THE AUSTIN BUNIONECTOMY REVISITED: A Review of 59 Procedures

Clay Ballinger, DPM, Richard Green, DPM Nicholas DeSantis, DPM Donald Green, DPM

INTRODUCTION

Hallux valgus is one of the most common disorders of the foot. Physicians treating disorders of the foot and ankle can choose from a variety of surgical approaches to treat this condition. According to Kelikian, there have been more than 100 procedures documented that describe different techniques in treating hallux valgus.¹ These surgical approaches range from soft tissue procedures,²⁸ to osteotomies of the first metatarsal head^{9,10-19} to metatarsal shaft procedures,²⁰⁻²⁶ to base procedures of the first metatarsal,^{18,19,25-35} and to combinations of head and base procedures.

One of the more widely accepted procedures today is the Austin9 bunionectomy. It is used to treat mild to moderate hallux valgus deformities,36 and has been reported to have good to excellent results.37-40 The authors of this article undertook a retrospective analysis of the Austin bunionectomy. The Austin was evaluated as to the technical results as set forth from radiographic angles. The subjective results were determined from our patients and was based on their perception of pain, function, cosmesis, and overall success of the surgery. The modified American Orthopedic Foot and Ankle Society Rating System for the hallux metatarsophalangeal joint was employed to evaluate our subjective results. The effectiveness of this tool as a rating system for the Austin was also analyzed. Patient expectations were used to evaluate the surgical outcomes.

MATERIALS AND METHODS

Questionnaires were mailed to all eighty-nine patients who underwent an Austin bunionectomy for painful hallux valgus deformity, between the years 1997 to 2003, by three of the authors (DRG, RMG, ND). Forty-five patients returned the questionnaire. Three were removed because the questionnaires were not completely filled out leaving forty-two patients. The medical records and radiographs, of the forty-two respondents were reviewed by LCB.

Of the 42 respondents, there were 37 women and 5 men. The average age at the time of surgery was 51 years (range, 15-84 years). The average length of follow-up was 2 years (range 6 months-6 years). 17 patients had bilateral surgery, 15 patients had surgery on their right foot, and 10 patients had surgery on their left foot, for a total of 59 Austin bunionectomy procedures performed. There were a total of 32 right foot procedures and 27 left-foot procedures.

A subjective clinical rating score was obtained using the modified American Orthopaedic Foot and Ankle Society Rating Scale (Table 1)⁴¹ from the results of the subjective questionnaires. A total of 100 points were awarded for the following areas; pain (0 to 40 points), function (0 to 40 points), alignment/cosmesis (0 to 5 points), and success of surgery (0 to 15 points). A value of 90 to 100 points was an excellent result, 80 to 89 was a good result, 70 to 79 was a fair result, and less than 70 was a poor result.

Thirteen patients for twenty procedures agreed to a follow-up examination and an updated radiographic evaluation. Appearance, edema, scarring, neurologic status, deformity, first metatarsophalangeal joint range-of-motion, first ray range-of-motion, pain, calluses, shoe gear limitations and toe purchase were all evaluated by LCB First metatarsophalangeal joint range-of-motion was measured using a tractograph as described by Buell et al.⁴² First ray range-of-motion was measured by using a segmometer as described by Whitney.⁴³

Of the patients who responded to the

subjective questionnaire, preoperative and postoperative radiographs were compared. All radiographs of the patients were taken while weightbearing. Measurements of the radiographic angles and calculations were performed on dorsoplantar (DP) views. All measurements of the radiographic angles and calculations were performed by LCB using a tractograph (made by Allied OSI Labs), a protractor and compass (made by Staedtler), and an ultra fine Sharpie point marker which was used to mark out the angles. The radiographic angles included: 1. Hallux Abductus Angle (HAA), 2. True 1-2 Intermetatarsal Angle, 3. Metatarsal Protrusion Distance (MPD), and 4. Tibial Sesamoid Position (TSP). Radiographic measurements were performed as described by others.44-48

