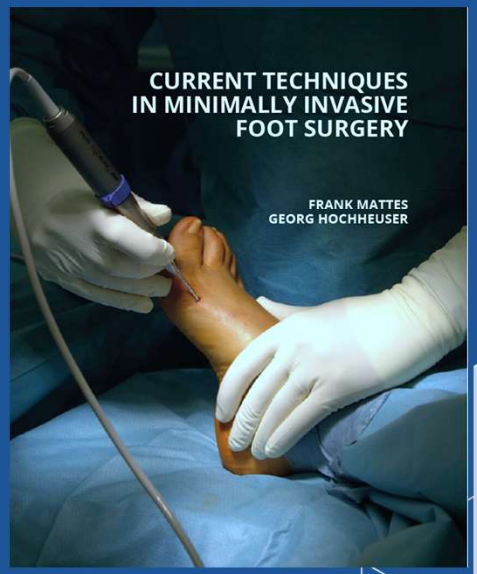
CONTACT ME:
frank.mattes1@gmail.com

Hands-On
Cadaver Seminar
February 21-23, 2024
Celebration, Florida

DMMO, Indications, Technics, Variations

Dr. med. Frank Mattes



interALPES
foot and ankle academy
Ausbildung auf höchstem Niveau

Academy of
Minimally Invasive
Foot & Ankle
Surgery

Conflict of Interest Disclosure

Dr. Frank Mattes has a financial relationship with the following companies and/or products. These relationships may or may not apply to this lecture.

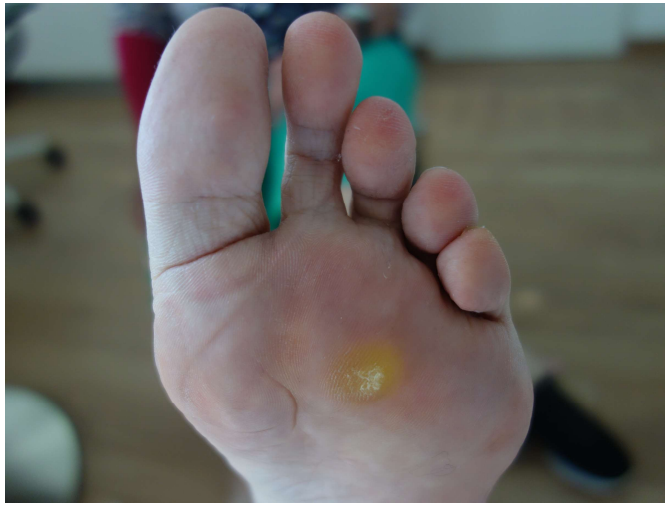
The content of this presentation reflect the opinions of the speaker alone and any products or services mentioned are not endorsed by the AMIFAS.

Where Do I Come From

Hands-On Cadaver Seminar

February 22-24, 2023
Celebration, Florida

DMMO is used to treat static metatarsalgia

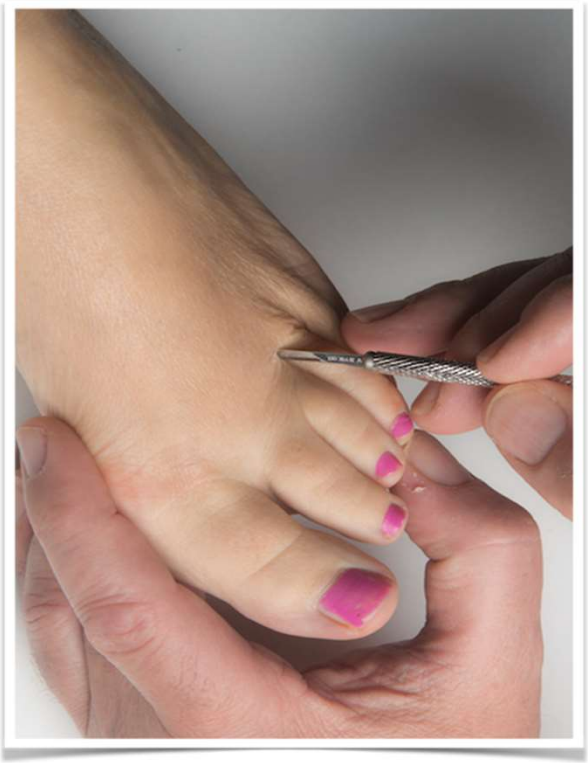


Indication:

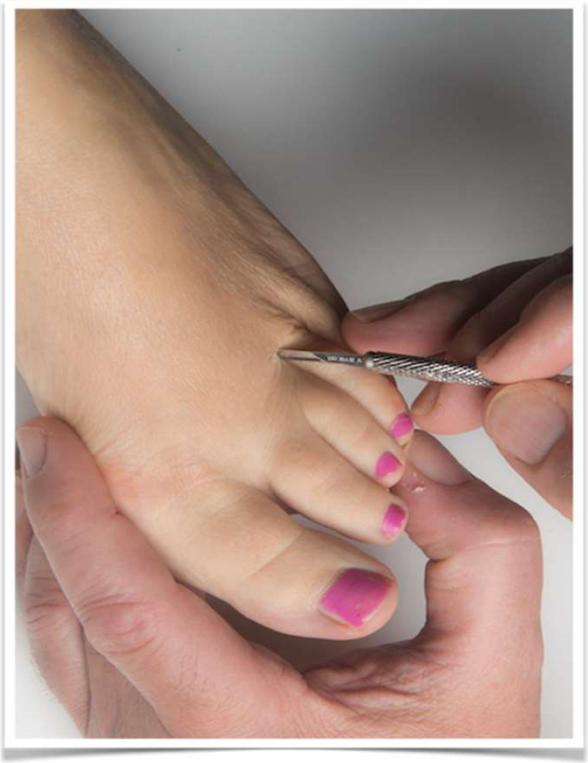
- Static metatarsalgia

→Open alternative: Weil Osteotomy

How to perform ?



Extensor side stab incision approximately 1 cm proximal to the interdigital fold parallel to the extensor tendon



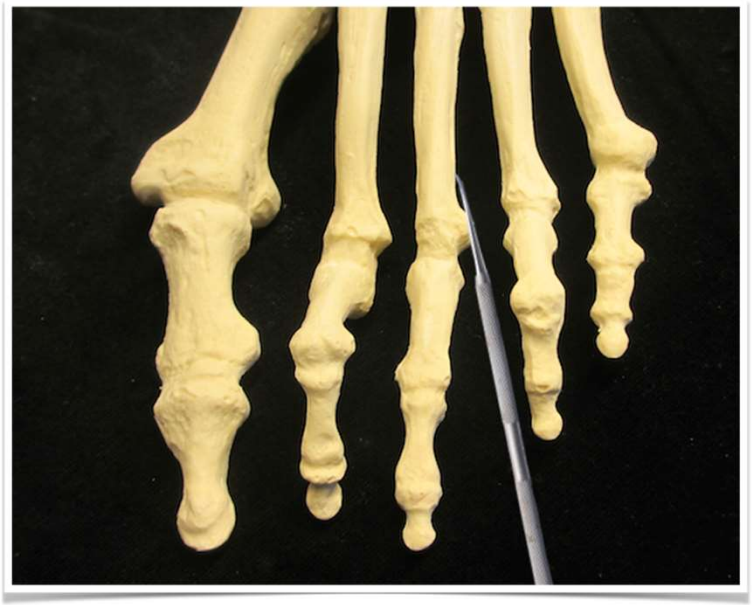
(left foot): slightly lateral of the metatarsal

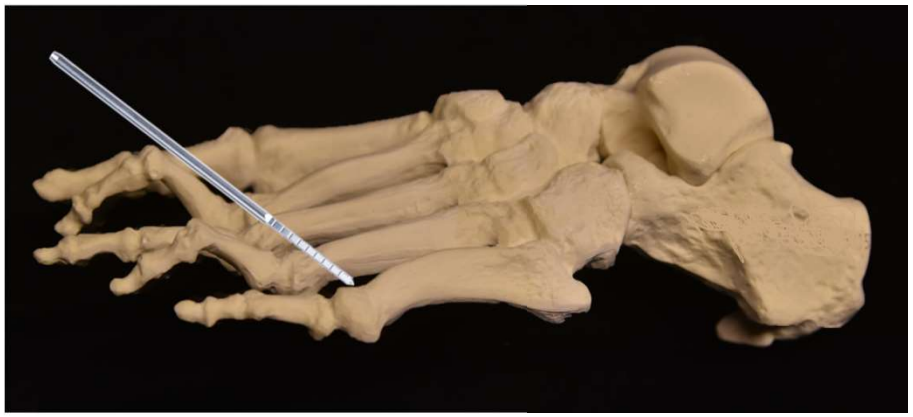
(right foot): slightly medial the metatarsal

(right handed surgeon)

the subcapital region is tunneled subperiosteally on one side

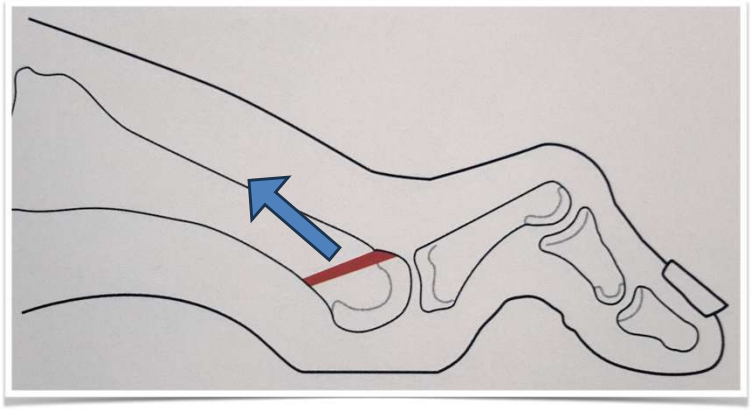
(left foot laterally)
(right foot medially)



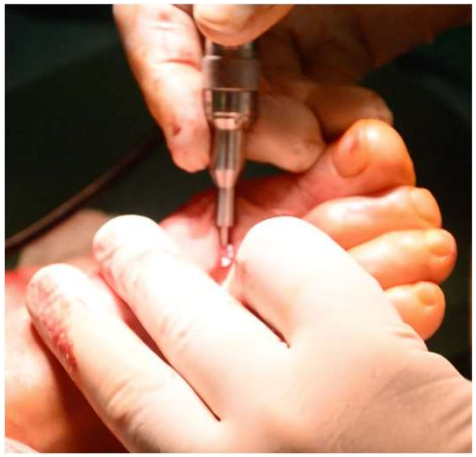


The Osteotomy is :

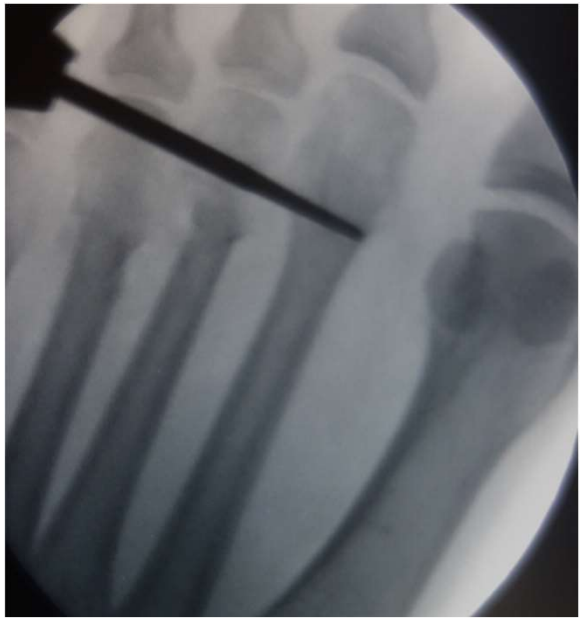
- subcapital
- extrarticular
- rising in approx. 40-45 degrees
- The distal-dorsal end of the osteotomy is locatet at the cartilage-bone border of the MT head



The head slides into the correct position on its own and is fixed by full weight bearing



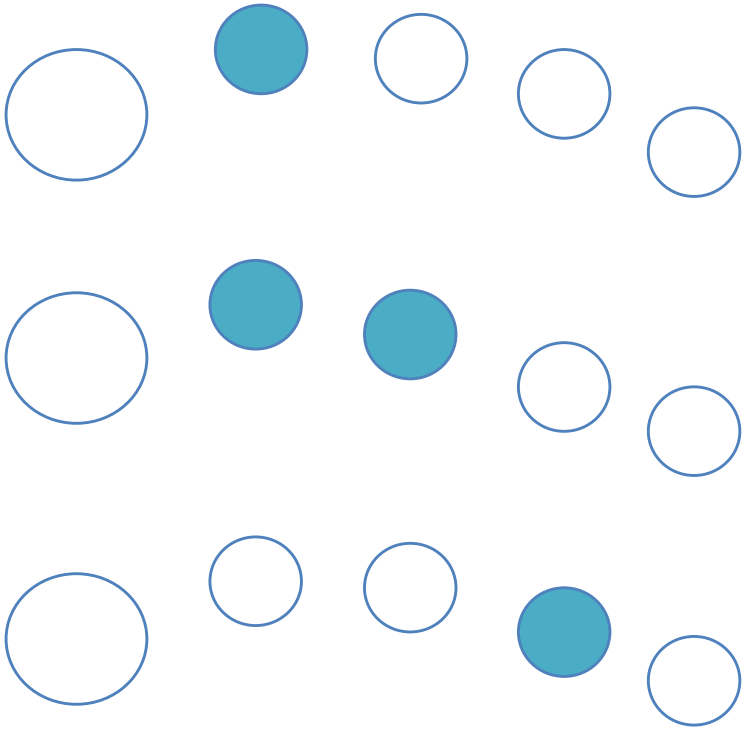
Osteotomy carried out by supination of the wrist



Perpendicular to the MFK to avoid unwanted lateral offset

How many bones ?

= Pain



DMMO 2 +3

DMMO 2 +3+4

DMMO 4+5 bzw. 3+4

No isolated DMMO‘s !

Exception:

Distal intra-capsular minimally invasive osteotomy (DICMO)

Or

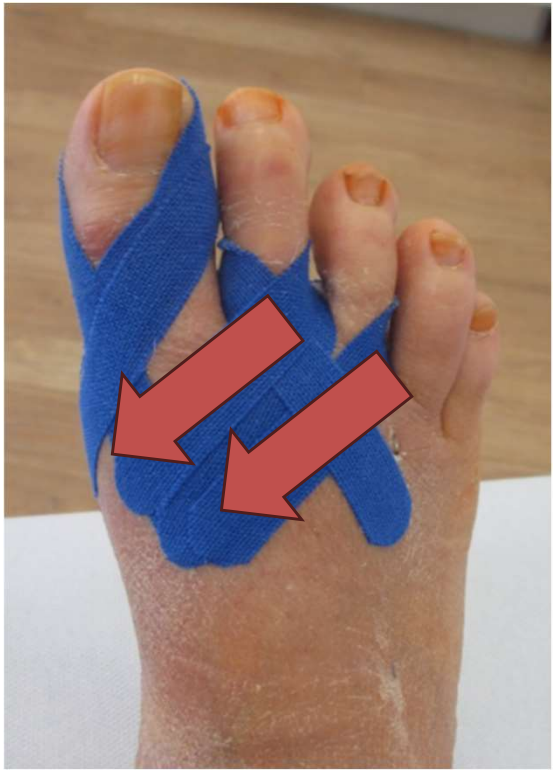
Recurrence

Post op treatment

Direct full weight bearing with ore without flat postop shoe allowed

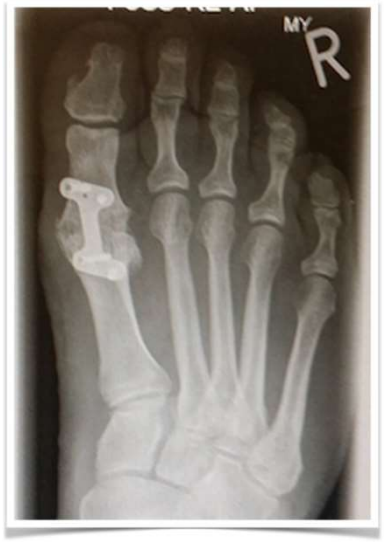
Taping towards D1 to prevent lateral dislocation

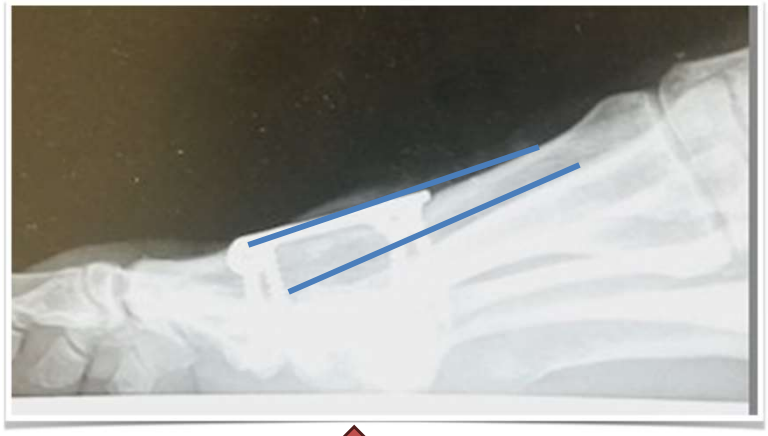
(6 weeks) x ray control after 6 weeks and 3 month



A typical example

Post op transfer metatarsalgia after MTP 1 fusion

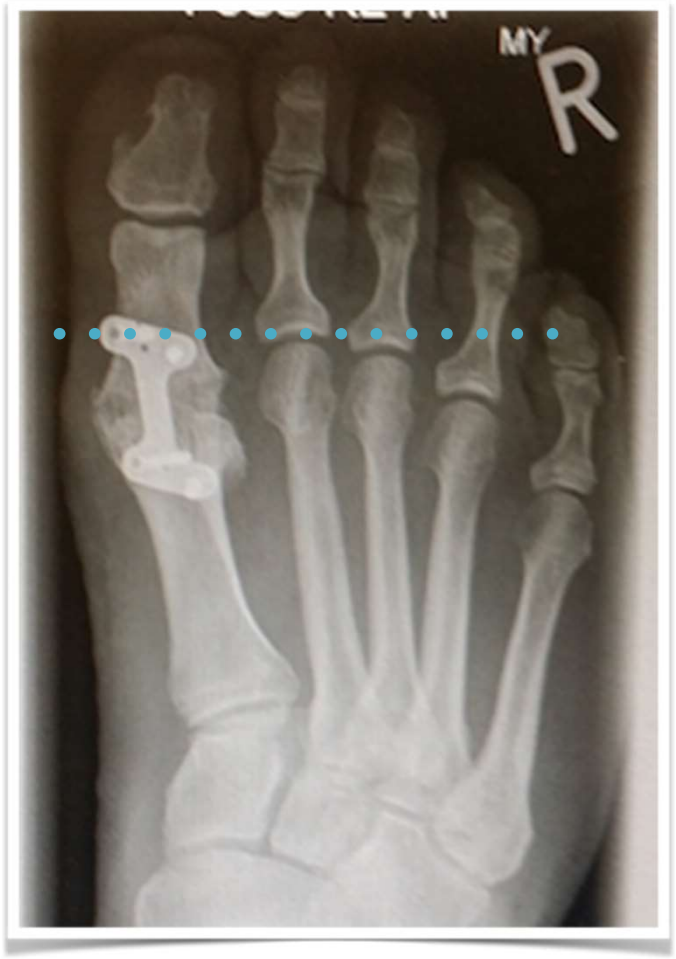


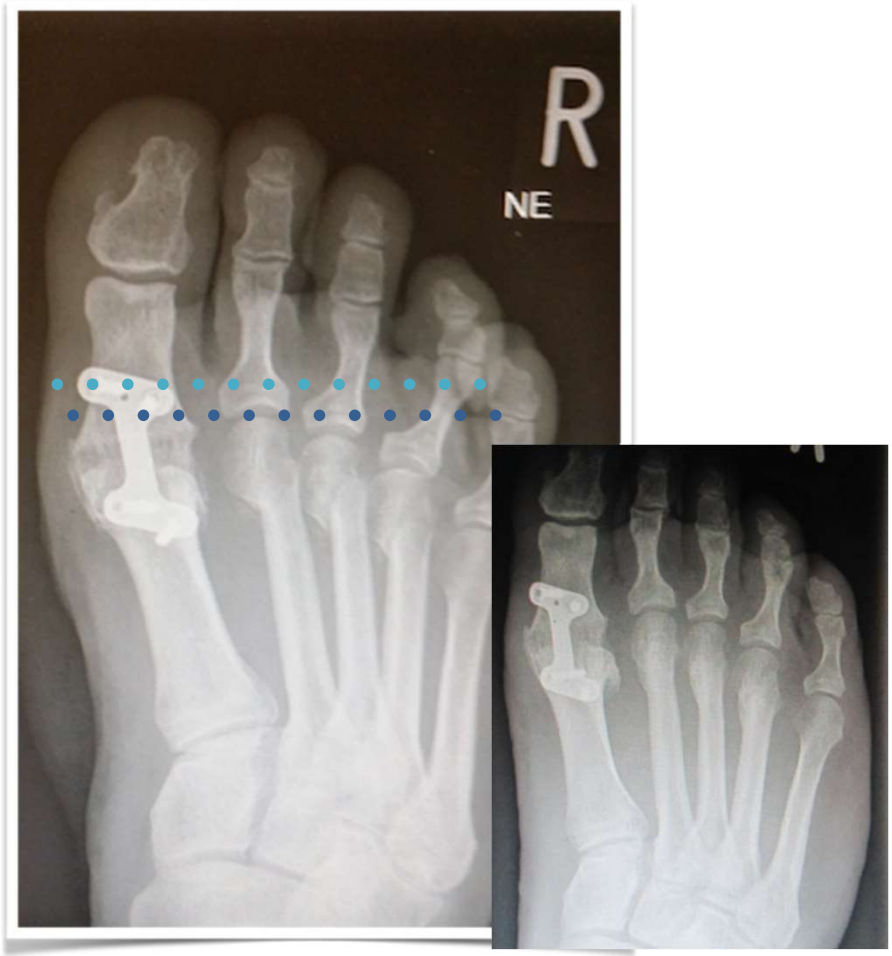


Elevation of MT I !

