Foot & Ankle Surgery: common problems – current therapies

Zurich, Sep 4, 2014

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> Ankle arthrosis – from osteotomy to total ankle replacement

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Ankle arthrosis – from osteotomy to total ankle replacement

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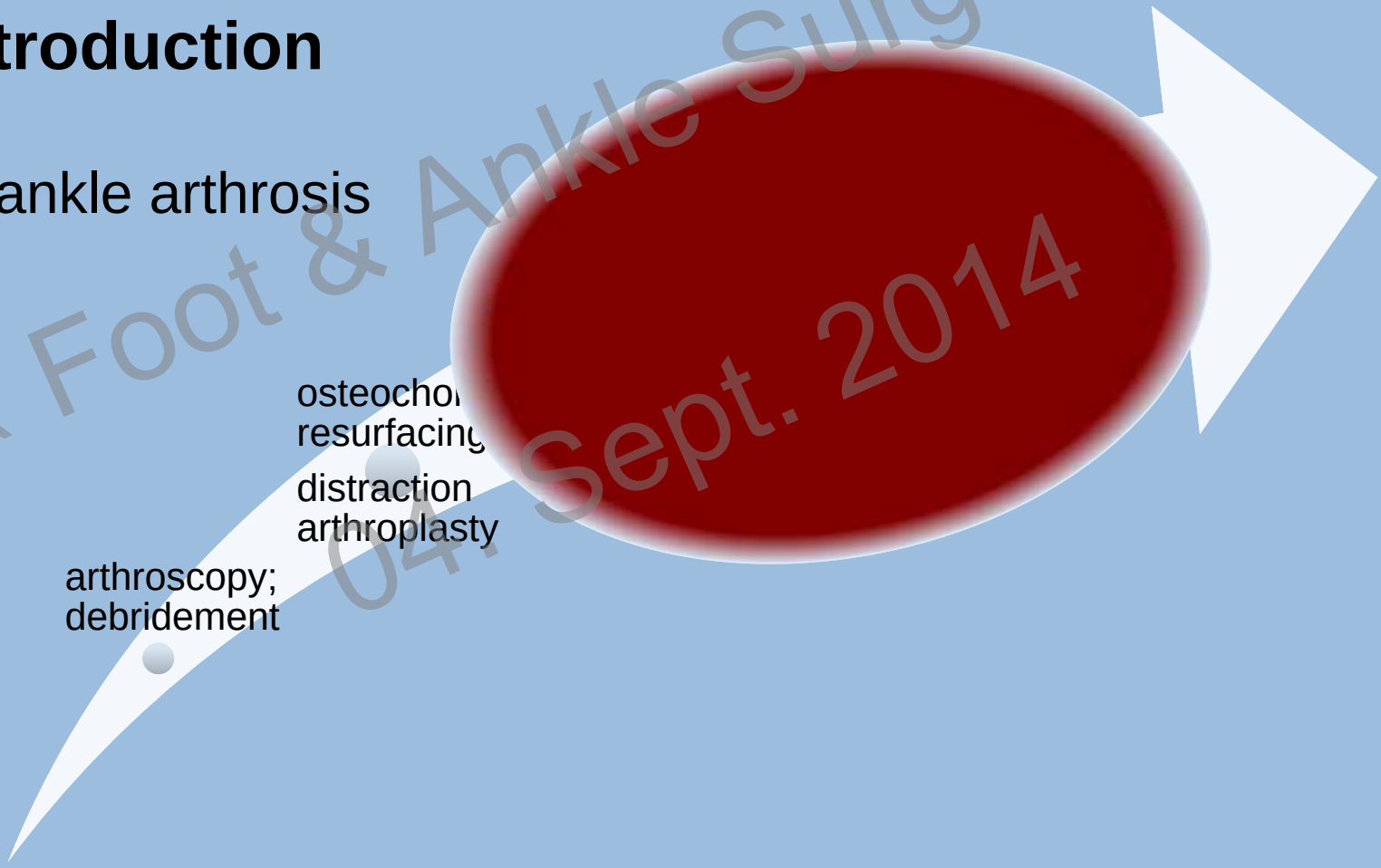
Introduction

