# Hallux rigidus

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# Disclosures

Georg Hochheuser is Consultant of MAXXOS GmbH

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# Hallux Rigidus

The term Hallux Rigidus (HR) was introduced by the end of the 19th century.

painful restriction of ROM of the MTP-1 in degenerative changes of the articular surface of various origins.

2,5% of the population older than 50y (Gould 1980)

Women more frequently than men (Coughlin 2003)

**Gould N, Schneider W, Ashikaga T**
Epidemiological survey of foot problems in the continental United States: 1978-79
Foot Ankle 1980; 1:8-10
**Coughlin MJ, Shurnas PS**
Hallux Rigidus: Demographics, Etiology and Radiographic Assessment
Foot Ankle Int. 2003 Oct; 24(10):731-43

# Hallux Rigidus
# Etiology

Still not clear (Lucas 2015).

positive family history in about two thirds of the cases (Coughlin 2003): usually bilateral complaints.

unilateral findings: single macrotrauma or repetitive microtraumas are common (Lucas 2015).

**Lucas DE, Hunt KJ**
Hallux Rigidus: Relevant Anatomy and Pathophysiology
Foot Ankle Clin. 2015 Sep; 20(3):381-9

**Coughlin MJ, Shurnas PS**
Hallux Rigidus: Demographics, Etiology and Radiographic Assessment
Foot Ankle Int. 2003 Oct; 24(10):731-43

# Hallux Rigidus
## Aetiology

Osteochondrosis dissecans, forefoot pronation, overlength of the first ray (Bouaicha 2010).

inflammatory changes: gout, rheumatoid diseases (de Prado 2009).

may be associated with Hallux Valgus interphalangeus (Coughlin 2003)

Metatarsus Primus Elevatus (MPE)? (Mayer 1987, Horton 1999, Bouchaia 2010, Ohara 2019): still controversial


**Bouaicha S, Ehrmann C, Moor BK et al.**
Radiographic Analysis of Metatarsus Primus Elevatus and Hallux Rigidus
Foot Ankle Int. 2010 Sep; 31(9):807-14
**De Prado M, Ripoll PL, Golano P**
Minimally Invasive Footsurgery: surgical techniques, indications, anatomical basis
About Your Health Publishers 2009 S. 111-22
ISBN-13: 978-84-613-1609-0
**Coughlin MJ, Shurnas PS (a)**
Hallux Rigidus: Demographics, Etiology and Radiographic Assessment
Foot Ankle Int. 2003 Oct; 24(10):731-43

**Meyer JO, Nishon LR, Weiss L et al.**
Metetarsus primus elevatus and the etiology of hallux rigidus
J Foot Surg. May-Jun 1987; 26(3): 237-41
**Horton GA, Park YW, Myerson MS**
Role of metatarsus primus elevatus in the pathogenesis of hallux rigidus
Foot Ankle Int.1999 Dec; 20(12):777-80
**Ohara K, Tanaka Y, Taniguchi A et al.**
Is metatarsus primus elevatus truly observed in hallux rigidus?
Radiographic study using mapping methods
J Orthop Sci 2019 Mar; 24(2):312-19


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# Hallux Rigidus
# clinical findings

leading symptom: pain
often during the lift-off phase of the gait cycle.

restriction initially of dorsiflexion (Caravelli 2018) with still painless movement in the neutral position (Walther 2018)

provocation of pain in passive plantar flexion

forefoot supination: pain on the lateral edge


**Caravelli S, Mosca M, Massimi S**
A comprehensive and narrative review of historical aspects and management of low-grade hallux rigidus: conservative and surgical possibilities
Musculoscelet Surg. 2018 Dec; 102(3):201-11

**Walther M, Chomej P, Kriegelstein S et al.**
Minimalinvasive Cheilektomie
Oper Orthop Traumatol . 2018 Jun; 30(3):161-70


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# Hallux Rigidus
# clinical findings

dorsal osteophytes at the MT1-head and base of proximal phalanx

sometimes impingement of superficial peroneal nerve (Hamid 2015).

**Hamid KS, Parekh SG**
Clinical Presentation and Management of Hallux Rigidus
Foot Ankle Clin. 2015 Sep; 20(3):391-9

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# Hallux Rigidus
# Klinik

IPG and big toe often in compensatory hyperextension: plantar hyperkeratoses

forefoot supination

overload of the outer edge of the foot with corresponding pain: kinematics of the entire lower extremity may be disturbed (Cansel 2021)

**Cansel AJM, Stevens J, Bijnens W et al.**
Hallux rigidus affects lower limb kinematics assessed with the Gait Profile Score
Gait Posture. 2021 Feb; 84:273-79

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# Hallux Rigidus

## Regnauld-classification

grade 1

moderate pain

< 40° dorsiflexion, 20° plantarflexion

sclerosis

joint space close to normal

loss of convexity

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# Hallux Rigidus

## Regnauld-classification

grade 2

restriction of ROM more severe

narrowing of joint space

Osteophytes

increasing scleorosis

hypertrophy of sesamoids

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# Hallux Rigidus

## Regnauld-classification

grade 3

complete loss of joint space

bridging osteophytes

osteophytes of the sesamoids

However:

radiological classifications have no correlation with severity of osteoarthritis found intraoperatively or pain complained:

surgical indication based on clinical findings!!!

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# Hallux Rigidus
## conservative therapy

in early stages adequate shoe fitting and insoles may be sufficient (Kon Kam King 2017).

insoles with a special rigidus fitting.

physical therapy combined with strengthening of flexors, mobilization of sesamoids and gait training (Shamus 2004).