Pain

Solution: DMMO 2-4

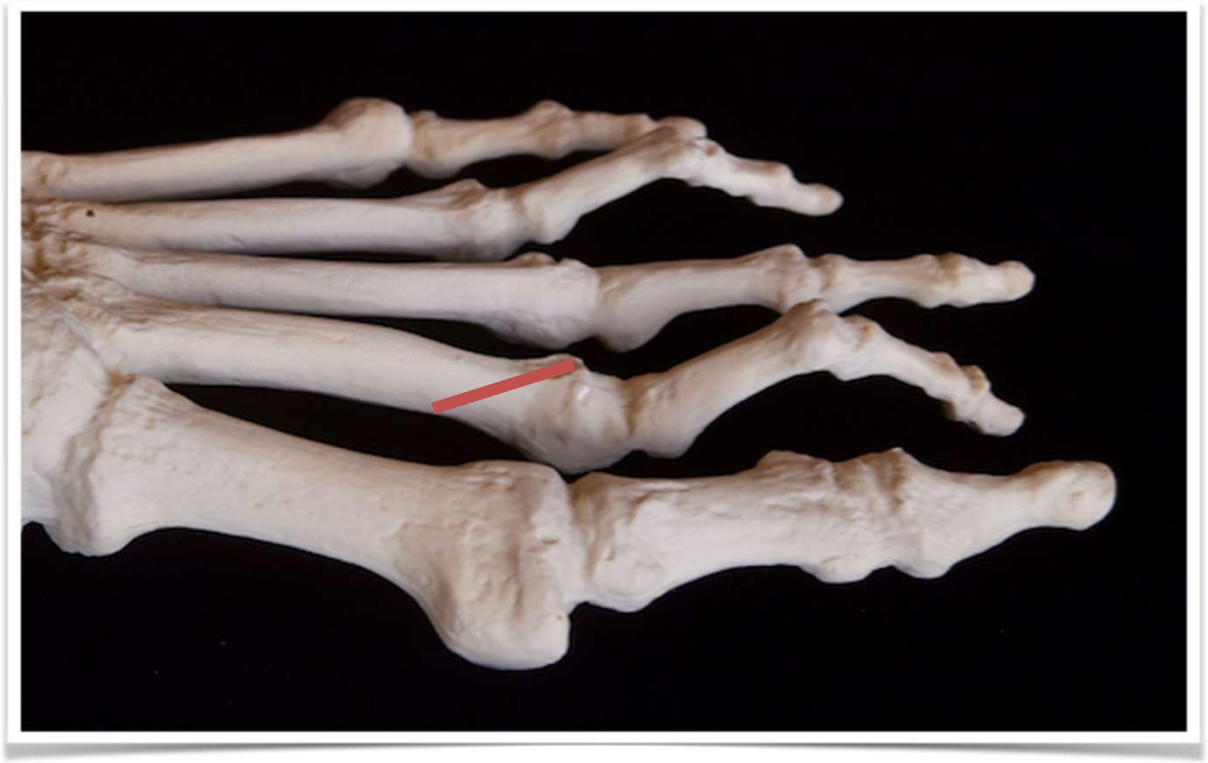




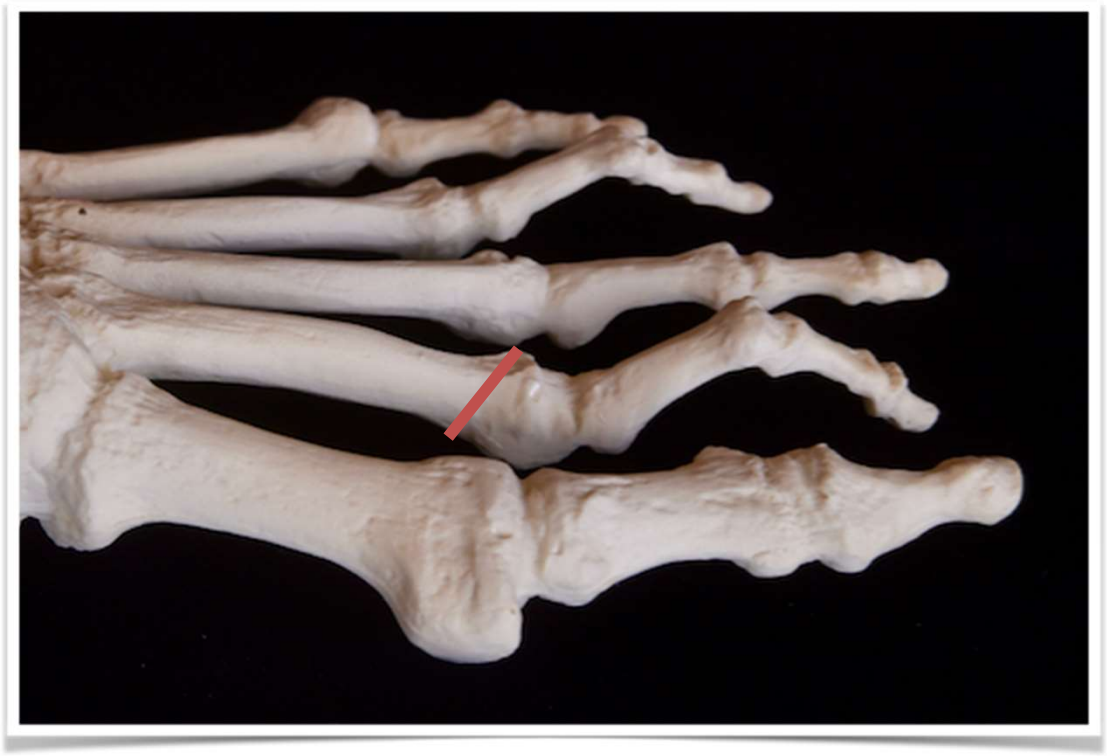
Präop

PostOp

6 month post op

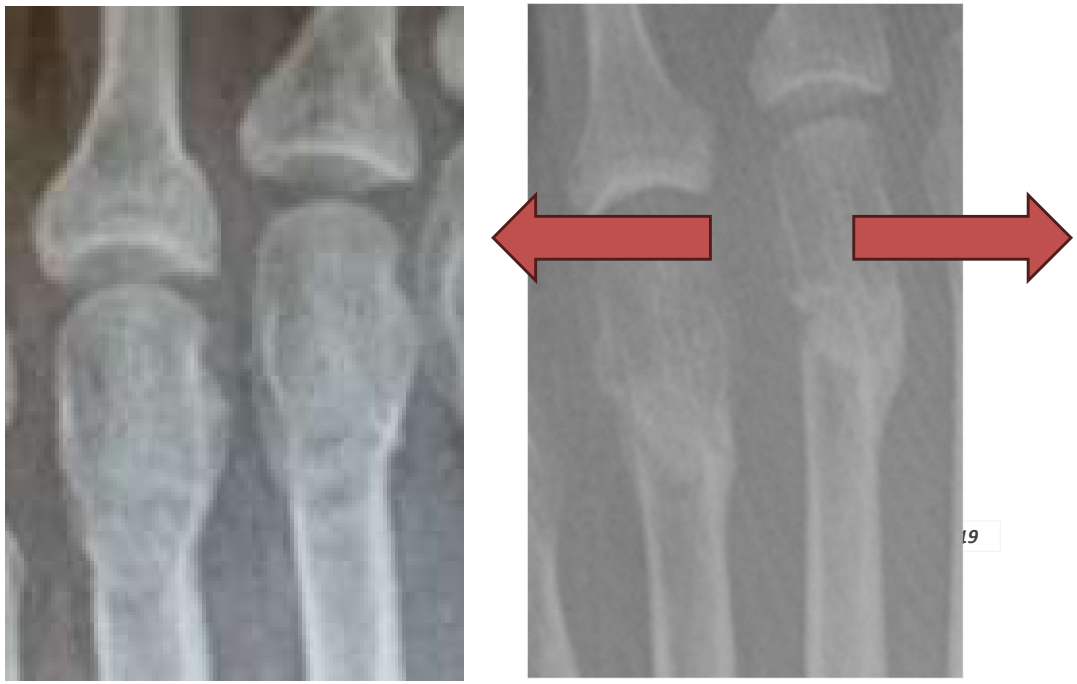


The flatter the more shortening can be expected



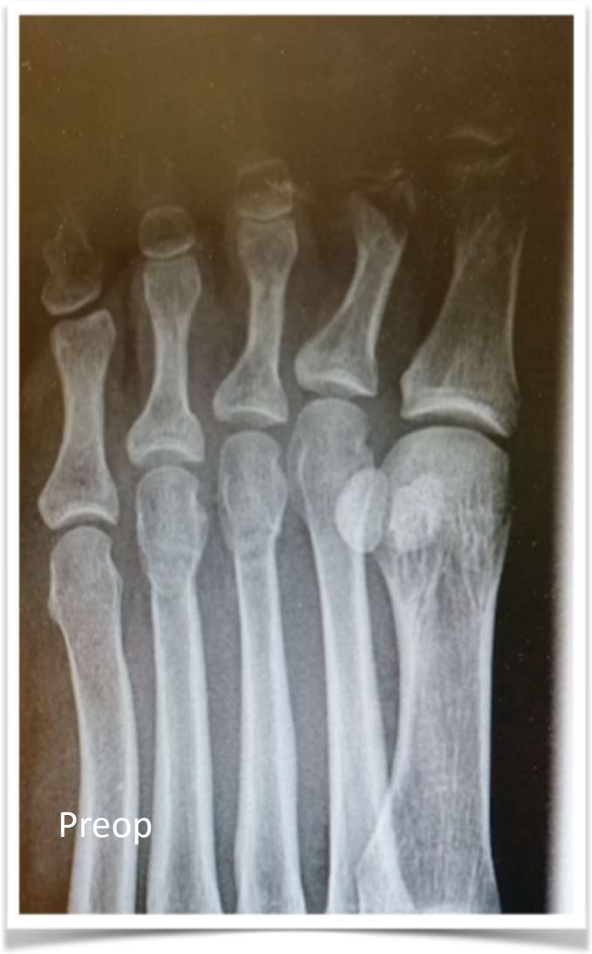
The steeper the more elevation can be expected

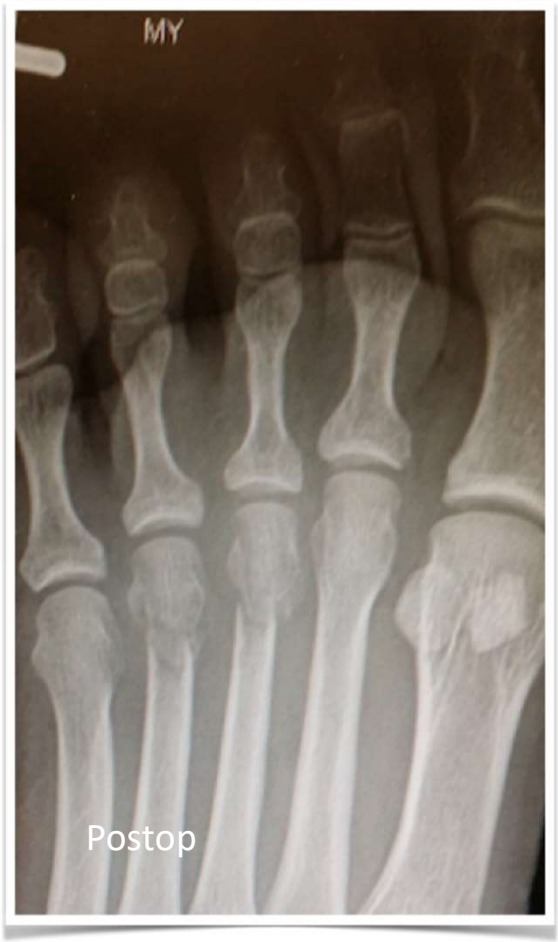
Desired lateral offset is also possible

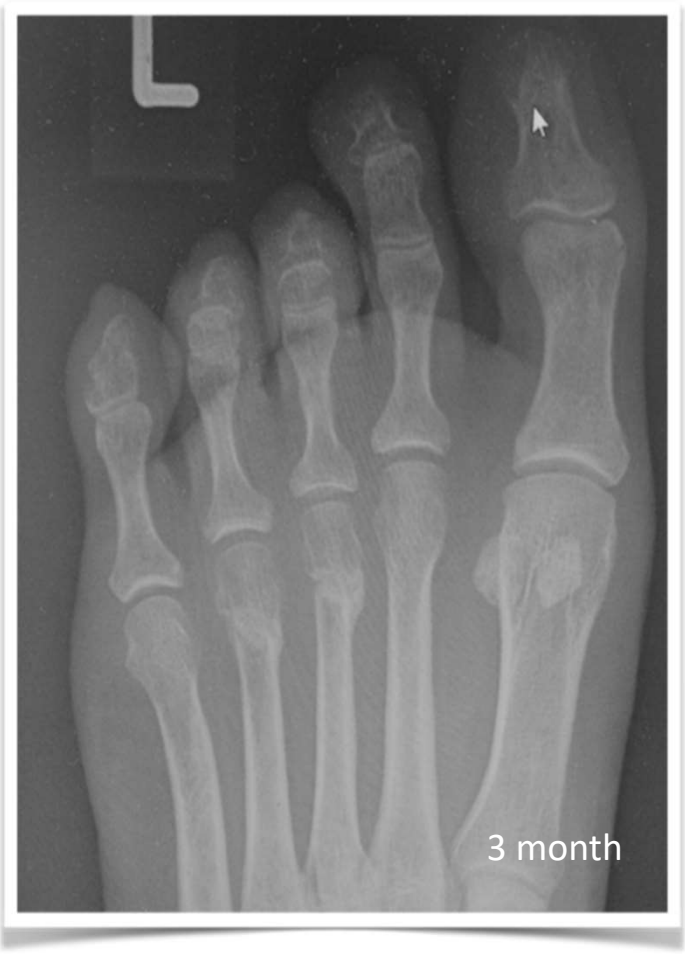


For example with Morton Neuralgy

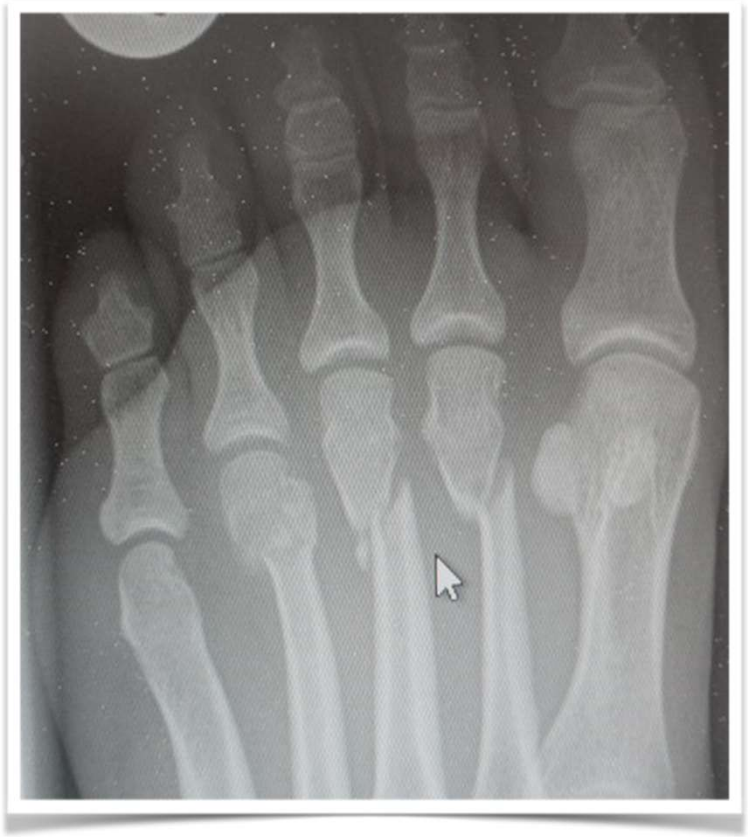
With transection of the transverse metatarsal ligament







Another example of DMMO with lateral offset

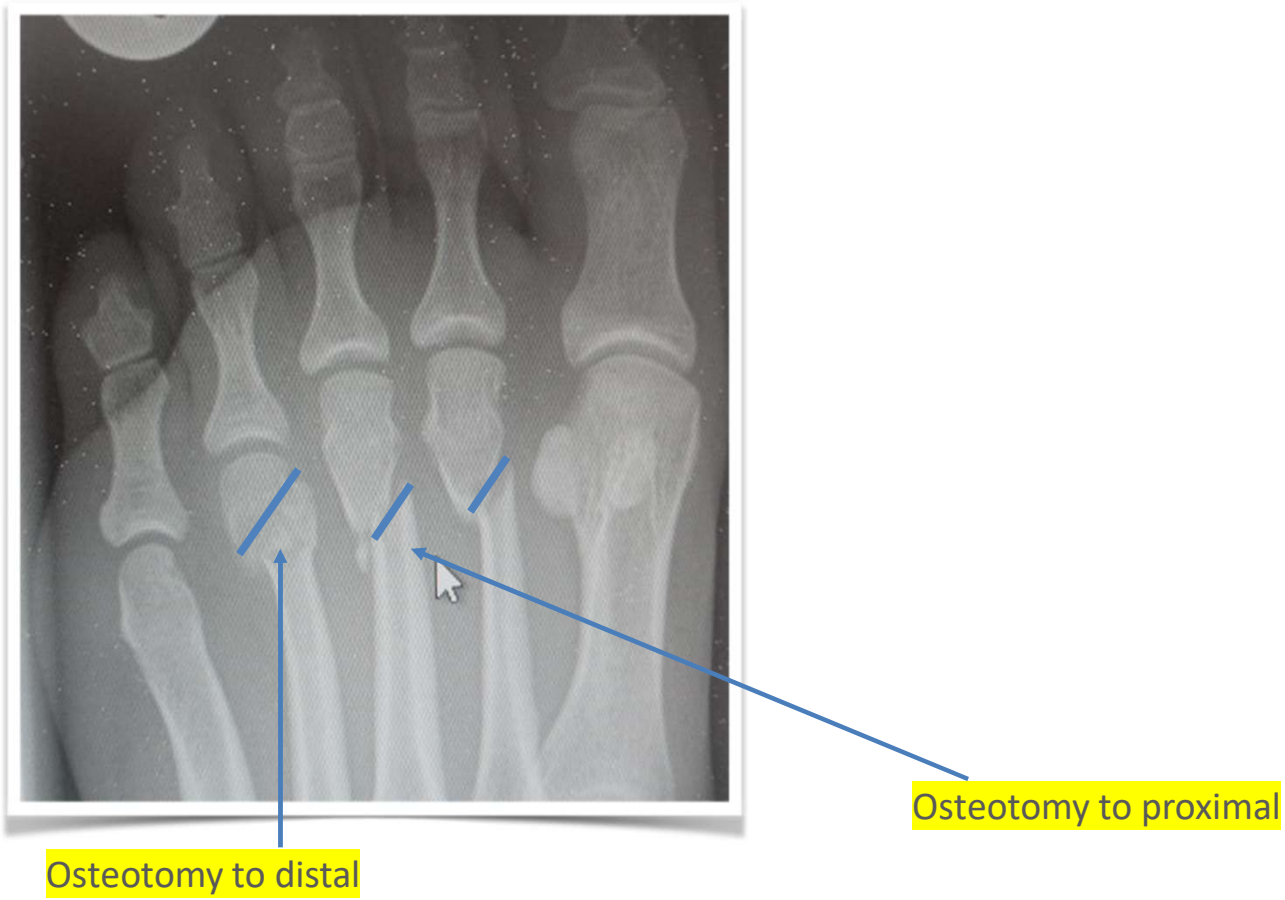


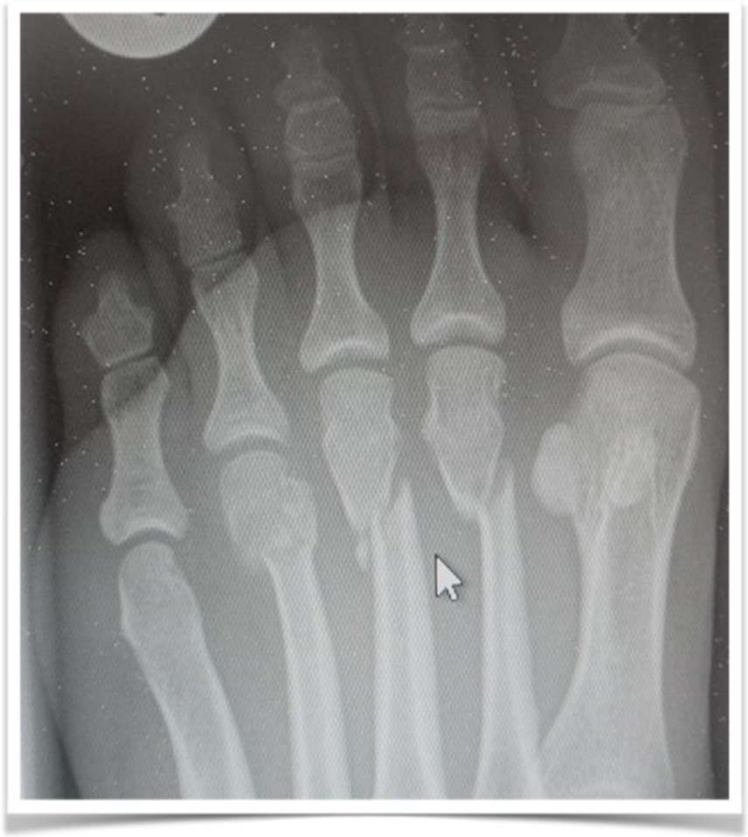
No typical perpendicular osteotomy here !

