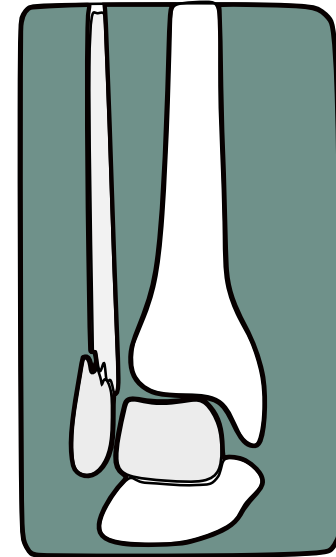
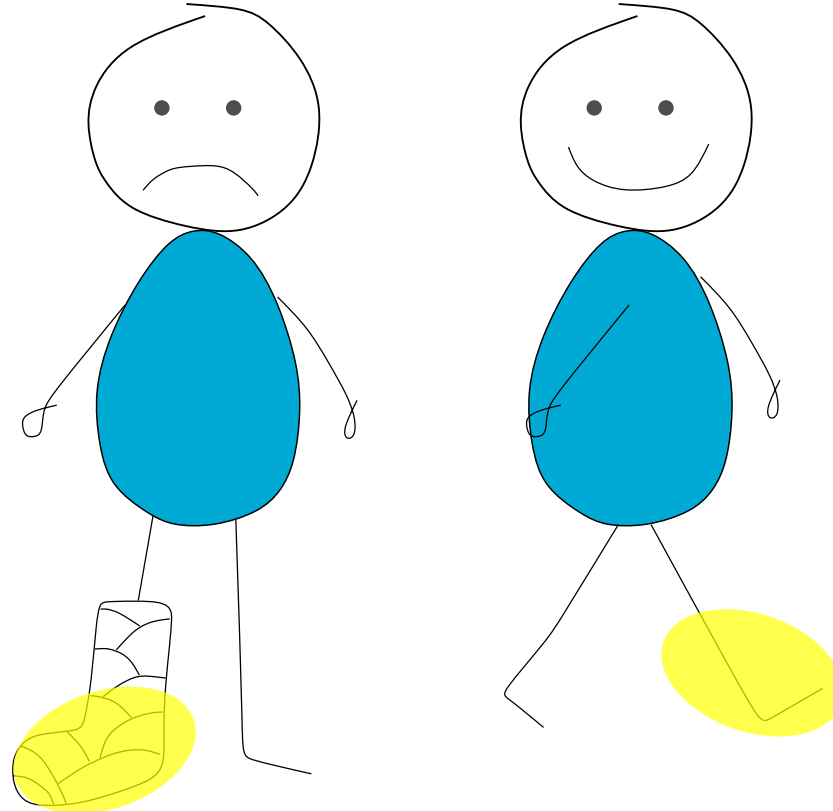
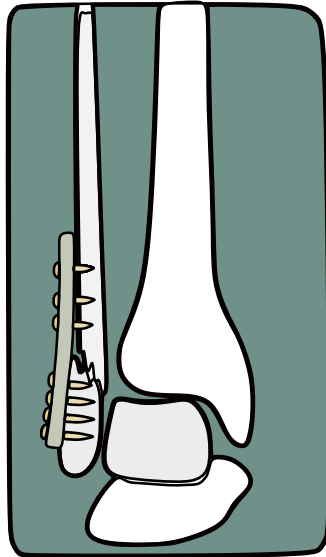