> ankle arthrosis



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Introduction

- asymmetric / focal arthrosis

  — recently more effort to restore neutral articular alignment

  => early and aggressive realignment surgery to prevent or delay ankle arthrosis

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Introduction

- Indications for realignment surgery
  - existing or impending asymmetric / focal ankle arthrosis
    - congenital malalignment distal tibia
    - posttraumatic malunion after distal tibia-, malleolar-, and talus fractures
    - hindfoot deformity, e.g. cavovarus / planovalgus deformity
  - > 50% preserved articular surface
  - isolated osteochondral lesion
  - alignment for TAR and ankle arthrodesis

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Asymmetric ankle arthrosis

- hindfoot deformity (varus / valgus) leads to increased ankle joint pressure and potentially to asymmetric arthrosis in the long-term[1,2]
- malalignment
  - isolated at single structural level (e.g. supramalleolar)
  - part of complex deformity with multiple structural levels involved (e.g. cavovarus deformity)

[1]Krause F. et al. J Bone Joint Surg Br 2007;89(12):1660–5
[2]Stufkens SA, et al. J Bone Joint Surg Br 2011;93-B:1232-9

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Introduction

- Supramalleolar osteotomies for intraarticular malalignment (varus / valgus joint line)

- Calcaneal osteotomies for extraarticular malalignment (neutral joint line, varus / valgus hindfoot deformity)

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Diagnostic

- weight-bearing radiographs
  - Ap and lateral foot, ankle and tibial shaft (full-length radiographs)
    - tibial articular surface angle(TAS, 90 ± 3 degrees)
    - tibiotalar angle (TTA 0 ± 3 degrees)
  - hindfoot alignment view
  - both leg stance radiograph
- MRI
- SPECT CT

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Classification of intraarticular varus ankle arthrosis