Ist a oblique osteotomy

that means more lateral offset

Another example of DMMO with lateral offset

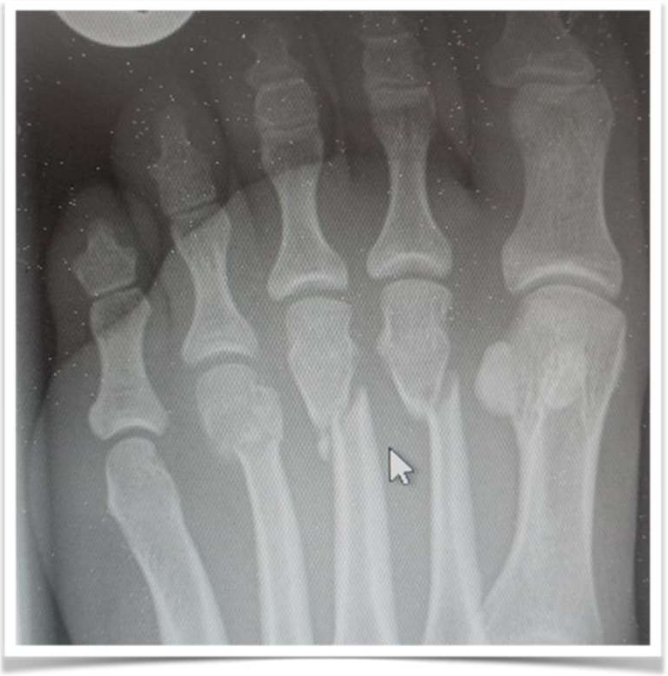


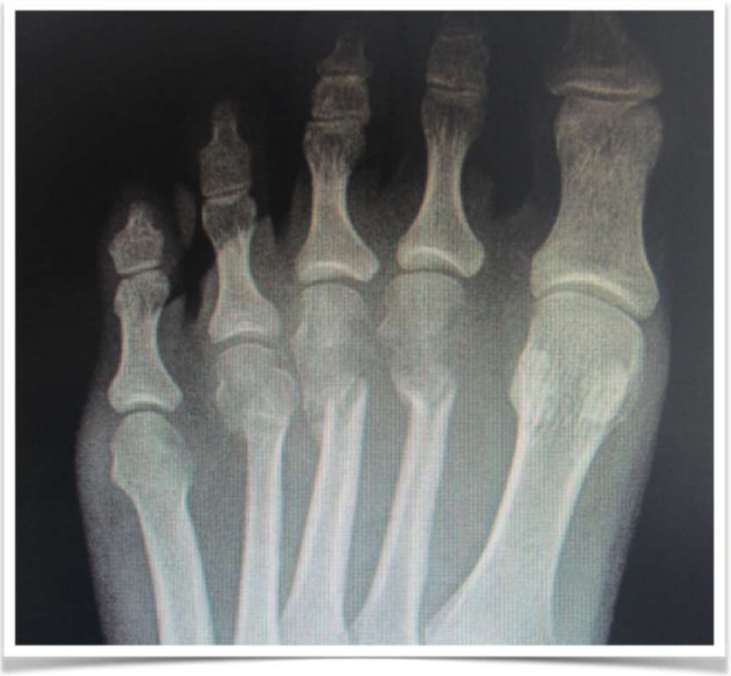


No DMMO

MARATHON run !!!

After 3 month





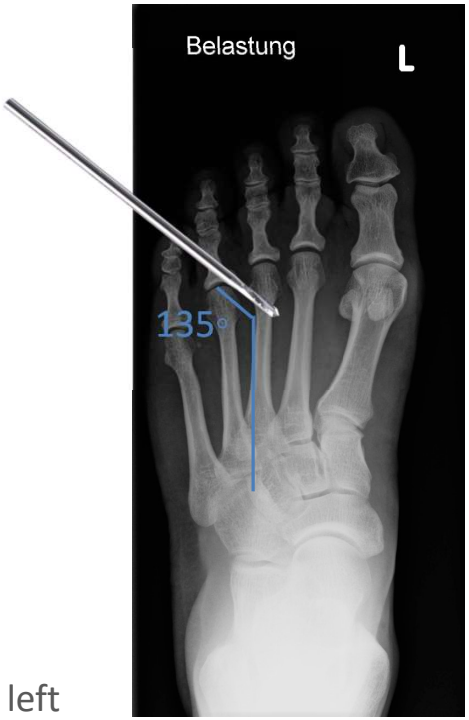
to limit the lateral displacement (e.g. with DMMO 2-5)

The osteotomy plane (horizontal plane) can be changed accordingly

Osteotomías de los metatarsianos laterales

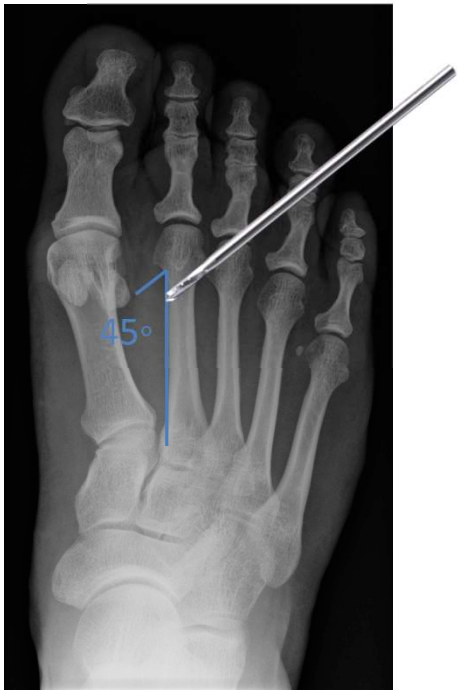
O. Laffenêtre, M. Dalmau-Pastor, T. Bauer, le GRECMIP[1]

Volume 11, Issue 1, March 2019, Pages 1-10



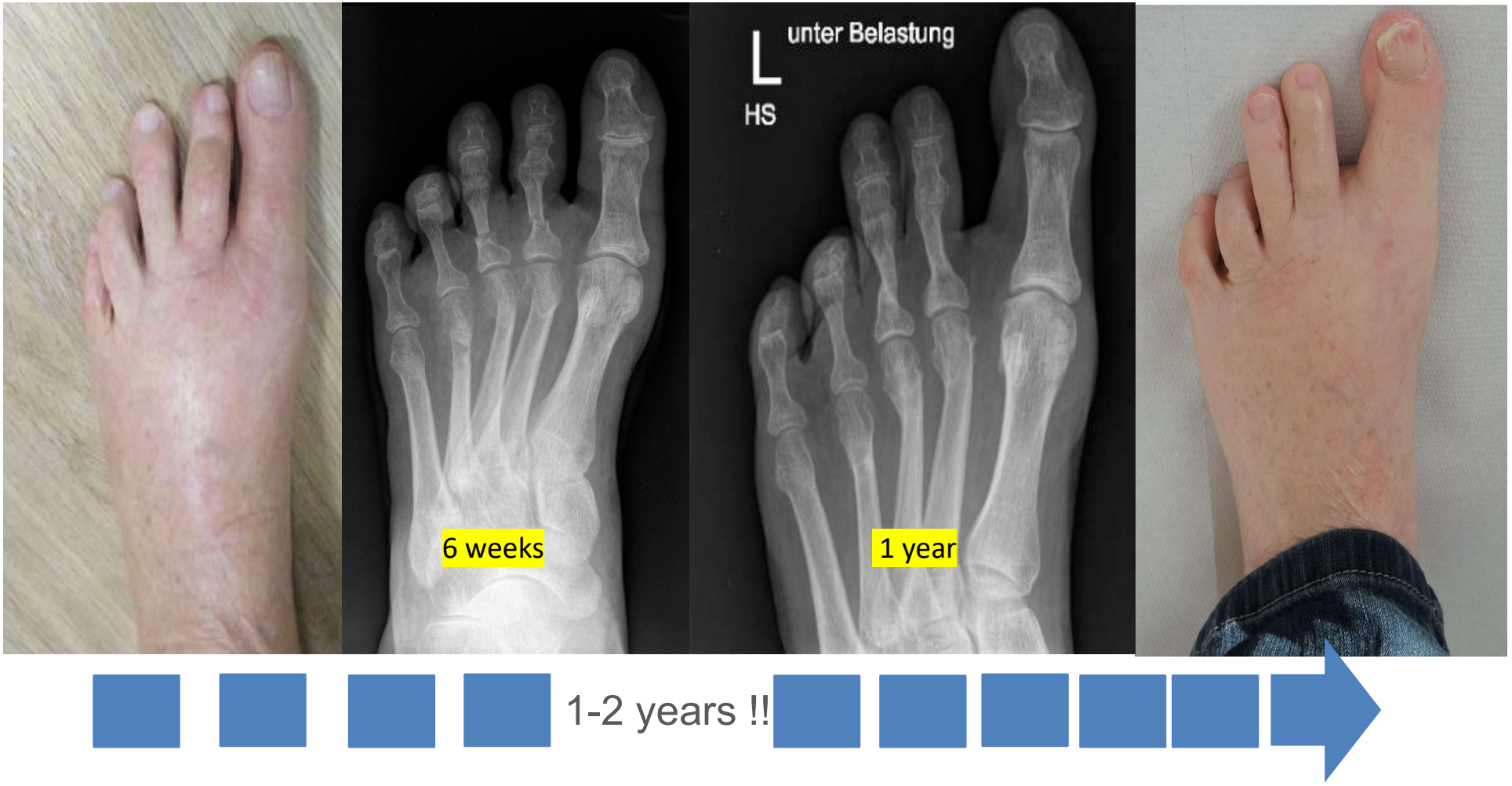
left

Left foot 135◦
Right foot 45◦

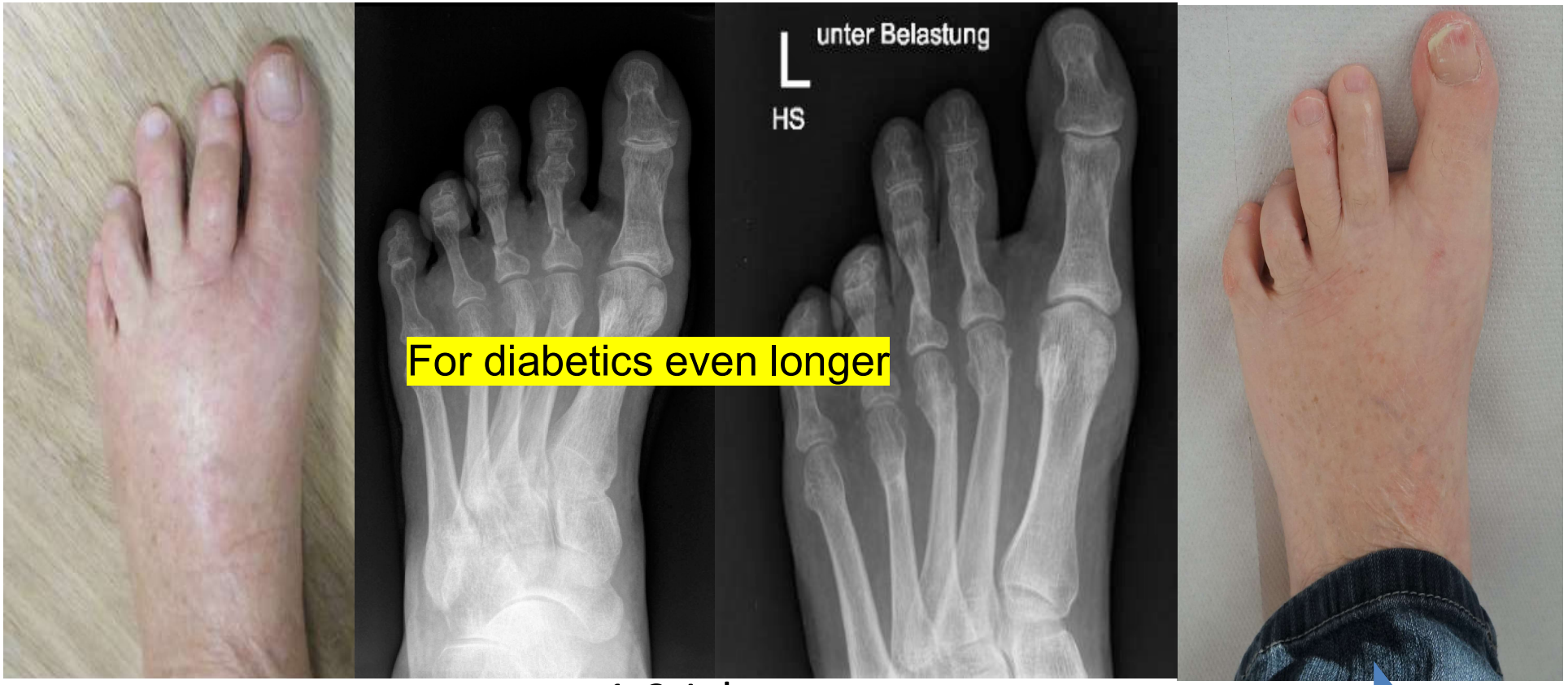


right

The radiological postoperative course is prolonged

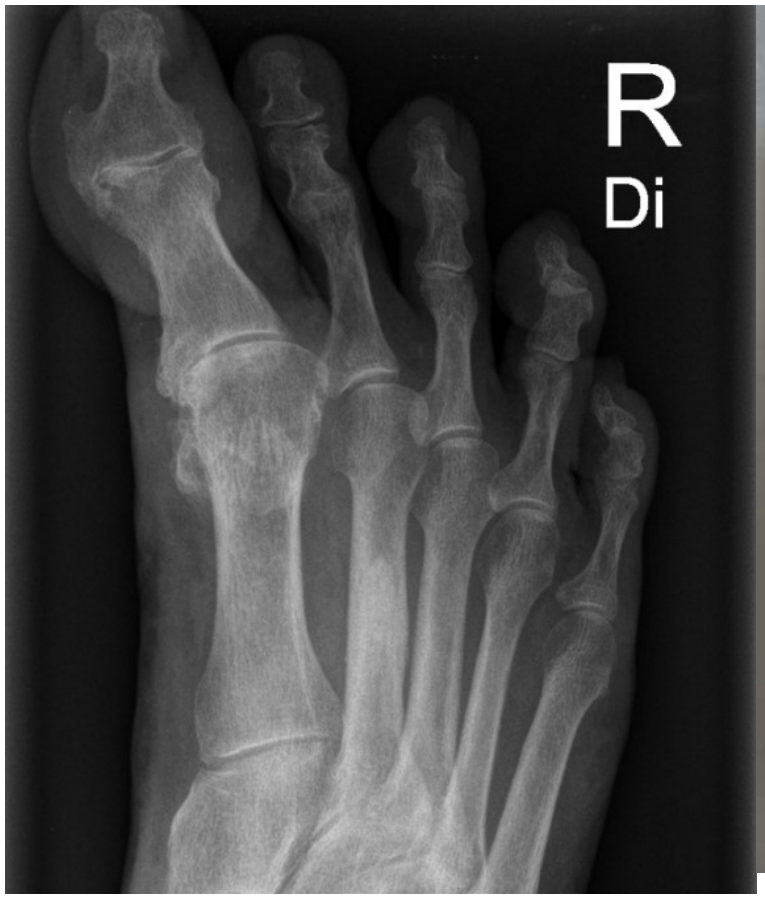


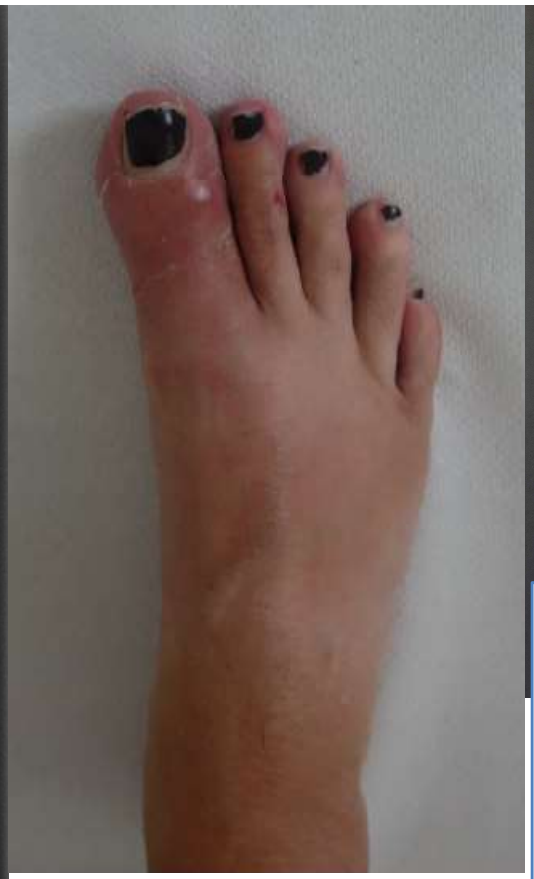
The radiological postoperative course is prolonged

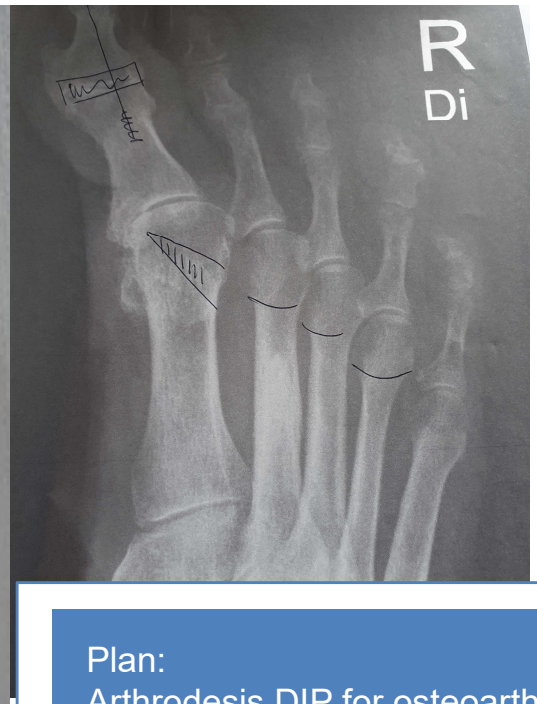


1-2 Jahre
!!

