Pain at MTP on activity was noted in three feet. Three feet had metatarsalgia over second and third toes. We had no non union or avascular necrosis of metatarsal head. We had decreased sensations in 8 feet after surgery. However, 5 of them recovered fully. Three patients (4 feet) developed pain due to tight plaster in post operative period. They were managed by removal of plaster and reapplication after sometime.

## Discussion

Hallux valgus is the most common deformity involving the fore foot. Hallux valgus angle > 15 degree and intermetatarsal angle >9 degree is regarded as Hallux valgus [9]. Piggott [1960] considered clinical features more important than radiological assessments [10]. He pointed out that no arbitrary angle can be given above which Hallux valgus is pathological, for in his congruous or "exaggerated" normal group MTP angle reached up to 28 degrees. Pain over medial eminence, cosmetic and problem with shoe wear is the major reasons for seeking treatment.

The management of the Hallux valgus aims at a well aligned and painless first metatarso-phalangeal (MTP) joint with preservation of dorsiflexion, allowing normal progression in the gait cycle from flat foot to toe off stages [11]. Conservative management includes broad toed shoes, exercise, toe spacer and activity modification. Operative procedures are an option once conservatives fail. More than 130 different procedures have been described for this condition [12]. These include soft tissue procedures like McBride's bunionectomy, distal metatarsal osteotomies like Mitchell's, Gibson Piggott's and Cheviron; proximal metatarsal osteotomy like Mann and proximal Cheviron; osteotomy of medial cuneiform Rudi; double osteotomy Cheviron-Akin; combined soft tissue and bony Keller resection arthroplasty and arthodesis of 1<sup>st</sup> MTP joint. Helal, Gupta and Gojaseni (1974) considered some form of distal osteotomy as treatment of choice in younger patients with moderate Hallux Valgus [13] while Turbull and Grange (1986) preferred osteotomy over excision arthroplasty even in elderly [14].

The aim of operative management is to have pain relief, correction of fore foot deformity and a biomechanically functional foot. Mitchell's osteotomy, which consists of osteotomy of distal 1<sup>st</sup> metatarsus with lateral and planter shifting of capital portion along with bunionectomy and medial capsulorrhaphy, has been in vogue for around six decades.

A number of modifications have been used by others like fixation of osteotomy by Herbert's screw (Wu's bunionectomy) [15] or specially designed staples (Briggs *et al*) [16]. The reported advantages of implant fixation are that they increase strength and stability at osteotomy site [17] thus allowing early weight bearing and increased ROM at MTP joint [16]. Calder [18] was not able to find any significant difference between suture fixation groups and implant group viz a viz clinical and radiological result. The only advantage seems to be early return to work as in Briggs T.W [16] study, who fixed the osteotomy by special staples; it took on an average 8.3 weeks for return to full employment as compared to 15.5 weeks in our study. Further, use of suture obviates the need for re surgery to remove the implant and other hardware related problems.

The major indication for surgery in our series was pain over bunion not responding to conservative treatment of at least six months duration. Thirty five of our patients (48 feet) were operated primarily for pain in 1<sup>ST</sup> MTP joint, thirty three patients had no pain on follow up and only 2 patients had

some pain on vigorous exercise. Thirty seven (92%) of our patients were satisfied with the appearance of their feet. Thirty eight (96%) patients were satisfied with their shoe wear. When we compare our results with other series we find similar results. M Zaheer<sup>[2]</sup> had complete pain relief in 94% of his 69 patients while others had some reservations. 97% of his patients were fully satisfied with their appearance while others had some reservations. Briggs *et al*<sup>[16]</sup> had 84% fully satisfied and 10% satisfied with some reservations as far as pain over 1<sup>st</sup> MTP joint is concerned while 75% were fully satisfied and 19% were satisfied with reservations as far as appearance is concerned. Glynn<sup>[19]</sup> had 92% excellent or good results in his series. The average valgus angle in our series improved from 35 degree to 17 degree and IM angle from 17 to 9 degree. In other reported series MTP angle reduced from 38.5 to 9.2<sup>[2]</sup>, 35 to 23<sup>[16]</sup> and 35.8 to 13<sup>[19]</sup>; IM angle in these series was reduced from 16.2 to 7.9, 16 to 11 and 13.4 to 4, respectively. We encountered few complications in our study. Four of our patients had infection in post operative period. Three subsided with I.V. antibiotics and one needed removal of sutures and wound debridement. There was no sign of active infection in any one at the latest follow up. Delayed union occurred in three cases, one case with infection and other two were active smokers who continued smoking in post operative period. No active intervention was needed all united after a prolonged period of immobilization in plaster of paris cast. Residual pain on exertion occurred in two and shoe fitting problems in three of our patients. Metatarsalgia over 2<sup>nd</sup> and other metatarsal heads was reported in three patients in as many feet. The reasons for metatarsalgia which have been proposed are dorsal angulations of metatarsal head<sup>[16]</sup> or shortening of first metatarsus >10 mm<sup>[20]</sup>. All of them had 1<sup>st</sup> metatarsal shortening 10mm. Metatarsalgia secondary to 1<sup>st</sup> metatarsal shortening >10 mm have been reported by many authors as was the case with our series. However, two patients with 10mm shortening had no metatarsalgia at latest follow up. Some authors disagree with the concept that metatarsal shortening causes metatarsalgia<sup>[11, 21]</sup>. Post operative stiffness at 1<sup>st</sup> MTP joint was not a problem in our study. We did not encounter any non union or avascular necrosis of metatarsal head. This may be due to precaution we took to preserve the soft tissue over lateral aspect of the first metatarsus thus preserving the blood circulation to this part.

### Conclusion

Mitchell's Osteotomy shortens the length of the first metatarsal bone and thus relieves tension in soft tissues such as the adductor hallucis. Nonetheless, the procedure can induce metatarsophalangeal joint malalignment and metatarsalgia, and plantar callosity may develop or persist after surgery.

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