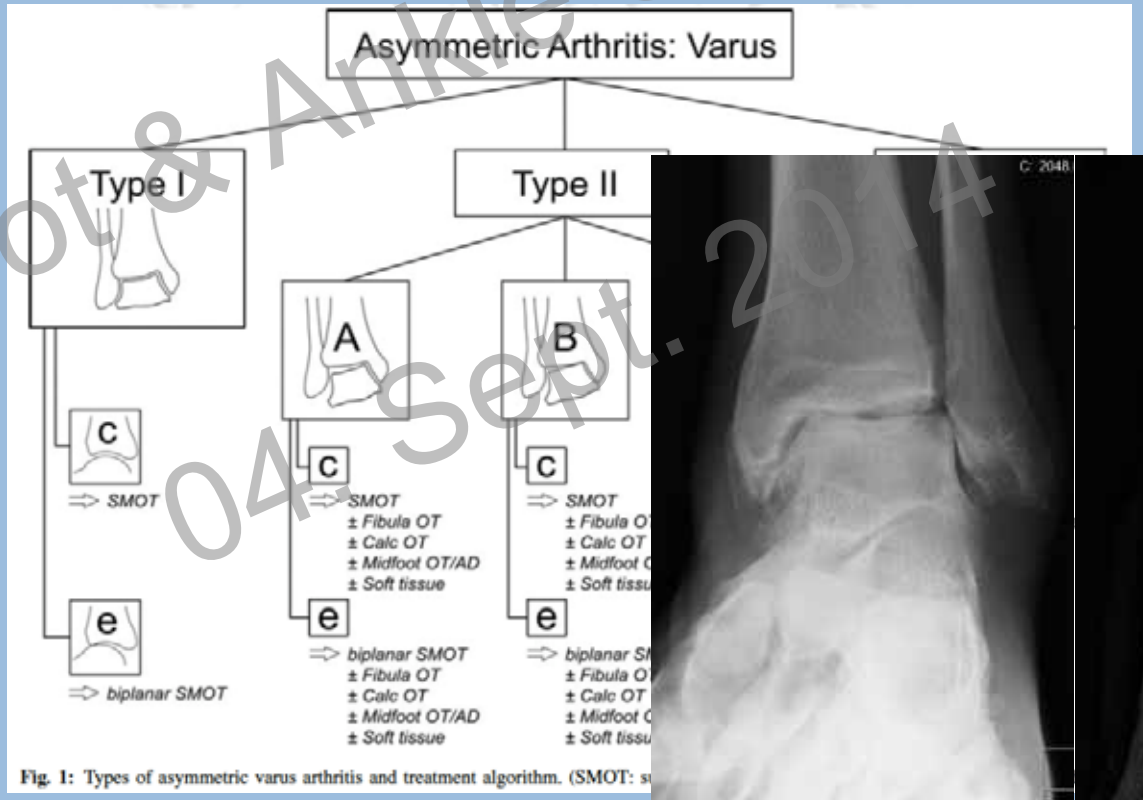

Fig. 1: Types of asymmetric varus arthritis and treatment algorithm. (SMOT: s

Knupp M, et al: Foot Ankle Int. 2011;32:1029-32

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Intraarticular valgus alignment

- Medial closing supramalleolar osteotomy
- Advantages
  - simple approach
  - ease of bone cut
  - reliable and rapid healing
- Disadvantages
  - weakening of TP tendons

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Intraarticular varus alignment

- Medial opening supramalleolar osteotomy
- Advantages
  - simple approach,
  - ease of bone cut
- Disadvantages
  - Correction < 10 ° (fibula restriction)
  - graft morbidity
  - potentially load increase in the medial ankle by tensioning of the medial extrinsic tendons[1]

[1]Takakura Y et al. J. Bone Joint Surg. 1998;80-A:213 – 218

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Medial opening supramalleolar osteotomy[1]

- time to union, no delayed or nonunion?
- AOFAS score improved significantly from 52 (range 22 to 83) to 73 (range 27 to 100)
- VAS pain decreased from 4.4 (range 0-8) to 2.6 (range 0-7)
- ROM increase 5 ° on average
- progression to end-stage arthrosis at average follow-up of 45 (range 15 to 88) months in 3/35 pts.
- implant removal in 10/35pts

[1]Pagenstert GI, et al. Clin Orthop Relat Res 2007;462:156–68.

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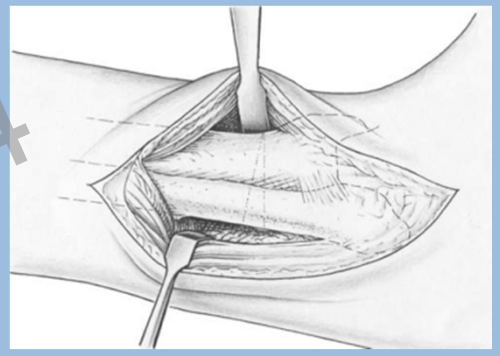
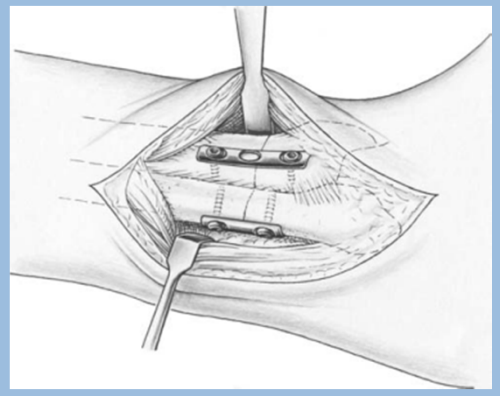
Intraarticular varus alignment

- Lateral closing supramalleolar osteotomy
- Advantages
  - Correction > 10 ° (no fibula restriction)
  - ease of fixation
  - reliable and rapid healing
- Disadvantages
  - possibility of leg-length discrepancy
  - more soft-tissue dissection
  - weakening of peroneal tendons





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Lateral closing supramalleolar osteotomy