Can also be used for hallux varus



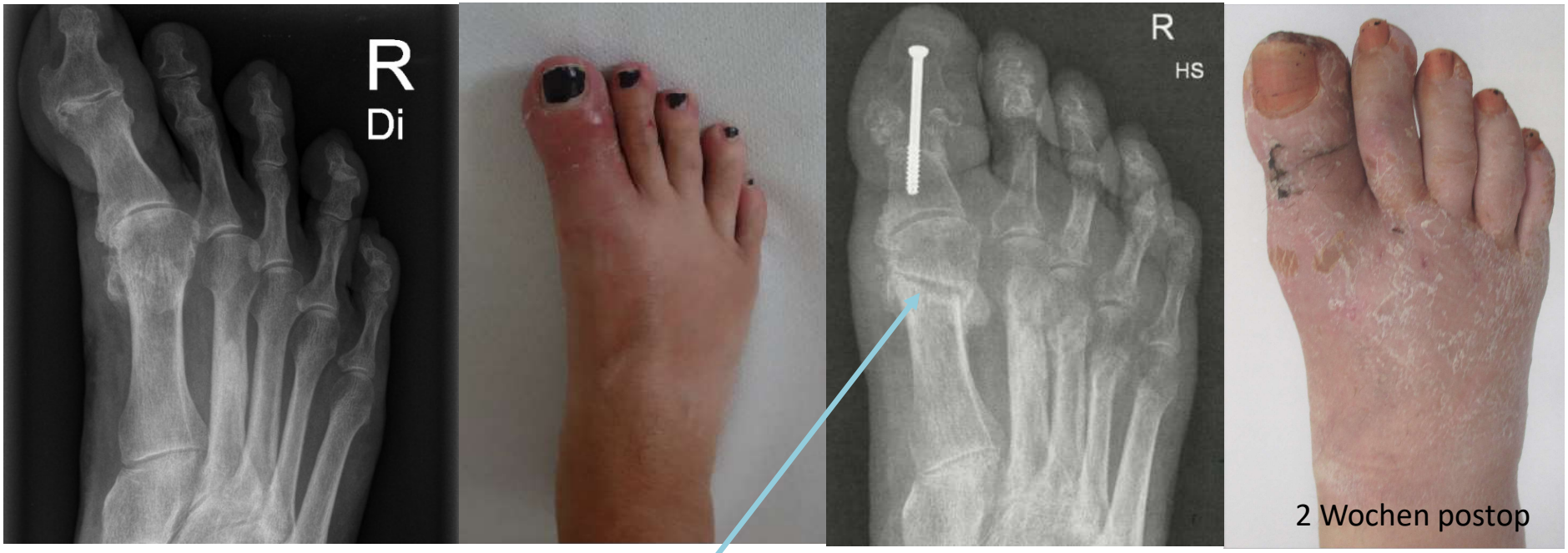




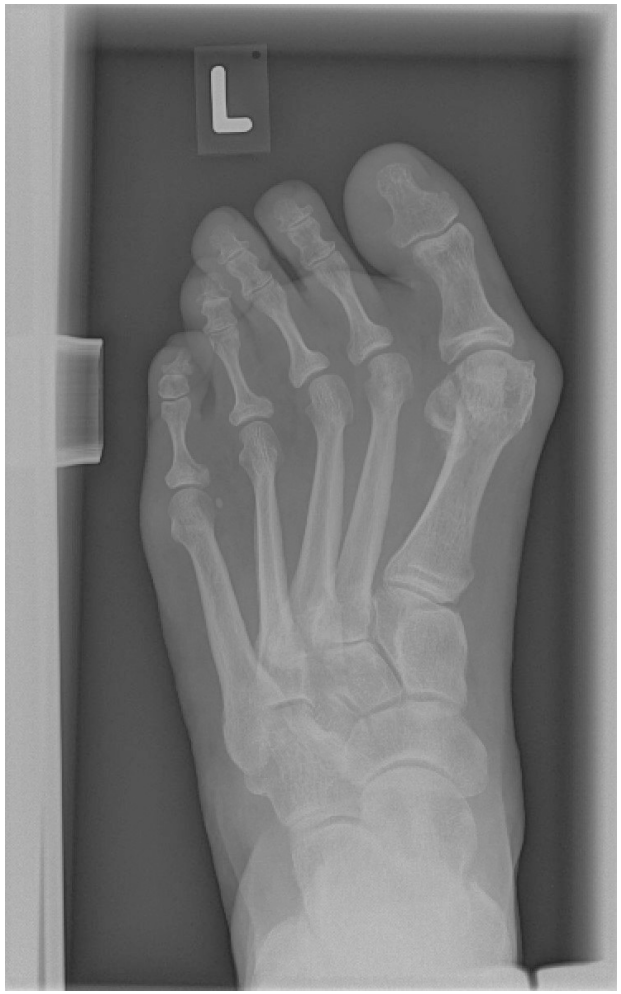
Plan:
Arthrodesis DIP for osteoarthritis
Reversed Akin osteotomy
Reversed Isham osteotomy
No medial release because of reversed Isham
DMMO 2-4

Can also be used for hallux varus

6 weeks post-op immediately after removal of the bandages



The gap will be visible radiologically for at least 6 months

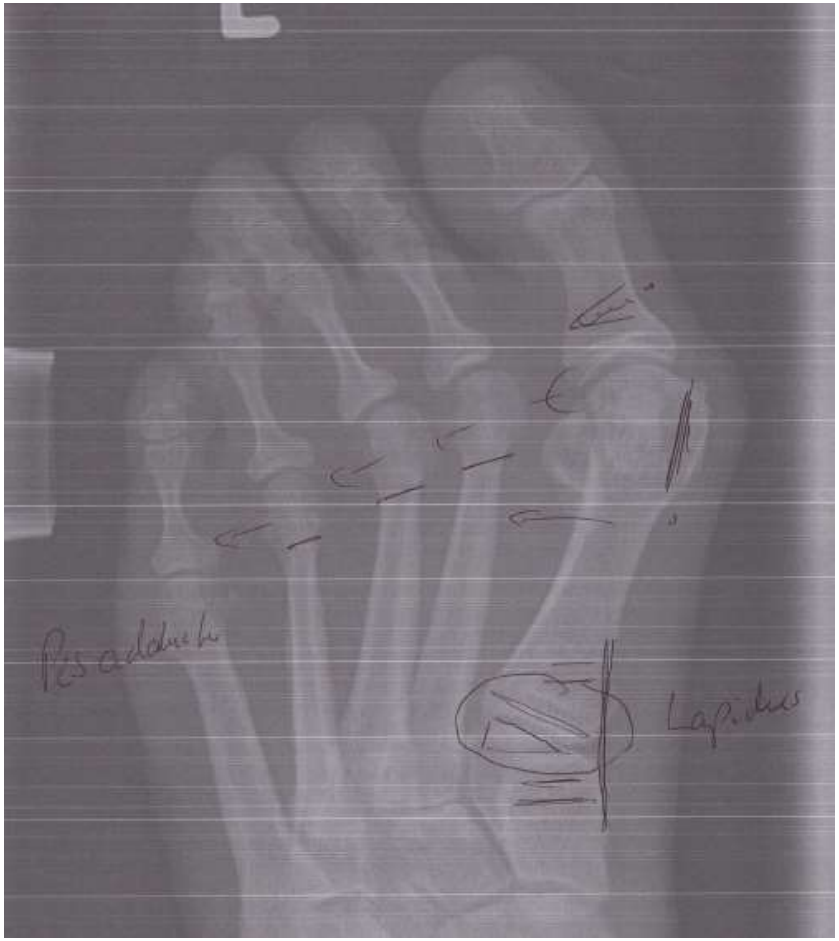


Lapidus arthrodesis planned here

But…. Metatarsus adductus

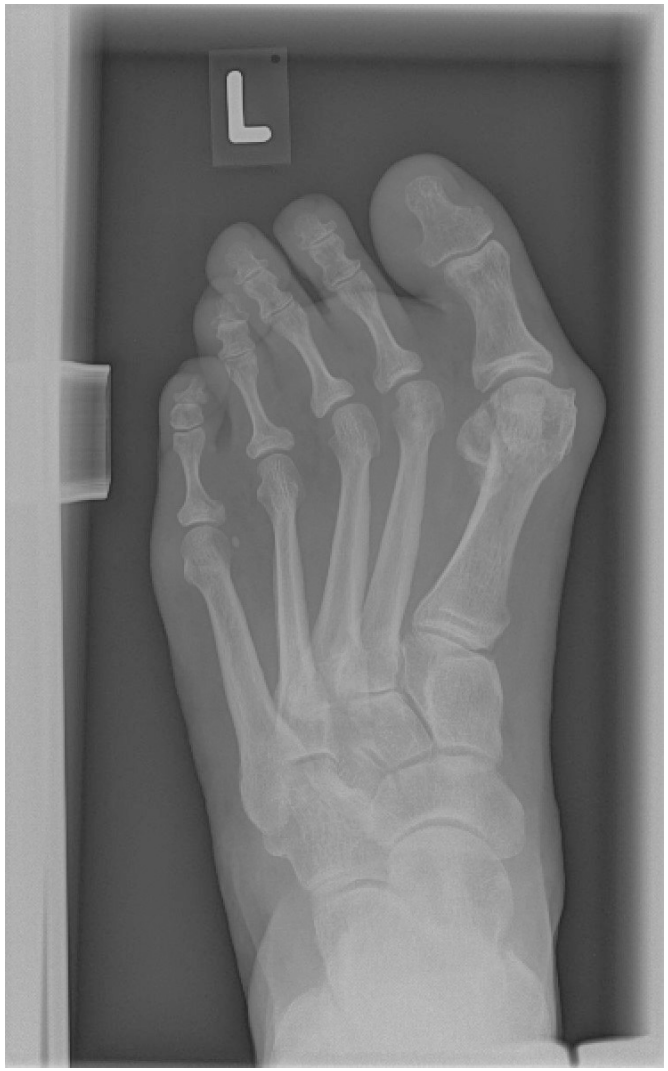
Too little space for lateralization of the MT 1

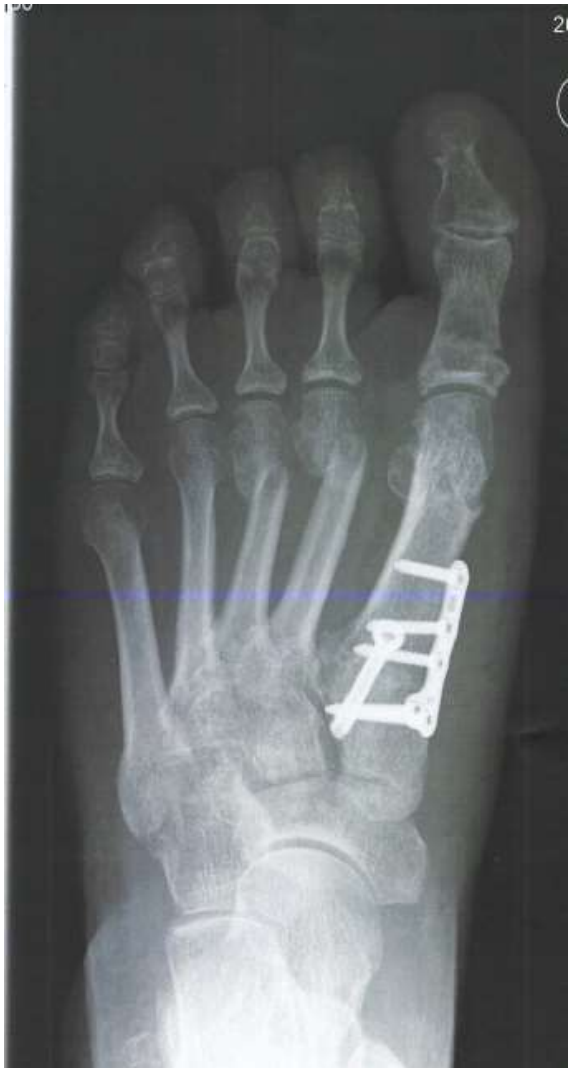
Plan:



Step 1 →DMMO 2-3(4)

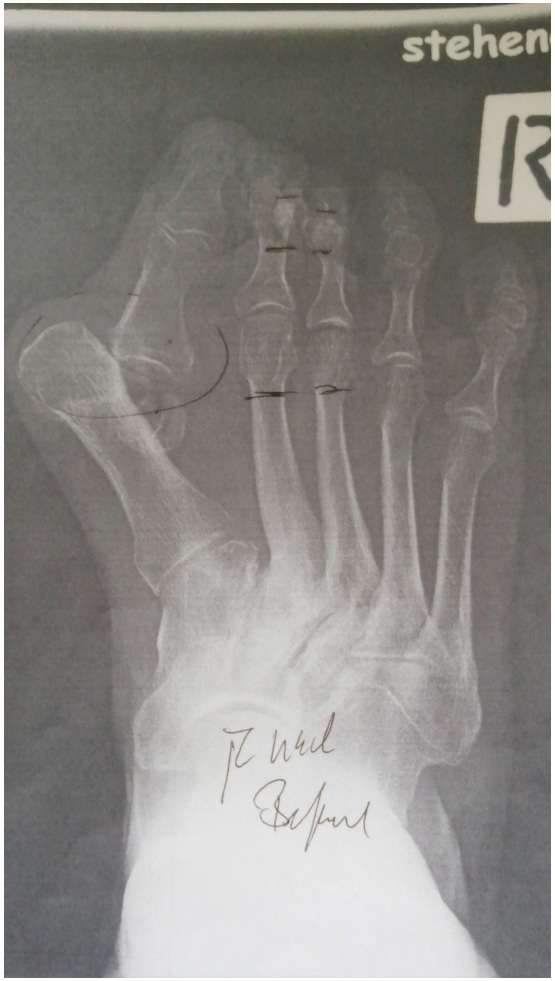
Step 2→ Lapidus arthrodesis

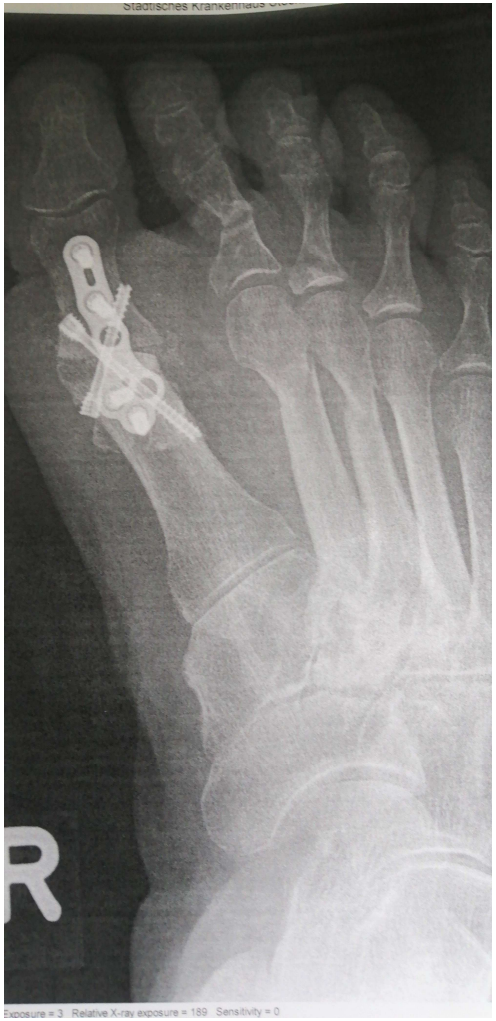




Post op 6 weeks

DMMO often makes correction possible in the first place





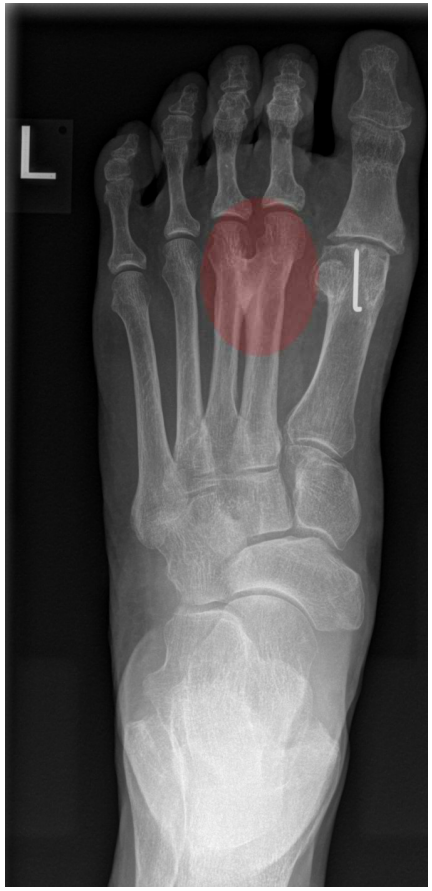
DMMO ? And everything is just fine ?

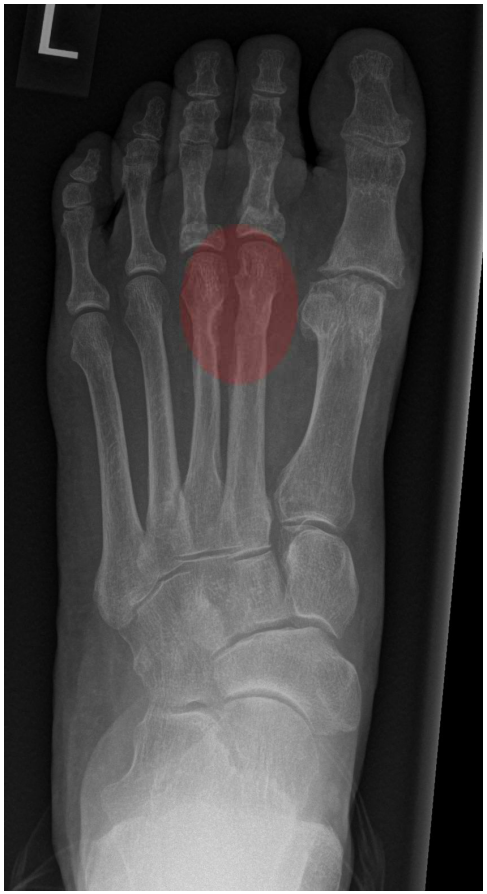
Generally at MIS → Long post-op swelling phase

Additionally at DMMO:
Restriction of movement MTP joints
Palpable callus

must be discussed with the patient

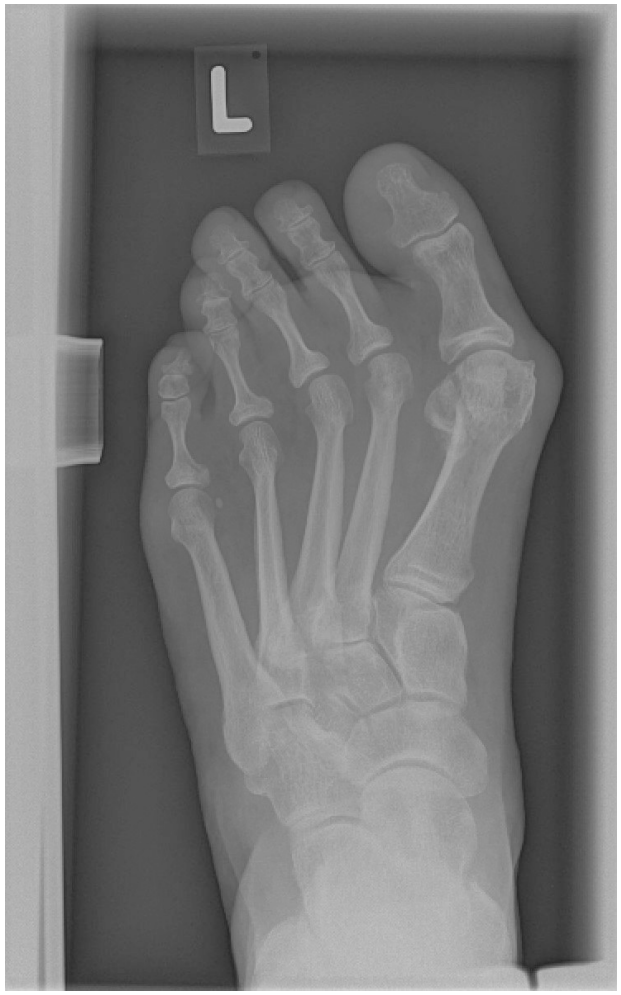
Bone bridge between the metatarsals



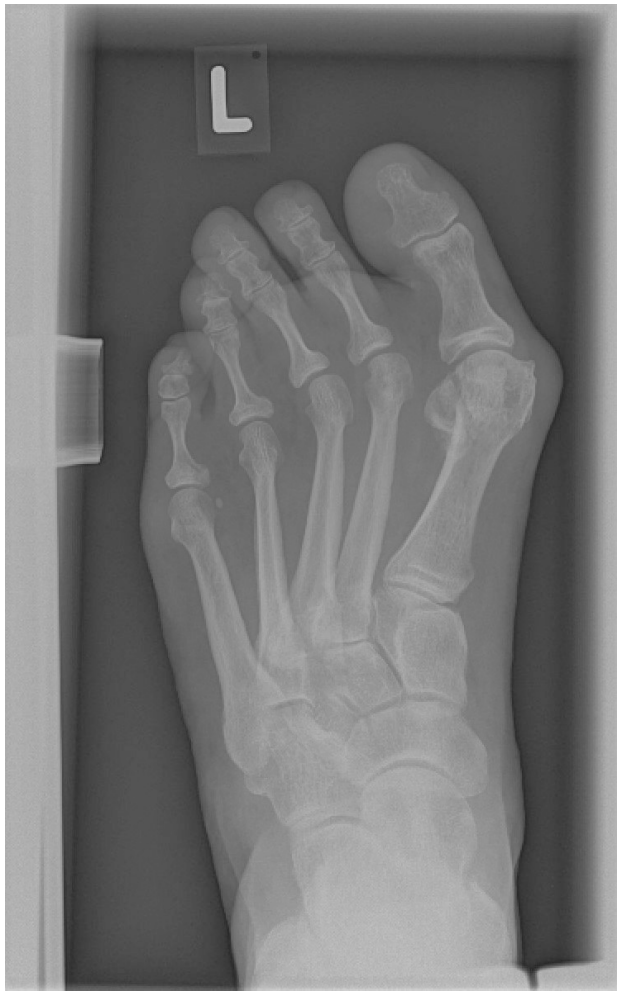


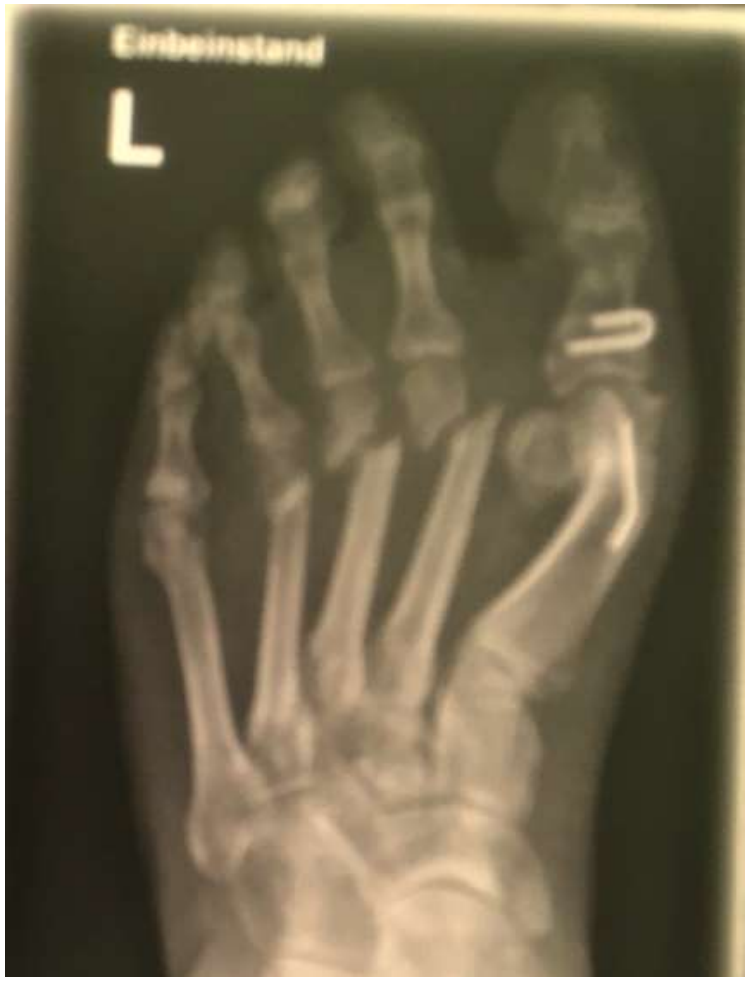
really rare

Caution !!



