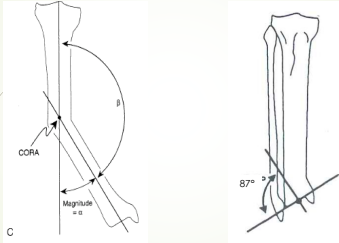




## CORA – Center of rotation and angulation



Paley, D., et al., *Deformity planning for frontal and sagittal plane corrective osteotomies*. The Orthopedic clinics of North America, 1994, 25(3): p. 425-45.

## Patient selection – Results

- Good results :
  - \*Stage 1-2-3A OA (Modified Takakura-Tanaka Classification).
  - \*TT <7,3°
  - \*<60 years
  - \*non-smoker
- Bad results:
  - \*Stage 3B -4 OA (Modified Takakura-Tanaka Classification).
  - \*OA on the medial gutter (Krupp Classification Type)
  - \*TT >7,3°
  - \*>60 years
  - \*Smoker

## How much correction?

### ■ VALGUS DEFORMITY:

No cartilage damage : Restore TAS to normal value of 93°  
 Cartilage damage: Slightly undercorrection TAS 88-86°

### ■ VARUS DEFORMITY:

No cartilage damage: Restore TAS to normal value of 93°  
 Cartilage damage: Slightly overcorrection TAS 93-95°  
 When >95°: risk subfibular impingement

### ■ PROCURVATUM/RECURVATUM DEFROMITY

Restore TLS to normal value of 80-86°

\*Reppert, G.L., et al., *Realigning surgery as alternative treatment of varus and valgus ankle osteoarthritis*. Clinical orthopaedics and related research, 2007, 462: p. 156-68.  
\*Tanaka, T., *The concept of ankle joint preserving surgery: why does supramalleolar osteotomy work and how to decide when to do an osteotomy or joint replacement*. Foot and ankle clinics, 2012, 17(4): p. 345-53.  
\*Haseguchi, N., et al., *Weight-bearing line analysis in supramalleolar osteotomy for varus type osteoarthritis of the ankle*. The Journal of bone and joint surgery, American volume, 2015, 97(6): p. 833-9.  
\*Lee, W.C., et al., *Indications for supramalleolar osteotomy in patients with ankle osteoarthritis and varus deformity*. The Journal of bone and joint surgery, American volume, 2011, 93(13): p. 1243-8.  
\*Liu, L.H., *Opening wedge low tibial osteotomy: a minimally invasive approach*. Foot and ankle surgery: official journal of the European Society of Foot and Ankle Surgeons, 2011, 17(1): p. 1-7.  
\*Womack, E.M., et al., *Calculation of the opening wedge for a low tibial osteotomy*. Foot & ankle international, 2004, 25(11): p. 179-82.  
\*Chang, Y.A., et al., *Low tibial osteotomy for moderate ankle arthritis*. Archives of orthopaedic and trauma surgery, 2001, 121(6): p. 355-8.

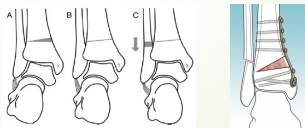
## Type osteotomy

TYPE	INDICATION	ADVANTAGE	DISADVANTAGE
MEDIALE CLOSING WEDGE	Valgus	*Allows multiplane correction *Direct bone to bone contact (weight bearing, less nonunion)	*Risk of shortening limb length
MEDIAL OPENING WEDGE	< 10° Varus	*Allows multiplane correction	*Bone defect (+/- bone grafting) -WB *Risk non-union *Tension medial structures (tarsal tunnel/fib.post) *Risk of lengthening limb
LATERAL CLOSING WEDGE	> 10° Varus	*Allows multiplane correction *Direct bone-on-bone contact (weight bearing, less nonunion) *No tension on medial structures	*Risk of shortening limb length