- time to union 10 weeks (range 6 to 14), no delayed or nonunion
- no measurable leg length discrepancy
- base of fibular wedge 6.7 mm (range 4 to 12)
- AOFAS score improved significantly from 48 (range 21 to 67) to 74 (range 51 to 88)
- little arthrosis progression at average follow-up of 56 (range 15 to 88) months in 2/9 pts.
- implant removal in 2/9 pts

Harstall R et al. Foot Ankle Int. 2007;27:542-8

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Literature

Study	LOE	Patients	Follow-up (years)	Surgical technique	Pain relief	Functional outcome	ROM
Cheng et al. (2001) [59]	IV	18 (18 ankles)	4.0 (2.1–6.8)	Medial opening wedge OT with oblique OT of the fibula (18)	24.4→47.5[a]	25.2→41.0[b]	n.a.
Harstall et al. (2007) [60]	IV	9 (9 ankles)	4.7 (1.3–7.3)	Lateral closing wedge OT (9)	16±8.8→30±7.1[c]	48±16.0→74±11.7[d]	n.a.
Hintermann et al. (2011) [47]	IV	48 (48 ankles)	7.1 (2–15)	Medial closing wedge OT (45), lateral opening wedge OT (3)	41 patients pain-free, 6 patients VAS 2.1	48→86[d]	41.2°→40.1°
Knupp et al. (2011) [6]	II	92 (94 ankles)	3.6 (1.0–10.5)	Medial closing wedge OT (61), lateral closing wedge OT or medial opening wedge OT (33)	4.6±1.9→2.8±2.3[e]	55.6±17.2→72.8±18.9[d]	n.a.
Knupp et al. (2012) [42]	IV	14 (14 ankles)	4.2 (2.0–8.2)	Medial closing wedge OT (14)	4.1±1.7→2.2±1.5[e]	51.6±12.3→77.8±11.8[d]	25±12°→29±9°
Lee et al. (2011) [70]	IV	16 (16 ankles)	2.3 (1.0–6.5)	Medial opening wedge OT with oblique OT of the fibula (16)	n.a.	62.3±8.9→82.1±11.4[d]	n.a.
Pagenstert et al. (2008) [56]	II	35 (35 ankles)	5.0 (3.0–10.5)	n.a.	7.0±1.6→2.7±1.6[e]	38.5±17.2→85.4±12.4[d]	32.8±14.0°→37.7±9.4°
Stamatis et al. (2003) [67]	IV	12 (13 ankles)	2.8 (1.0–4.9)	Medial closing wedge OT (7), medial opening wedge OT (6)	14.6±10.5→32.3±5.9[c]	53.8±19.3→87.0±10.1[d]	n.a.
Takakura et al. (1995) [68]	IV	18 (18 ankles)	6.9 (2.7–12.1)	Medial opening wedge OT (18)	16.4±4.6→34.6±5.3[f]	39.3±4.1→48.4±3.9[g]	n.a.
Takakura et al. (1998) [69]	IV	9 (9 ankles)	7.3 (2.3–13.2)	Medial opening wedge OT (9)	20.0±7.1→34.4±5.3[f]	48.9±15.3→52.8±12.0[g]	62.9±9.6°→54.5±9.8°

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58 y, male, teacher
Recurrent ankle sprains for years
Increasing pain anteromedial ankle bilat.

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3/12 postop

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8/12 postop

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Extraarticular varus / valgus malalignment

- Calcaneal osteotomy
- Advantages
  - ease of fixation
  - no graft
  - reliable and rapid healing
- Disadvantages
  - limited correction (> 1 cm translation)
  - weakening of Achilles lever arm
  - tibial nerve compression