Ankelbrudd

Diagnostikk og behandlingstilnærming



Martin Gregersen, spes.fysio/stipendiat



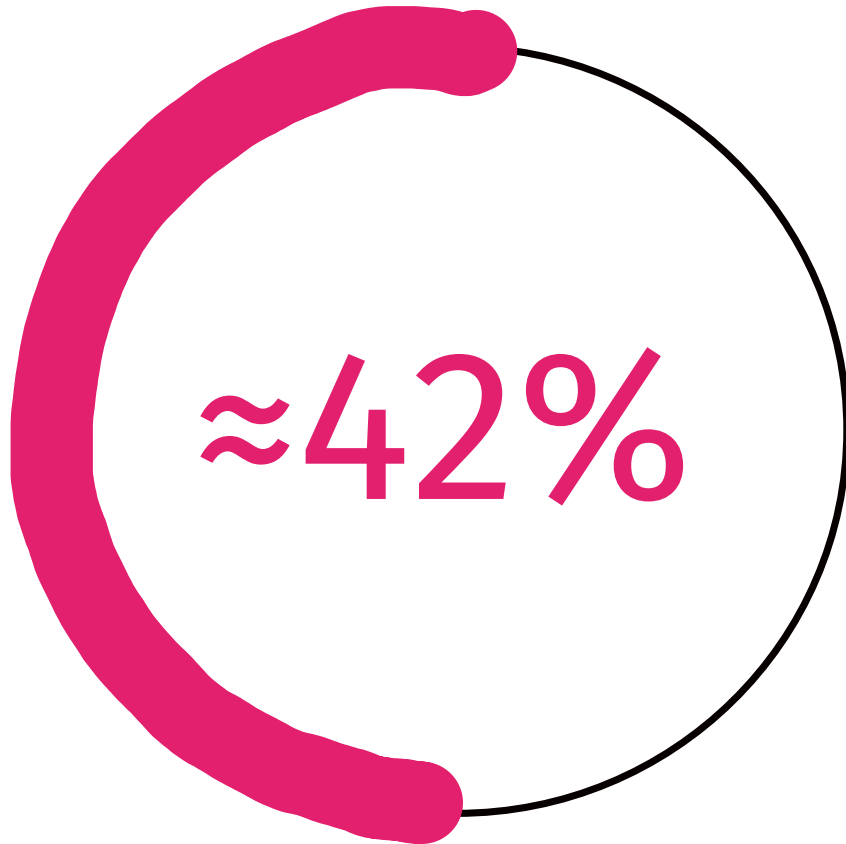
UNIVERSITY
OF OSLO

 SYKEHUSET ØSTFOLD

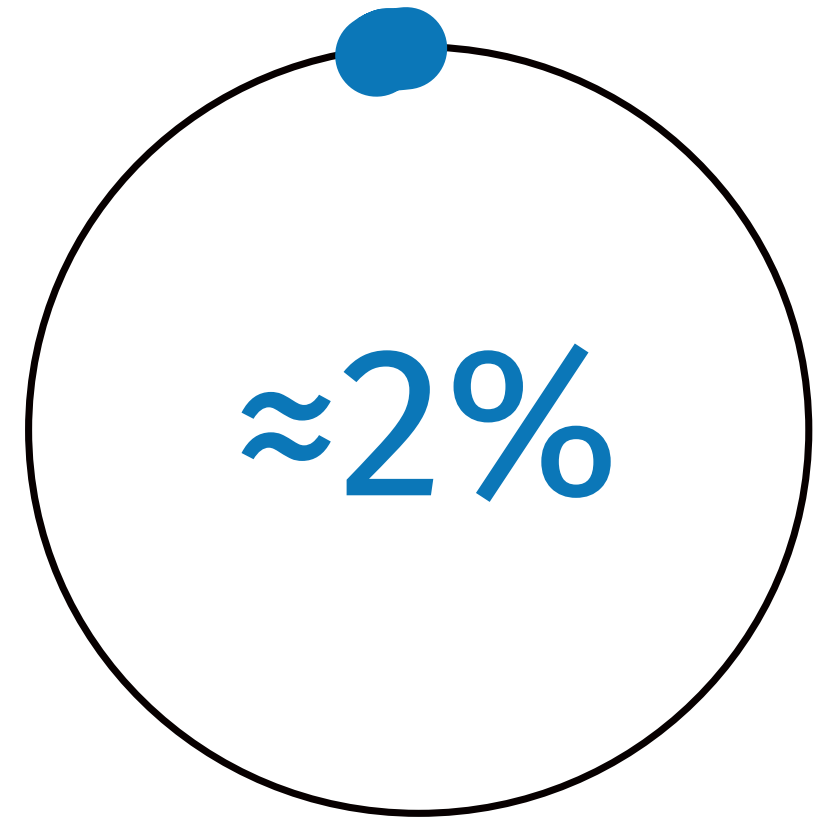


Aalesund
BIOMECHANICS LAB

Før opererte vi



Nå opererer vi



AV DET VANLIGSTE ANKELBRUDDET

Ankelbrudd er vanlig

170-180/100.000 personer/år

~10% av alle brudd

Juto et al. 2018, BMC Musculoskelet Disord, Elsoe et al. 2017, Foot Ankle Surg, Court-Brown et al. 2006, Injury