**Kon Kam King C, Loh Sy J, Zheng Q et al.**
Comprehensive Review of Non-Operative Management of Hallux Rigidus
Cureus. 2017 Jan 20;9(1):e987

**Shamus J, Shamus E, Gugel RN et al.**
The effect of sesamoid mobilization, flexor hallucis strengthening and gait training on reducing pain and restoring function in individuals with hallux limitus: a clinical trial
J Orthop Sports Phys Ther. 2004 Jul; 34(7):368-76

# Hallux Rigidus
## conservative therapy

intraartikular injektion of Steroids and local anesthetics

intraartikular injektion of hyaluronic acid/PRP:

only early stages,
cave toxicity steroids

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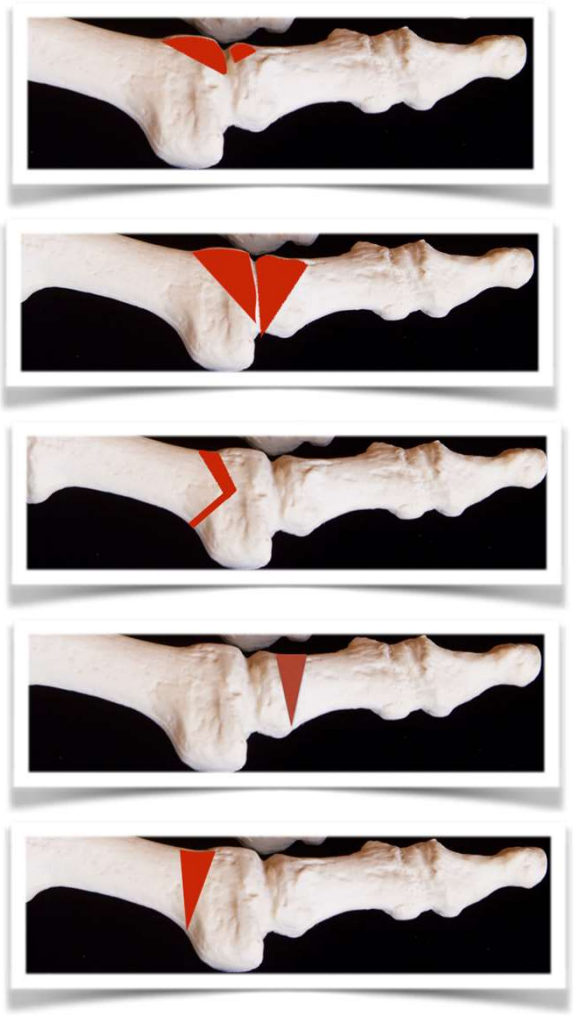
# Hallux Rigidus
# operative options

- Cheilektomy
- Valenti
- Youngswick
- Moberg / Kessel Bonney
- Waterman



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# Hallux Rigidus
# Cheilectomy



Principle: decompression of MTP 1 by removal of
up to 25% - 30% of the joint surface

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# Hallux Rigidus
# Cheilectomy

## Cheilectomy alone:
## if exclusively pain caused by
## mechanically disturbing Osteophytes

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# Hallux Rigidus
# Cheilectomy

## 6 weeks postop.

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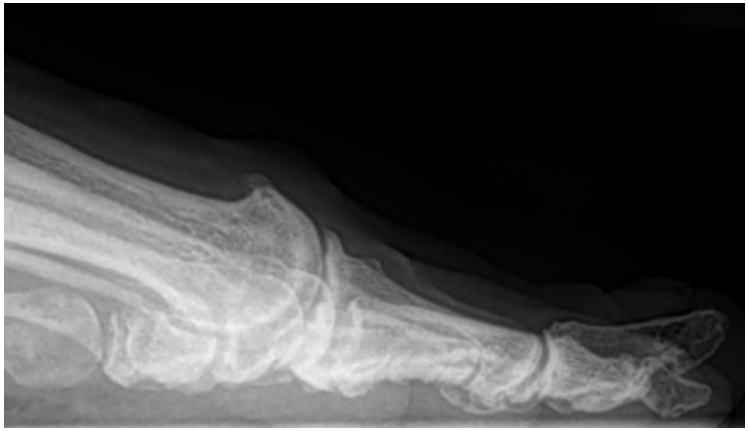
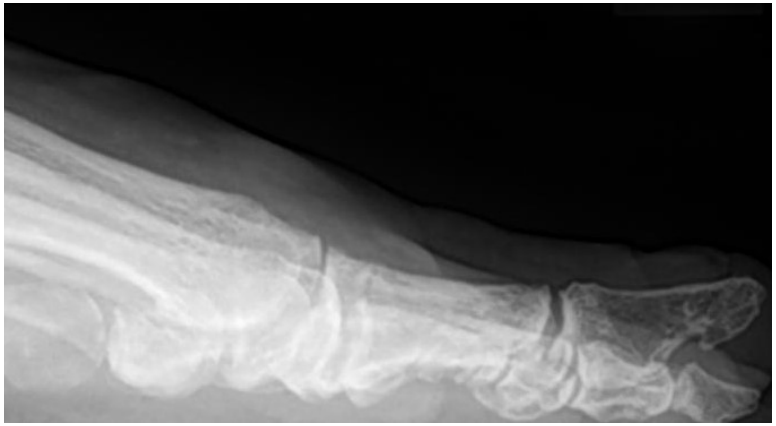
# Hallux Rigidus:

## stage 2-3 Regnauld (Coughlin u. Shurnas)

best treatment:
Cheilectomy in combination with osteotomy of basal phalanx and/or metatarsal (Waizy 2010)





**Waizy H, Czardybon MA, Stukenborg-Colsman C et al.**
Mid- and long-term results of the joint-preserving therapy of hallux rigidus
Arch Orthop Trauma Surg. 2010 Feb; 130(2):165-70

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# Hallux Rigidus:

# Coughlin und Shurnas grade 4

radiologically like grade 3

clinically Midrange pain, Grind-Test positive
pain at rest/ at night:

Arthrodesis Goldstandard (Galois 2020, Teoh 2019).

Hydrogel-Implantate rather disappointing (Brandao 2020).


**Galois L, Hemmer J, Ray V et al.**
Surgical Options for hallux rigidus: state of the art and review of the literature
Eur J Orthop Surg Traumatol. 2020 Jan; 30(1):57-65

**Teo KH, Tan WT, Atiyah Z et al.**
Clinical Outcomes Following Minimally Invasive Dorsal Cheilectomy for Hallux Rigidus
Foot Ankle Int. 2019 Feb; 40(2):195-201

**Brandao B, Hall A, Aljawadi A et al.**
Joint sparing management of hallux rigidus: Cartiva SCI vs cheilectomy a comparative review
J Orthop. 2020 Jul; 21:401-5