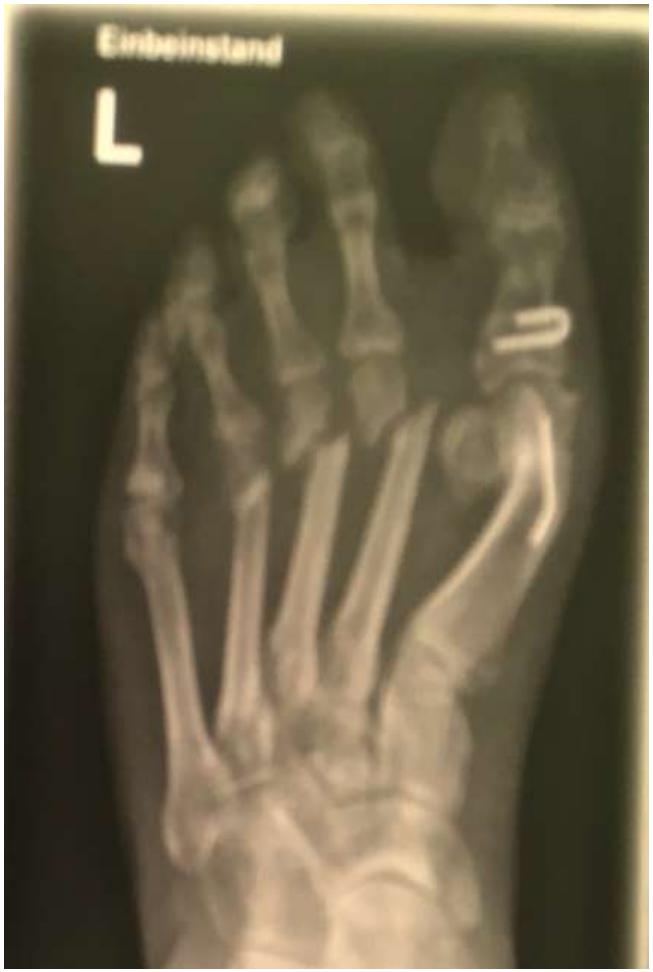
An isolated DMMO would Increase the hallux valgus angle!!!

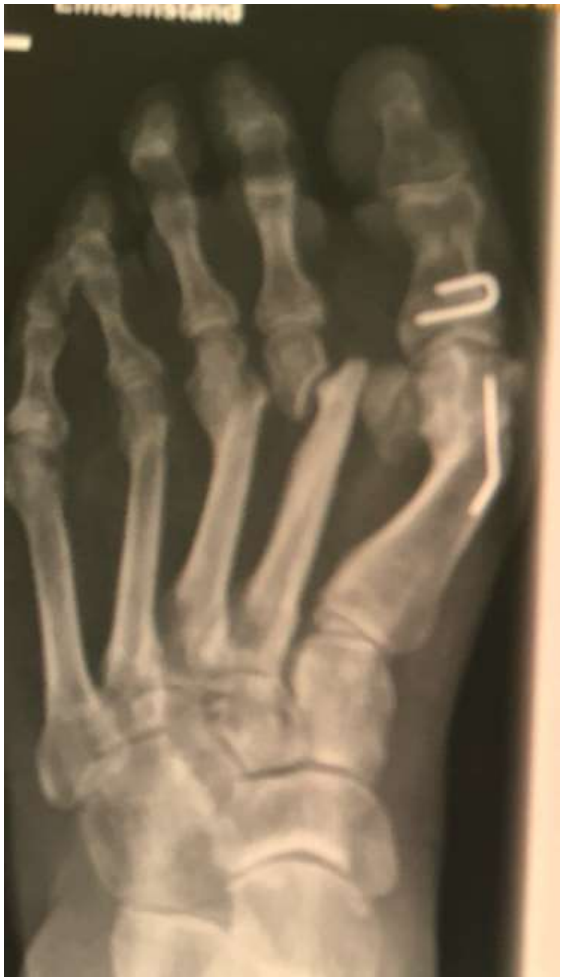

L


Einbeinstand
L

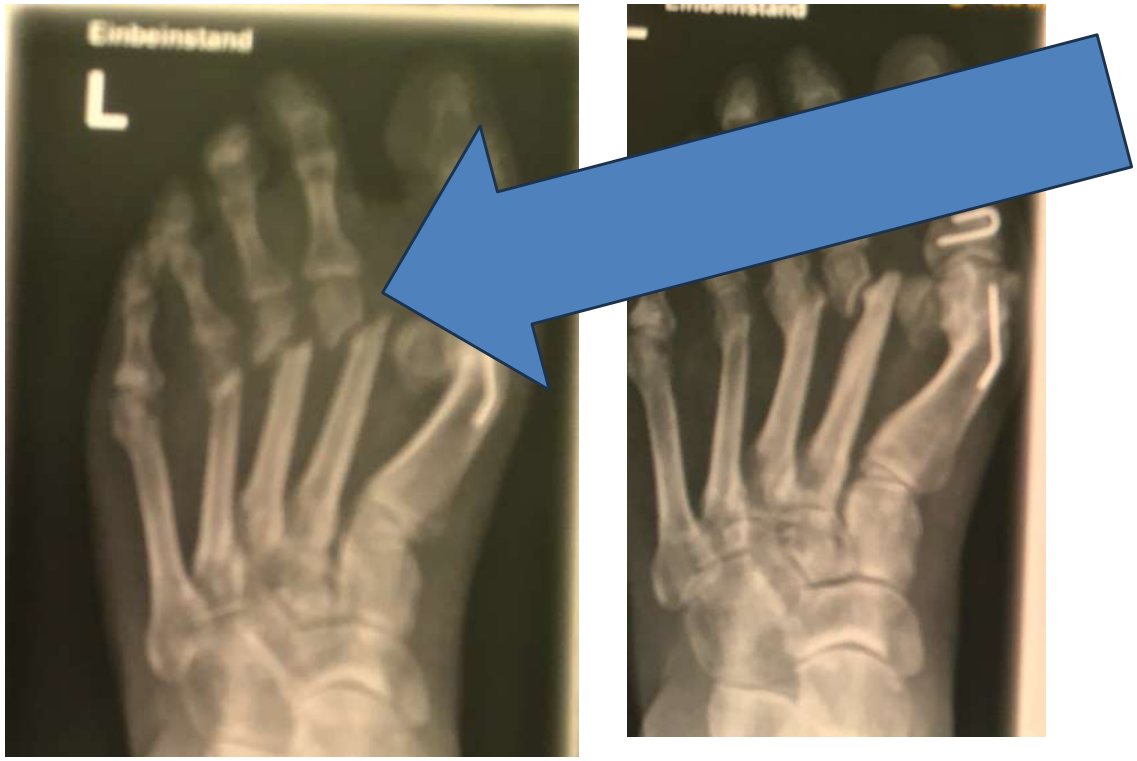
Some time later….

Thank God this its not my case



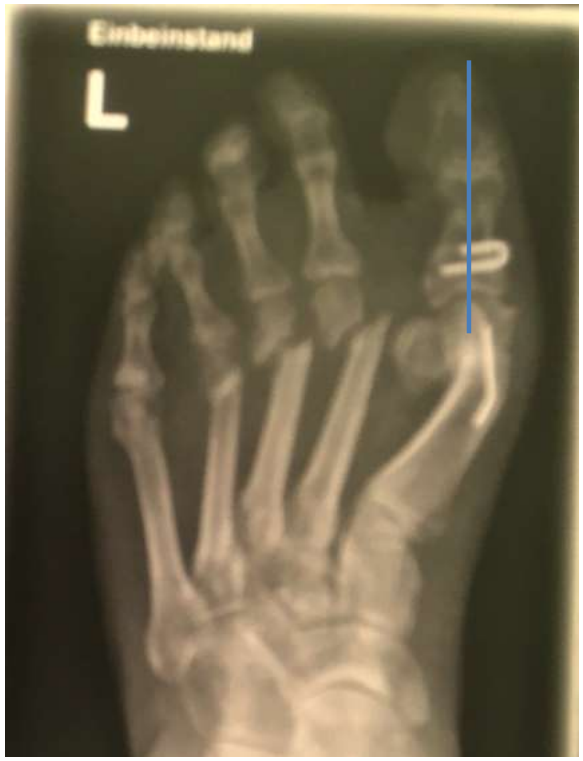


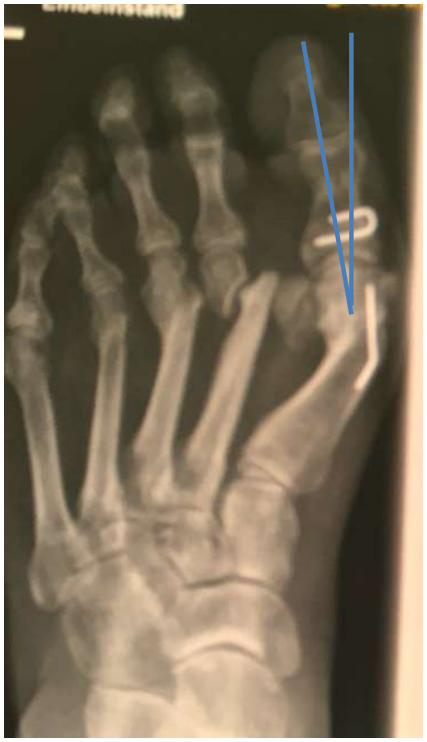
Accurate technique necesary



DMMO is perpendicular !!

Accurate technique necesary





DMMO is perpendicular

That means:

Lateral translation of the MT heads

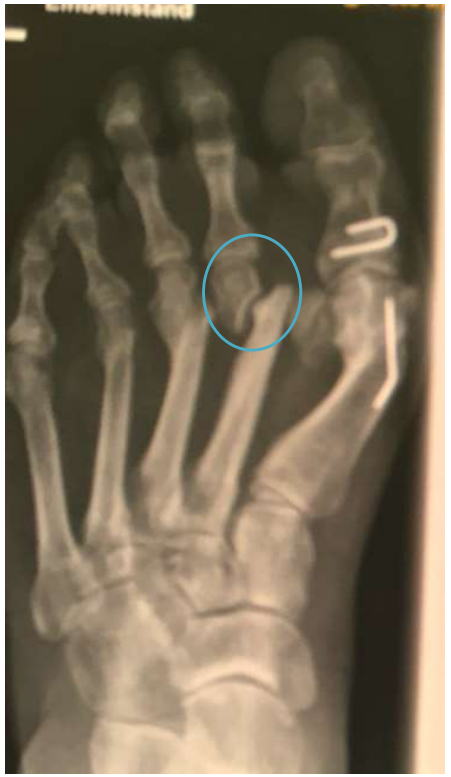
MTP-I- valgus will increase!!

Blunt Burr ??

Too hot ?

Never use a Burr twice !!

→ Pseudarthosis



By the way ……

What do I do if I have a pseudarthrosis after a DMMO ?

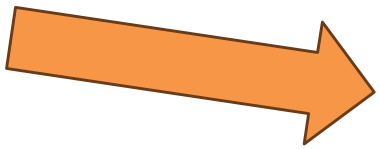
Just wait !!

By the way ……

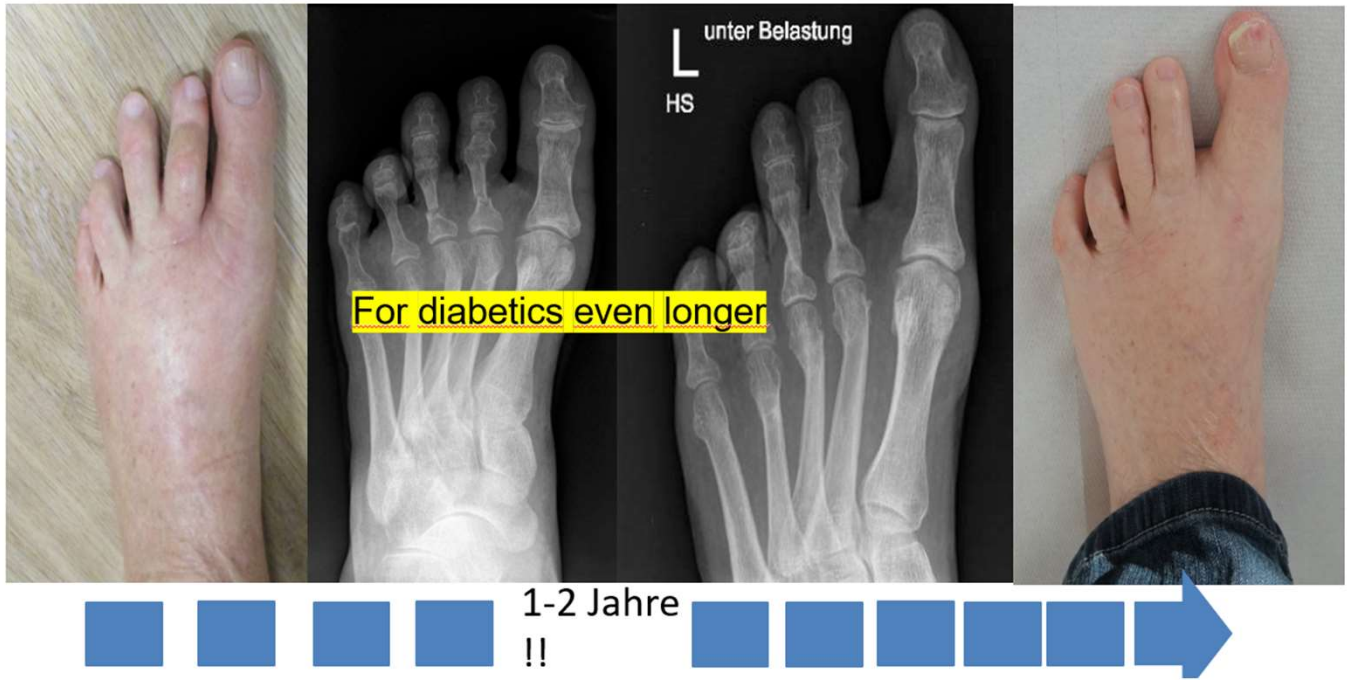
What do I do if I have a pseudarthrosis after a DMMO ?

Just Wait !!!!!!!!!

You remember that slide ?



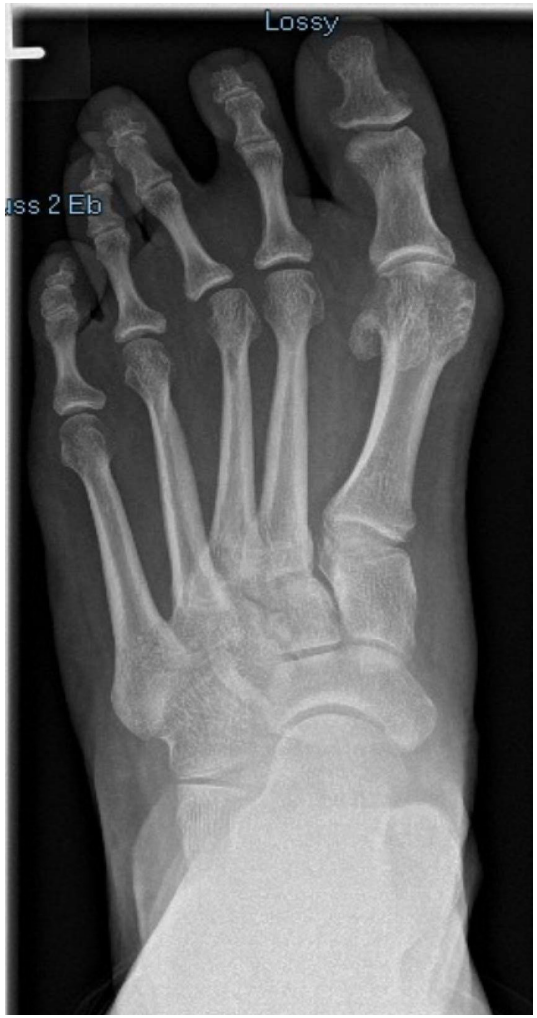
The radiological postoperative course is prolonged

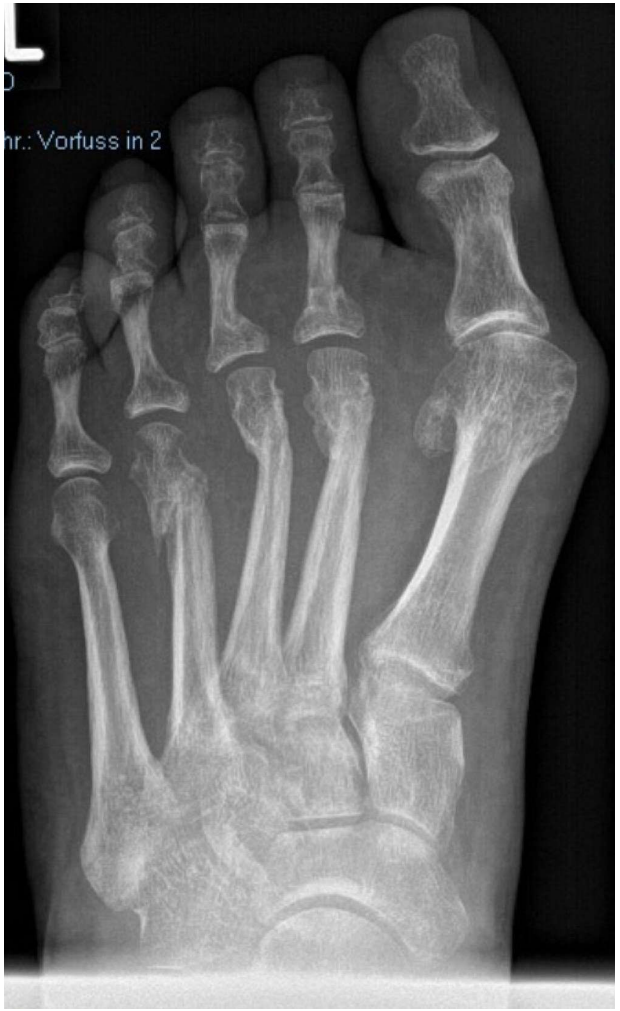


The typical patient after DMMO complains for 5 month :

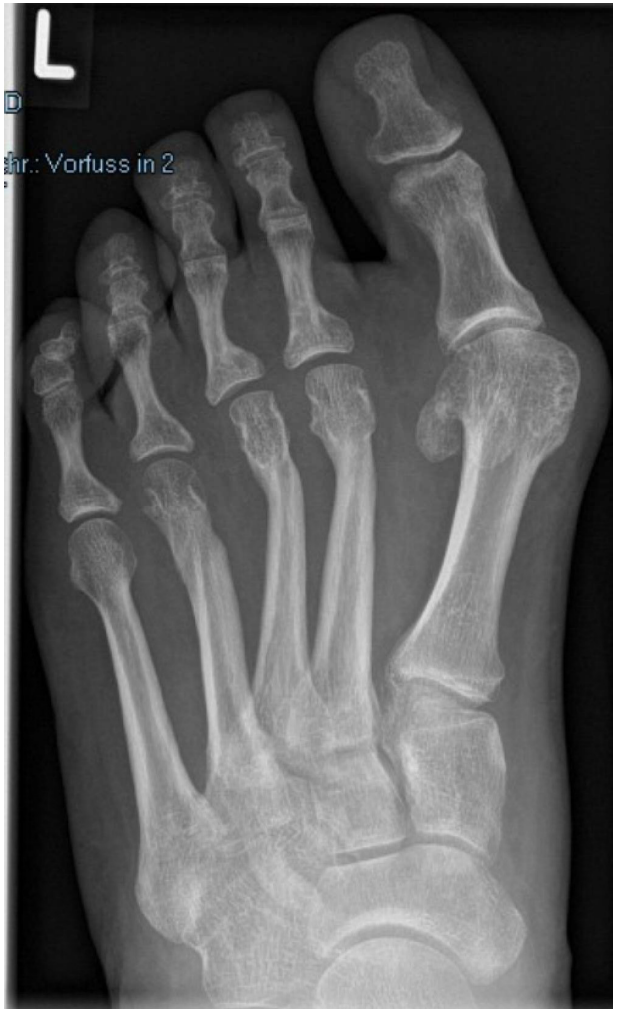
- The Patient is not satisfied the first 3-6 month.
- It is swollen
- Often the lesser toes has no contact to the floor (swelling)
- Often there is pain

Discuss this with your patient !