\*Knap, M., et al., *Distraction in varus malalignment of the ankle*. Operative Orthopaedics and Traumatology, 2008, 18(6): p. 262-73.  
\*Tanaka, T., et al., *Results of opening-wedge osteotomy for the treatment of a post-traumatic varus deformity of the ankle*. The Journal of bone and joint surgery, American volume, 1998, 80(2): p. 273-8.  
\*Knap, M., et al., *Classification and treatment of supramalleolar deformities*. Foot & ankle international, 2011, 32(1): p. 1022-31.  
\*Tanaka, T., *The concept of ankle joint preserving surgery: why does supramalleolar osteotomy work and how to decide when to do an osteotomy or joint replacement*. Foot & ankle clinics, 2012, 17(4): p. 345-53.  
\*Knap, M., et al., *Mid to Long-term Results of Supramalleolar Osteotomy*. Foot & ankle international, 2017, 38(2): p. 124-32.  
\*Bede, S.H., Jr, Hols, and T. Bredt, *Changes of the joint mechanics excising the pathogenesis of post-traumatic arthritis of the ankle joint: a cadaveric study*. Foot & ankle international, 2011, 32(2): p. 174-81.

## Additional procedures- Fibula osteotomy

- Peroperative evaluation
- Valgus deformity + medial closing wedge osteotomy :  
Tension band effect lateral collateral ligaments  
→ fibula lengthening osteotomy
- Varus deformity + wedge osteotomy:  
intact fibula prevents correct position of talus  
→ fibula shortening osteotomy



Krupp, M., *The Use of Osteotomies in the Treatment of Asymmetric Ankle Joint Arthritis*. Foot & ankle international, 2017, 38(2): p. 220-229.  
Ahn, Tae-Kwon et al., *Distal Tibial Osteotomy without Fibular Osteotomy for Medial Ankle Arthritis with Ankle Widening*. JBJS: Essential Surgical Techniques, 2014, 11, 2014

## Additional procedures- Calcaneum osteotomy

- Goal: Physiologic valgus 0-5°
- Varus malalignment : lateral shift osteotomy
- Valgus malalignment: medial shift osteotomy

\*Cole, F., et al., *Subtalar joint configuration on weightbearing CT scan*. Foot & ankle international, 2014, 35(10): p. 1057-62.  
\*Apostle, K.L., N.W. Coleman, and B.J. Songgeonzi, *Subtalar joint axis in patients with symptomatic posterior subluxation compared to normal controls*. Foot & ankle international, 2014, 35(11): p. 1153-8.  
\*Probasco, W., et al., *Assessment of coronal plane subtalar joint alignment in peritarsal subluxation via weight-bearing multiplanar imaging*. Foot & ankle international, 2015, 36(3): p. 302-9.  
\*Krupp, M., *The Use of Osteotomies in the Treatment of Asymmetric Ankle Joint Arthritis*. Foot & ankle international, 2017, 38(2): p. 220-229.  
\*Krupp, M., *The Use of Osteotomies in the Treatment of Asymmetric Ankle Joint Arthritis*. Foot & ankle international, 2017, 38(2): p. 220-229.

## Additional procedures- Soft tissue procedures

- Tendontransfer:  
Bv: Varus deformity :  
Peroneus Brevis to Peroneus Longus  
Tibialis Anterior tendon reinsertion on lateral cuneiform;  
Bv: Valgus deformity:  
Flexor Digitorum Longus to Tibialis Posterior
- Tendon lengthening :  
varus correction mediate opening wedge osteotomie:  
Tibialis Posterior tendon lengthening
- Ligamentary reconstructions/releases:  
(lateral ligament, deltoid ligament, spring ligament)

## Conclusion – Take home

- Technically demanding
- Significant improvement of clinical scores (VAS, OAFAS)
- AO type 1-2-3A
- Type of OT depends on the amount of correction needed and the soft tissue envelop
- No cartilage degeneration : correct to normal value of TAS 93°
- Cartilage degeneration:  
Varus: slightly overcorrect TAS 93°-95°  
Valgus slightly undercorrect TAS 88°-86°
- After a SMO re-evaluate the ankle joint and the need for a  
-fibula osteotomy  
-calcaneum osteotomy  
-midfoot osteotomy/artrodesis  
-soft tissue procedure

The end

Thank you!!!