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# Hallux Rigidus
# Cheilectomy: Instruments


conical

Wedge

2,9  4.3

Shannon

corta

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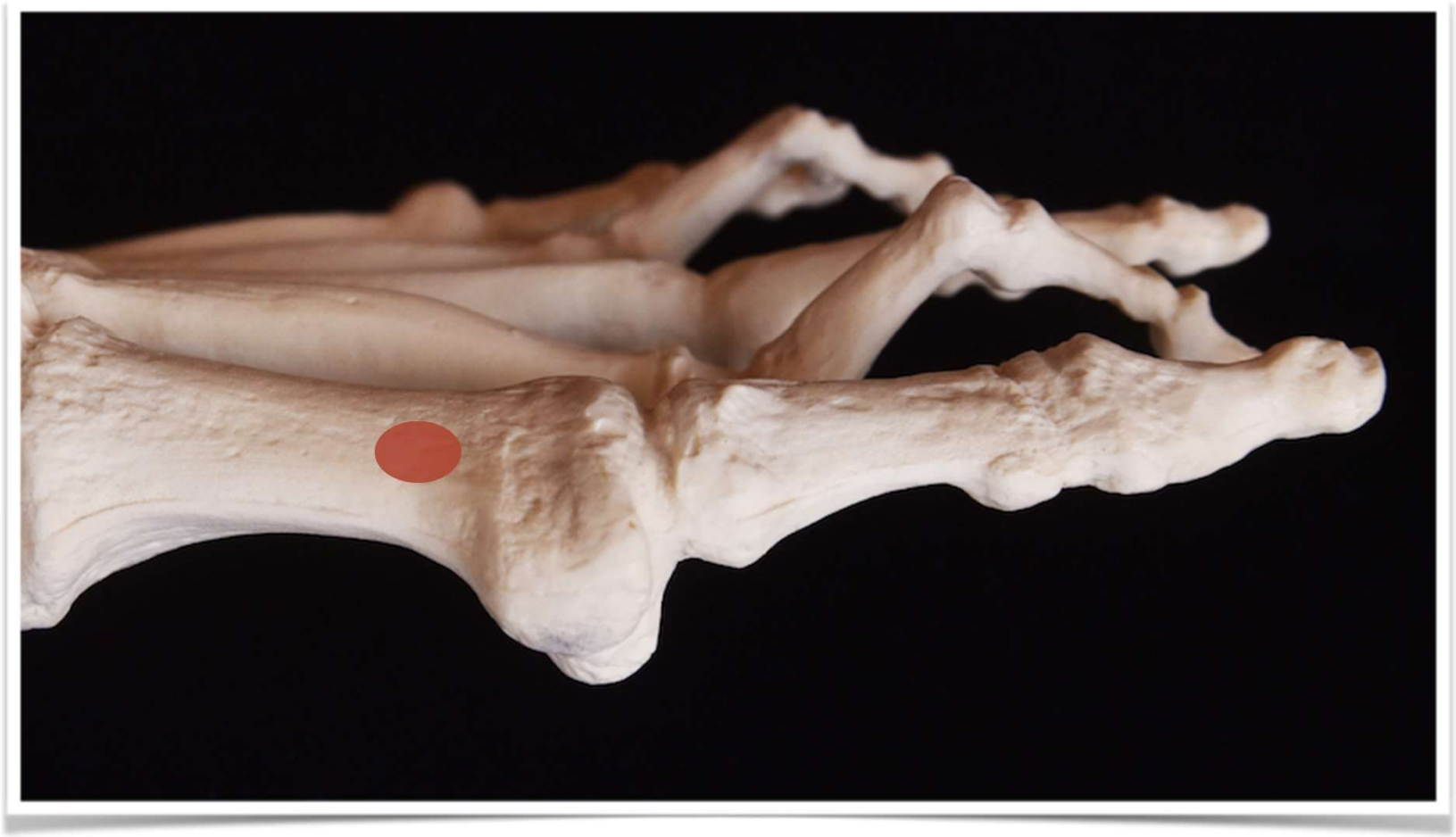
# Hallux Rigidus
# cheilectomy: surgical technique

## Portal dorsal roughly 2,5 cm proximal of MP-joint



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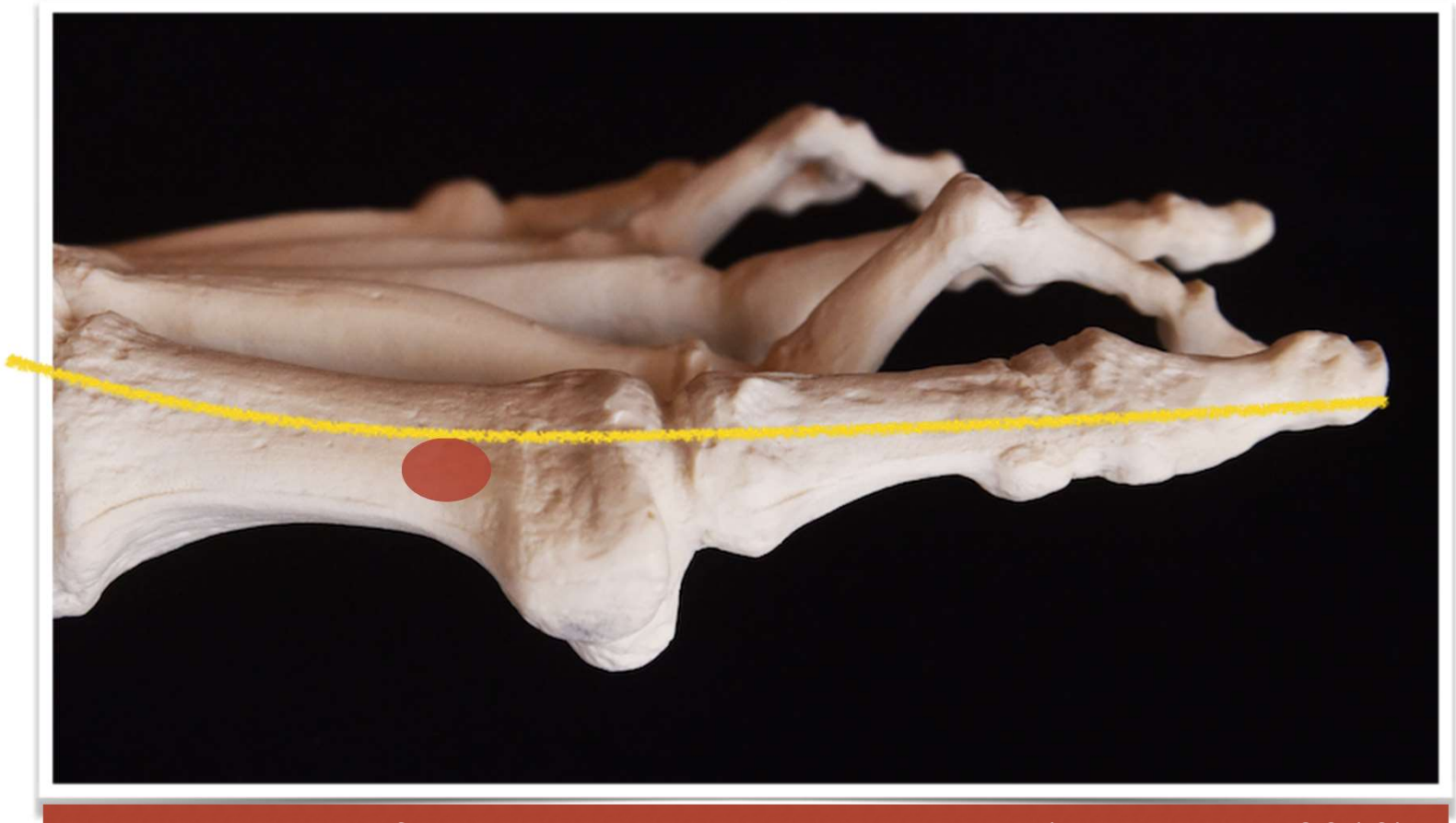
# Hallux Rigidus
# cheilektomy: surgical technique



