Effect of Blood Flow of the Metatarsal Head with Hallux Valgus after Minimally Invasive Distal Linear Metatarsal Osteotomy

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Disclosure

- NO CONFLICT TO DISCLOSURE
  - Effect of Blood Flow of the Metatarsal Head with Hallux Valgas after Minimally Invasive Distal Linear Metatarsal Osteotomy
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    - Takuaki Yamamoto, MD, PhD
  - Our dislosure are in the final AOFAS Mobile App.
  - We have no potential conflicts with this presentation.
Introduction

- Avascular necrosis of the metatarsal head following a distal osteotomy for HV
  - Chevron osteotomy, a commonly performed procedure, results in osteonecrosis of the first metatarsal head in 0% to 20% of cases.
  - It is aggravated by overpenetration of the saw blades or injury during a lateral soft-tissue release.

- Minimally invasive distal linear metatarsal osteotomy (DLMO) exhibited good outcomes, with no major complications such as nonunion or avascular necrosis of the metatarsal head.
Laser Doppler flowmetry

- LDF is used to noninvasively and repeatedly measure tissue blood flow.
- This technique has been proven useful for clinical and experimental evaluation of skin, ligament, superior labrum anterior and posterior lesions, and bone blood flow.
Purpose

The purpose of this study was to evaluate the *in vivo* blood flow of the pre- and post-DLMO metatarsal head in patients with HV using laser Doppler flowmetry (LDF).
Methods

- Between April and November 2015
- 7 patients 7 feet (male: 2, female: 5)
- Mean age at surgery 43.4 y.o (range 21-62)
- The inclusion criteria of DLMO were all levels of severity of correctable HV deformity under manual reduction.
DLMO

- A 1.5-cm skin incision
  - Center of the medial aspect of the first metatarsal neck
- Osteotomy
  - At the subcapital level in a single plane perpendicular to the first metatarsal shaft axis using oscillating saw
- A 2.0-mm Kirschner wire
  - Under direct vision, the Kirschner wire was introduced into the medullary canal of the first metatarsal shaft.
Blood flow measurements

- Blood flow measurements of the pre- and post-osteotomy first metatarsal head in the seven patients were performed by LDF.
- The probe was touched to the first metatarsal head.
- The blood flow measurements were repeated three times, and the mean values were calculated.

The probe tip points to the first metatarsal head during DLMO.
Result

- HV angle  mean 38.0 degree (range 22.4-45.8)
- M1M2 angle  mean 17.0 degree (range 14.0-21.9)

<table>
<thead>
<tr>
<th></th>
<th>Pre-DLMO</th>
<th>Post-DLMO</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>Blood pressure (mmHg)</td>
<td>87.3±7.76</td>
<td>88.1±8.25</td>
<td>0.85</td>
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<tr>
<td>Blood flow (ml/min/100g)</td>
<td>1.71±0.68</td>
<td>1.67±0.49</td>
<td>0.9</td>
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</tbody>
</table>
Discussion

- The main arterial blood supply
  - Including the head and the capsule, originates from the dorsal metatarsal artery and the medial plantar artery.

- A distal osteotomy can lead to avascular necrosis
  - Because an aggressive plantar cut can disrupt the soft tissue plantarly, thereby disrupting the blood supply of digital arteries.

Our study

- The blood flow of the pre- and post-DLMO metatarsal head was present in all patients.
- There were no significant difference in the blood flow rates of the metatarsal head before and after DLMO.
Conclusions

- The blood flow of the pre- and post-DLMO metatarsal head was present in all patients.

- There were no significant difference in the blood flow values of the metatarsal head before and after DLMO.

- We suggest that DLMO is a reliable procedure for mild to severe HV deformities.
References