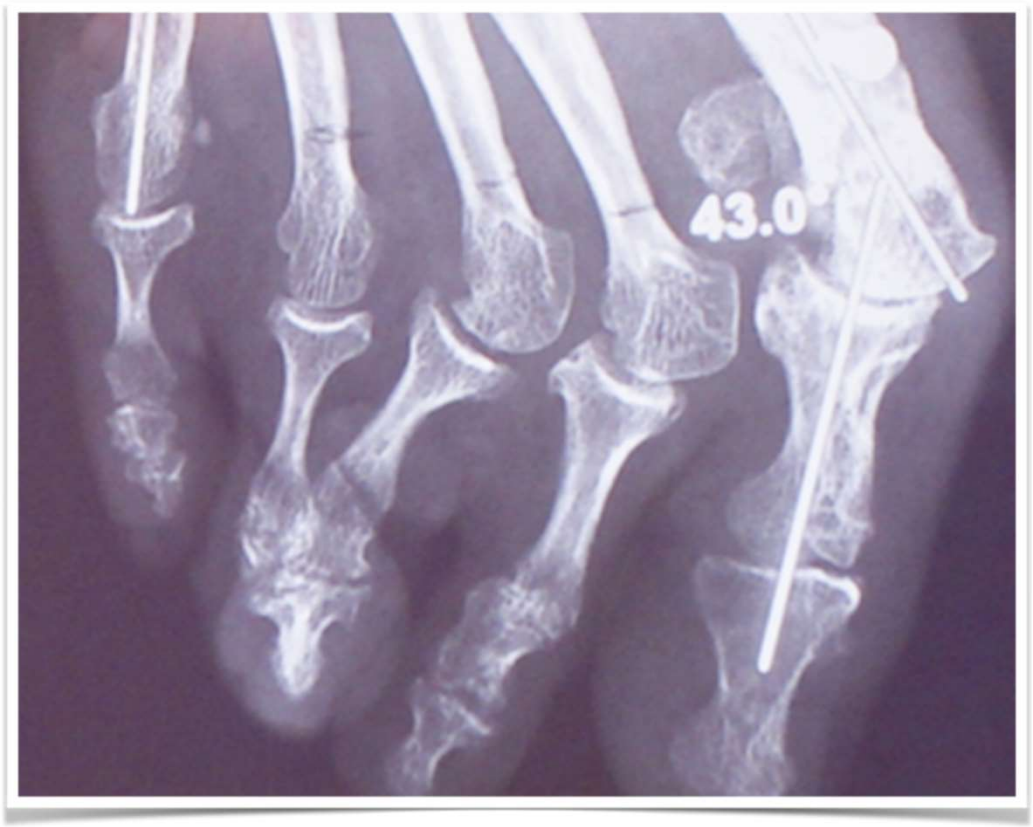




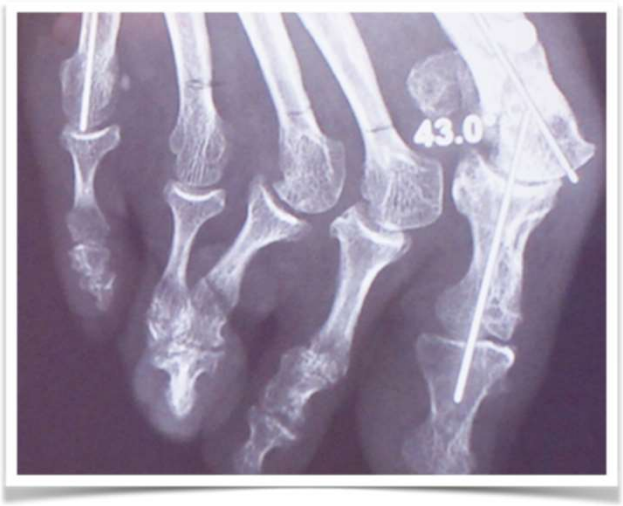
After 6 month: Swelling! Pat is not satisfied



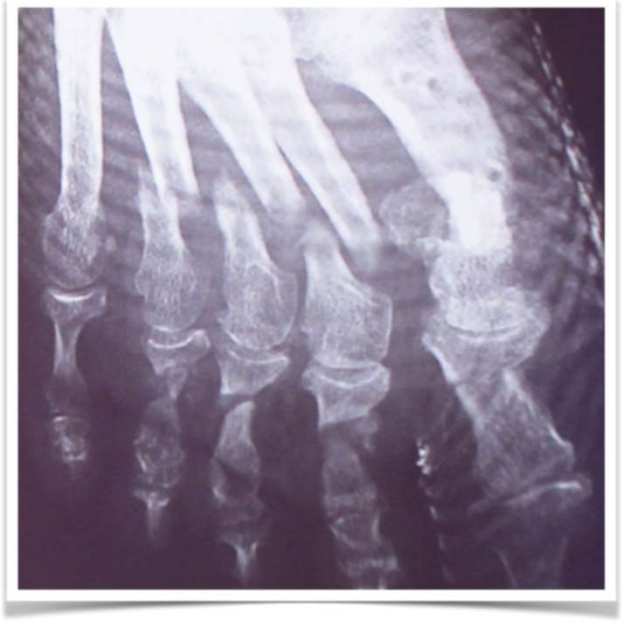
1 year postop: I did`t really believe you

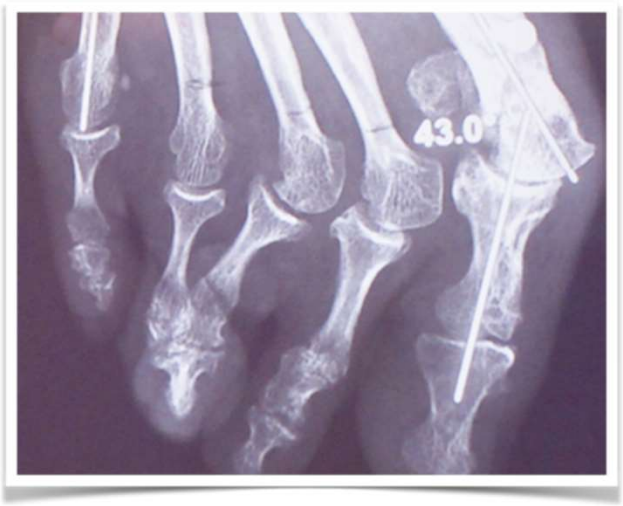


Case Mrs Dr Piclet from France

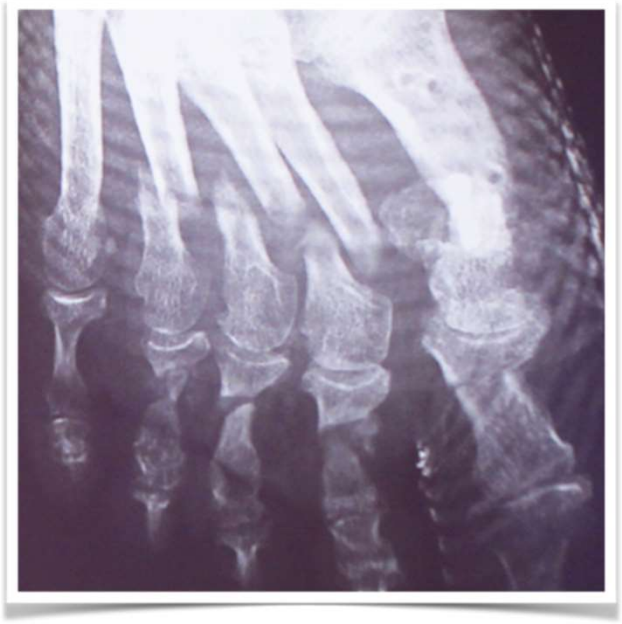


ARE
YOU
MAD
BRO ?

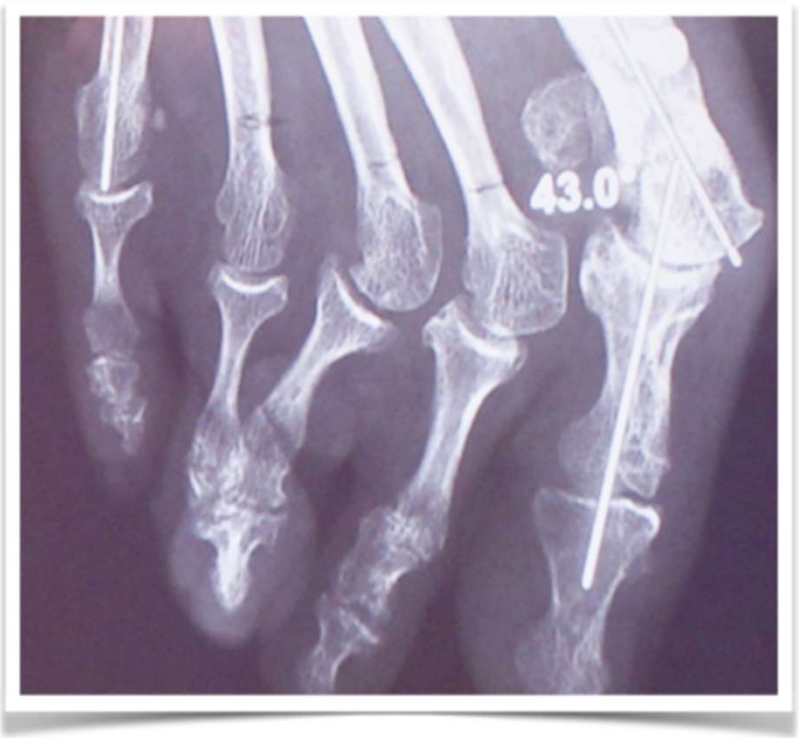


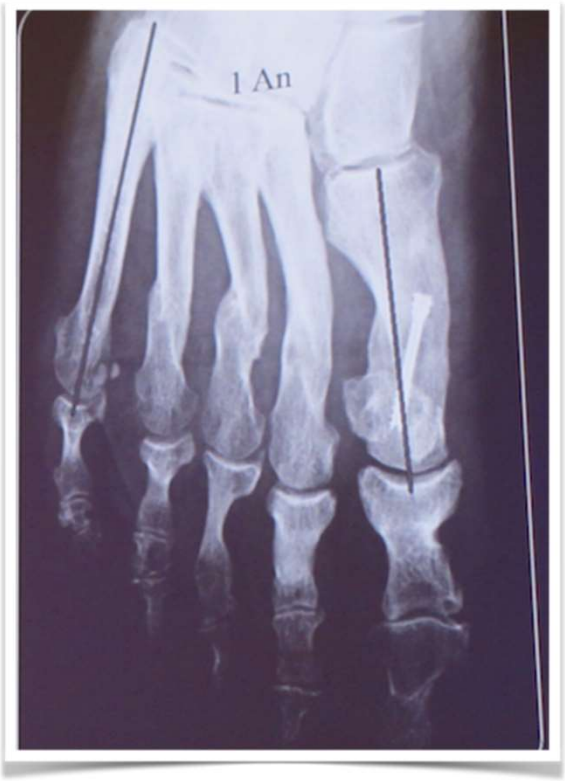


I give you the phone number of a good lawyer



But even this will heal !





1 year postop

Problem: Shortening of the classic DMMO is limited !!

With Weil 1 cm shortening is easily possible

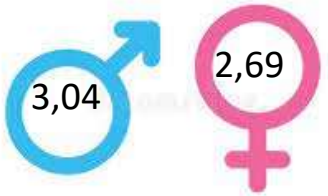
DMMO mean 2,76 mm

J Orthop Surg Res. 2019 May 8;14(1):121. doi: 10.1186/s13018-019-1159-0.

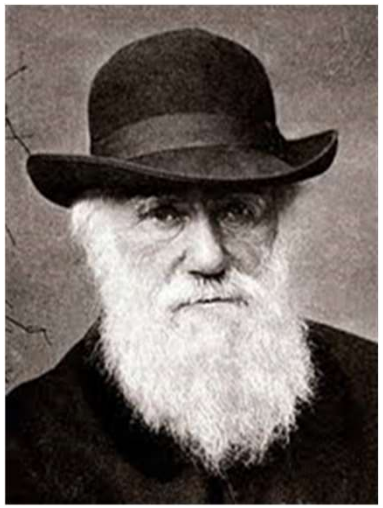
Journal of Orthopaedic Research

Evaluation of results after distal metatarsal osteotomy by minimal invasive surgery for the treatment of metatarsalgia: patient and anatomical pieces study

Miguel Lopez-Vigil [1], Santos Suarez-Garnacho [1], Vanesa Martín [1], Carmen Naranjo-Ruiz [2], Carmen Rodriguez [3]



This led to the evolutions of DMMO

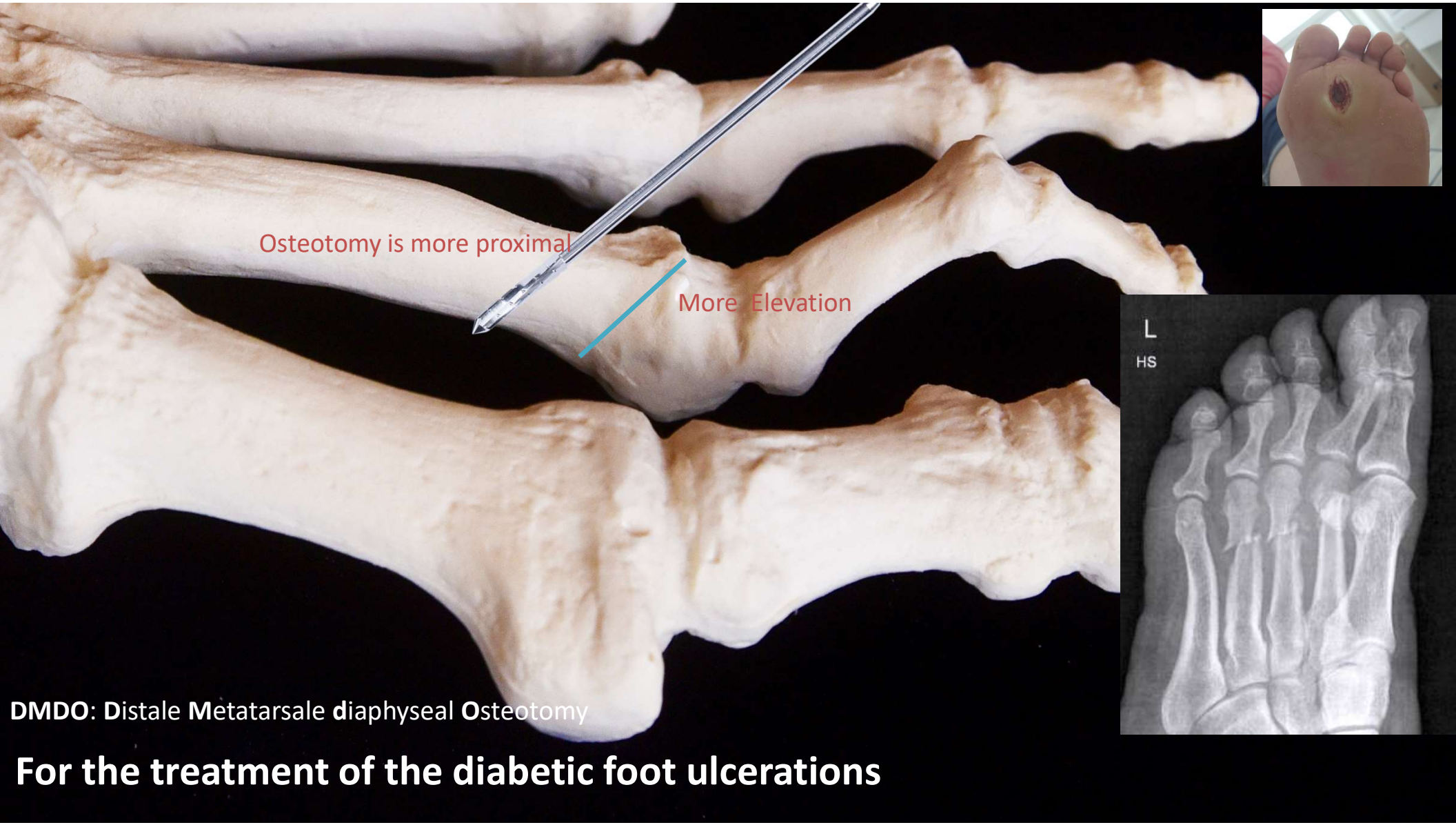


DMDO: **D**istale **M**etatarsale **d**iaphyseal **O**steotomy

DICMO: Distale **I**ntra-**C**apsular **M**etatarsal Osteotomy

DOMMO: Distale **O**blique **M**inimally invasive **M**etatarsal **O**steotomy

Converse DMMO= Reversed DMMO (rDMMO)



DMDO: **D**istale **M**etatarsale **d**iaphyseal **O**steotomy

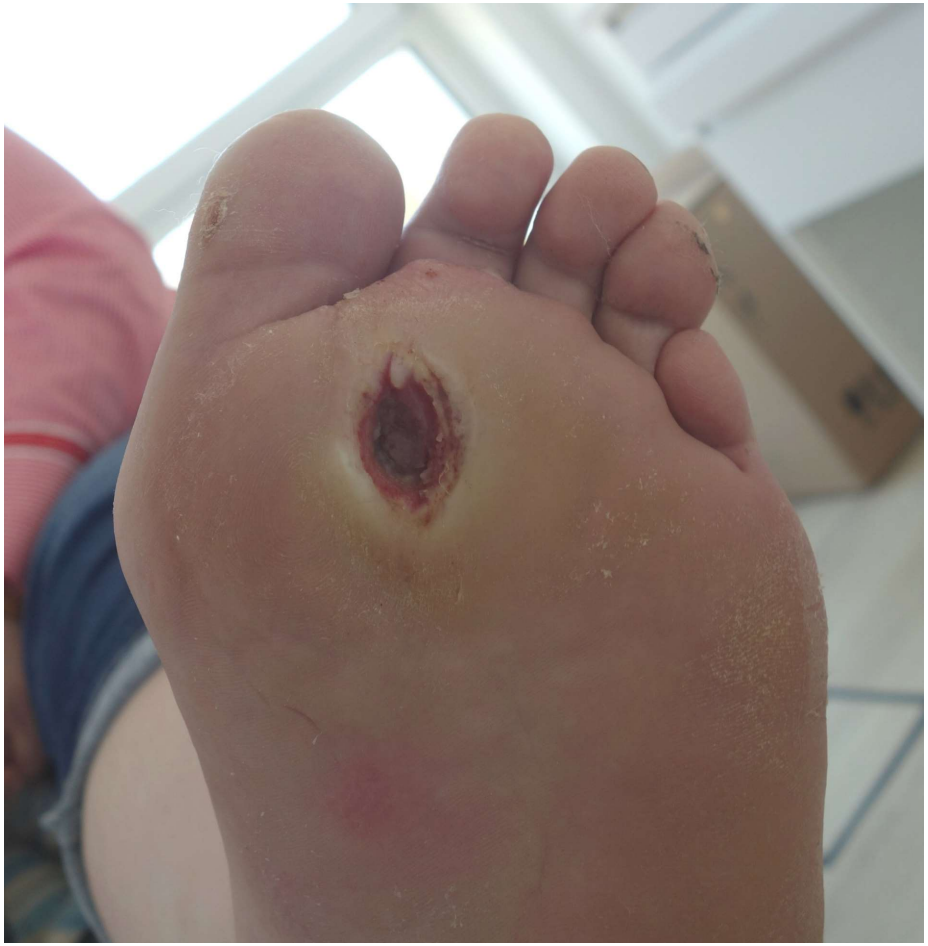
For the treatment of the diabetic foot ulcerations

2018 Jan; 39 (1): 83

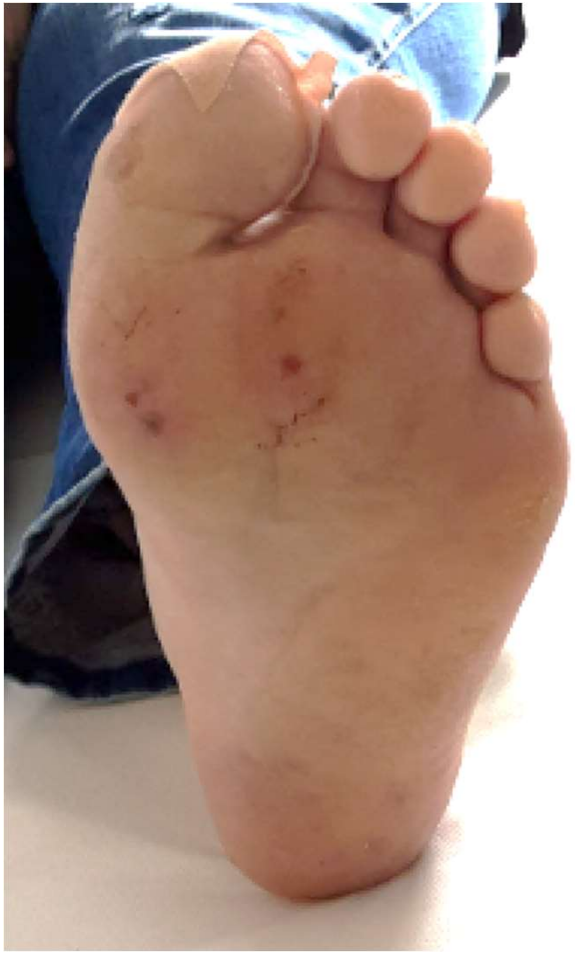
Minimalinvasive distale metatarsale diaphysäre Osteotomie (DMDO) bei chronisch plantaren diabetischen Fußgeschwüren

