Treatment of the Juvenile Bunion by Mitchell Osteotomy

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ABSTRACT: Twelve patients who had a total of 18 Mitchell bunionectomies were reviewed to assess the long-term results of the procedure. Although metatarsus varus correction was maintained in all cases, hallux valgus recurred in 11 of the 18 cases. Sixty-seven percent reported complete relief or improvement of preoperative pain. Although lateral metatarsalgia did occur, the most common area of persistent pain remained the first metatarsal. Six of 18 procedures had marked loss of active joint motion, associated with pain and an unsatisfactory result. Of 18 procedures, 11 (61%) were satisfied with the results of their osteotomy.

Although the Mitchell osteotomy corrected the metatarsus primus varus in each case, the current series shows a discouraging incidence of later recurrence of hallux valgus and restriction of metatarsophalangeal motion causing the abandonment of this procedure for the management of juvenile bunion.

Introduction

Hallux valgus with exostosis of the medial first metatarsal head is a common condition. It most often is seen by the orthopedist in older patients with established subluxation and degeneration of the first metatarsophalangeal joint and can be debilitating. In these patients resection arthroplasty of the degenerated joint is a commonly performed procedure. In the adolescent, it can be a cosmetic problem and present problems with shoe wear.

In the juvenile patient, whose joint usually is still congruous and who wishes to maintain an active lifestyle, functional results and acceptance of resection arthroplasty have been poor. In 1943, Mitchell called attention to the association between adolescent hallux valgus and metatarsus primus varus. He designed a step-cut lateral displacement osteotomy of the distal first metatarsal to correct the deformity.

The osteotomy is performed through a dorsal-medial approach. The exostosis is excised and a step-cut osteotomy is performed through the distal diaphysis. The distal fragment is displaced laterally and secured with a suture through drill holes (Fig. 1). The medial capsule is imbricated and the foot immobilized in the corrected position. This removes the exostosis, corrects the metatarsus varus, narrows the foot and corrects the hallux valgus (Fig. 2).

The object of the present retrospective study was to obtain follow up with regard to recurrence of metatarsus varus, hallux valgus, or exostosis, and to assess patients' satisfaction with the procedure. Because of reports of late development of lateral metatarsalgia following Mitchell osteotomy, inquiries about postoperative pain patterns and activity limitation were made in particular.

Materials and Methods

During the period 1976 to 1980 at Oklahoma Children's Memorial Hospital, 26 Mitchell osteotomies were performed of which 12 patients with 18 osteotomies could be located for follow up. Six neurogenic deformities were excluded from the study group.

The operation was performed as described and is depicted in Figure 1. Fixation of the osteotomy was with a single 0 non-absorbable suture. Postoperatively, a plaster toe spica slipper was applied and used for six weeks. No special footwear was employed although a stiff soled shoe of adequate width was recommended for one to two months after plaster removal.

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Fig. 2: These radiographs illustrate the preoperative, postoperative and follow up radiographs of the Mitchell osteotomy.

Each of the patients was interviewed and examined by one of the authors. The examiner had not performed any of the procedures. Using a pressure sensitive footprint grid (Apex Foot Company), several footprints were made of each foot during a normal walking stride to obtain a record of the weight bearing pattern.

Standing AP radiographs were obtained and compared to preoperative and postoperative films. Radiographic measurements included the angle between the first and second metatarsals (metatarsus primus varus), the angle between the first metatarsal and the proximal phalanx (hallux valgus), the distance between the first and second metatarsal heads, the amount of first metatarsal-phalangeal subluxation, and the amount of first metatarsal shortening.

Results

Seven females had 12 osteotomies and five males had six osteotomies. Follow up ranged from two years, eight months to six years, ten months with an average of three years, nine months. Age at surgery ranged from 12 to 20 years with an average of 14.8 years. Seven of the feet had been previously operated of which three were proximal osteotomies and four simple bunionectomies.

Pain

Eighty-three percent of the feet were sufficiently painful preoperatively to restrict the patients' activities. At follow up examination 39% reported no pain, 28% unchanged, and 11% were worse. Postoperative pain typically was related to prolonged standing and none reported significant restrictions in vocation or activities due to foot discomfort. Forty-four percent complained of pain at the medial or plantar first metatarsal head, 22% under the second metatarsal and 22% under the other metatarsals or toes.

Examination

At follow up examination 11 of 18 feet, or 61%, had clinical hallus valgus exceeding 20°. Four of these had significant rotation of the great toe; four feet had significant plantar callosities; nine feet had some hammertoe deformity; four feet had second toes that projected beyond the great toe during gait.

Compared to normal, there was a significant restriction of active first metatarsophalangeal joint motion. Six feet showed combined motion of active plantarflexion and dorsiflexion of less than 20°. All of these patients complained of pain and were dissatisfied with their results.
Radiographic Measurements

Standing preoperative radiographs demonstrated metatarsus primus varus (greater than 10°) in all feet operated on. This was corrected in each case. Average preoperative varus was 13.6° and postoperative 6.9°. Final radiographs showed no instance of recurrence of metatarsus varus.

Hallux valgus preoperatively averaged 27.4° (range 15° to 41°) with postoperative correction to 12.3° (range 6° to 18°). Follow-up showed a high incidence of recurrence with average hallux valgus 20.7° (range 7° to 32°).

The distance between the first and second metatarsals was reduced an average of 23%. This correction was maintained on subsequent radiographs.