Fraktur i en eller flere malleoler

Uni- (1), bi- (2) eller trimalleolær (3)



Peak incidens i unge
aktive personer (ofte idrettsrelatert)
og i eldre (pga tap av benkvalitet)

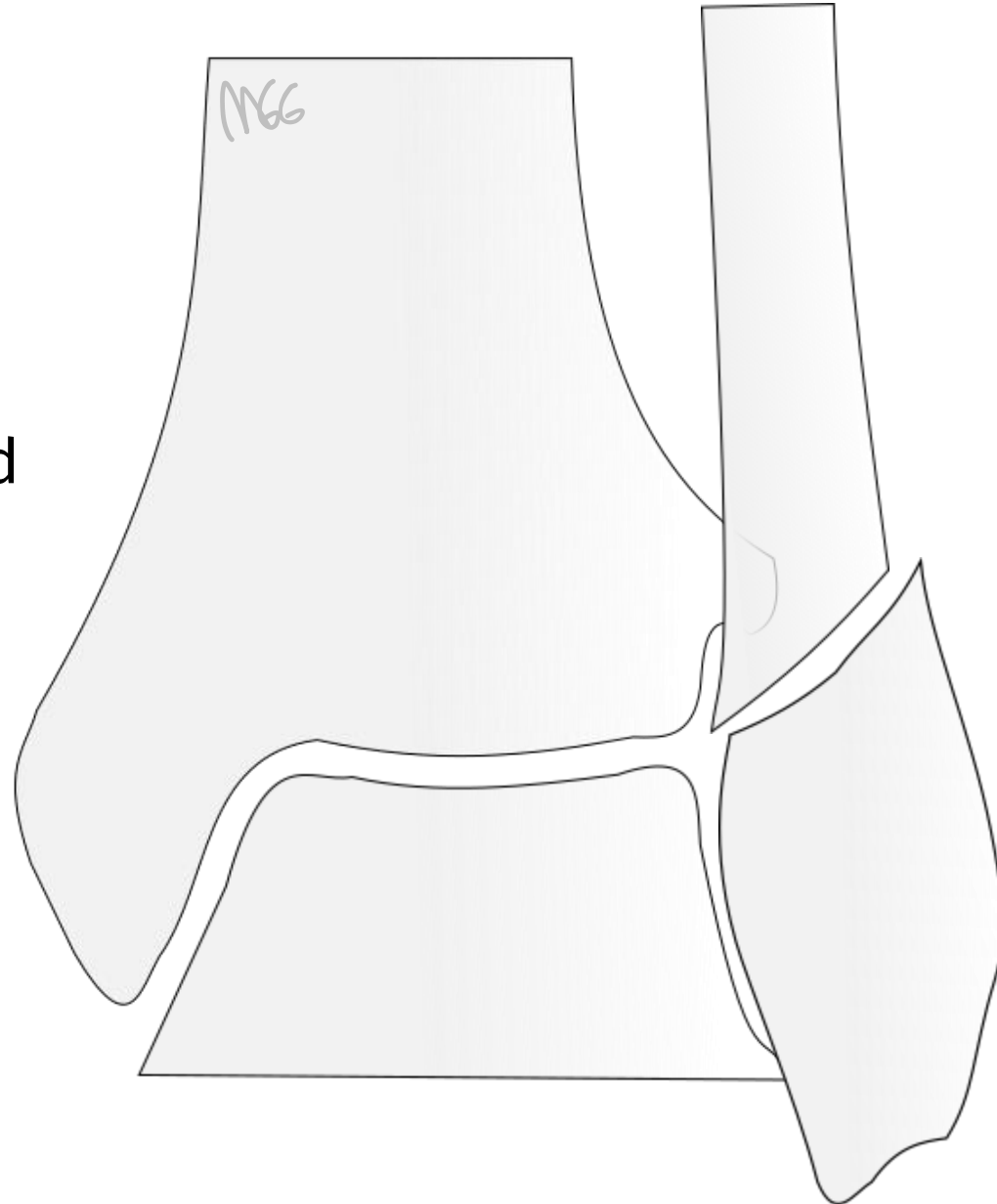
Behandles kirurgisk eller konservativt



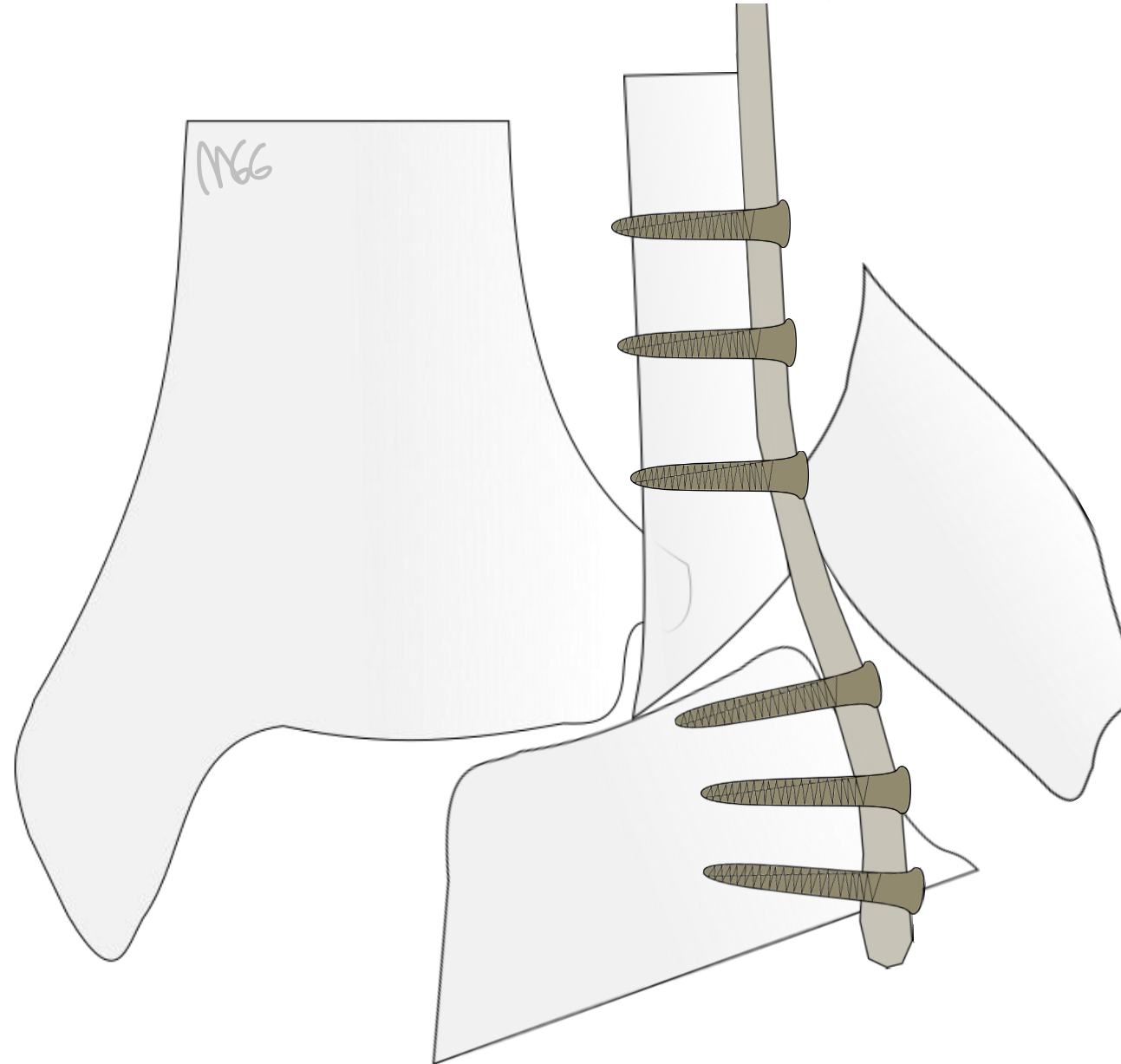
Kontroversielt!

