Optimizing Outcomes in Bunion Surgery

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KEYWORDS

• Bunion • Hallux valgus • Surgery • Stability • Alignment
• Correction

A plethora of surgical approaches and procedures for deformities of the first ray have been described over the past 100 years. Although these techniques vary, they are based on the principle of anatomic restoration. Understanding the anatomy of the first ray and its biomechanical relationship to the foot and ankle are paramount in the evaluation and treatment of hallux valgus. The underlying goal of treatment not only is directed toward anatomic correction but also toward treatment based on an understanding of the cause and maintaining long-term correction.

With more than a 100 different surgical procedures described for the correction of hallux valgus, it seems difficult to determine which technique to use for any given patient. Many factors must be considered in selecting the appropriate procedure to achieve excellent long-term results. Despite various soft tissue and osseous surgical procedures and anatomic variations of each patient, the principles of anatomic restoration and stability remain consistent. These principles are eminent in achieving successful surgical outcomes.

Rush and colleagues[1] demonstrated normalization of the first ray mobility by restoring the anatomy of the first metatarsal, which in essence improves the efficiency of the plantar aponeurosis. Coughlin and Smith[2] demonstrated that surgical correction of the hallux valgus angle and the first-second intermetatarsal angle (IMA), even without a first tarsometatarsal joint arthrodesis, decreases mobility of the first ray. Maintenance of correction seems to reflect the stability of the first ray, and Coughlin and colleagues[3] believe this "stability may be a function of first ray alignment and the plantar aponeurosis." This article focuses on using various techniques and surgical adjuncts to optimize not only immediate postoperative results but also long-term maintenance of correction. This is accomplished through restoring anatomic alignment, imparting first ray stability, meticulous surgical technique, and accounting for other causes that may contribute to first ray instability.

FIRST METATARSOPHALANGEAL JOINT SOFT TISSUE ADJUNCTS

Various contractures and laxities of ligaments and tendons may be the initiating cause or the result of foot and ankle deformities. Nonetheless, particular attention must be

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directed to restore appropriate soft tissue balance to achieve desirable results. The main soft tissue constraints in achieving anatomic correction of hallux valgus deformities at the level of the first metatarsophalangeal joint are attenuation of the medial structures and contracture of the lateral anatomy.

Once the skin incision and initial soft tissue dissection are accomplished, visualization is achieved of the first metatarsophalangeal joint capsule. Various capsulotomies have been described, including a dorsal longitudinal capsulotomy, a medial longitudinal capsulotomy, a vertical capsulotomy, and an inverted L-shaped capsulotomy with a proximal and dorsal apex or a distal and dorsal apex. A capsulorrhaphy with a longitudinal capsulotomy allows surgeons to impart a supination and varus correction of the hallux. A capsulorrhaphy with a vertical medial capsulotomy allows surgeons to medialize the hallux in the transverse plane. An inverted L-shaped capsulotomy allows surgeons versatility in terms of soft tissue correction in the frontal and transverse planes.

When performing a capsulotomy along with dissection for the planned osteotomy or arthrodesis, many investigators state the importance of soft tissue preservation in maintaining the periosteum at the neck of the first metatarsal head.[4–7] This meticulous dissection aids in preventing the incidence of avascular necrosis, as the blood supply enters at this level.[7] Malal and colleagues[8] evaluated the vascular supply of the first metatarsal head that is supplied by branches of the first dorsal metatarsal, first plantar metatarsal, and medial plantar arteries. They showed that although the first dorsal metatarsal artery is the prominent artery, all three arteries form a plexus and enter at the plantar lateral aspect of the metatarsal neck. This suggests that medial and dorsal capsulotomies are safe with regard to the main vascular supply of the first metatarsal head, but careful attention must be directed if creating a distal first metatarsal osteotomy or a lateral first metatarsophalangeal joint soft tissue release that is in close approximation to the metatarsal neck.

In pathologic hallux valgus, the sesamoids are deviated laterally, leading to a mechanical advantage of the lateral joint structures, which subsequently become a primary deforming force potentiating the abducted position of the hallux.[9] Releasing the lateral soft tissue contractures removes this underlying deforming force and allows for mobilization of the first ray with respect to the sesamoid apparatus. This mobilization is important in restoring proper positioning of the sesamoids along with the plantar aponeurosis. Sarrafian[10] stated the importance of the plantar aponeurosis alignment in providing stability to the first ray. Oda[11] used tibial sesamoid position (TSP) to analyze outcomes of a modified Lapidus arthrodesis. The TSP was assessed relative to the first metatarsal head on a scale of 1 to 7, with a position of 4 representing the tibial sesamoid being a midline alignment. The study demonstrated that TSP correlated with the amount of correction, as satisfactory cases corrected a mean of 5.5 positions and undercorrected cases corrected a mean of 2.5 positions.

First interspace dissection along with releasing the plantar lateral soft tissue contractures have been described by various approaches.[4–7] Coughlin and Mann[4] described a specific sequence of release: fibular sesamoidal ligament transection, adductor hallucis tendon transection or transfer, transverse metatarsal ligament transection, and lateral capsule perforation. Releasing those structures aides in mobilizing the hallux and the sesamoid apparatus to achieve a reducible hallux and relocate the first metatarsal over the sesamoid complex. This relocation is essential to decreasing the potential of a recurrent hallux valgus.[4] After releasing the fibular sesamoidal ligament, inspection should be performed of the fibular sesamoid to assess degenerative changes. The fibular sesamoid should be preserved, except in cases of significant degenerative changes, to reduce the incidence of hallux varus and tibial sesamoid