Portal  plantar of cutaneous nerve: clock method (Malagelada 2018)

**Malagelada F, Dalmau-Pastor M, Fargues B et al.**
Increasing the safety of minimally invasive hallux surgery-An anatomical study introducing the clock method
Foot Ankle Surg. 2018 Feb; 24(1): 40-44

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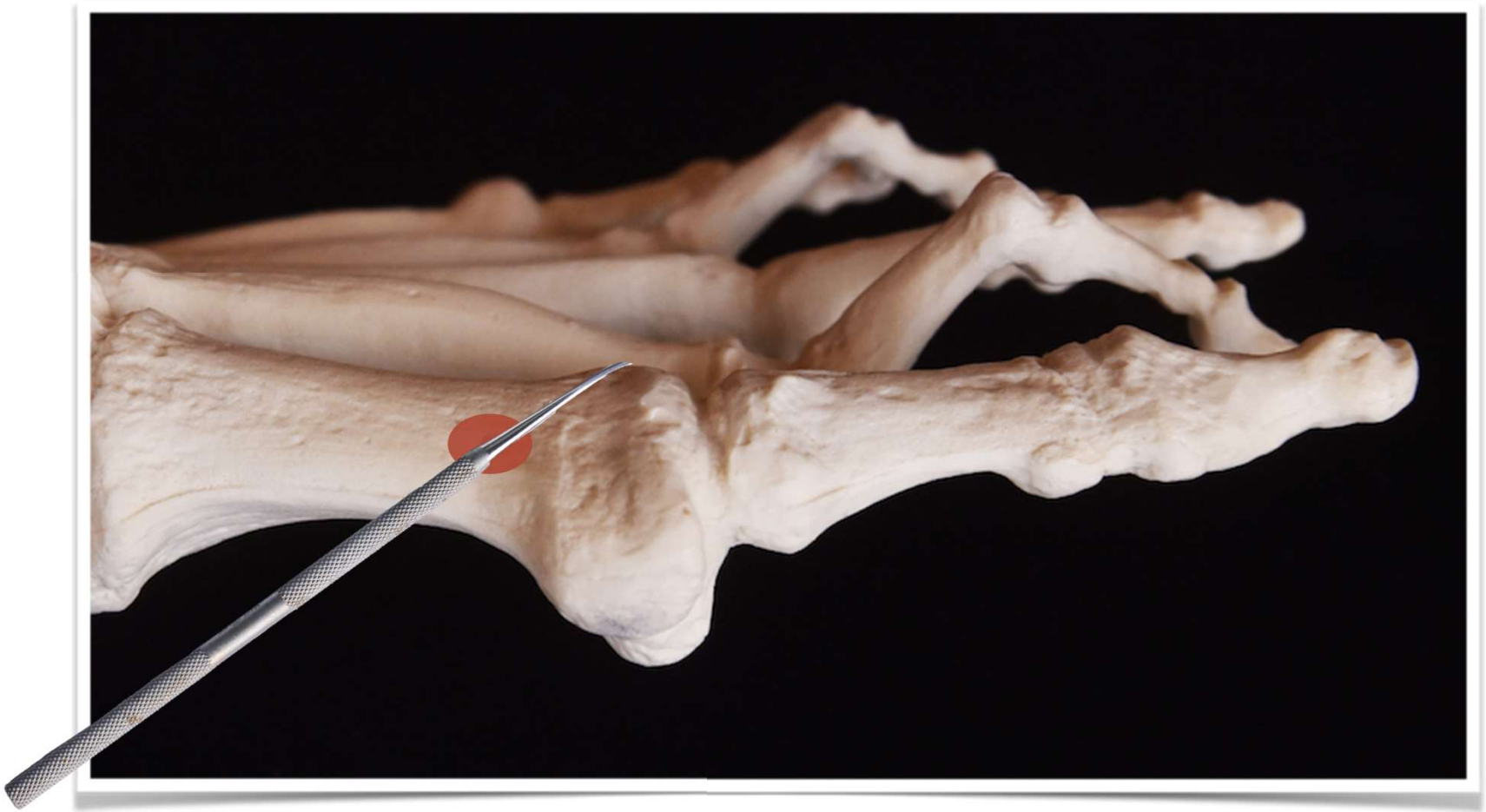
# Hallux Rigidus
# cheilectomy: surgical technique

## lift-off of soft tissue



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# Hallux Rigidus
# cheilectomy: surgical technique
# Cave: extensor tendon!

Dorsiflexion of big toe to relax the extensor tendon, alternatively hold the tendon away from the running burr.

