

Original Research Article

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Classical Mitchell's osteotomy in the management of symptomatic hallux vulgus

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ABSTRACT

Background: Hallux vulgus is common deformity of fore foot frequently resulting in pain at first metatarso phalangeal joint and cosmetic problems. Hallux vulgus is particularly more common in shoe wearing populations. Ours being a sub Himalayan region with harsh and prolonged winters where shoe wearing is a must this condition is very common. Various surgical procedures have been described for its management. These range from soft tissue procedures to arthodesis of first metatarso phalangeal joint. Distal first metatarsal osteotomy (Mitchell's osteotomy) is a time tested procedure in its management.

Methods: Forty adult patients (56 feet) with symptomatic hallux vulgus, who did not respond to conservative treatment, were managed with Mitchell's osteotomy.

Results: Results were assessed as per American Orthopaedic Foot and Ankle Society grading. More than ninety percent of our patients were fully satisfied with their pain relief and foot cosmetics while others were satisfied with some reservations. There was no major complication or non-union at osteotomy site.

Conclusions: Management of hallux vulgus is conservative to begin with, measures like life style modifications, broad toed shoes, toe spacers and physical therapy are tried first. Surgical intervention is indicated if conservative measures fail to relieve symptoms. More than 130 surgical procedures have been described for hallux vulgus ranging from soft tissue procedures like MacBride's to arthodesis of first metatarso phalangeal joint. Distal metatarsal osteotomy was first described by Hawkins in 1945 but was named after Mitchell who published his work in 1958. From our study we conclude that this is a time tested procedure for symptomatic cases of Hallux Vulgus not responding to conservative measures.

Keywords: Hallux vulgus, Osteotomy, Mitchell's osteotomy

INTRODUCTION

Hallux vulgus 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 vulgus of greater toe, metatarsus primus varus, genetic factors, shoe wear and anatomic factors like pronated flat foot, abnormal insertion of tibialis posterior, long 1st ray, increased obliquity of 1st 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 nonshoe wearing Chinese population.³ Its main concerns are pain over 1st metatarsophalangeal joint (MTP), difficulty in shoe wear and cosmetics. 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 vulgus.⁴ More than 130 surgical procedures have been described since then for it. These range from soft

tissue procedures like McBride's procedure to arthodesis of 1st metatarsophalyngeal joint.⁵ Hawkins and associates first described an osteotomy of distal metatarsal to correct hallux vulgus 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 1st metatarsal with lateral and planter displacement of capital portion along with bunionectomy and medial capsulorrhaphy. Mitchell's osteotomy is a time tested procedure for managing hallux vulgus. We report our experiences with this and compare it with other series.

METHODS

Ours was a prospective study conducted at tertiary care institute from November 2010 to December 2012. 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 (1st MTP joint) of at least six months duration and five (8 feet) for cosmetic and shoe fitting problems. Exclusion criteria were osteoarthritis (OA) of 1st metatarsophalyngeal (MTP) joint, rheumatoid arthritis, infection in the region, 1st metatarsus more than 3 mm shorter than 2nd, decreased sensations due to any neuropathy and peripheral vascular disease. Pre and postoperative 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 1st MTP joint (i.e dorsiflexion and planter flexion) and radiologically by weight bearing dorso-planter and lateral views. Hallux vulgus 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 1st MTP joint were noted.

Patients were operated under spinal/epidural anaesthesia and pneumatic tourniquet. Dorso-medial incision centred over 1st MTP joint beginning from middle of proximal phalanx to middle of 1st metatarsal was used. Due care was taken to preserve the terminal branches of the medial division of superficial peroneal nerve. Capsule of 1st 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 postoperative metatarsalgias. 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 1st MTP joint, pain over 1st MTP joint, shoe wearing problems and metatarsalgias. Weight bearing X-rays to see for vulgus angle and IM angle were taken once union was achieved. All patients were followed for minimum of 18 months (range 18 to 40).



Figure 1: (a) preoperative deformity
(b) postoperative correction and healthy scar
(c) preoperative X-ray
(d) postoperative X-ray healed osteotomy.

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 weeks). Return to full employment took 15.5 weeks on an average (range 10 to 28 weeks). Thirty five of our patients (48 feet) had

pain as the predominant reason for surgery. Most of them 33 patients (45 feet; 94%) were satisfied with the surgery, two patients (3 feet) had some pain on vigorous exercise though their pain was much lesser than initial one. Ninety two percent of our patients (37/40) were satisfied with the appearance of their feet rest had some concern though all agreed that there was definite improvement in the appearance of their feet. 38 out of 40 patients were satisfied with their shoe wear two had some concern. First metatarsal shortening of an average of 4.5 mm (3 to 11 mm) was noted.

Table 1: Clinical results in 40 patients.