SURGICAL TECHNIQUE

The procedure begins with a dorsomedial curvilinear incision made medial to the extensor hallucis longus tendon along the contour of the deformity extending from midshaft of the metatarsal to midshaft of the proximal phalanx. Anatomical dissection in layers is deepened down, taking care to retract the dorsomedial cutaneous nerve which runs medial to the metatarsal and along the first metatarsophalangeal joint. Attention is then directed to the first interspace where the conjoined tendon of the adductor hallucis is released at its attachment to the base of the proximal phalanx. The fibular sesamoid then freed of its sesamoid metatarsal is suspensory ligament. A medial capsulotomy is then performed, and the capsule is reflected to allow exposure of the first metatarsal head. Using power instrumentation the dorsomedial eminence is resected. removing more bone dorsally than plantarly.

A through and through V-osteotomy is performed from medial to lateral through the first metatarsal head. The apex of the V-osteotomy is placed in the metatarsal head and the arms are angled at 60 degrees extending proximal-dorsal and proximal-plantar from the apex (Figure 1). The metatarsal head is then displaced laterally approximately one-third the width of the metatarsal shaft. At this point, the capital segment is impacted onto the shaft of the metatarsal (Figure 2). The capital fragment is fixated to the metatarsal with absorbable pins or kwires. The remaining medial bone shelf is then resected with power instrumentation and the denuded edges are smoothed. The wound is copiously irrigated and a standard layered closure of the soft tissues is performed. A betadine soaked gauze postoperative dressing is then applied. Postoperative shoe is utilized to allow weightbearing as tolerated.

SUBJECTIVE RESULTS

A total of 42 patients having 59 procedures responded to the above mentioned questionnaire. On a pain-rating scale of 0 to 10 (with 10 being the worst pain), an average preoperative pain score of 6 (range, 0-10) was reported. Preoperatively, 39% of the patients reported having limitations in their daily activities. A limitation in sports activities was reported by 51% of the patients, and 64% of the patients reported some type of limitations to the types of shoes they were able to wear. Twelve percent of the patients reported their joint(s) as very stiff; 44% reported their joint(s) as not very stiff; and 44% reported no stiffness at all preoperatively.



Figure 1. Surgical Technique: Austin V-Osteotomy, V angled at 60 degrees.



Figure 2. Surgical Technique: Capital fragment displaced laterally.

The reasons for the patients' decision to have surgery were reported as follows: bump pain 36/42, a crooked toe 20/42, difficulty wearing shoes 30/42, an unsightly appearance of their foot/ feet 18/42, calluses 6/42, response to their doctor's recommendation 16/42, hammertoe of their second digit 6/42, and joint pain 22/42 (Table 3). The types of conservative therapies attempted before surgery included 16 bunion shields, 42 wider shoe(s) at the toe region, 10 toe spacers, 23 stretching their shoe(s), and 4 reported no conservative measures (Table 4).

All postoperative results were related to the number of procedures(52). None to mild occasional pain in the first metatarsophalangeal joint(s) was reported by 94% of the patients. 69% reported relieving all stiffness, and 98% resulted in no painful calluses on the side of the patients' hallux surgery. No swelling was reported by 88%, and 48% reported no pain with daily activities ; 46% reported mild, occasional pain; and 6% reported moderate daily pain. In regards to the limitations of daily living, 92% of the patients reported no limitations postoperatively, while 8% reported some limitations, and none of the patients reported severe limitations. A total of 81% of the patients are now able to participate in sports activities without pain. These sporting activities include walking, running, step aerobics, golfing, bowling, volleyball, weightlifting, kickboxing, swimming, karate, softball, dancing, yoga, sailing, cycling, mountain hiking, and tennis.

Patients were satisfied with their amount first metatarsophalangeal joint motion in 86% of the procedures, 24% reported the motion in their joint(s) had increased greatly, 32% reported a somewhat increase in motion, 30% reported no change in motion, and 14% reported a decrease in motion. Participation in some type of physical therapy was reported by 29% of the patients, and 71% reported no physical therapy participation at all.

