2021

# Post-Traumatic Hallux Valgus: A Modified Surgical Technique

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Technical Note

# Post-Traumatic Hallux Valgus: A Modified Surgical Technique

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**Abstract:** Post-traumatic hallux valgus, a turf toe variant, is a rare, yet limiting injury. According to the literature, the deformity has been associated with acute medial collateral ligament tears, turf toe variant injuries, Lisfranc injury patterns, and first metatarsal fractures. There have been few documented cases of post-traumatic hallux valgus secondary to medial collateral ligament tears, and the treatment has been variable. Some authors have described direct end-to-end repair of the ligament to address the deformity, while others have described a modified McBride bunionectomy involving a Silver bunionectomy, lateral soft tissue release, and medial capsular and ligamentous repair. We propose a modified technique similar to the modified McBride bunionectomy, however, with the use of an all-suture anchor in the medial capsular and ligamentous repair. Our belief is that the all-suture anchor will allow for a stronger repair that will meet the physical demands of everyday ambulation and athletic participation. We used this technique in an individual who had evidence of a medial ligamentous complex injury of the hallux on MRI and failed conservative management. Postoperatively, the patient is immobilized until they can begin working on range of motion, strengthening, and finally to achieve return to full activity and sports.

## Introduction

Post-traumatic hallux valgus is a rare, yet significantly limiting injury in athletes and nonathletes. While the literature is abundant regarding the etiologies of chronic hallux valgus, the literature on causes of acute hallux valgus are limited. To date, post-traumatic hallux valgus has been attributed to Lisfranc injury,[1] medial plantar neuropathy,[2] turf toe variant injuries,[3] first metatarsal fracture,[4] and medial collateral ligament (MCL) tears.[5,6] Rupture of the first metatarsal medial collateral ligament was initially described in 1997 in a professional soccer player.[7] Since then, there has been less than 10 reported documented cases of post-traumatic hallux valgus secondary to MCL tears. Literature describing the surgical technique to repair the MCL and address the valgus deformity is even more sparse and varied. Douglas et al.[7] describe an end-to-end repair of the MCL using two 0-Ethibond sutures, which were subsequently removed two weeks after surgery. Lohrer[6] describes an end-to end repair of the ligament using 3-0 Vicryl reinforced by a periosteal flap. Fabeck et al.[5] and Covell et al.[3] describe a modified McBride bunionectomy involving a Silver bunionectomy, lateral soft tissue release, and medial capsular and ligamentous repair. Our Technical Note introduces the use of an all-suture anchor in treating a MCL tear in order to address post-traumatic hallux valgus. Our belief is that the all-suture anchor will allow for a stronger repair that will meet the physical demands of everyday ambulation and athletic participation.

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*The authors report the following potential conflicts of interest or sources of funding: K.M.S. reportspersonal fees from Arthrex, outside the submitted work. J.S.L. reports personal fees from Stryker/Wright Medical, Medshape/DJO, Medline, Kinos Medical/Restor 3d, ActivOrtho, Panther Orthopaedics, and Bioventus, outside the submitted work. Full ICMJE author disclosure forms are available for this article online, as supplementary material.*

*Received July 30, 2021; accepted August 29, 2021.*

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*2212-6287/211110*

*https://doi.org/10.1016/j.eats.2021.08.032*

## Surgical Technique (With Video Illustration)

### Indications

Given the paucity of literature regarding the injury, there are no clear indications on when to surgically treat a MCL tear of the first MTP joint. Our indications include hallux MTP joint instability, progressive deformity, progressive symptoms, additional intra-articular joint pathology (e.g. first metatarsal head osteochondral lesion), and those who have failed conservative therapy and continue to have pain and/or functional limitations.

### Patient Evaluation

Prior to proceeding with surgery, a thorough history should be obtained, including mechanism and chronicity of injury, attempted treatments to date, and impact on activities. Physical examination should be performed with attention to gait, joint alignment, tenderness to palpation, stability of the joint, and with comparison to the contralateral limb. Plain radiographs (Fig 1) and MRI (Fig 2) should be obtained to evaluate the MCL complex, as well as other anatomical considerations, such as the hallux valgus angle (HVA), intermetatarsal angle (IMA), and distal metatarsal articular angle (DMAA). As the decision is made to proceed with surgery, the patient should be educated on the postoperative rehabilitation and recovery process.