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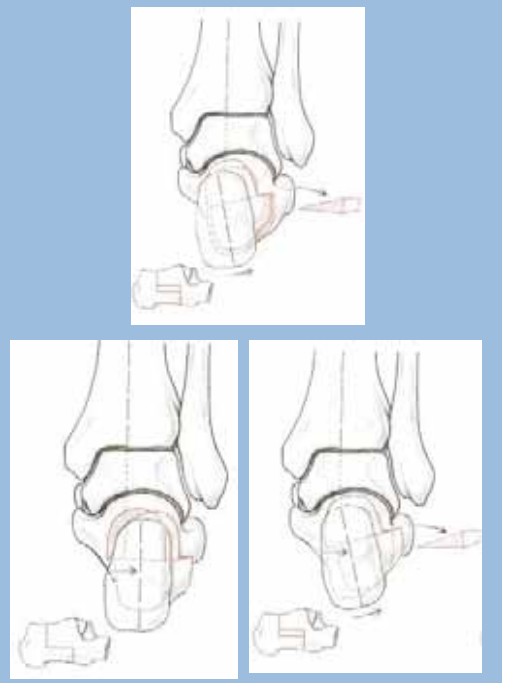
Calcaneal Osteotomy

- realignment of the varus hindfoot by calcaneal osteotomies substantially contributes to normalize ankle contact stresses in pes cavovarus[1]
  - Closing wedge (Dwyer) and Z-osteotomy (Malerba) without tuberosity lateralization for small correction (rotation only)
  - Lateral sliding and Z-osteotomy with tuberosity lateralization for large correction (translation and rotation)[1,2]



[1]Krause F. et al. Foot Ankle Int. 2010 Sep;31(9):741-6.
[2]Knupp M, et al. Tech Foot Ankle Surg.2008;7:90-95.

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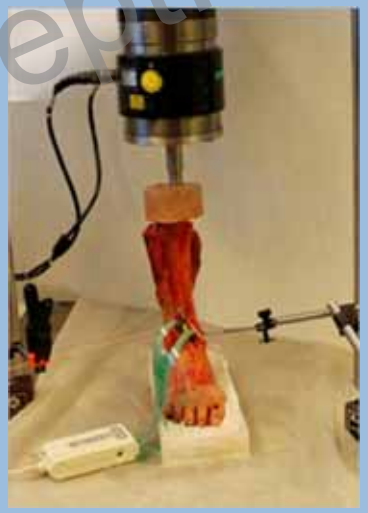
supramalleolar versus calcaneal

> No difference of efficacy “lateral closing SMOT versus lateralizing COT in pes cavovarus”[1]



[1]Schmid T. et al. Foot Ankle Int. 2013:34:1190-1197

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- failure case preop, 66y, male
  idiopathic fixed cavovarus deformity

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> failure case postop

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- failure case 1 year postop

=> correction not aggressive enough?
=> arthrosis too advanced?
=> indications exceeded?

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preserving versus sacrificing

- no comparative studies
- no guidelines

⇒ literature?

⇒ personal experience?

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preserving versus sacrificing

	joint preserving realignment surgery	joint sacrificing AA or TAR
age	young (< 60)	old (>70)
arthrosis localization	focal / < 50%	global / > 50%
arthrosis severity	< grade 4?	grade 4
talar tilt	<10°	>10°
anterior talus sublux	-	+
ankle ROM, ligamentous stability	good	good (TAR), poor (AA)
neuro-arthropathy, incompliance	-	+ (AA)

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Global ankle arthrosis

- global
  - inflammatory arthritides: rheumatoid disease and seronegative spondyloarthropathies
  - hemophiliac, gouty crystalline deposition, and septic arthropathies
  - some posttraumatic, e.g pilon fractures

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preserving versus sacrificing

	joint preserving realignment surgery	joint sacrificing AA or TAR
age	young (< 60)	old (>70)
arthrosis localization	focal / < 50%	global / > 50%
arthrosis severity	< grade 4?	grade 4
talar tilt[1]	<10°	>10°
anterior talus sublux	-	+
ankle ROM, ligamentous stability	good	good (TAR), poor (AA)
neuro-arthropathy, incompliance	-	+ (AA)

