Minimally Invasive Bunion Correction

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KEYWORDS

• Minimally invasive • Percutaneous • Triplanar • Bunion correction • Hallux valgus • Bunion deformity

KEY POINTS

- Hallux valgus has been treated surgically with an open technique for many years, which involves open soft-tissue balancing and osteotomy with internal fixation to realign the malaligned toe.
- Percutaneous/minimally invasive methods are growing in popularity for many orthopedic procedures, including hallux valgus.
- Minimally invasive surgery allows for faster recovery, decreased operating time, cosmetic scarring, and equivalent healing compared with open procedures reported in the literature.
- This method can be applied to a variety of hallux valgus deformities (mild, moderate, severe) to achieve an excellent outcome.

INTRODUCTION

Hallux valgus is a common forefoot condition that can be described as mild, moderate, or severe. It is characterized by lateral deviation and pronation of the hallux and medial deviation of the first metatarsal. This progressive condition can lead to pain with ambulation, difficulty with shoe gear, soft-tissue irritation (digital neuritis/bursitis), transfer plantar lesser metatarsal lesions, and digital deformities. Constrictive shoe gear and a genetic predisposition have been implicated as extrinsic and intrinsic factors in the development of this condition.[1–6] If conservative measures to manage this painful condition fail, surgical intervention is used to realign the great toe joint.

Traditional approaches to mild to moderate hallux valgus correction have been described as open approaches that consist of single or multiple incisions that involve capsular dissection, resection of the medial eminence, release of lateral ligamentous

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and tendinous structures, capsule tendon balancing, and placement of internal fixation.[6,7] Severe deformities involve correction with more proximal metatarsal osteotomies and/or metatarsal-cuneiform fusion.[8] An abundance of articles exist on these open methods of correction that report good to excellent radiographic outcomes with high patient satisfaction rates.[9,10]

In comparison, there seems to be a relative paucity of literature that has looked at outcomes with a minimal or percutaneous approach to correct hallux valgus.

Bösch and colleagues[11] were one of the first to describe and publish a minimally invasive approach to hallux valgus correction. This method used a small incision (<1 cm) over the metatarsal head and neck. Dissection was extended to the bone, and a Lindemann burr was used to complete the subcapital osteotomy. A grooved device was used to translate the metatarsal head into a corrected position, and a 2-mm Steinmann pin was placed into the medullary canal.[11] No additional soft-tissue procedures were performed. Bösch and colleagues[12] later reported results after following patients for 7 to 10 years who underwent the Bösch method of correction. In this study,[12] they reported the results of 4 different surgeons performing the procedure in 114 feet. Bösch and colleagues[12] reported excellent radiographic outcomes and a patient satisfaction rate of 81%. Patients also reported a 95% satisfaction rate at the long-term follow-up.

In North America, Isham[13] reported his minimally invasive modification to the Reverdin open method of bunion correction. The Reverdin-Isham modification method placed multiple small incisions at the level of the first metatarsophalangeal joint (MPJ). A small Shannon No. 44 burr was first introduced into the capsule to remove and reduce the medial eminence. A closing wedge osteotomy of the first metatarsal was performed through this same incision. A secondary incision was then made over the dorsal lateral aspect of the first MPJ, and a modified lateral release was performed. Finally, a third incision was made as needed at the level of the first proximal phalanx to complete an Akin osteotomy. No fixation was used, and the reduction was maintained with aggressive splinting and bandages.

Giannini and colleagues,[14] in 2003, described an alternative approach to percutaneous distal metatarsal osteotomy for hallux valgus. The approach varied in its method from Bösch and colleagues[11] by the manner of performing the osteotomy and fixating the capital fragment. Giannini and colleagues[14] performed a subcapital osteotomy with a saw (vs burr) and advanced the Steinmann pin retrograde through the incision toward the end of the digit before manipulating the pin into the medullary canal and advancing it into the metatarsal for stability.

Magnan and colleagues[15] similarly performed a distal first metatarsal osteotomy via a minimal incisional approach. They used the surgical method described by Bösch and colleagues[11,12] and reported radiographic and satisfaction outcomes for 118 feet. They observed improvement in all radiographic parameters, and 91% of patients were satisfied with the clinical results at the short-term follow-up.

Brogan and colleagues,[16] more recently, described a third-generation percutaneous correction. Brogan and colleagues[16] categorized the various approaches to minimally invasive bunion correction as first, second, and third generation. The first-generation technique uses medullary pin fixation as described by Bösch and colleagues.[11] Second-generation procedures used a chevron and akin osteotomy with internal fixation. The third-generation bunionectomy, by Brogan and colleagues,[16] used a hybrid of methods combining a medullary pin with internal fixation. They analyzed 45 feet and performed a minimally invasive chevron osteotomy at the metatarsal neck through a 5-mm incision. The chevron osteotomy was completed with a Shannon burr; the capital fragment was translated, as described by Bösch and