### Positioning and Preparation

A regional block is performed in the preoperative area. Generally, regional anesthesia is avoided in higher-level athletes, in favor of a general anesthetic (Table 1). The patient is brought into the operating room and placed supine on the table. IV sedation or general anesthesia is initiated. A well-padded thigh tourniquet is placed. The operative leg and foot are then prepped and draped in a sterile fashion. The leg is Esmarch exsanguinated and the tourniquet is inflated.

### Procedure

A transverse 5-cm incision is made over the medial aspect of the first MTP joint (0:05). Care is taken to identify and protect the dorsomedial cutaneous nerve of the hallux. Sharp dissection is then carried out down to the medial capsule. Full-thickness plantar and dorsal skin flaps are then developed. The capsule is then examined for any disruptions, fibrosis, or adhesions. A transverse incision is then made in the medial capsule exposing the medial ligamentous complex (0:32). The medial ligamentous complex is examined for any disruptions, attenuation, or fibrosis (Fig 3). The disrupted MCL is released proximally off of its origin on the metatarsal, exposing the metatarsal head (0:52) (Fig 4A).


**Fig 1.** Preoperative weight-bearing AP view of a left foot demonstrating a hallux valgus angle of 19° (normal $\leq$ 15°). Preoperative assessment of radiographs should be performed in conjunction with physical exam. One should evaluate the hallux valgus angle, intermetatarsal angle, distal metatarsal articular angle, and hallux valgus interphalangeal angle. Close consideration of these radiographic measurements is important to determine whether osteotomies are indicated.

The medial metatarsal head is examined for exostosis formation. A silver bunionectomy is then performed to remove the prominence on the medial aspect of the metatarsal head (1:04) (Fig 4B). A 2-cm dorsal incision is made in the first webspace at the level of the metatarsal heads (1:10) (Fig 5). Dissection is carried out until the adductor hallucis tendons are identified. These tendons are sharply released off of the first metatarsal head. A 15-blade scalpel is then used to make several, short pie-crust openings through the lateral capsule of the first MTP joint. Varus stress is then applied to the joint to release any lateral joint contracture and help neutralize the alignment of the hallux.

A 1.9-mm double-loaded SUTUREFIX ULTRA anchor (Smith & Nephew, Andover, MA) is then placed on the

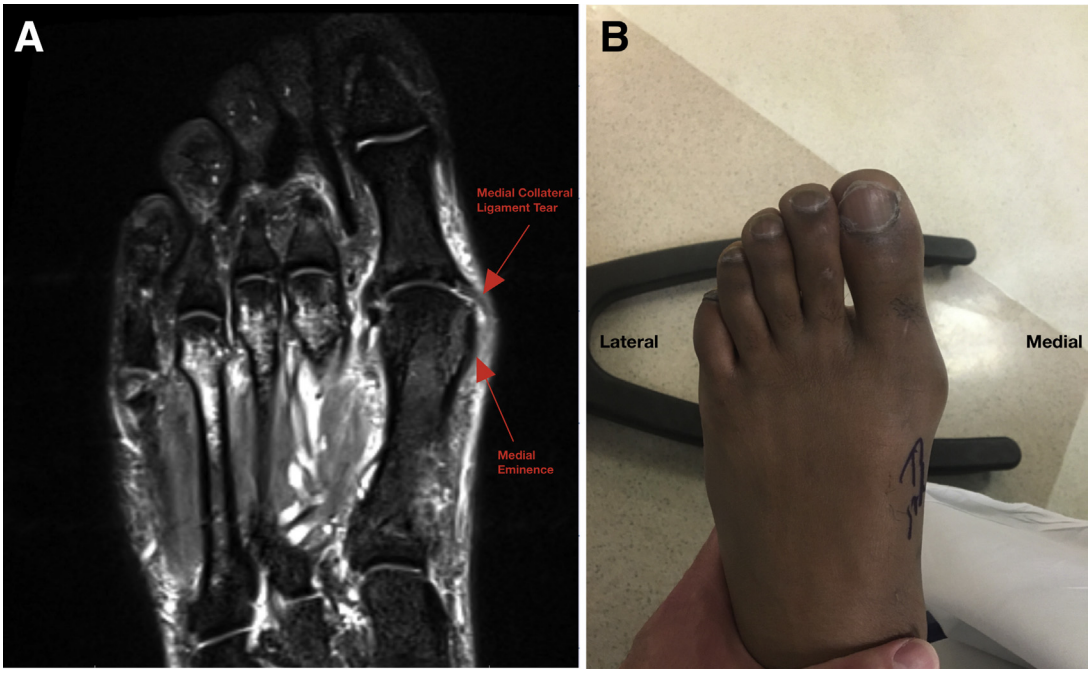


**Fig 2.** T2 axial view of the left foot (A) demonstrating disruption of the medial collateral ligament of the first metatarsophalangeal joint. The ligament originates at the medial eminence of the first metatarsal head and travels obliquely to attach at the volar aspect of the medial base of the proximal phalanx. This can manifest with gross hallux valgus deformity (B), valgus laxity at the joint, tenderness to palpation at the medial aspect of the joint, and pain with weight bearing or activity.