Only 2% of patients reported being able to return to wearing regular shoes within 2 weeks of surgery, 9% were able to return to regular shoes in 4 weeks, 14% in 6 weeks; and 75% returned to regular shoes in over 6 weeks. A total of 61% of the patients reported having no restrictions to the types of shoes they are now able to wear, 7% reported being restricted to wide shoes/sneakers, and 32% reported being unable to wear many types of shoes such as dress shoes/high heeled shoes.

Table 2

SUBJECTIVE RESULTS SCORED ON THE MODIFIED AMERICAN ORTHOPAEDIC FOOT AND ANKLE SOCIETY RATING SYSTEM FOR HALLUX METATARSOPHALANGEAL JOINT

Result	Score (%)	Number of Procedures	
Excellent	90 - 100	32	
Good	80 - 89	8	
Fair	70 - 79	14	
Poor	<69	5	

Table 3

REASON WHY PATIENT CHOSE TO HAVE SURGERY

Reason	# of Responses		
Bump pain	36		
Crooked great toe	20		
Difficulty wearing shoes	30		
Did not like the appearance			
of your foot	18		
Calluses	6		
Recommendation of doctor	16		
Hammertoe second digit	12		
Joint pain	22		

Table 4

TYPES OF CONSERVATIVE TREATMENT THERAPIES TRIED BEFORE GOING TO SURGERY

Conservative Treatment	# of Responses		
Bunion shields	16		
Wider shoe at the toe region	42		
Toe spacers	10		
Stretching your shoes	23		
Nothing	4		

on a series of measurements of the HAA, true IM 1-2, TSP, and MPD, which indicated satisfactory measurement reliability.

DISCUSSION

Austin, from his original study, believed that a satisfactory bunion operation "should redirect the first metatarsal head to create a uniform contact at the first metatarsophalangeal joint, that the hallux valgus should be fully corrected, that most of the correction of primus varus should be obtained, that rotation, or dorsiflexed attitude of the first metatarsophalangeal joint if present should be corrected, and that the first metatarsal should not be significantly shortened."9 This study intended to look at these parameters set forth by Austin as well as patient overall satisfaction to evaluate the Vosteotomy. The true 1-2 intermetatarsal angle was found to have a mean change of 7 degrees, the hallux abductus angle had a mean change of 14 degrees, the tibial sesamoid position changed by a mean of 3, and the metatarsal protrusion distance had a mean change of 2.3mm. The mean change in each of these angles was statistically significant. These findings are consistent with the findings of previously reported studies (Table 5).49-54 One would speculate that the significant changes in the radiographic angles following an Austin bunionectomy would provide excellent results for the patient's overall satisfaction.

Our results demonstrated the patient's pain was significantly diminished, they were able to get back to activities of daily living as well as sporting activities, patients were satisfied with the amount of motion in their first metatarsophalangeal joint, the majority were able to get back to many types of shoes, greater than half were pleased with the appearance of their foot, and more than 70% would recommend the surgical procedure to a family member or a friend. When the results were tabulated utilizing the MAOFAS rating system for the hallux metatarsophalangeal joint, we only reported 68% good to excellent results. These values from the rating system did not seem to correlate with our findings from our patients.

Our results were then compared with other previously reported studies that evaluated the same categories as our study but did not withe the MAOFAS rating system to evaluate their overall results. Johnson et al37 reported on 18 patients for 26 procedures and found 24 patients (92%) were completely satisfied with the results. Two were satisfied with minor reservations secondary to cosmetic reasons. Hattrup et al38 reported on 154 patients and 225 procedures. A total of 79.1% of the patients (178) feet were completely satisfied with their results. Leventen40 reported on a series of 90 patients for 120 procedures. His results found that 90% of the patients had complete pain relief. A total of 77% of the subjects were completely satisfied. Trnka et al55 and Pochatko et al49 reported on 49 patients and 62 procedures and 30 patients and 42 procedures respectively. Trnka et al found 86.6% of his patients had good to excellent results, and Pochatko et al found 91% of his patients had good to excellent results.

