Bilateral Hallux Varus Deformity Correction With a Suture Button Construct

Andrew R. Hsu, MD, Christopher E. Gross, MD, and Johnny L. Lin, MD

Abstract

Hallux varus deformity typically results from soft-tissue overcorrection at the metatarsophalangeal joint during surgery for hallux valgus. There are several soft-tissue procedures available for flexible hallux varus deformity including transfer of the extensor hallucis longus or abductor hallucis. To our knowledge, there have not been any previous reports in the literature of bilateral hallux varus deformities in the setting of potential pregnancy-related ligamentous laxity combined with iatrogenic injury. We present the case of an isolated bilateral hallux varus deformity occurring after pregnancy and prior bunion surgery. The simultaneous operations using the Mini TightRope device (Arthrex Inc, Naples, Florida) were considered a success with the patient having pain relief and return to regular activities with normal shoewear.

Hallux varus deformity typically results from soft-tissue overcorrection at the metatarsophalangeal (MTP) joint during surgery for hallux valgus.[1] The incidence of hallux varus after hallux valgus surgery is reported to range from 2% to 15%.[1,2] Deformity can result from over tightening the medial capsule of the MTP joint, excessive lateral release, excision of the fibular sesamoid, or excessive resection of the medial aspect of the first metatarsal head.[2,3] The traditional McBride procedure with excision of the fibular sesamoid has the highest reported incidence of hallux varus.[4] Patients with hallux varus managed conservatively early on have been reported to have decreased symptoms in 22% of cases.[5] In patients that do not respond to conservative treatment, deformity correction can be achieved using medial capsular release, corrective osteotomies,[6,7] tendon transfers, and arthrodesis.[2] Delayed surgery can lead to pain, stiffness, and arthritic changes in addition to patient difficulty with shoewear.

A variety of soft-tissue procedures have been described for flexible joints without bony abnormality that release the medial capsule and rebalance hallux alignment.[2,8,9] The most common surgery for hallux varus correction is transfer of the extensor hallucis longus partially or completely under the deep transverse intermetatarsal ligament to the lateral aspect base of the proximal phalanx.[10,11] However, complications include weakened extension and the inability to fix an overcorrected intermetatarsal angle. Alternatively, the abductor hallucis can be tenotomized or transferred to the base of the proximal phalanx to reconstruct the lateral capsular ligaments.[8,9] The lateral capsular ligaments can be reinforced or reconstructed with fascia lata or soft-tissue anchors, but these procedures rely on adequate healthy tissue remaining around the MTP joint.[9,12]

The Mini TightRope (Arthrex Inc, Naples, Florida) is an implanted suture endobutton device that has previously been used for hallux valgus repair.[13] The suture button technique has also been used to recreate ligaments and tendons in syndesmotic disruptions of the ankle,[14,15] Lisfranc fracture dislocations,[14] acromioclavicular joint dislocations,[16] biceps tendon rupture,[17] and general tendon reinforcement and reconstruction procedures.[18] The suture button technique can be individually tensioned for each deformity correction and used in a minimally invasive manner to expedite weight-bearing and postoperative recovery. Pappas and Anderson[19] were the first to describe hallux varus correction using the suture button technique to re-establish the lateral collateral ligaments around the MTP joint. Gerbert and colleagues[20] have reported the preoperative indications, surgical technique, and potential complications of hallux varus repair with the suture button technique.

To our knowledge, there are no previous reports of bilateral hallux varus deformities in the setting of potential pregnancy-related ligamentous laxity combined with iatrogenic injury. We present the case of an isolated bilateral hallux varus deformity occurring after pregnancy and previous bunion surgery that was successfully treated using the Mini TightRope device (Arthrex Inc).

The patient provided written informed consent for print and electronic publication of this case report.