central portion of the medial aspect of the first metatarsal head (1:41) (Fig 6A). The double-loaded anchor is then used to mattress sutures through the plantar aspect of the capsular layer (1:53) (Fig 6B). Knots are then tied down to help re-establish the accessory ligament and the plantar capsule to the metatarsal head. Suture limbs are then passed through the dorsal capsular leaflet in a mattress fashion to help imbricate this over the plantar capsule (2:40) (Fig 6C). 2-0 FiberWires (Arthrex, Naples, FL) are then placed in a figure-eight fashion distally in a pants-over-vest fashion to

**Table 1.** Pearls and Pitfalls

| Pearls | Pitfalls |
|---|---|
| Refrain from using regional anesthesia in athletes due to the risk of postoperative neurologic symptoms that would effect timely participation in rehabilitation and return to sport. | Failure to address associated deformities that would indicate a need for osteotomies |
| Perform lateral release prior to medial reconstruction to ensure there is appropriate balancing of soft tissues. | Failure to identify and protect the dorsomedial cutaneous nerve of the hallux |
| Ensure central placement of the anchor in the metatarsal head to reduce the risk of violating the joint. | Failure to cast in appropriate position with a balance between adequate padding and molding |
| Obtain meticulous hemostasis after tourniquet let-down to prevent development of a hematoma. | Overtensioning the medial ligamentous complex reconstruction and/or overaggressive release of the lateral structures |

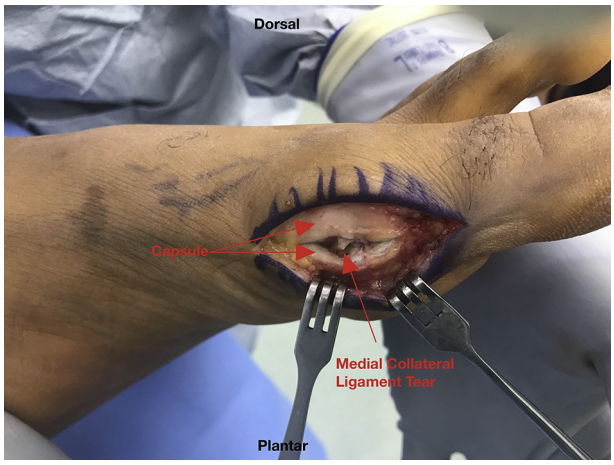


**Fig 3.** Intraoperative view of the medial aspect of left foot demonstrating the developed full thickness skin flaps, incision of the medial capsule and a disrupted medial collateral ligament. This significant soft tissue dissection increases the risk of postoperative hematoma formation; therefore, meticulous hemostasis must be achieved once the tourniquet is released at the end of the case.

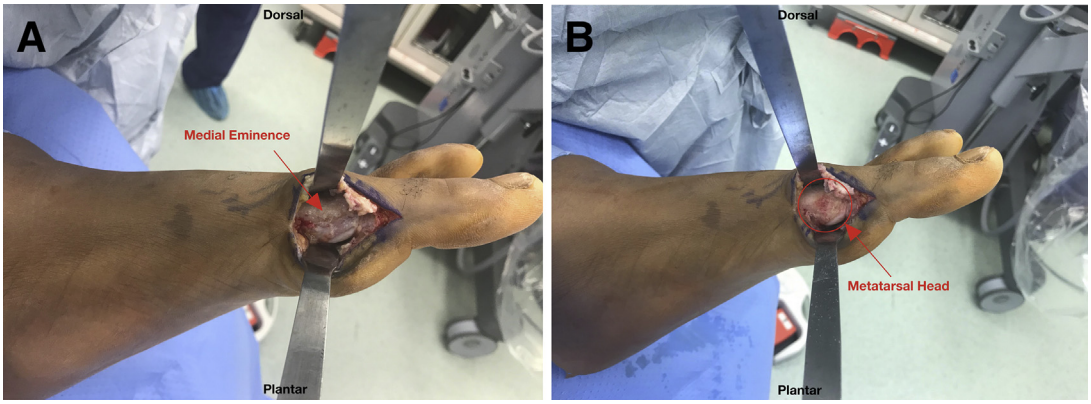


**Fig 4.** (A) Picture shows the exposed first metatarsal head of a left foot after the medial collateral ligament has been completely released from its proximal attachment. There is evidence of medial eminence prominence. (B) Picture shows the medial metatarsal head after a silver bunionectomy has been performed to remove the medial prominence of the metatarsal head. This exostectomy is performed to relieve any symptoms caused by the medial prominence, as well as for exposure for suture anchor placement.

further complete the imbrication overlying the proximal phalanx (3:12). A #2 FiberWire (Arthrex, Naples, FL) is used proximally to imbricate the remaining proximal capsule again in a pants-over-vest fashion.