Based on the rating system MAOFAS, the results of our study compared to others, appeared to be significantly lower. Yet when looking at individual components; 95% were pleased with the results and would recommend the procedure, 71% would

Table 5

Study	HAA	IM 1-2	TSP	MPD
Duke (57)	17	8	N/A	5
Knecht and Van Pelt (67)	10	2	N/A	N/A
Pochatko et al (56)	14	5	N/A	N/A
Seiberg et al (58)	21	8	2	3
Steinbock and Hetherington (59)	15	7	1	3
Bryant and Singer (68)	14	5	2	4
This Study	14	7	3	2

RADIOGRAPHIC CHANGES FOLLOWING THE AUSTIN BUNIONECTOMY

highly recommend to a family member or a friend, and 96% felt that more than 50% of their chief complaint was resolved. The patient satisfaction ratings were higher than what the MAOFAS rating system actually allowed in its scoring. Looking closer at this rating system is where the discrepancy between our study and others can be found.

The rating system does not account for a preoperative to postoperative evaluation of pain. For example, if the patient had severe pain preoperatively and mild pain postoperatively then he would only receive a score of 30 points. If the patient had mild pain preoperatively then severe pain postoperatively, he would receive a score of 0. Why not a score of -30? The individual has gone from good to worse. The rating system needs to correlate preoperative levels of pain to post-operative levels.

The functional aspect of the rating system evaluates the patient's perspective of activity limitations, footwear requirements, range-of-motion, calluses and swelling. Of these subcategories footwear requirements seemed to be the most significant factor for the female patient. Almost every female patient had the expectation that following this procedure they would be able to get into high heels. Those that were unable to return to high heels, had their expectation unmet. This study did not record how many could not get into high heels preoperatively.

Patient expectations seemed to play a large role in the success of the surgery. If the patient was expecting to return to a certain type of shoe and this expectation was not met then the success of the surgery was not always favorable. One other area that seemed to be significant was cosmesis. A large number were pleased with the final appearance of their foot following the surgery but the ones with hypertrophic scars were displeased. This was a significant factor in the overall success of the surgery. Upon our clinical follow-up examination and speaking with the patients, we found it to be absolutely imperative to understand your patients' expectations.

When analyzing the questionnaires using the Modified American Orthopaedic Foot and Ankle Society Rating System for Hallux Metatarsophalangeal Joint, the overall findings were 68% with good to excellent results. When comparing the MAOFAS rating system findings with the patient's ratings, the poor correlation leads the author to conclude the Modified American Foot and Ankle Society Rating System for the Hallux Metatarsaophalangeal Joint may be too strict in its rating system. For example, one patient that had some mild pain and limitation dropped 20 points on the Rating System which automatically rated that patient's procedure as fair. However, that same patient stated being highly satisfied, or what would be an excellent rating. How the scale rated the outcome of the procedures did not always correlate with the patients' overall perception of the outcome. The parameters for the rating system scored the patients' responses equally, rather than allowing for individuality. When using this particular rating system, one needs to be very certain the criteria being entered for rating precisely fits the strictly designed parameters of the scale and has no other possible interpretation.

CONCLUSION

The Austin bunionectomy has been reported to have good to excellent results. This study showed the same statistical significant results from a technical standpoint, as well as overall patient satisfaction. The Austin bunionectomy still continues to be an effective approach for treating hallux valgus deformity. The use of the MAOFAS Rating System may not be the best in its current form. A prospective system which compares the preoperative signs and symptoms with the postoperative results appears to be more effective. The percentage of points may need to be revised more in the direction of patient satisfaction to be more in line with the success of the outcome.