Under no circumstances press the the soft tissue against the running burr

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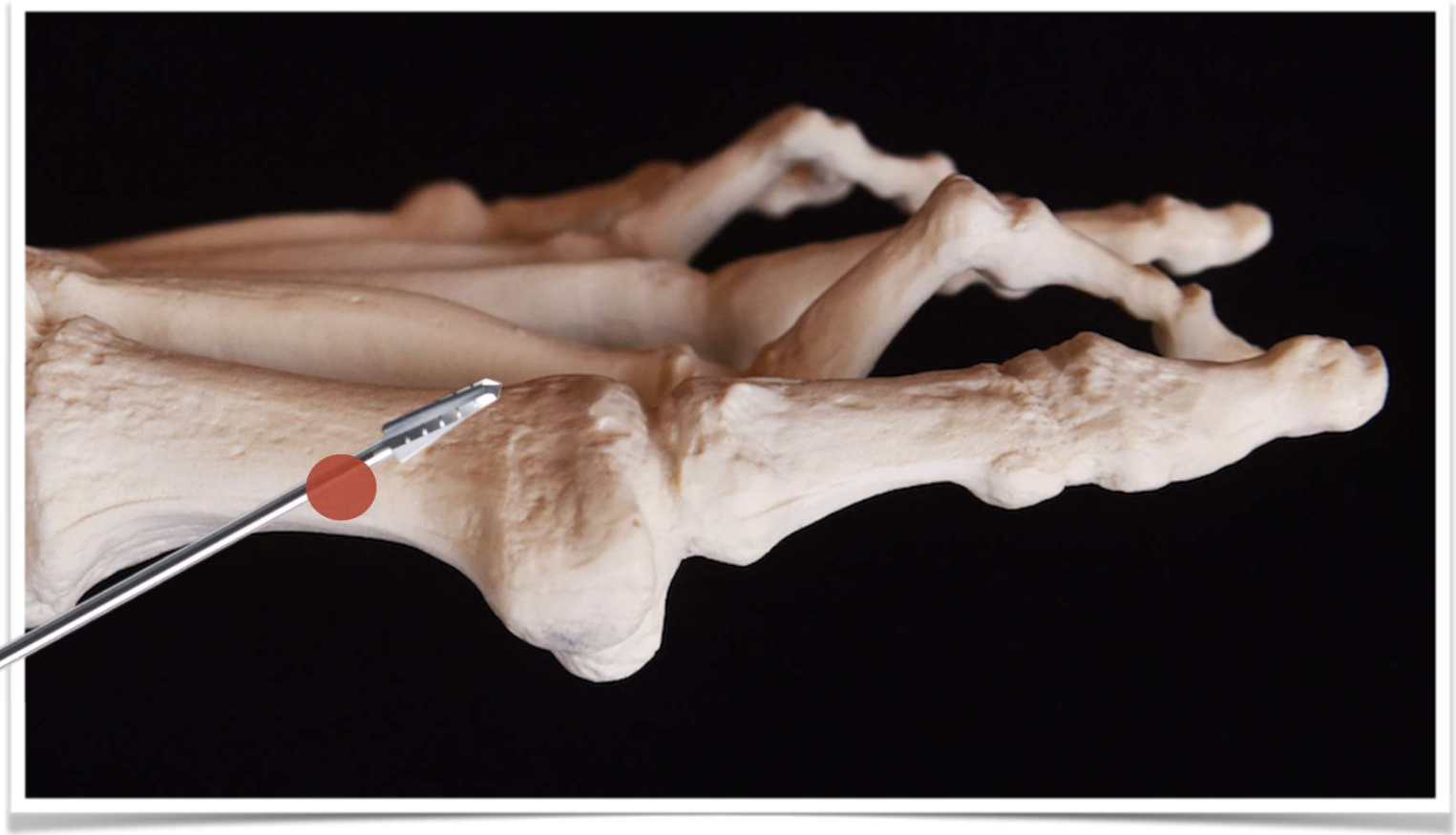
# Hallux Rigidus
# cheilectomy: surgical technique



large ostephytes: approach from the base and from proximal to distal

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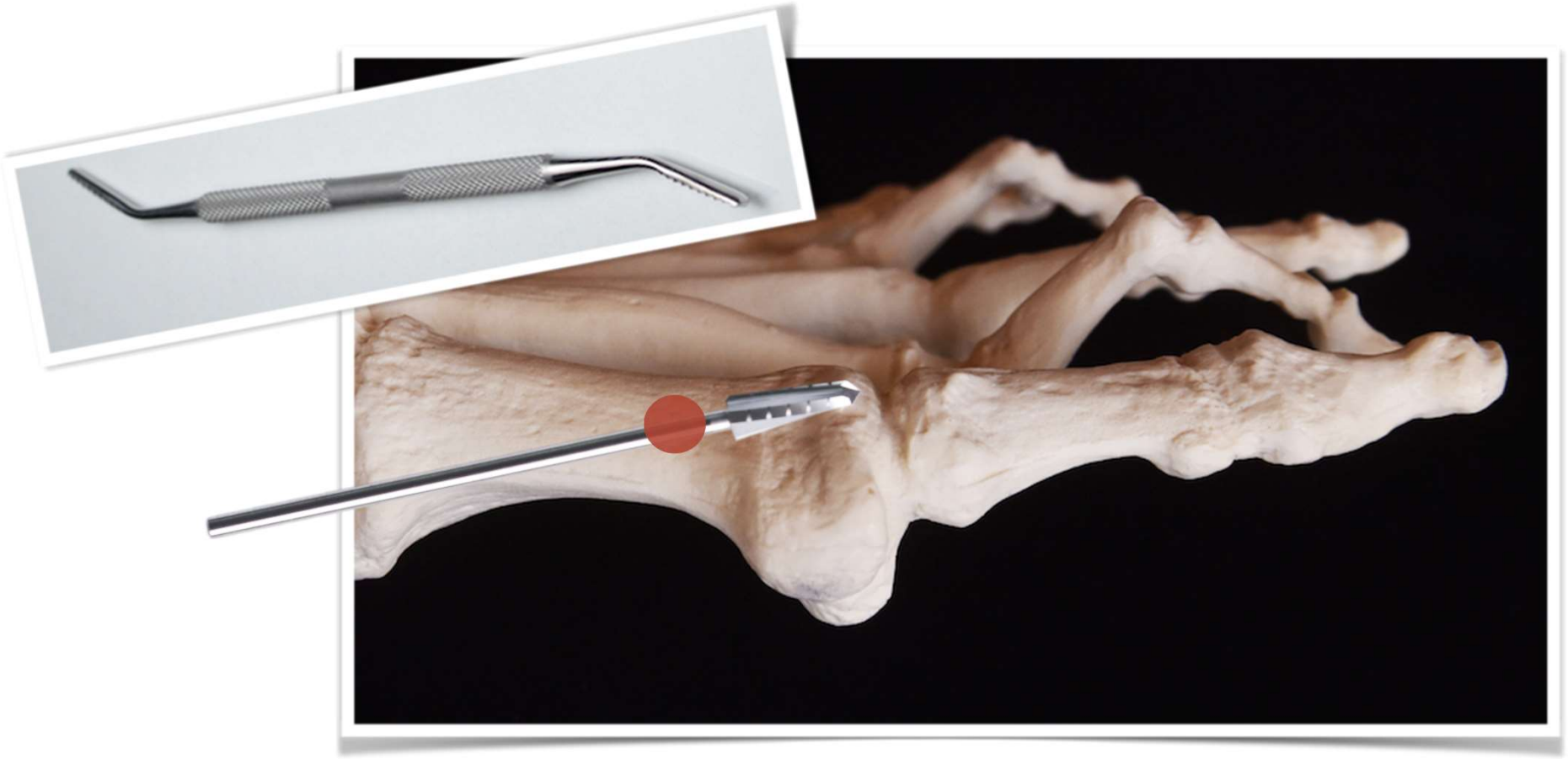
# Hallux Rigidus
# cheilectomy: surgical technique