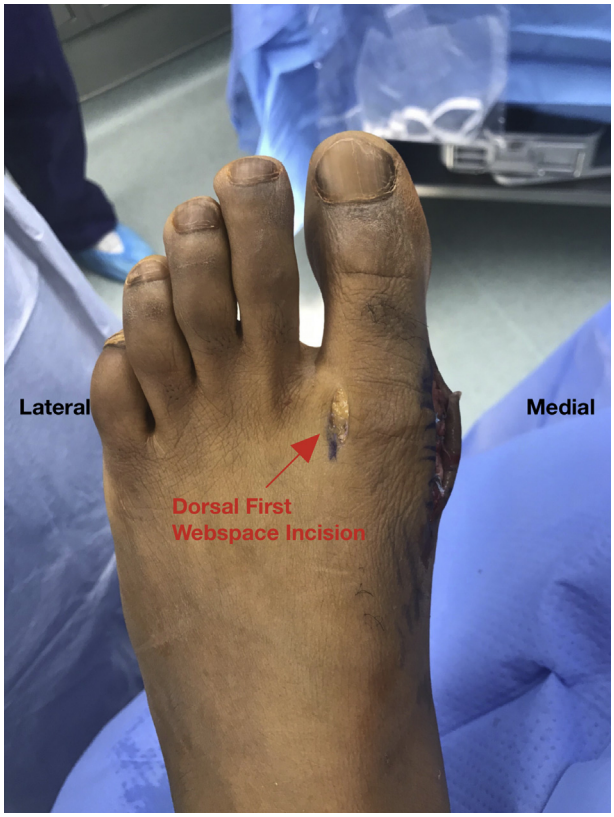


**Fig 5.** Intraoperative view of the dorsal aspect of a left foot demonstrating the first webspace incision used to perform the adductor hallucis tendon release and lateral capsule pie-crusting. Performing this soft tissue release will help in addressing excess hallux valgus angle. It is important to perform this release prior to the medial ligamentous complex reconstruction to ensure proper tensioning of soft tissues and neutral alignment of the joint.

### Closure

The wound is thoroughly irrigated. The tourniquet is released and hemostasis is obtained. The medial and dorsal incisions are closed with 3-0 Ethicon Nylon sutures (Ethicon, Raritan, NJ) in a vertical mattress fashion. The operative extremity is then placed in a short leg splint modified with a toe spica component holding the great toe in adduction (Fig 7).

### Postoperative Course and Rehabilitation

Postoperatively, the patient is kept non-weight bearing in a toe spica cast for 3 weeks. They are then transitioned into a boot with toe spacers. They are kept non-weight bearing for an additional week before initiating partial weight bearing at the 4 week post-operative mark, increasing by 25% of body weight each week. Passive range of motion of the toe will begin at the 4 week mark with physical therapy and active range of motion will begin at the 8 week mark at which time they will come out of the boot. At the 12 week mark, they will be allowed to resume running. Full activity including contact sports is allowed at the 4 to 6 month mark.

## Discussion

In the limited literature that exists regarding post-traumatic hallux valgus injuries, patients often present with significant pain with ambulation and limited function with regard to athletic and nonathletic activities. Characterizing the mechanism and spectrum of injury, as well as the appropriate treatment options, is difficult. Injuries have been described after a direct blow resulting in a valgus force to the hallux,[6,8] as well as after a significant valgus stress is experienced during