REFERENCES

- Kelikian H. Hallux valgus and Allied deformities of the Foot and Metatarsalgia. Philadelphia: WB Saunders; 1965. p. 163-204.
- McBride E. A conservative operation for bunions. J Bone Joint Surg 1928;10:735.
- McBride E. Surgical treatment of hallux valgus bunions. Am J Surg 1939:44:320.
- McBride E. Surgical treatment of hallux valgus. Am J Orthop 1963;5:44-6.
- McBride E. The McBride bunion hallux valgus operation, J. Bone Joint Surg Am 1967;49:1675.
- Silver D. The operative treatment of hallux valgus, J Bone Joint Surg 1923;5:225.
- Lawton J. Modified McBride bunionectomy. J Am Podiatry Assoc 1975;65:670.
- Mann R, Pfeffinger L. Hallux valgus repair: DuVries modified McBride procedure. *Clin Orthop* 1991;272:213-8.
- Austin D, Leventen E. A New Osteotomy for Hallux Valgus: A Horizontally Directed "V" Displacement Osteotomy of the Metatarsal Head for Hallux Valgus and Primus Varus. *Clin Ortbop Rel Res* 1981;157:25-30.
- Kalish S, Spector J. The Kalish osteotomy: a review and retrospective analysis of 265 cases. J Am Podiatry Med Assoc 1994;84:237.
- Sharpe D. Double first metatarsal osteotomies for a particular type of hallux abductus deformity. Arch Pod Med. 1974;1:255.
- 12. Reverdin J. De la deviation en dehors du gros orteil et de son traitement chirurgical, *Tr Internat Med Congr* 1881;2:408-12.
- Laird P. Two Reverdin-Laird osteotomy modifications for correction of hallux abducto valgus. *JAPMA* 1988;78:403.
- Mitchell C. Osteotomy-bunionectomy for hallux valgus. J. Bone Joint Surg Am 1958[†];40:41.
- Johnson J, Smith S. Preliminary report on derotational, angulational, transpositional osteotomy: a new approach to hallux abducto valgus surgery. J Am Podiatry Assoc 1974;64:667-5.
- Hohman G. Uber hallux and Spreizfuss ihre entstehung und physiologische behandlung. Arch Orthop unfall-chir. 1923;21:525-50.
- 17. Peabody C. Surgical care of hallux valgus. J Bone Joint Surg 1931;13:273.
- Daly N. Modification of the crescentic osteotomy for hallux valgus correction. J Am Podiatry Med Assoc 1992;82:260.
- 19. Cohen M. The crescentic shelf osteotomy. J Foot Surg 1993;32:204.
- Meyer M. Eine neue modifijation der hallux valgus operation. Abl Chir 1926;53:3215.
- Mau C, ALuber H. Die operative behandhung des hallux valgus (nachuntersuchungen). Dtsch Z Chir 1926;197:363.
- Glickman S, Zahari D. Short "Z" bunionectomy. J Foot Ankle Surg 1986:25:304-6.
- Duke H. Rotational SCARF (Z) osteotomy bunionectomy for correction of high intermetatarsal angles. J Am Podiatry Med Assoc 1992;82:352-60.
- Chang T. The inverted SCARF bunionectomy. In Update 1992. Reconstructive Surgery of the Foot and Leg. Tucker (GA): Podiatry Institute; 1992. p. 265-70.
- Balascescu J. Un caz de hallux valgus simetric. Rev Chir Orthop 1903;7:128.
- Chapchal G. Zuc operativen behandlung des hallux valgus. Ztschr Orthop grenzgb 1941;73-74:47-60.
- Juvara E. Nouvcau procedure pou-la cure radicale du "hallux valgus." Nouv Presse Med 1919;40:395.
- Juvara E. Cure radicale de l'hallux-valgus per la resection cuneiform de la portion moyenne de la diaphyse du metatarsien, suive de l'osteosynthese des fragments. Lyon Chir 1926;23:429.
- Juvara E. L'hallux-valgus; son traitment operatoire. Rev Chir 1932;5:321.