Carlo Biz [1], Stefano Gastaldo [1], Miki Dalmau-Pastor [2 3 4], Marco Corradin [1], Andrea Volpin [1 5], Pietro Ruggieri [1]

All ulcerations healt after 7,9 ± 4,0 weeks (4-17) weeks.
Die AOFAS-Score increased from 55,3 auf 81,4 Punkte (*P* <0,001).
After a mean time of 2 years (18-71 month) no cases of new ulcerations were seen

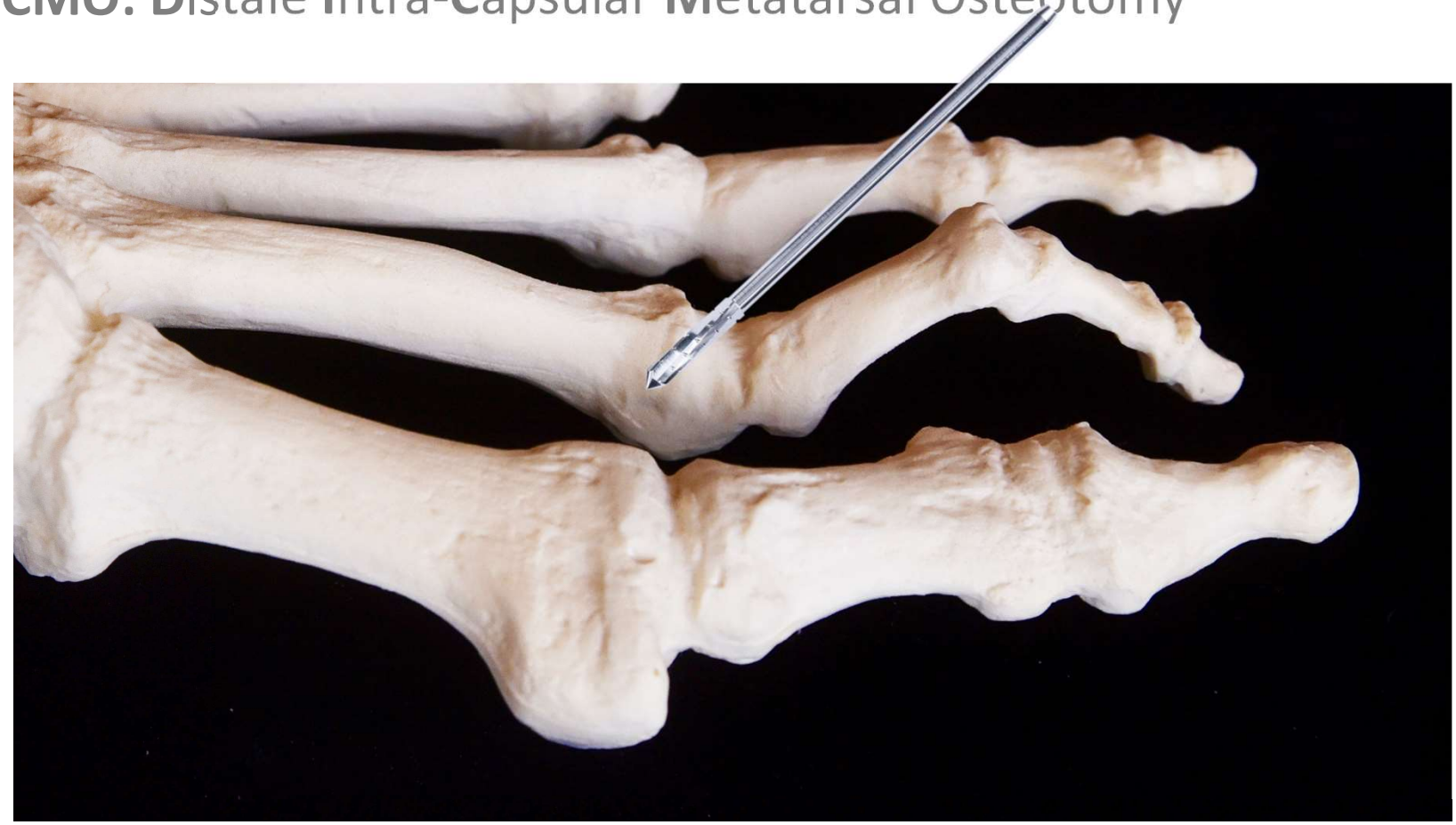


DMDO 2-4



6 month later

- **DICMO: D**istale **I**ntra-**C**apsular **M**etatarsal Osteotomy



DICMO

Distal intra-capsular minimally-invasive osteotomy

Osteotomy is intra-articular→Advantage stable (capsule prevents dislocation. Particularly to the side) = ``Percutaneous Weil``

Allows a simple elevation corresponding to 2 mm burr diameter
Shortening approx. 1 millimeter or less (more with axial compression)

In contrast to DMMO, it can be carried out in isolation

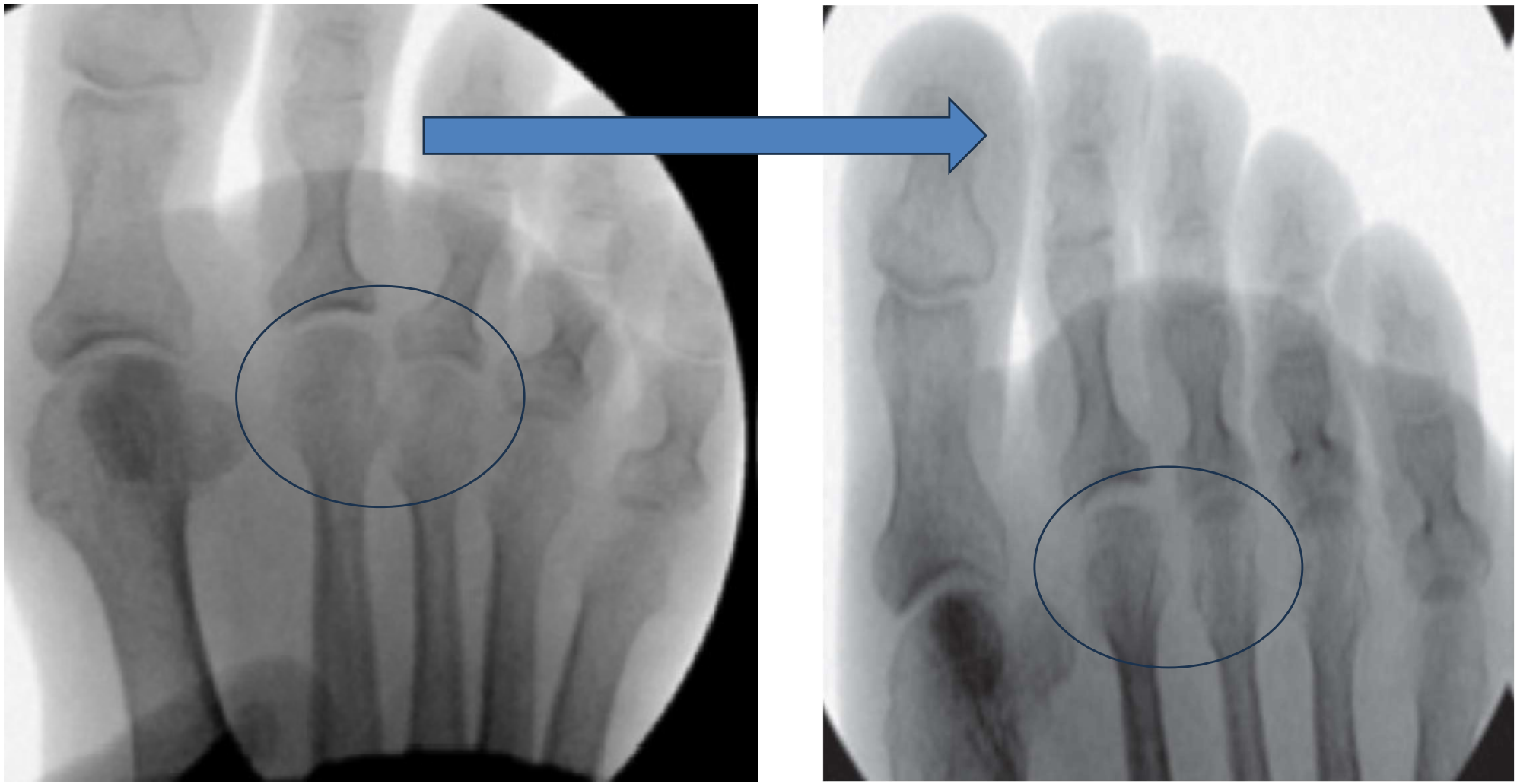
Same consolidation time as DMMO (3-4 months)

DICMO Indication:

Too long MT 2, ratio MT 2/3 >5 mm

Advantage :
No transfer metatarsalgia, stable, less swelling and restricted movement

Disadvantage: Not suitable for dislocation MTP joint, Shortening is limited



How to perform it ?

Protect the extensor tendon by incising laterally or medially of the tendon

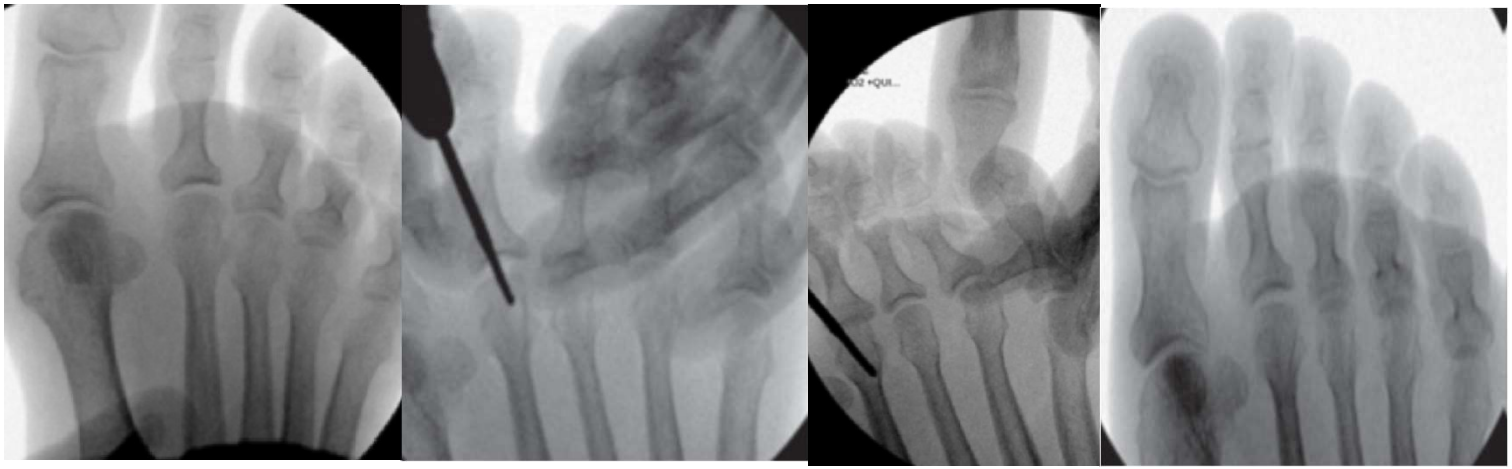
Same 45 degree angle like DMMO

The osteotomy is intracapsular

The boundaries of the joint capsule must be respected

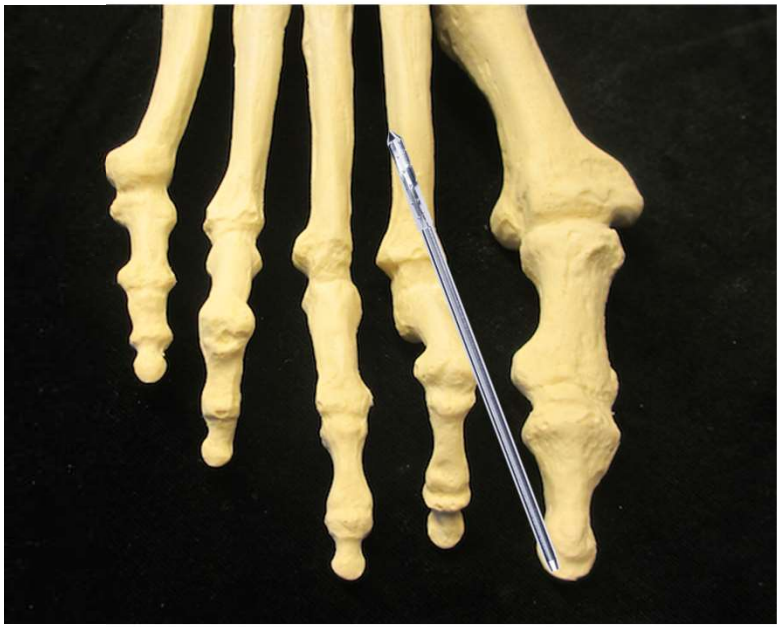
Osteotomías de los metatarsianos laterales

O. Laffenêtre, M. Dalmau-Pastor, T. Bauer, le GRECMIP[1]



DOMMO

distal **oblique metatarsal** minimally-invasive osteotomy



DOMMO What is different ?

distal **oblique metatarsal** minimally-invasive osteotomy

- Metaphyseal osteotomy
- Dislocations of 1 cm can be achieved
- The longer the osteotomy, the greater the shortening
- No additional tenotomies ??

DOMMO

distal **oblique metatarsal** minimally-invasive osteotomy

Indication:

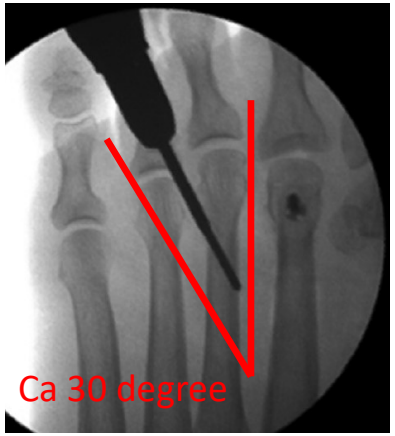
Rheumatoid forefoot

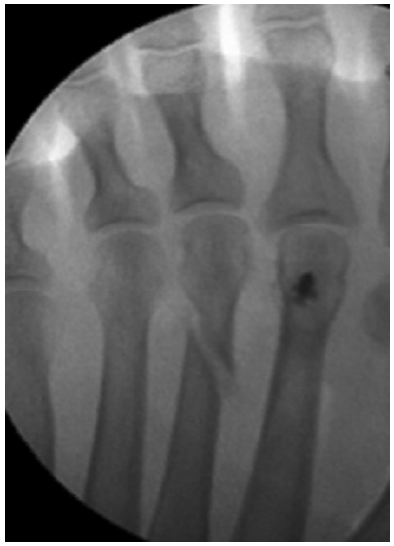
Revision operation

Extreme metatarsalgy

DOMMO: How to perform it ?

- Medial or lateral approach depending on the desired effect
- Metaphyseal osteotomy
- Reamer position: oblique, plantar to dorsal
- Convergent DOMMO: direct the reamer medially
- Divergent DOMMO: direct the reamer laterally





Osteotomías de los metatarsianos laterales

O. Laffenêtre, M. Dalmau-Pastor, T. Bauer, le GRECMIP[1]

Example convergent DMMO

DOMMO

distal **oblique metatarsal** minimally-invasive osteotomy

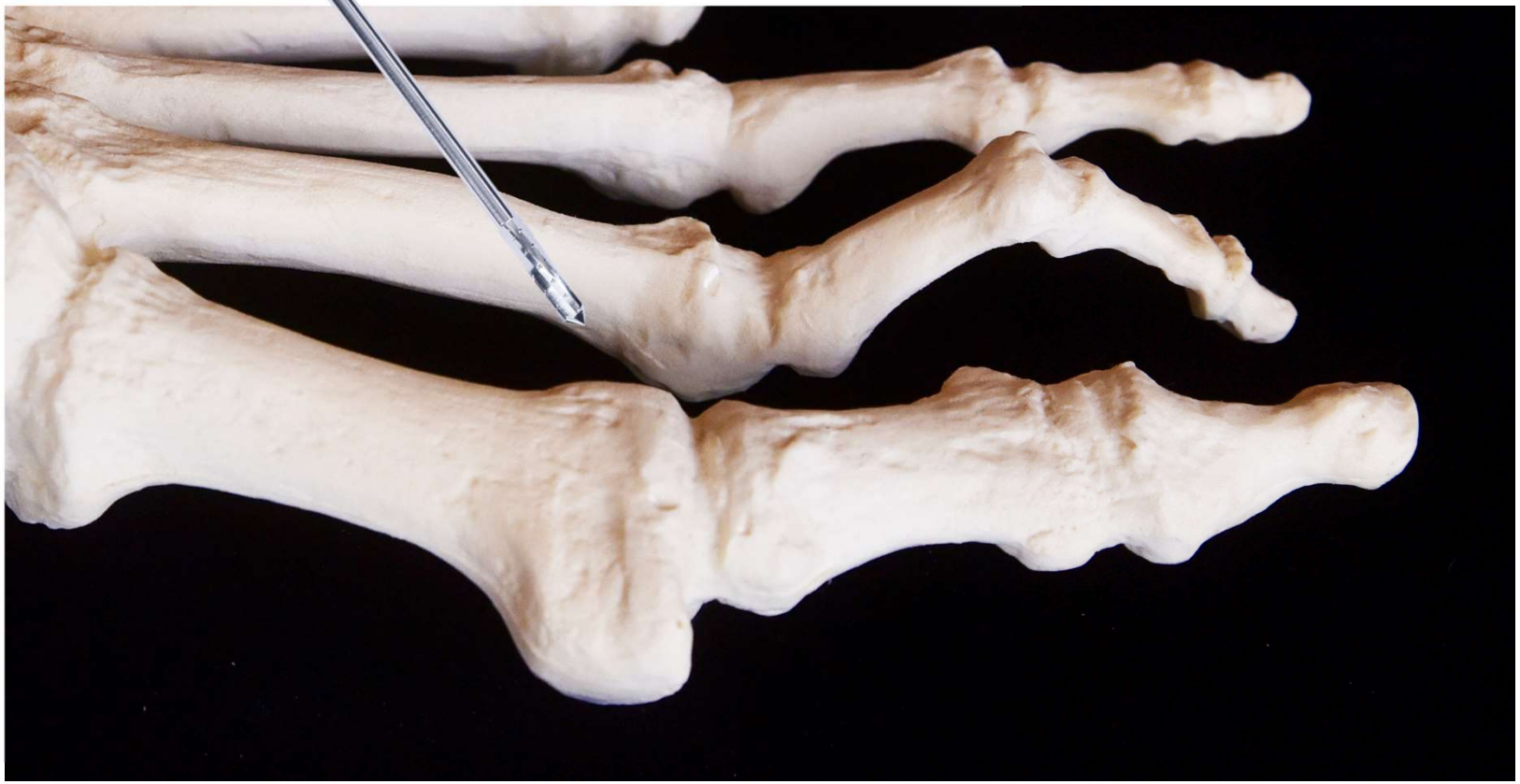
Advantage:
Large interfragmentary surface → Good for consolidation

Disadvantage:
No isolated DOMMO (transfer metatarsalgia)
Exception Revision after Weil osteotomy
No additional tailor's bunioncorrection (no lateral stabilization)

Converse DMMO = reversed DMMO (rDMMO)

Open: Helal Osteotomy

Incision ca 2cm proximal MTP-joint



rDMDO does what ?

