

UNRECOGNIZED ABNORMAL DISTAL ARTICULAR SET ANGLE AND INCREASING PROXIMAL ARTICULAR SET ANGLE AS AN ETIOLOGY OF IATROGENIC HALLUX ADDUCTO VARUS

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INTRODUCTION

Hallux adducto varus is well covered in the literature, with a common understanding that the deformity presents as a medial deviation of the hallux at the metatarsophalangeal joint (MPJ), with possible development of varus rotation and extension components (Figure 1). Not only is there consensus on the definition, but there is also an agreement that the development of iatrogenic hallux adducto varus is a common postoperative etiology of many hallux abducto valgus correction procedures (1, 2).

Postoperative hallux adducto varus was first described by McBride in 1935 with an incidence of 5.1% among first ray surgeries, however newer studies have described the

relative occurrence as 1.5% (3-6). Historically, the majority of hallux adducto varus cases followed McBride type procedures, however recently numerous first metatarsal osteotomies have further contributed to the iatrogenic medial deviation at the MPJ (7). In a 2006 review by Roman and Ruch, the development of iatrogenic hallux adducto varus as a complication of the surgical correction of hallux abducto valgus was presented as multifactorial, and unable to be related to a single surgical modality (8, 9) leading surgeons to think about acquired hallux adducto varus as a combination list of contributing factors.

The typical discussion of iatrogenic hallux adducto varus related to a hallux abducto valgus correction includes the following etiologies:



Figure 1A. The complete triplanar deformity of hallux adducto varus.



Figure 1B. The complete triplanar deformity of hallux adducto varus with medial deviation at the MPJ in addition supination and extension following a simple exostectomy.

1. Total release of the lateral supporting structures (excision of the fibular sesamoid)
2. Excessive resection of the medial eminence with disruption of the sagittal groove (staking first metatarsal head)
3. Over correction of the intermetatarsal angle (negative intermetatarsal angle)
4. Excessive medial capsulorrhaphy
5. Transection of the adductor hallucis and the lateral head of the flexor hallucis brevis tendons
6. Aggressive postoperative bandaging or splinting

The presented list, although well established in the literature, does not account for two subtle yet distinct etiologies of hallux adducto varus. An unrecognized increase in the distal articular set angle (DASA) can falsely present as first MPJ abduction at the joint when in all actuality the joint will be congruous (4). As described by Yu et al and further developed in our discussion, the surgeon will continue to tighten the medial capsule to correct for the soft tissue deformity at the joint, when the abnormality actually belongs to the bone of the proximal phalanx.

The inadvertent increasing of the proximal articular set angle (PASA) with a head osteotomy can also cause the medial base of the proximal phalanx to dislocate into a hallux adducto varus deformity.

In this presentation we aim to establish the recognition of an abnormal DASA and the increase of PASA as additional aspects of iatrogenic hallux adducto varus pertaining to intraoperative decision making.

DISCUSSION

Three cases are presented to illustrate the relationship of abnormal PASA, DASA, and hallux adducto varus deformities. The first patient is at postoperative week 6 following an Austin bunionectomy with internal fixation. The intermetatarsal angle is normal, the PASA is normal, and the hallux abductus angle is normal (Figure 2A).

The metatarsophalangeal joint is in adduction because of the tight medial capsule correction to compensate for the unrecognized abnormal DASA. The unrecognized abnormal DASA allowed a normal hallux abductus angle with an underlying hallux adducto varus. The hallux and specifically the hallux toenail were held in rectus position as the medial base of the proximal phalanx drifted into adduction during closure (Figures 2B and 2C).

The unrecognized abnormal DASA gives the surgeon the improper perception of the position of the hallux. Intraoperative radiographs will display a successfully corrected hallux abducto valgus deformity, however with closure, over tightening of the medial capsule will cause a congruous joint to develop into an iatrogenic hallux varus.

The second patient presents with a hallux adducto varus deformity one year after an Austin bunionectomy. The abnormal DASA is seen as the hallux drifts medial (Figures 3A and 3B).

The proper procedure would be to address the abnormal DASA with a proximal Akin osteotomy with the apex lateral and wedge of bone removed medial corrects the abnormal DASA. The improper procedure would be to



Figure 2A. The unappreciated abnormal distal articular set angle allowed the hallux adducto varus soft tissue position during capsular closure.



Figure 2B. Proximal Akin osteotomy with the apex lateral and wedge of bone removed medial corrects the abnormal distal articular set angle.

address the position of the hallux with a proximal phalanx osteotomy with the apex medial and the wedge of bone removed lateral. This actually increases an already abnormal DASA. This is an example of a “cheater reverse Akin.” The hallux is clinically corrected with an increasing abnormal DASA and without correction of the underlying hallux adducto varus (Figures 4A and 4B).

The third patient presents one year after an Austin bunionectomy with a normal hallux abductus angle and a deviated joint (Figure 5). The increasing PASA can occur as the metatarsal head is shifted laterally during the procedure. If the periosteum at the lateral exit of the osteotomy is still firmly attached, the head can tilt undetected and create a hallux adducto varus with a normal intermetatarsal angle and a normal hallux abductus angle.

CONCLUSION

Three basic concepts of hallux adducto varus deformity are presented: the effect of an unrecognized abnormal proximal articular set angle; the inappropriate use of a proximal phalanx osteotomy to increase an abnormal proximal articular set angle; and the effect of increasing the proximal articular set angle with the distal metatarsal osteotomy.



Figure 2C. Healed proximal phalanx osteotomy with normal distal articular set angle.



Figure 3A. Hallux adducto varus at one year postoperative.



Figure 3B. The abnormal distal articular set angle is easily identified.



Figure 4A. Improper proximal phalanx osteotomy corrects the hallux abductus angle while increasing the abnormal proximal articular set angle.



Figure 4B. Abnormal distal articular set angle is further deformed by the inappropriate proximal phalanx osteotomy.



Figure 5. Abnormal increase in proximal articular set angle was created by the tilt of the osteotomy and the metatarsal head falling into the interspace.

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