Very big osteophytes: undercut and remove from plantar to dorsal

larger fragments may be removed with clamp or rasp

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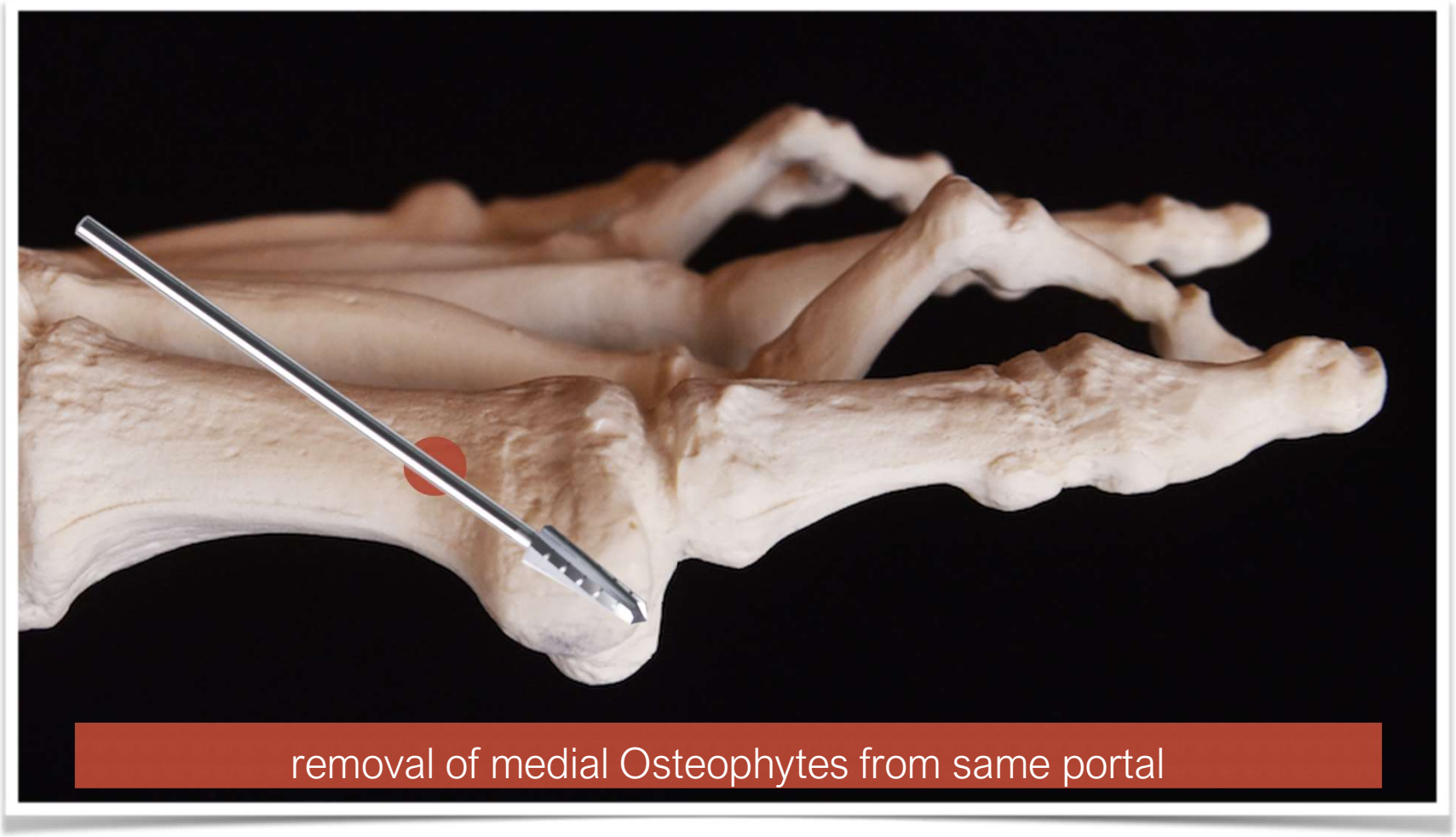
# Hallux Rigidus
# cheilectomy: surgical technique

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# Hallux Rigidus
# cheilectomy: surgical technique
# lateral osteophytes

second portal lateral of ext. tendon:
resection of P1-osteophytes possible from both portals

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# Hallux Rigidus
# cheilectomy: surgical technique

extensive irrigation (preferably in inside out-technique: from lateral portal to medial portal) with constant passive movement of big toe.

removal of all debris is mandatory: Cave inflammatory reaktions up to arthrofibrosis.

continue irrigation until water-clear fluid emerges („drinking water-quality“)

„washout of the joint debris is key to the success of minimally invasive cheilectomy“ (Walter 2015)

At the conclusion of the procedure fluoroscopy: check extend of resection and if any bone meal remaining.

Arthroscopy is ideal for verification.

**Walter R, Perera A**
Open, Arthroscopic and Percutaneous Cheilectomy for Hallux Rigidus
Foot Ankle Clin. 2015 Sep; 20(3):421-31

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# Hallux Rigidus
# arthroscopy

for optimal visibility two additional approaches dorsomedial and -lateral on joint level

2,7mm 30°- Optic

inspection of the joint: remaining bony edges/bony debris?