- Elevates the MT head to the maximum
- Shortens only slightly
- Almost none lateral displacement

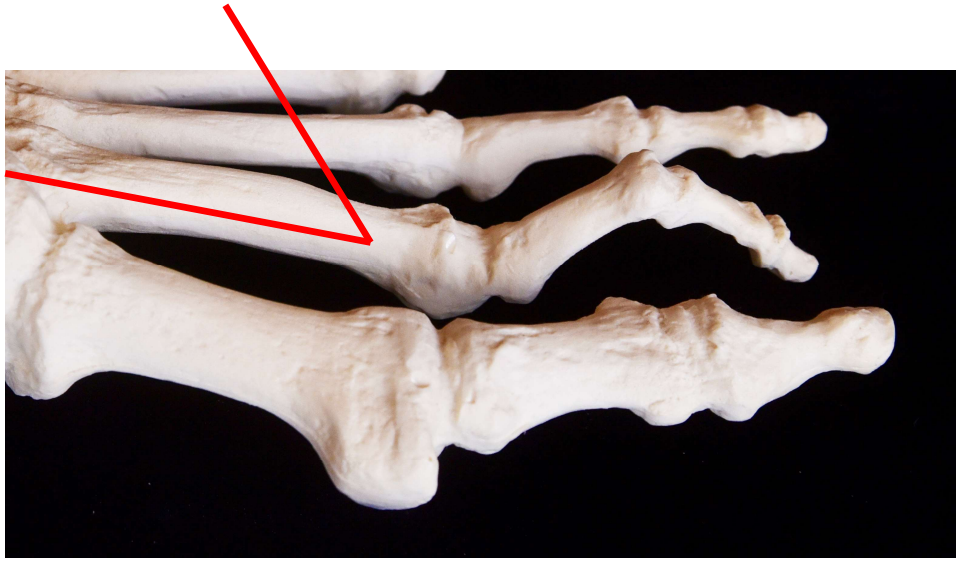
Difference open Helal Osteotomy versus converse DMMO:

Open Helal Osteotomy
→ Exposure of the MT head causes uncontrolled elevation and more scarring

rDMMO How to perform it ?

Incision approx. 2 cm proximal to the MTP joint

45 degrees to the long axis of the metatarsal



Right-handed surgeon:
Right foot → medial
Left foot → lateral

Converse DMMO= reversed DMMO (rDMMO)

Advantage:
Elevation is maximized
Shortens only little

Disadvantage:
Is unstable
Transfer metatarsalgy

Converse DMMO= reversed DMMO (rDMMO)

Hand-picked patients only

Indication:

Extreme metatarsalgy

MTP dislocation

Poor bone quality: Rheumatoid forefoot, Diabetic foot syndrom,Revision after Weil osteotomy or DMMO
Alternative to head resection

Lisfranc osteoarthritis: An alternative to fusion

ELSEVIER

The Foot

Volume 43, June 2020, 101652

Original Article

Early results of minimally invasive, reverse-oblique, distal metaphyseal metatarsal osteotomy (R-DMMO) for arthritis of the lesser tarsometatarsal joints — A retrospective case series

Timothy Edward Schneider [a], Caroline Ruth Varrall [b], Karan Malhotra [a]

safe procedure for lesser TMTJ arthrosis which can produce good results and prevent, or at least delay, the need for arthrodesis without compromising future operative options. Good to excellent outcomes have been shown with few significant complications in the short term in selected patients.

Data situation classic DMMO Where do we stand?

Foot Ankle Surg. 2018 Jul 5.

Data: Medline, Pubmed, Embase, Cinahl and Cochrane Library.

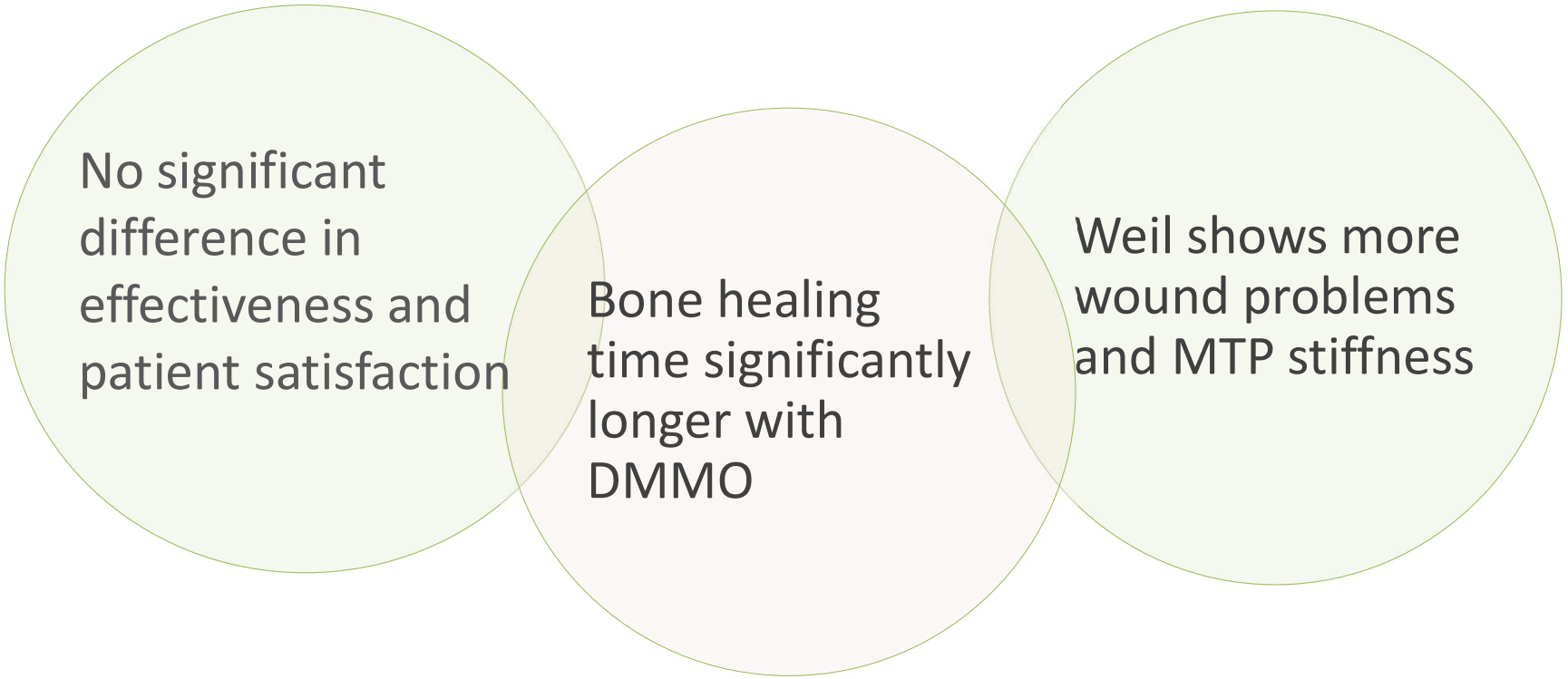
Review 2018

Comparison of DMMO and Weil osteotomy

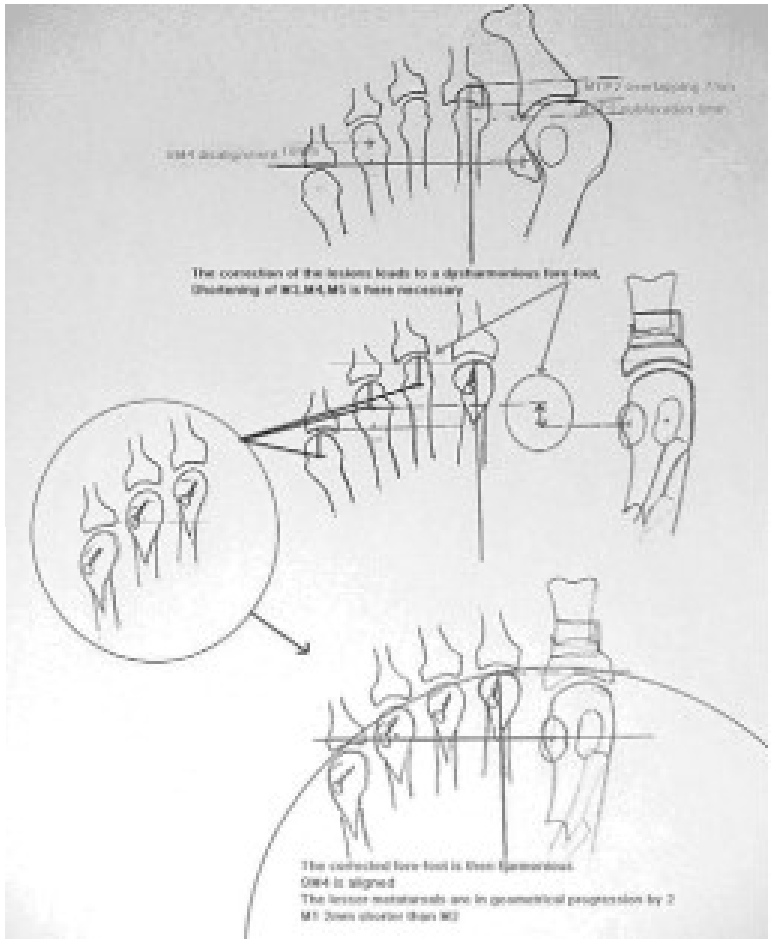
Clinical effectiveness and safety of Weil's osteotomy and distal metatarsal mini-invasive osteotomy (DMMO) in the treatment of metatarsalgia: A systematic review.

Rivero-Santana A, Perestelo-Pérez L, Garcés G, Álvarez-Pérez Y, Escobar A, Serrano-Aguilar P.

4 studies (retrospective)



Does the DMMO produce a harmonic forefoot parabola in the sense of the Maestro criteria?

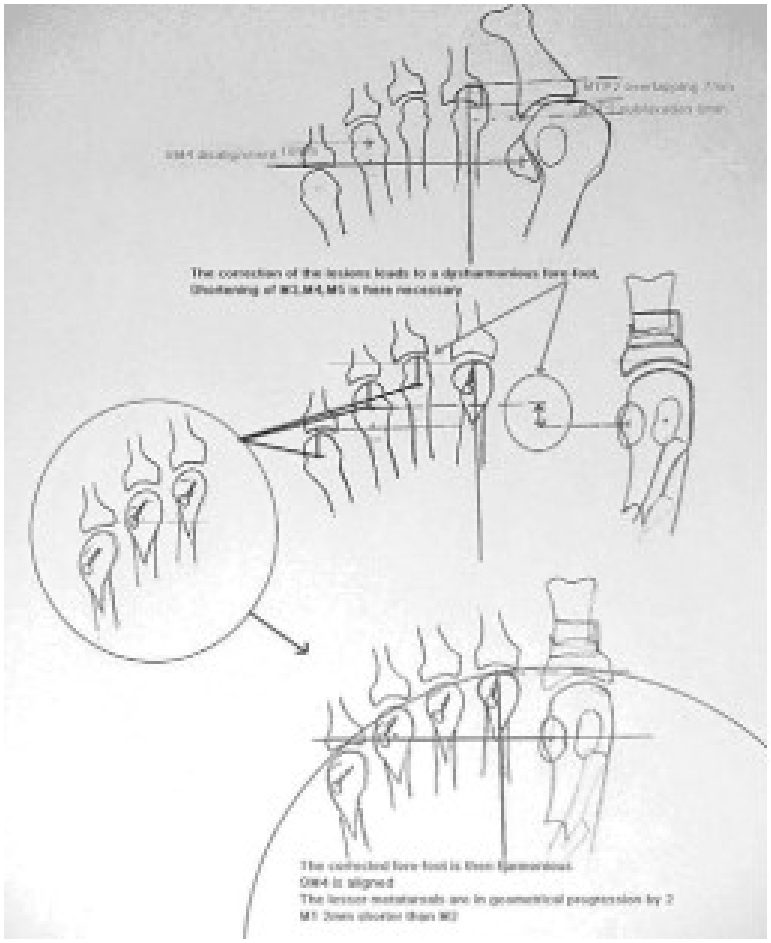


Review > Foot Ankle Clin. 2003 Dec;8(4):695-710. doi: 10.1016/s1083-7515(03)00148-7.

Forefoot morphotype study and planning method for forefoot osteotomy

Michel Maestro [1], Jean-Luc Besse, Mathieu Ragusa, Eric Berthonnaud

Does the DMMO produce a harmonic forefoot parabola in the sense of the Maestro criteria?



But…..

the study produced 2 other statements

2 Statements

Distal Metatarsal Metaphyseal Osteotomy (DMMO), often associated with percutaneous or open techniques for HV correction and percutaneous soft tissue and/or bone procedures in cases of lesser toe deformities, **is a safe and effective minimally invasive method for the treatment of biomechanical central metatarsalgia.**
Further, age, gender, BMI, and smoking are not potential contraindications

Safe and effective method for the treatment of central metatarsalgia

Age, gender, BMI and smoking are not potential contraindications

As far as current studies show:

- DMMO brings comparable results to Weil Osteotomy
- Is less invasive
- Needs less operating time
- No need for implants
- Full weight bearing postop

(Immobile patients, rheumatism, diabetes)

Summary

Data available

Too little data available

Indication for DMMO and its variants

Central Metatarsalgie→ DMMO 2-4

MTP Dislocation < St II Coughlin → DMMO

MTP Dislocation > St II Coughlin → Weil Osteotomy

Plantar Ulceration (Diabetic foot)→ DMDO

Relief of the Lisfranc joint in osteoarthritis with DMMO 2-4, DOMMO (seems promising)

Extreme metatarsalgy, rheumatoid foot, Revision after Weilosteotomie→ converse DMMO, DOMMO

Insulated overlength MT 2 , MT 3 → DICMO

Summary

Indication for DMMO and its variants

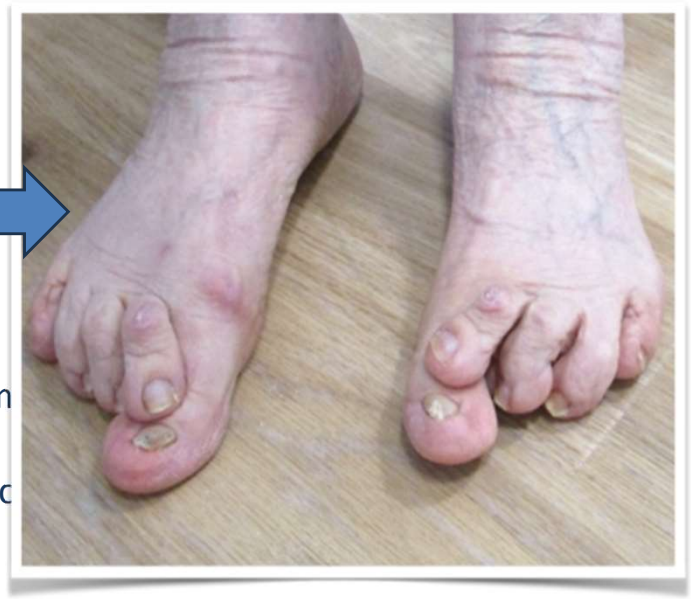
Data available

Too little data available

Central Metatarsalgie→ DMMO 2-4

MTP Dislocation < St II Coughlin → DMMO

MTP Dislocation > St II Coughlin → Weil Osteotomy



Plantar Ulceration (Diabetic foot)→ DMDO

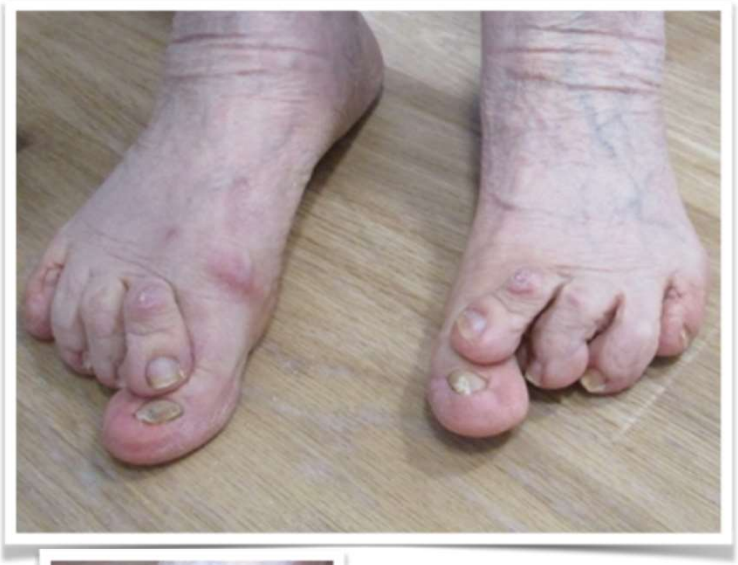
Relief of the Lisfranc joint in osteoarthritis with DMMO 2-4, DOMMO (seem

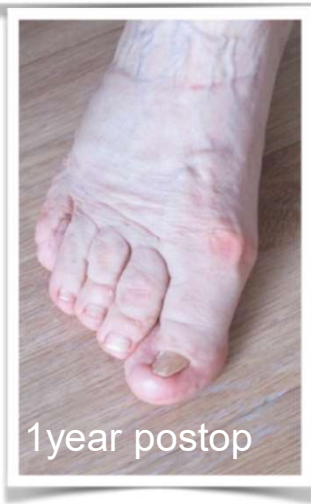
Extreme metatarsalgy, rheumatoid foot, Revision after Weilosteotomie→ cc

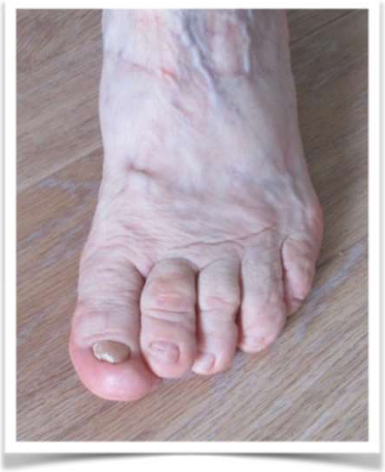
Insulated overlength MT 2 , MT 3 → DICMO

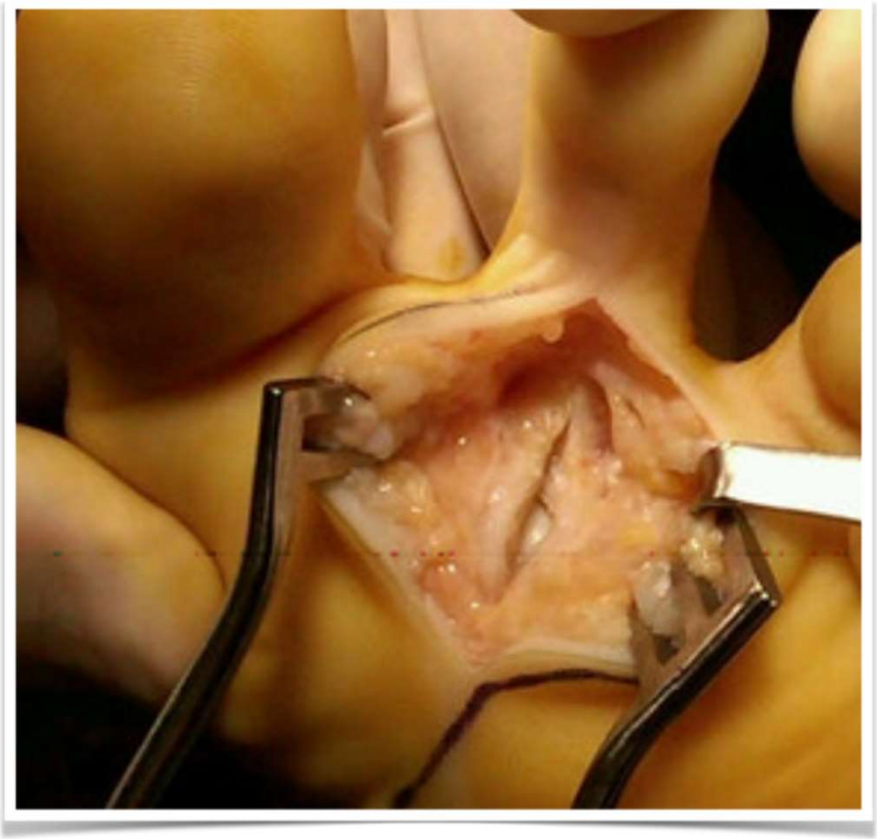
In combination with the DMMO variations

Higher-grade MTP dislocations can also be addressed









Acute tear of the plantar plate

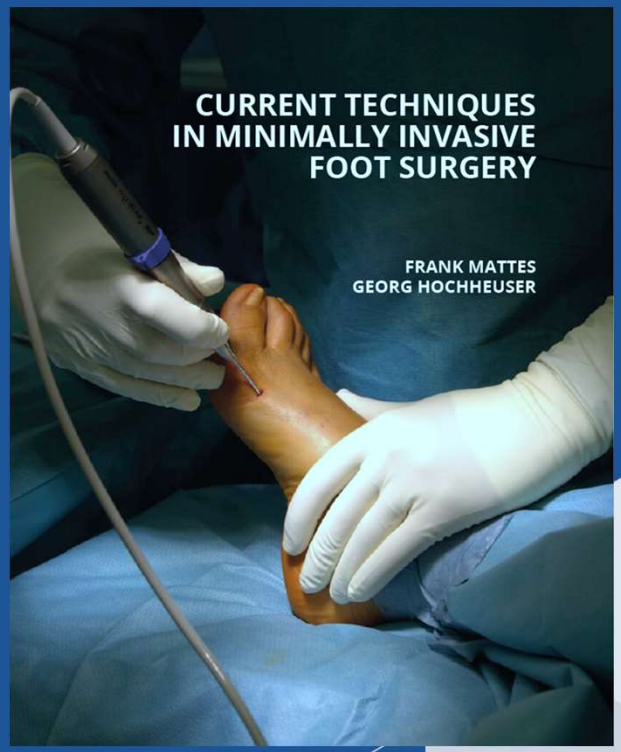
For me, this is the only indication for suturing the plantar plate

THANK YOU

CONTACT ME:
frank.mattes1@gmail.com

Hands-On Cadaver Seminar

February 21-23, 2024
Celebration, Florida



Academy of Minimally Invasive Foot & Ankle Surgery