Case Report

A 43-year-old African American female actress presented to clinic with progressively worsening bilateral great toe pain and varus deformity that started during pregnancy and immediately worsened following the birth of her daughter 3 years ago. The patient had no history of trauma to her feet and

Authors' Disclosure Statement: The authors report no actual or potential conflict of interest in relation to this article.

had bilateral bunionectomy procedures 15 years prior at an outside institution. She noted that both of her feet developed a crescent moon shape, making it painful and difficult to wear normal shoes. Her past medical history was positive for hypertension and migraines. On physical examination, the patient had a varus deformity of the great toe bilaterally, greater on the left than the right. Bilateral hallux varus deformities were easily, passively, correctable. Standing radiographs showed evidence of previous proximal osteotomies and distal first metatarsal osteotomies that were well-healed (**Figure 1**). The hallux varus deformity measured 23° on the left and 16° on the right. Due to unsuccessful nonoperative management, surgical reconstruction was offered.

In the operating room, both lower extremities were prepped and draped in the usual sterile fashion. An Esmarch bandage was used at the level of the calf for intraoperative hemostasis. An incision was made over the first web space and the lateral capsule of the first MTP joint was identified and found to be notably lax. Next, 2 separate incisions were made on the medial side of the first MTP joint, one over the proximal phalanx and one over the first metatarsal head. After all soft tissue was cleared and the location verified on fluorosopic imaging as being extra-articular, two 1.2-mm guidewires were drilled from medial to lateral exiting at the insertion sites of the lateral capsule in the proximal phalanx and first metatarsal. A 2.7-mm cannulated drill was then passed over the wire before passing a Mini TightRope device (Arthrex Inc). The lateral capsule was then incised and oversewn in a pants-over-vest fashion with the joint in a corrected and congruous position. The Mini TightRope device (Arthrex Inc) was then manually tensioned to maintain the desired correction. No medial capsular release was needed due to the flexible nature of the deformity. The identical procedure was then performed on the contralateral foot. Both feet were wrapped using a forefoot bandage to maintain the alignment of the hallux.

Figure 1. Preoperative anteroposterior standing radiograph showing retained hardware from previous foot surgeries and increased hallux varus deformity bilaterally greater on the left than the right.

Figure 2. Postoperative weight-bearing radiograph at 6-week follow-up showing good alignment and consolidation with appropriate hallux valgus angles bilaterally.

Figure 3. Postoperative weight-bearing radiograph at 9-month follow-up showing neutral alignment on the left with a mild amount hallux varus angulation on the right with continued proper alignment of the Mini TightRopes (Arthrex Inc).

The postoperative regimen consisted of using a postoperative shoe for 6 weeks. Forefoot bandages were changed every 2 weeks for 6 weeks total. Weight-bearing was restricted for the first 2 weeks, followed by 2 weeks of heel weight-bearing, and 2 weeks of flatfoot weight-bearing. No further splinting or immobilization was recommended after 6 weeks. Use of accommodative shoes was permitted based on the level of soft-tissue swelling and clinical exam.

At 6-week follow-up, the patient was recovering well and had a hallux valgus angle of 3° on the left and 7° on the right (**Figure 2**). There were no signs of hallux varus or valgus of either foot with hallux dorsiflexion to 80° on the left and 60° on the right with no pain at either MTP joint. At 9-month follow-up, the patient was pain free and overall very pleased with the functional and cosmetic results of her procedures, with a minor concern that there was a mild recurrence on the right side. The patient had normal range of motion at bilateral MTP joints and full strength. Weight-bearing radiographs showed a hallux valgus angle of -3° on the left and -6° on the right (**Figure 3**). The patient is now 1-year status postsurgery and continues to be pain free wearing normal shoewear during regular activities with no further recurrence and no plans for further operative intervention.