(partial) resection of synovium, microfracturing

additional continuous irrigation

**van Dijk CN, Veenstra KM, Nuesch BC**
Arthroscopic surgery of the metatarsophalangeal first joint
Arthroscopy. 1998 Nov-Dec; 14(8):851-5

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# Hallux Rigidus cheilectomy: literature

scientific data has improved continuously in the last few years

results and PROMS very good,
at least equal to open procedure


**Sidon E, Rogero R, Bell T**
Long-Term Follow-up of Cheilectomy for Treatment of Hallux Rigidus
Foot Ankle Int. 2019 Oct; 40(10):1114-21

**Stevens R, Bursnall M, Chadwick C**
Comparism of Complication and Reoperation Rates for Minimally Invasive Versus Open Cheilectomy of the First Metatarsophalangeal Joint
Foot Ankle Int. 2020 Jan; 41(1):31-36

**Teo KH, Tan WT, Atiyah Z et al.**
Clinical Outcomes Following Minimally Invasive Dorsal Cheilectomy for Hallux Rigidus
Foot Ankle Int. 2019 Feb; 40(2):195-201

**Walther M, Chomej P, Kriegelstein S et al.**
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# Hallux Rigidus: surgical technique

# supplementary options

## Waterman + Moberg

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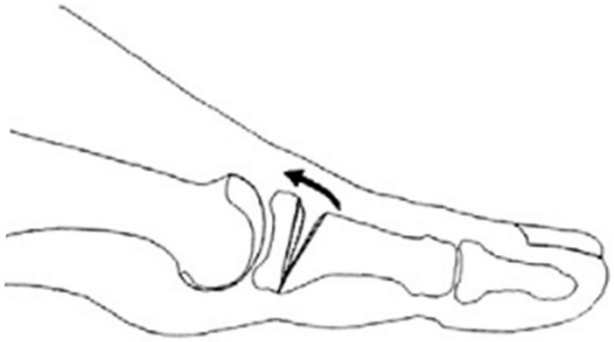
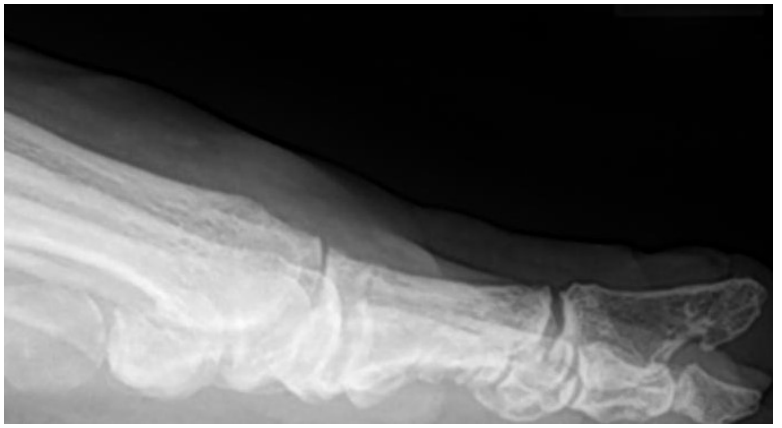
# Hallux Rigidus
# Moberg: surgical technique





no improvement of ROM in MTP

Dorsiflexion for easier unroll

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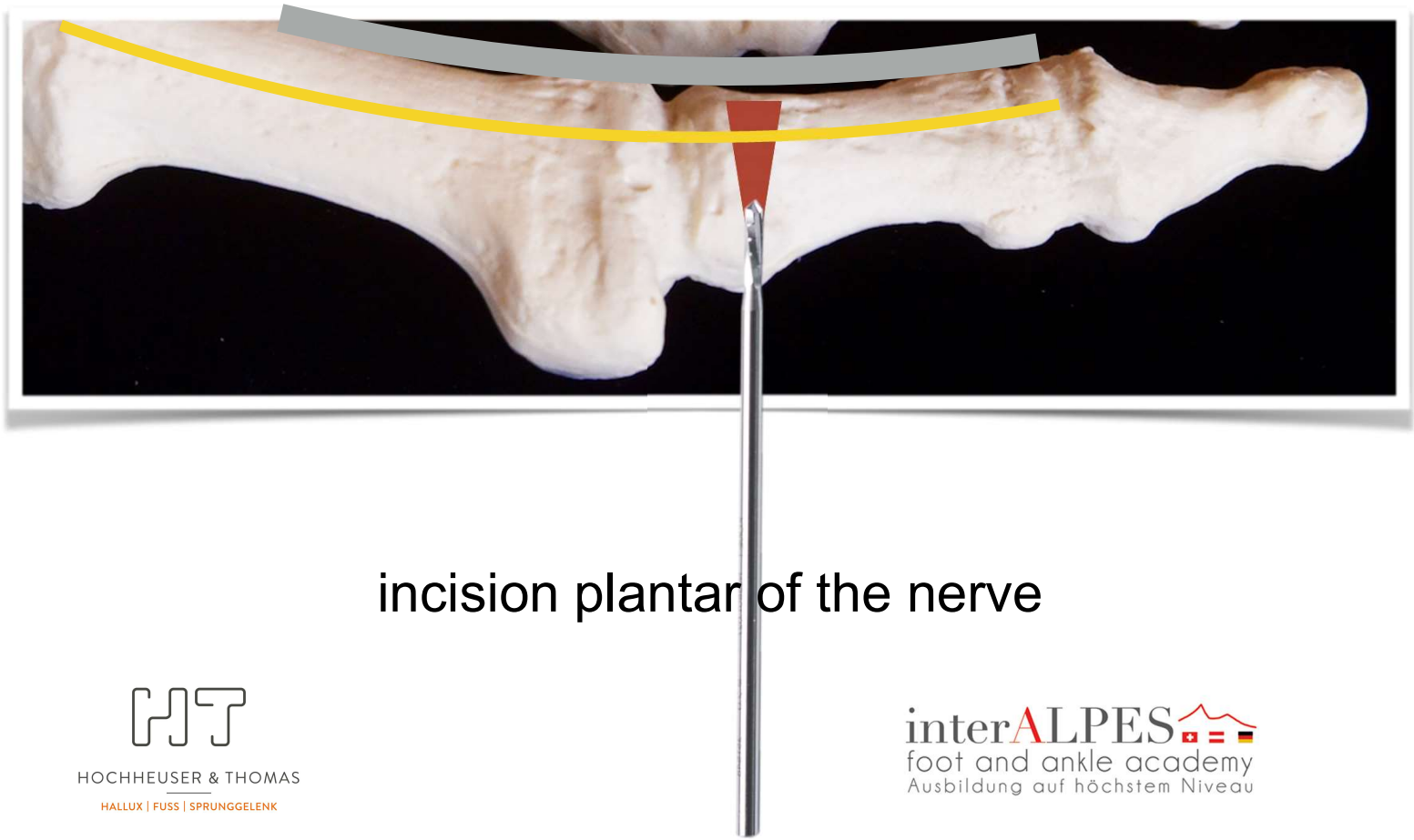
# Hallux Rigidus
# Moberg: surgical technique



incision plantar of the nerve

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# Hallux Rigidus
# Moberg: surgical technique

safe hole-technique:

osteotomy starting from a safe borehole

osteotomy of medial/lateral and dorsal cortex

plantar cortex first stays intact

when dorsal wedge is sufficient finalize plantar osteotomy (closing wedge or complete)

