A New Distal Metatarsal Osteotomy Having a Mortise and Tenon Structure with Headless Compression Screw for Hallux Valgus

Koji Hayashi, M.D., Ph.D.¹; Takenori Matsuda, M.D.¹; Yasuhito Tanaka, M.D., Ph.D.²

¹Department of Orthopaedic Surgery, Otemae Hospital, Osaka, Japan.
²Department of Orthopaedic Surgery, Nara Medical University, Kashihara, Japan.

5th IFFAS Triennial Scientific Meeting, July 19-21, 2014
AOFAS Annual Meeting 2014, July 21-23, 2014
Chicago, Illinois USA
<Presentation Title>
A New Distal Metatarsal Osteotomy
Having a Mortise and Tenon Structure
with Headless Compression Screw
for Hallux Valgus

<Presenter’s Name>
Koji Hayashi

My disclosure is in the Final AOFAS Mobile App.
I have no potential conflicts with this presentation.
Introduction

Mitchell osteotomy (1945: by Hawkins et al)\(^1\)

There is high stability on the transverse plane, while deficient stability on the sagittal plane.

Chevron osteotomy (1981: by Austin et al)\(^2\)

There is high stability on the sagittal plane, while deficient stability on the transverse plane.

Purpose

We developed a new technique mixing the advantages of these two techniques.

The purpose of this study is to introduce and evaluate radiologically a new technique of distal metatarsal osteotomy for hallux valgus.
A single surgeon performed surgeries.

Materials

- 24 feet (19 patients)
- 15 female and 4 male
- The average age at the time of surgery: 63 years (range, 44 to 83)
- The average follow-up period: 33 months (range, 19 to 69)

Measurements

- Hallux Valgus Angle (HVA)
- Intermetatarsal Angle (IMA)

*measured with anteroposterior weight-bearing radiographs of the foot
Figure A: standard Mitchell osteotomy (on the transverse plane)

Figure B: modified Chevron osteotomy (on the sagittal plane)
Figure C: Capital fragment and proximal fragment were moved laterally and medially respectively.

Figure D: Capital fragment was proximally moved and stabilized with headless compression screw.
Results

- **The average HVA**
  
  improved significantly from 30 (range, 20 to 46) to 9 (range, -3 to 16) degree.

- **The average IMA**
  
  improved significantly from 16 (range, 12 to 19) to 8 (range, 1 to 14) degree.

- **Additional procedure**
  
  lateral soft tissue procedure, lesser to osteotomy, bunionectomy and lateral column lengthening were performed on 13 (54%), 10(42%), 3 (13%) and 1 (4%) feet respectively.

- **No osteonecrosis of the metatarsal head and no dislocation of the osteotomy surface were found at the final follow-up.**
52 yeas, female: Preoperation

31°
52 years, female: Postoperation

9°
Advantages of this procedure

- The plantar arm is made on a plane parallel to the plantar surface of the foot.
- Distal end is self-locked by chevron structure.
  ⇒ strong stability on the sagittal plane
- Distal end is self-locked by step-cut structure, moreover fixed with a headless compression screw
  ⇒ strong stability on the transverse plane
- Plantar aspect of the metatarsal neck can be preserved.
  ⇒ maintain blood supply to the metatarsal head
Blood supply to the metatarsal head

The metatarsal head was supplied by branches, and the first dorsal metatarsal artery was the dominant vessel.

A plexus was formed at the plantar-lateral aspect of the metatarsal neck.

Only minor vascular branches were found entering the dorsal aspect of the first metatarsal head.

Our procedure

- can preserve plantar aspect of the metatarsal neck.
- can maintain blood supply to the metatarsal head.
- can combine lateral soft tissue procedure safely.

Perforators from plantar-lateral corner plexus
Conclusions

- Capital fragment can keep enough blood supply by preserving plantar region of the metatarsal neck; therefore, lateral soft tissue procedure can be performed safely by reducing the risk of the osteonecrosis of the metatarsal head.

- The morphology of the osteotomy region has a mortise and tenon structure, the osteotomy surface is self-locked and a screw makes compression force; therefore, strong stability is obtained in every direction on the sagittal and transverse planes.

- Our results suggest that this technique provides a satisfactory option for correcting hallux valgus deformity including severe cases.

References