Results	Satisfied no. of patients	Satisfied with reservation no. of patients	Dissatisfied no. of patients
Pain	33	2	0
Appearance	37	3	0
Shoe wear	38	2	0

Table 2: 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 bear footed	15	0
4	At rest	10	0

Table 3: Total movements, in degrees, of the first MTP joint (mean and average).

	Preoperative	Postoperative
Dorsiflexion		
Active	25 (10 -50)	20 (0- 35)
Passive	30 (10-55)	22 (0-35)
Planter flexion		
Active	25 (10-45)	20 (0-45)
Passive	35 (15 to 50)	25 (0-50)

Main complications encountered were delayed union, infection, residual deformity, pain at 1st MTP joint, decreased sensations over medial aspect of hallux, tight plaster and metatarsalgias as shown in Table 4.

Delayed union at osteotomy site occurred in three feet. Twelve weeks was the time after which we considered it as delayed union. All of them healed in cast within 20 weeks none needed any further management. Superficial infection occurred in four cases. All of them settled with i/v antibiotics except one who needed suture removal and wound debridement.

Pain at MTP on vigorous activity was noted in three feet. Two of these three feet had some residual deformity also. Three feet had metatarsalgias over second and third toes. We had no nonunion 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 postoperative period. They were managed by removal of plaster and reapplication after sometime.

Table 4: Complications.

Complications	No. of feet
Delayed union	3
Infection	4
Pain at MTP	3
Residual deformity	2
Metatarsalgias	3
Decreased sensation	8
Tight plaster	4

DISCUSSION

Hallux vulgus is the most common deformity involving the fore foot. Hallux vulgus angle >15 degree and intermetatarsal angle >9 degree is regarded as hallux vulgus.⁹ Piggott considered clinical features more important than radiological assessments.¹⁰ He pointed out that no arbitrary angle can be given above which hallux vulgus is pathological, for in his congruous or "exaggerated" normal group MTP angle reached up to 28 degrees. Pain over medial eminence, cosmetics and problem with shoe wear are the major reasons for seeking treatment. The management of the hallux vulgus aims at a well aligned and painless first metatarsophalyngeal [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 Piggots and Chevron; proximal metatarsal osteotomy like Mann and proximal Chevron; osteotomy of medial cuneiform Rudi; double osteotomy Chevron-Akin; combined soft tissue and bony Keller resection arthroplasty and arthodesis of 1st MTP joint. Helal et al considered some form of distal osteotomy as treatment of choice in younger patients with moderate hallux vulgus while Turbull et al preferred osteotomy over excision arthroplasty even in elderly.^{13,14} 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 1st metatarsus with lateral and planter shifting of capital portion along with bunectomy and medial capsulorrhaphy, has been in vogue for around six decades.

We stabilised the osteotomy with heavy absorbable sutures. A number of modifications have been used by others like fixation of osteotomy by Herbert's screw (Wu's bunieectomy) or specially designed stapples (Briggs et al).^{15,16} The reported advantages of implant fixation is that they increase strength and stability at osteotomy site thus allowing early weight bearing and increased ROM at MTP joint.^{16,17} Calder was not able to find any significant difference between suture fixation group and implant group viz a clinical and radiological results.¹⁸ The only advantage seems to be early return to work as in Briggs 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.¹⁶ 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. We achieved pain relief in most of our patients. Thirty five of our patients (48 feet) were operated primarily for pain in 1ST MTP joint, thirty three (45 feet; 94%) had no pain on follow up and only 3 feet in 2 patients (6%) had some pain on vigorous exercise. Ninety two percent (37) of our patients were totally satisfied with the appearance of their feet rest had some reservations though all accepted an improvement in the appearance. Similarly ninety six (38) percent of our patients were fully satisfied with their shoe wear and two had some reservations one amongst them who was operated on both sides was satisfied with one foot and not with the other one. When we compare our results with other series we find similar results. Zaheer had complete pain relief in 94% of his 69 patients while others had some reservations.² 97% of his patients were fully satisfied with their appearance while others had some reservations. Briggs et al had 84% fully satisfied and 10% satisfied with some reservations as far as pain over 1ST MTP joint is concerned while 75% were fully satisfied and 19% were satisfied with reservations as far as appearance is concerned.¹⁶ Glynn had 92% excellent or good results in his series. The average vulgus 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, 35 to 23 and 35.8 to 13; 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.^{2,16,19} Four of our patients had infection in postoperative period. Three subsided with i/v antibiotics one needed removal of sutures and wound debridement. All did well though delayed union occurred in one case that needed debridement. There was no sign of active infection in any one at the latest follow up. Delayed union occurred in three cases (3 feet), one case with infection and other two were active smokers who continued smoking in postoperative period. No active intervention was needed all united in cast which was prolonged. Residual pain at MTP joint on vigorous exercise occurred in two and some cosmetic/shoe fitting concerns in three patients. Metatarsalgias over 2nd and other metatarsal heads was reported in three patients in as