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# Hallux Rigidus
# Moberg: indication

suitable for young and active patients

always in combination with cheilectomy

in cases with limited dorsiflexion and maintained active plantarflexion

in Hallux Rigidus II-III


**Roukis TS (a)**
Outcomes after Cheilectomy with Phalangeal Dorsiflexory Osteotomy for Hallux Rigidus: A Systematic Review
J Foot Ankle Surg. 2010 Sep-Oct; 49(5):479-87

**O´Malley MJ, Basran HS, Gu Y et al.**
Treatment of advanced stages of hallux rigidus with cheilectomy and phalangeal osteotomy
J Bone Joint Surg Am. 2013 Apr 3; 95(7);606-10

**Maes DJA, De Vil J, Kalmar AF et al.**
Clinical and Radiological Outcomes of Hallux Rigidus treated with Cheilectomy and a Moberg-Akin Osteotomy
Foot Ankle Int. 2020 Mar; 41(3):294-302


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# Hallux Rigidus
# Waterman: surgical technique

Dorsally closing  MT1-Osteotomy via existing medial approach for cheilectomy

perpendicular osteotomie in safe hole-technique

creating a dorsal wedge

after returning to starting point milling in plantar direction

if possible only weakening of plantar cortex and closing of the dorsal wedge
in real life osteotomy often accidentally complete: don`t worry!

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# Hallux Rigidus: Waterman principles

dorsal part of the articular surface is usually more affected by arthrosis: gets rotated out of the stress zone, less affected plantar part gets rotated in

decompression of the joint and relaxation of flexors and extensors

**Cave:**
not in metatarsus primus elevatus
plantar very close to sesamoids
osteotomy primary unstable

**Cho BK, Park KJ, Park JK et al.**
Outcomes of the Distal Metatarsal Dorsiflexion Osteotomy for Advanced Hallux Rigidus
Foot Ankle Int. 2017 May; 38(5): 541-550

**Lee JY, Tay KS, Rikhraj IS**
Distal oblique osteotomy versus cheilectomy moderate-advanced hallux rigidus: A 2-year propensity-score-matched study
Foot Ankle Surg. 2021 Jun; 27(4):443-449

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# Hallux Rigidus
# postoperative treatment

mobilisation vwb in flat bandage shoe

after cheilektomie change to normal comfortable footwear within a few days

after the first week within one`s home mobilization without the bandage shoe is possible, independently of the type of osteotomy

after MT1-osteotomy wearing of the bandage shoe outside usually 4-6 weeks postop.

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# Hallux Rigidus: therapy algorithm

complaints exclusively by osteophytic attachments:
cheilectomy sufficient (especially in elderly patients)

up to Regnauld grade 3 (Coughlin and Shurnas):
cheilectomy plus osteotomy of basal phalanx and/or metatarsal

Coughlin and Shurnas grade 4:
don´t be a hero, fuse it: arthrodesis

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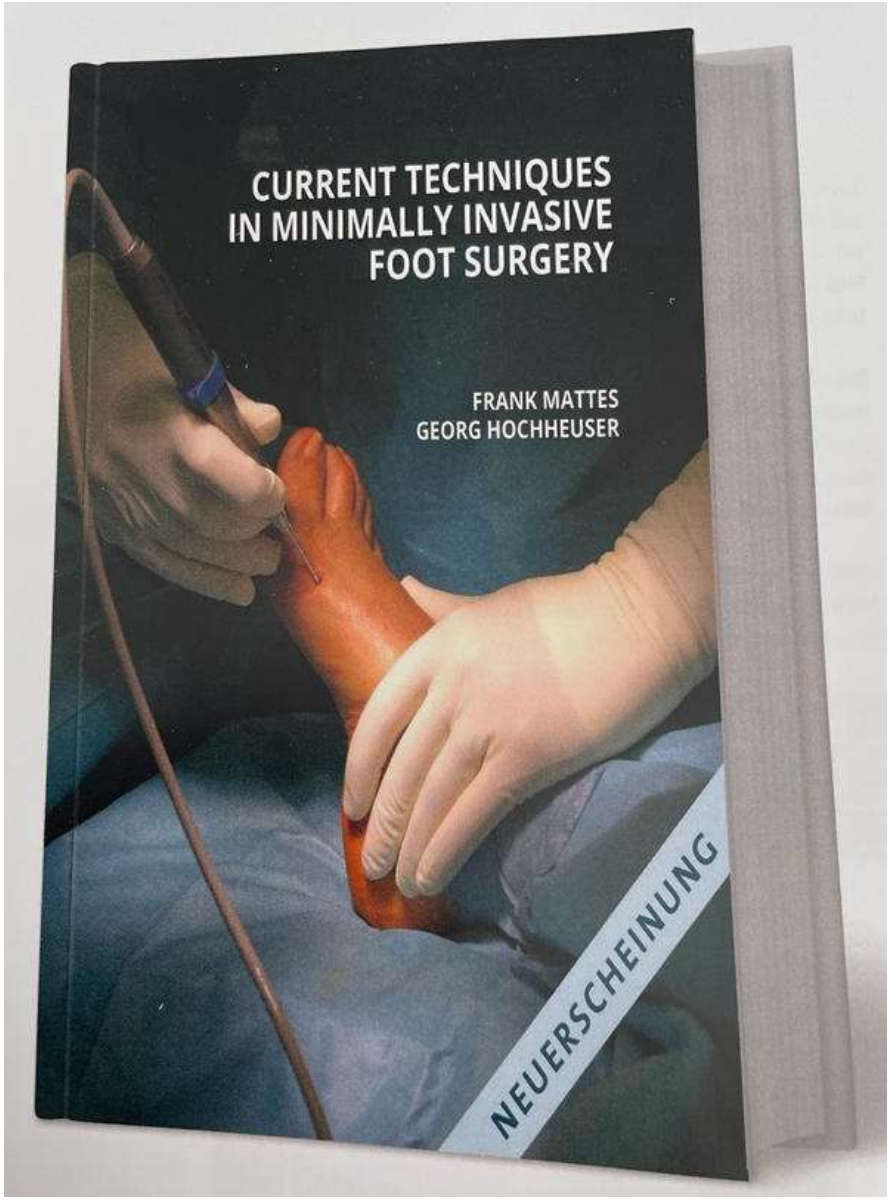


find all techniques described in detail

www.interalpes.com

or on
www.amazon.de

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# Thanks for your attention!


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