Sixteen of the feet had exostoses preoperatively. Of these, four feet had exostoses at follow up and three feet had been reoperated for recurrent exostoses.

Subluxation of the metatarsophalangeal joint averaged 44% preoperatively. At follow up, subluxation averaged 28%.

The second metatarsal was used as a reference to correct for differences in radiographic technique. Radiographic measurement showed shortening of the first metatarsal which averaged 4.5% (range 3% to 12%). There were no instances of radiographically apparent degenerative disease of the first metatarsal phalangeal joint or aseptic necrosis of the first metatarsal head.

Patient Satisfaction

Eleven of 18 cases (61%) reported they were satisfied with the results of their surgery. Reasons for dissatisfaction included pain and recurrence of hallux valgus deformity. Of the six cases showing less than 20° of metatarsophalangeal motion, all complained of pain and were dissatisfied with the results of their procedure.

Footprints

The pressure sensitive grid was used to estimate the distribution of weight bearing. Metatarsalgia seemed to correlate with areas of increased weight bearing, but this method was too imprecise to be of great aid in the final evaluation.

Discussion

The angular deformity of the first metatarsophalangeal joint leading to bunion formation is a complex forefoot deformity. The sesamoids sublux laterally, the medial collateral ligament and capsule are stretched and the lateral collateral ligament is contracted. With metatarsophalangeal subluxation the tendon of abductor hallucis subluxes plantarward and becomes a deforming rather than correcting force. The long flexors and extensors, displaced laterally, act as deforming forces. The great toe is in valgus and internally rotated. The first metatarsal is in varus and the forefoot is splayed. A bursa and underlying exostosis forms on the medial first metatarsal head. The malaligned great toe can no longer function properly in locomotion. The first metatarsophalangeal joint ultimately degenerates and becomes painful.

Depending on the surgeon’s viewpoint of the pathologic anatomy, a wide variety of procedures have been described for surgical correction of the juvenile bunion. A successful procedure for correction of bunion deformity should relieve the patient’s pain, correct the deformity, be cosmetically acceptable, and correct pathologic anatomy to prevent recurrence. In addition, in the adolescent patient it must restore and maintain proper dynamics of forefoot motion and weight bearing. It should be able to withstand years of use and not interfere with the physis.

Our results with the Mitchell osteotomy demonstrated that one object of the procedure, to decrease the distance between the first and second metatarsal heads, was achieved and maintained. Other parameters measured indicated our other goals were not as consistently achieved. The recurrence of hallux valgus in many of our patients suggests that altering this distance may not be sufficient to alleviate the forces that produce juvenile bunion.

Loss of metatarsophalangeal joint motion to an unacceptable degree occurred in one third of our cases and correlated closely with patient dissatisfaction. Presumably, this is due to the presence of a contracted lateral collateral ligament combined with the surgical trauma of medial capsule imbrication. Although some loss of active joint motion is common to surgical procedures for bunion deformity, it is a serious cause for dissatisfaction in the active young adult.

Malrotation of the toe, a serious consequence, occurred in four cases suggesting that the single suture fixation was inadequate. While all reasons for failure cannot be known, this method of fixation in an adolescent may be inadequate. In addition, the double saw cut method of performing the osteotomy leads to some shortening, which compounds any shortening already present.

The adolescent patient is somewhat difficult to subjectively evaluate. Compliance can be a problem. We were unable to evaluate our compliance rate, postoperative shoe wear or the effects of prolonging postoperative care such as by night splinting.

Conclusion

Based on the results of this study, we no longer use the Mitchell bunionectomy in the management of adolescent bunion. The rates of malrotation, recurrence of deformity, postoperative pain and loss of metatarsophalangeal motion were too high to justify its continued use.

References

Editorial Discussion

Orthopedics: Have the authors modified the Mitchell procedure, using internal fixation, for example, to prevent the complication of malrotation?

Sullivan: Based partially on this clinical review, we no longer perform the Mitchell procedure in adolescent or juvenile bunion, preferring instead a Chevron or dome type osteotomy in some patients and in some others, simple removal of the exostosis with the base of the first metatarsal osteotomy.

Orthopedics: Considering the recurrence rate of hallux valgus and the loss of MTP motion, do the authors feel a simple adductor hallucis tenotomy might be indicated with a Mitchell to decompress the lateral side of the joint and remove a deforming force?

Sullivan: We have no experience with simple adductor hallucis tenotomy but feel that simple tenotomy without correcting the bony deformity would be ineffective in and of itself.

Orthopedics: Surgery for juvenile and adolescent bunion has not produced particularly gratifying results in many surgeons' hands. Have the authors modified their indications, and what surgical procedure(s) do they now advocate?

Sullivan: We have, indeed, modified our indications and now would perform a dome or Chevron type osteotomy in those we think can have correction of the deformity merely by decreasing the distance between the first and second metatarsal. In others in which the first and second metatarsal angle is too great, we would perform an opening wedge osteotomy of the base of the first metatarsal and supplement this with a bone graft.

Orthopedics: The stiffness of MTP joint motion suggests that the fixation and postoperative splinting may not be a satisfactory combination. The loss of position and recurrent valgus deformity also suggests that a more rigid fixator may be a factor in the results (ie, screws or K-wires) with earlier motion. Shortening may also be avoided with a dome osteotomy.

Sullivan: We agree entirely with these comments and the initial part of the comment indicates many of the reasons why we no longer perform this procedure.