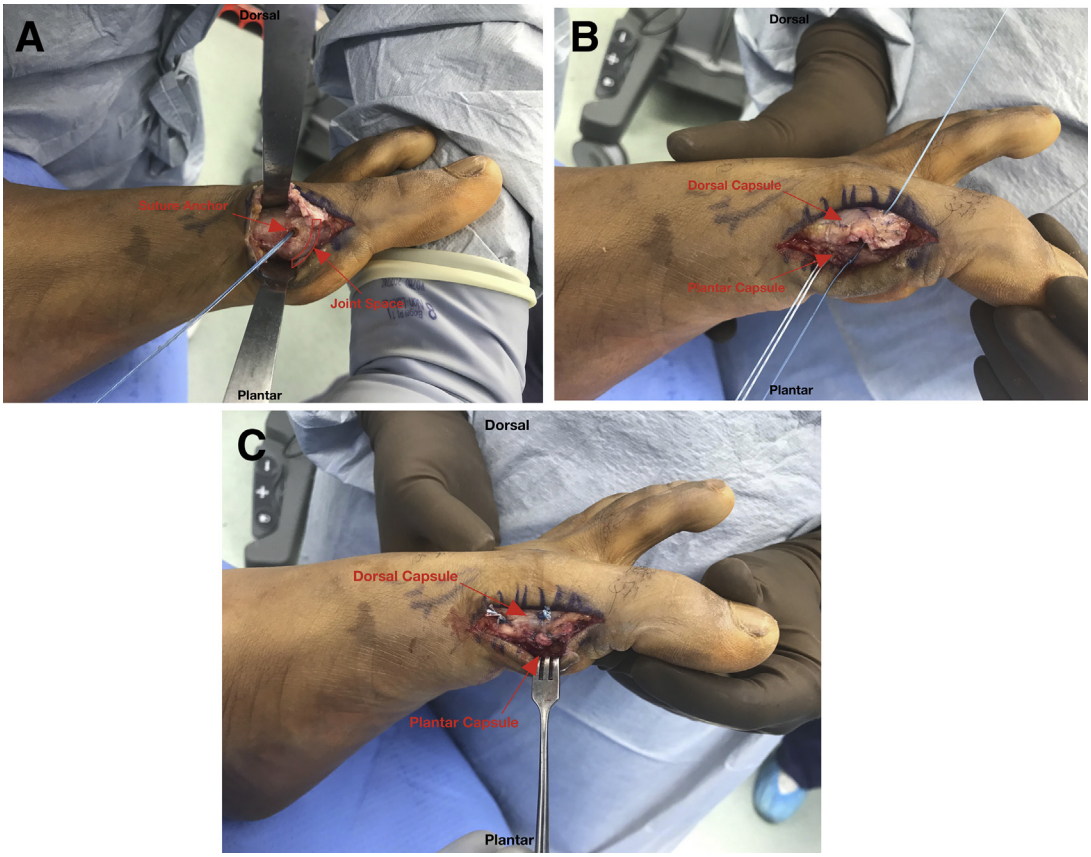


**Fig 6.** (A) Picture demonstrates suture anchor placement at the central aspect of the medial first metatarsal head of a left foot. Care must be taken to avoid violating the joint with anchor placement. (B) and (C) Pictures show the suture limbs being passed through the plantar and dorsal capsule in pants-over-vest fashion to recreate the medial ligamentous complex. This reconstruction will allow for maintained alignment and stability to the great toe.

**Fig 7.** A left leg in a short leg cast with great toe-spica modification. This is applied to maintain the great toe in neutral positioning and to allow the medial ligamentous complex repair to heal without undue stress. It is important to balance adequate padding with a good mold to ensure incisions are not threatened, and the alignment is maintained.

push off.[5] Chissell et al.[8] reported a successful outcome with cast immobilization in an adolescent female. Others[7] have reported successful outcomes with surgical intervention. In athletes, especially those with hopes of returning to high levels of play, there is a more significant stress on operative repairs than there would be for nonathletes. In athletes who have failed nonoperative treatment and require surgical intervention, we believe that our surgical technique using an all-suture anchor will provide a repair, which once healed, will hold up to the stresses placed on it by an athlete's activity demands (Table 2). Higher load to failure values in suture anchors versus sutures have been consistently reported in biomechanical studies.[9] Specifically, the use of an all-suture anchor is associated with minimal perianchor cyst formation.[10] The likely risks of this technique are similar to other procedures that use a suture anchor; such as anchor pull-out and suture failure. The technique also requires significant dissection and a long period of immobilization. This technique may not be ideal for those patients with poor wound healing ability or those who are unlikely to be compliant with weight-bearing restrictions. Furthermore, this technique has

**Table 2.** Advantages and Disadvantages

| Advantages | Disadvantages |
|---|---|
| The suture anchor augmentation provides a stronger repair than suture alone. | Significant soft tissue dissection |
| The use of an all-suture anchor translates to a lower risk of perianchor cyst formation compared to biocomposite or PEEK anchors. | Prolonged period of immobilization |

only been used in one patient, and therefore, outcome data are limited.

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