Discussion

The case presented here is unique in that the patient had bilateral hallux varus deformities that arose in temporal association with pregnancy and childbirth. Although the patient had previous bilateral bunion surgery 15 years prior to presentation, she reported that her bilateral hallux pain and deformity occurred during pregnancy and worsened immediately after giving birth. It is not possible to determine the exact underlying cause or combination of factors that lead to the final bilateral hallux varus, but the timing of the deformities with pregnancy suggests that hormone-related changes may have played a role in her clinical progression. To our knowledge, the role of pregnancy causing ligamentous and capsular laxity leading to hallux varus has not previously been reported in the literature. In addition, bilateral hallux varus is not commonly seen in isolation and is more frequently reported in cases of congenital hallux varus deformity[21,22] in conjunction with metatarsus valgus or talipes equinovarus deformities.[23]

Epidemiological surveys have shown increased generalized joint laxity in women, compared with men of the same age[24,25]; pregnancy-induced changes in joint laxity were first noted for the pubic symphysis by Abramson and colleagues[26] in 1934. The major hormonal changes that occur during pregnancy have been reported to cause increased peripheral joint laxity including laxity of the metacarpophalangeal joints of the hand[27,28] and anterior cruciate ligament.[29,30] The proposed mechanism of action is through the combined effects of estrogen, progesterone, and specifically the hormone relaxin on ligamentous fibroblast proliferation and procollagen synthesis.[31,32] During pregnancy there is a tenfold increase of relaxin that weakens soft-tissue structures and increases joint flexibility.[27] Block and colleagues[33] showed increased range of motion in the subtalar and first MTP joints in the foot from the eighth week of pregnancy to 6 weeks postpartum. Studies have shown no significant changes in bony foot structure during pregnancy as tested by graphically marking the locations of bony landmarks throughout pregnancy.[34,35]

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Dumas and Reid[30] noted that orthopedic problems in load-bearing joints may be particularly influenced by increased ligamentous laxity, pregnancy-related weight gain, and an anteriorly deviated center of gravity may further exacerbate the problem. The foot is particularly prone to pregnancy-related changes in biomechanics as it has been shown that pregnant patients have higher forefoot pressures and increased forefoot contact times with standing and walking.[36] Nyska and colleagues[37] has shown through dynamic gait analysis that there are significantly higher forces on the forefoot, midfoot, and hindfoot during pregnancy, and that lateralization of the gait line can increase lateral forefoot pressures and tension on the lateral collateral ligaments of the first MTP joint. The authors report that ligamentous laxity during pregnancy can create a biomechanically pronated foot with reduction of the longitudinal arch that can cause significant pain and disability.[37] However, it is still largely unknown for how long increased ligamentous laxity during pregnancy persists postpartum and what the long-term effects are on joint alignment and stability.

Gerbert and colleagues[20] reported the case of a 57-year-old woman with symptomatic unilateral hallux varus after prior bunionectomy procedure that was also treated using the suture button technique. Analysis of the published patient radiographs showed a preoperative hallux valgus angle of approximately -35° that was corrected by 52° at 2-week follow-up to a hallux valgus angle of 17°. Alignment decreased by roughly 7° at 6-month follow-up to a hallux valgus angle of 10° with overall decreased pain and increased function. The case by Gerbert and colleagues[20] had a similar trend of good clinical results despite mild loss of initial postoperative hallux alignment correction from 1- to 2-week follow-up to 6-month follow-up.

In the present case, we were able to achieve significant bilateral hallux varus soft-tissue deformity correction using a suture button technique with resolution of the patient's pain and return to normal shoewear. In the authors' experience, we have had success using the Mini TightRope (Arthrex Inc) technique to supplement soft-tissue hallux varus reconstructions in the absence of bony deformity. The potential role of pregnancy-related ligamentous and capsular laxity combined with iatrogenic deformity from previous bunion surgeries makes this case a previously unreported clinical scenario that contributes to the expanding knowledge available regarding the topic of hallux varus.

Further studies are needed to elucidate the role of Mini TightRope (Arthrex Inc) fixation in larger series of patients with hallux varus as well as the differences in clinical and radiographic results of Mini TightRope (Arthrex Inc), compared with other surgical and nonoperative options.

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Am J Orthop. 2013;42(3):121-124.

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