many feet. The reasons for metatarsalgias which have been proposed are dorsal angulations of metatarsal head or shortening of first metatarsus >10 mm.^{16,20} All of them had 1ST metatarsal shortening 10 mm. Metatarsalgias secondary to 1ST metatarsal shortening >10 mm have been reported by many authors and we agree with them. However, two patients with 10 mm shortening had no metatarsalgias at latest follow up. Some authors disagree with the concept that metatarsal shortening causes metatarsalgias.^{11,21} Postoperative stiffness as indicated by active and passive ROM at 1ST MTP joint was not a problem in our study. We did not encounter any nonunion 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.

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REFERENCES

1. Terry Canale S, Beaty JH. Campbell's operative orthopaedics. 4th volume. Chapter 78. 10th edition. Disorders of hallux. Canada: Elsevier; 2012: 3915.
2. Zaheer M, Dahabra I. Modified Mitchell's Osteotomy for the Treatment of Hallux Vulgus. Experience at King Hussein Medical Center. JRMS. 2003;10(2):6-10.
3. Sin-Fook, Hodgson A. A comparison of foot forms among the non-shoe wearing Chinese population. J Bone Joint Surg Am. 1958;40:1058-62.
4. Hueter C. Klinik der Gelenkkrankheiten mit Einschluss der Orthopadie. 3rd edition. St. Louis: CV Mosby; 1973: 1870-1871.
5. McBride E. Hallux vulgus, bunion deformity: its treatment in mild, moderate and severe stages. J Int Coll Surg. 1954;21:99.
6. Hawkins FB, Mitchell CL, Hedrick DW. Correction of Hallux Vulgus by metatarsal osteotomy. JBJS. 1945;27:387-94.
7. Mitchell CL, Fleming JL, Allen R, Glenney C, Sanford GA. Osteotomy-bunieectomy for Hallux Vulgus. JBJS [Am]. 1958;40:41-60.
8. Smith RW, Reynolds C, Stewart MJ. Hallux vulgus; report of Research Committee American Orthopaedic Foot and Ankle Society. Foot Ankle. 1984;5(2):90-103.
9. Reverdin J. On the outward deviation of great toe (hallux vulgus, bunions, balloons) and its surgical treatment. Trans Int Med Cong. 188;2:408.
10. Piggot H. The natural history of hallux vulgus in adolescence and early adult life. J Bone and Joint Surgery [Br]. 1960;42:749-60.
11. Mann R, Hagy J. The function of the toes in walking, jogging and running. Clin Orthop Related Res. 1979;142:24.

12. Richardson GE, Donley B. Disorders of the hallux. In: Canale ST, editor. Campbell's operative orthopaedics. 9th edition. Missouri: Mosby; 1998: 1624.
13. Helal B, Gupta SK, Gojaseni P. Surgery for adolescent hallux vulgus. *Acta Orthop Scand*. 1974;45:271-95.
14. Turbull T, Grange WJ. A comparison of Keller's arthroplasty and distal metatarsal osteotomy in the treatment of adult hallux vulgus. *J Bone and Joint Surgery [Br]*. 1986;68:132-7.
15. Wu KK. Modified Mitchell's bunionectomy (Wu's bunionectomy). *Orthopaedics*. 1997;20:253-7.
16. Briggs TWR, Smith P, McAuliffe. Mitchell's Osteotomy Using Internal Fixation and Early Mobilization. *JBJS [Br]*. 1992;74:137-9.
17. Calder JD, Hollingdale JP. Measurement of strength and stability of suture versus AO screw fixation of Mitchell's osteotomy: A cadaveric study. *Foot*. 1997;7:220-3.
18. Calder JD, Hollingdale JP, Pearse MF. Screw fixation versus suture fixation of Mitchell's osteotomy; A prospective, randomised study. *J Bone and Joint Surgery Br*. 1999;81:621-4.
19. Glynn MK, Dunlop JB, FitzPatrick D. The Mitchell distal metatarsal osteotomy for hallux vulgus. *J of Bone Joint Surg*. 1980;62(2):188-91.
20. Merkel KD, Katoh Y, Jonhson EW, Chao EY. Mitchell Osteotomy for hallux valgus: Long term follow-up and gait analysis. *Foot Ankle*. 1983;3:189-96.
21. Broughton V, Winson IG. Keller's arthroplasty and Mitchell's osteotomy: A comparison with first metatarsal osteotomy of the long term results for Hallux Vulgus deformity in younger female. *Foot Ankle*. 1988;10:201-5.

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