Metatarsus Adductus with Hallux Valgus: A retrospective review of surgical outcomes and a new angle for surgical planning

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STATEMENT OF PURPOSE

The purpose of this study is to retrospectively examine patients that have undergone surgical intervention for the correction of hallux valgus (HV) with associated metatarsal adductus (MA). Our goal is to present a quantitative radiographic analysis of the pre-operative and post-operative values. Further, this analysis will present a new angle that may determine if a fifth metatarsal osteotomy is required for MA correction.

METHODOLOGY & HYPOTHESIS

Between 2002 and 2015, 51 patients who underwent hallux valgus surgery with concurrent surgery to correct for metatarsal adductus were retrospectively identified. Of the 51 patients reviewed, 13 patients had bunion deformities that was corrected, recording a total of 64 feet. 8 patients did not meet the required follow up time of 10 months and were excluded from the study. We analyzed a total of 56 feet (43% HV, 75% MA; 35% MA, 56% HV). We evaluated 56 feet that underwent correction surgeries in order to simultaneously correct for both hallux valgus and metatarsus adductus (HVA and MA). Using standard weight bearing radiographic parameters including the first-second intermetatarsal angle (IMA), metatarsal adductus angle (MAA), and the corrected intermetatarsal (IMA) angle, pre-operative and post-operative values were recorded.

A newly proposed fifth metatarsal-cuboid (5th met-cuboid) angle was also evaluated. Pre-op and post-op values were obtained in order to recognize the need for a fifth metatarsal osteotomy. Of the 56 feet underwent a fifth metatarsal corrective osteotomy due to an increased 5th met-cuboid angle.

We hypothesized that the radiographic measurements comparing post-op to pre-op values would be statistically significant (p < 0.05). Also hypothesized was that the pre-operative values of those who had a 5th metatarsal osteotomy compared to those who did not would not be statistically significant.

PROCEDURE

All procedures were performed by the senior author. In order to correct the underlying MA, a rotational base osteotomy (lappet) of metatarsal 2-4 was most commonly utilized. Tarsometatarsal arthrodesis was addressed if arthritis was present. In all 56 additional feet, the adductus deformity was deemed necessary, a proximal closing wedge osteotomy was performed.

The procedure was performed through two dorsal longitudinal incisions over the second and fourth intermetatarsal space. Each of the lesser metatarsals was identified and sub peroneal dissection was completed, exposing the proximal one to two-half of the metatarsal segment (Fig. 1). A single oblique cut oriented from dorsal distal to plantar proximal was made with care being taken to cut through the plantar cortex. A 2.7 mm screw was inserted and at times used to direct the osteotomy. The osteotomy was maintained and maintained by a bone wire and a Kirschner wire. Our patients were demonstrated to be less than or equal to 35°. The internal fixation was then released into a corrected position and the screw was tightened.

If an additional 5th metatarsal osteotomy was deemed necessary, a proximal closing wedge base osteotomy was performed via the fourth intermetatarsal space incision and secured in place with a 3.5 mm screw and a Kirschner wire. After the osteotomy, the hallux was repositioned to its normal location within the hallux valgus deformity correction. The patient was then dressed in a light weight non-weight bearing cast.

ANCILLARY procedures that were utilized to correct the hallux valgus deformity included an oblique closing wedge base osteotomy of the 1st metatarsal, a base osteotomy in conjunction with a distal metatarsal osteotomy (Lapidus), and most commonly a 1st metatarsal-cuneiform arthrodesis (Lapidus).

LITERATURE REVIEW

Metatarsus Adductus (MA) is an anatomic disturbance in which there is deviation of all of the metatarsals from the lesser toes, typical of a clubfoot posture and metatarsus adductus (IMA). The MA angle is found in the young with the involvement of high dose and a wide variety of surgical methods including the use of the Lapidus procedure. The MA angle has been used to quantify the angle of the MA and this angle has been found to be a contributing factor in the development of hallux valgus deformity. A significant negative correlation has been demonstrated between the MA angle and IMA. The MA angle has also been shown to correlate with the presence of hallux valgus deformity and its severity.

The importance of identifying MA has been underscored in previous studies. MA can also complicate the operative correction of the HV deformity, especially if it is combined with an adductus deformity. The MA angle has been shown to be a contributing factor in the development of hallux valgus deformity. A significant negative correlation has been demonstrated between the MA angle and IMA. The MA angle has also been shown to correlate with the presence of hallux valgus deformity and its severity.

RESULTS

The mean pre-op-IMA (5th met) was 5.6° and 4.4° post-op.

The mean pre-op-Engel’s angle (5th met) was 33.8° and 19.2° post-op.

Pre-op difference of 14.4°.

Pre-op corrected-IMA (5th met) was 24.1° and 7.9° post-op.

Pre-op difference of 16.3°.

All values were highly statistically significant using a paired t test (p<0.0001).

For the MA, the mean pre-op-IMA was 15.8°, 9.1°, and 6.7° post-op.

Pre-op difference of 9.1°.

5 patients underwent osteotomy adjuvant to a MA correction.

Of the original 56 feet, we retrospectively compared the 5th met-cuboid angle in patients that underwent a 5th metatarsal osteotomy (N=20) to those who did not (N=36). Our data demonstrates a highly statistically significant difference (p<0.0001) pre-operatively. Post op values for patients that underwent a 5th metatarsal osteotomy versus the post-op values for patients that did not was statistically significant (p<0.0001).

In this series, we found a statistically significant correlation between the MA angle and the IMA. This correlation is important as this may influence the need for a 5th metatarsal osteotomy. In future studies, a value >37° this may necessitate the need for a 5th metatarsal corrective osteotomy. Furthermore, a value >13° this may necessitate the need for an additional osteotomy.

REFERENCES

To our knowledge, this is the largest study to quantify radiographic analysis of pre-op and post-op corrected MA in patients undergoing simultaneous surgical reconstruction of both HV and MA. To the authors’ knowledge, this study represents the only series available in current literature that includes MA influence on the 5th met-cuboid angle.


Engel’s formula to determine the plantar metatarsus angle and the 1st digital space of the hallux valgus angle. Foot Ankle Int. 2014 Dec;35(12):1292-1296.