[1]Lee WC, et al. J Bone Joint Surg Am, 2011;93:1243–8

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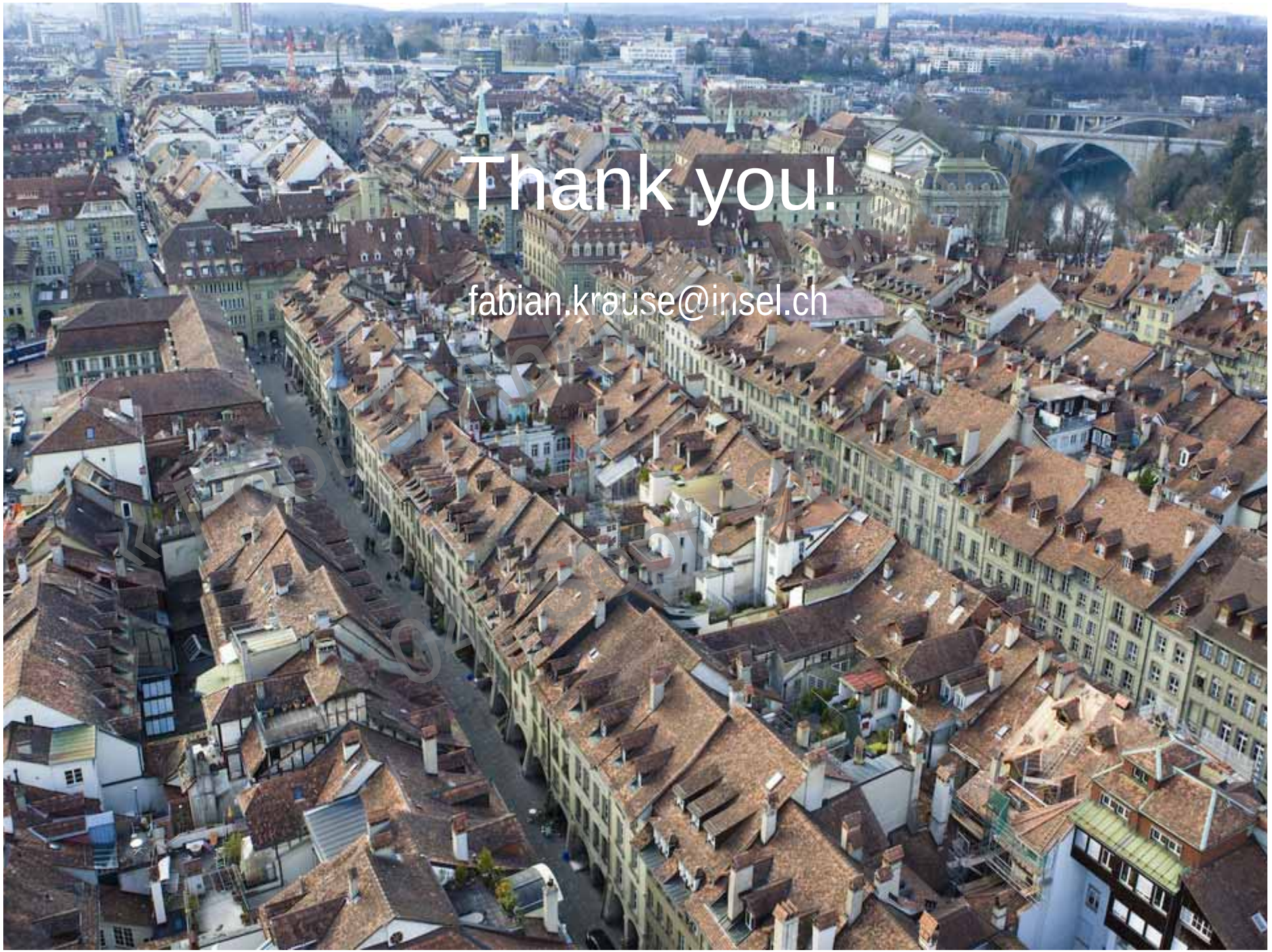
Conclusion

- age and arthrosis' extent most important for decision-making: preserving / sacrificing ankle
- if preserving realignment surgery:
  - early and aggressive (intraarticular plafond plasty, overcorrection 2-5 °) restoration of bony anatomy and alignment
  - realignment surgery where malalignment occurs
  - combine SMOT and COT when necessary


Thank you!
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