- Loison M. Note sur le traitment chirugicale du hallux valgus d'apres l'etude radiographique de la deformation. Bull Mem Soc Chir 1901;27:528.
- Trethowan J. Hallux valgus, a system of surgery. New York. Hoeber; 1923.
- Stamm T. The surgical treatment of hallux valgus. Guy's Hos Rep 1977;106:273.
- Balascescu J. Un caz de hallux valgus simetric. *Rev Chir Orthop* 1903;7:128.
- Logroscino D. Il trattamento chirurgico dell'aluce valgo. Chir Organ Mov 1948;32:81.
- 35. Lapidus P. The operative correction of the metatarsus primus varus in hallux valgus. *Surg Gynecol Obstet* 1934;58:183.
- Coughlin M. Hallux valgus: an instructional course lecture. J Bone Joint Surg Am 1996;78: 932-66.
- Johnson KA, Cofield RH, Morrey BF. Chevron osteotomy for hallux valgus. *Clin Othop* 1979;142:44-7.
- Hattrup SJ, Johnson KA. Chevron osteotomy: analysis of factors in patients' dissatisfaction. *Foot and Ankle* 1985;5:327-32.
- Hirvensalo E, Bostman O, Tormala P, Vainionpaa S, Rokkanen P. Chevron osteomty fixed with absorbable olyglycolide pins. *Foot Anble* 1991;11:212-8.
- 40. Leventon EO. The chevron procedure. Othopedics 1990;13:973-6.
- Kitaoka HB. Clinical Rating Systems for the Ankle-Hindfoot, Midfoot, Hallux, and Lesser Toes. Foot Ankle Int 1994;15:349-53.
- Buell T, Green DR, Risser J. Measurement of the First Metatarsophalangeal Joint Range of Motion. J Am Podiatry Med Assoc 1988;78:439-48.
- 43. Whitney AK. Whitney Measuring Devices "A Measure of Accuracy".
- Green D. Radiology and Biomechanical Foot Types. Update 1998, The Proceedings of the Annual Meeting of the Podiatry Institute. The Podiatry Institute, Atlanta; 1998. p. 292-313.
- 45. Gerbert J. Textbook of Bunion Surgery: Third Edition. Philadelphia: WB Saunders; 2001.
- Mitchell CL, Fleming JL, Allen R, Glenney C, Sanford GA. Osteotomy-bunionectomy for hallux valgus. J Bone Joint Surg 1958;40:41-60.
- Schneider W, Knahr K. Metatarsophalngeal and Intermetatrsal Angle: Different values and interpretation of postoperative results dependent on the technique of measurement. *Foot and Ankle Int* 1998;19:532-6.
- Yu GV, DiNapoli R. Surgical management of hallux abducto valgus with concomitant mrtatarsus adductus. *Reconstructive Surgery of the Foot and Leg-Update '89.* Tucker (GA): Podiatry Institute Publishing; 1989. p. 262-8.
- Pochatko DJ, Schlehr FJ, Murphy MD, Hamilton JJ. Distal chevron osteotomy with lateral release for treatment of hallux valgus deformity. *Foot and Ankle International* 1994;15:457-61.
- Duke HF. Buried Kirschner wire fixation of the Austin osteotomy-bunionectomy: a preliminary report. J Foot Surg 1986;25:197.
- Seiberg M, Felson S, Colson JP, Barth A, Green R, Green D. Closing base wedge versus Austin bunionectomics for metatarsus primus adductus. *J Am Podiatry Med Assoc* 1994;84:548.
- Steinbock G, Hetherington VJ. Austin bunionectomy transpositional osteotomy of the first metatarsal for hallux valgus surgery. *J Foot Surgery* 1988;27:211.
- Bryant A, Singer KP. Review of Radiographic Measurements Following Austin Bunionectomy. J Am Podiatry Med Assoc 1998;88:290-4.
- Trnka HJ, Hofmann S, Salzer M, Ritschl P. Clinical and radiological results after Austin bunionectomy for treatment of hallux valgus. Arch Orthop trauma Surg 1996;115:171-5.
- Knecht JG, Van Pelt WL. Austin bunionectomy with Kirschner wire fixation. J Am Podiatry Assoc 1981;71:139.