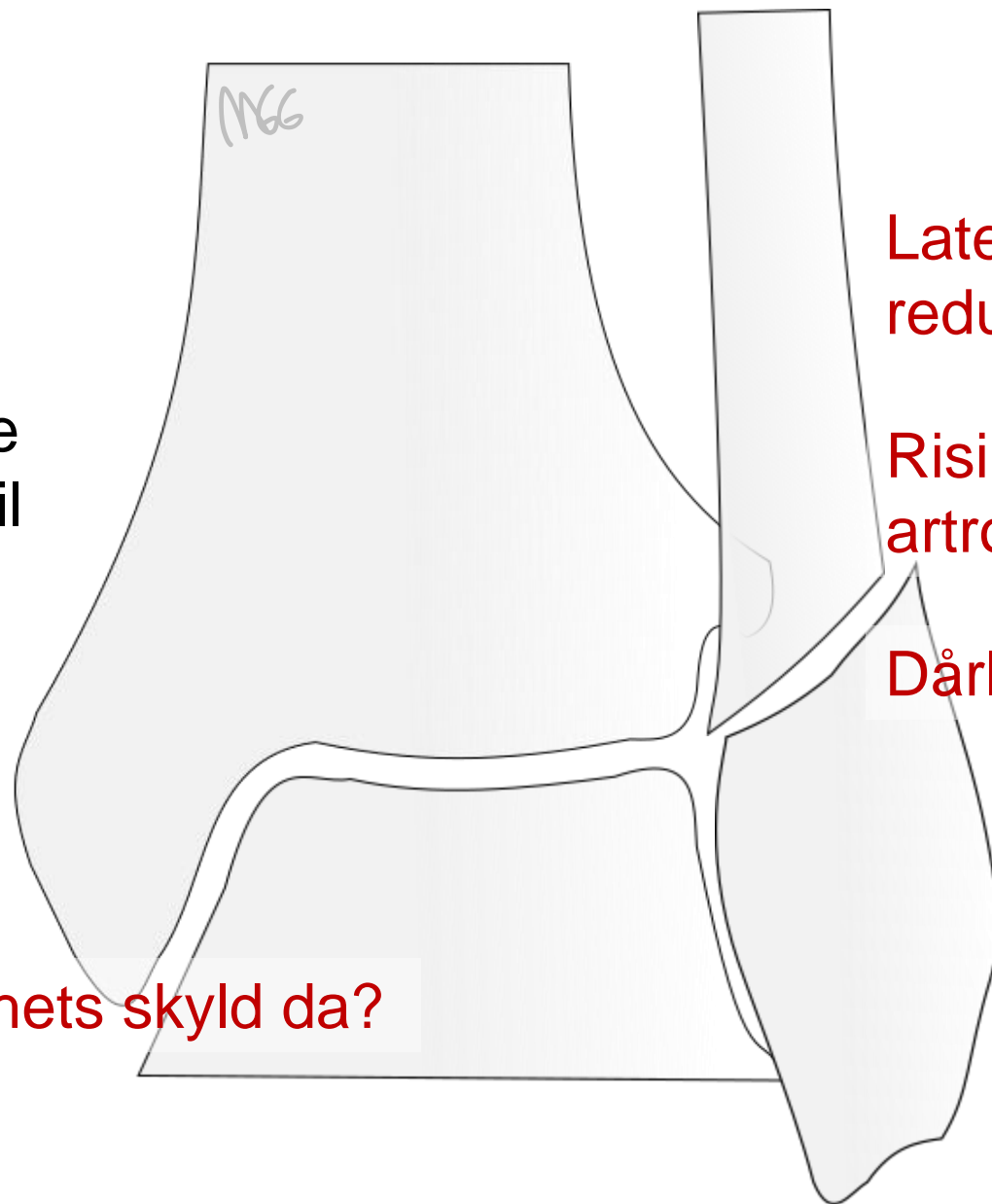


Hvilke ankelbrudd
trenger kirurgi?



Når alt *åpenbart*
står helt feil





De som kan ende opp med å stå feil

Lateralisering av talus = redusert kontaktflate i leddet

Risikofaktor for posttraumatisk artrose

Dårlig resultat på lang sikt

Operere for sikkerhets skyld da?

Men kirurgien har 6-20% komplikasjonsrate

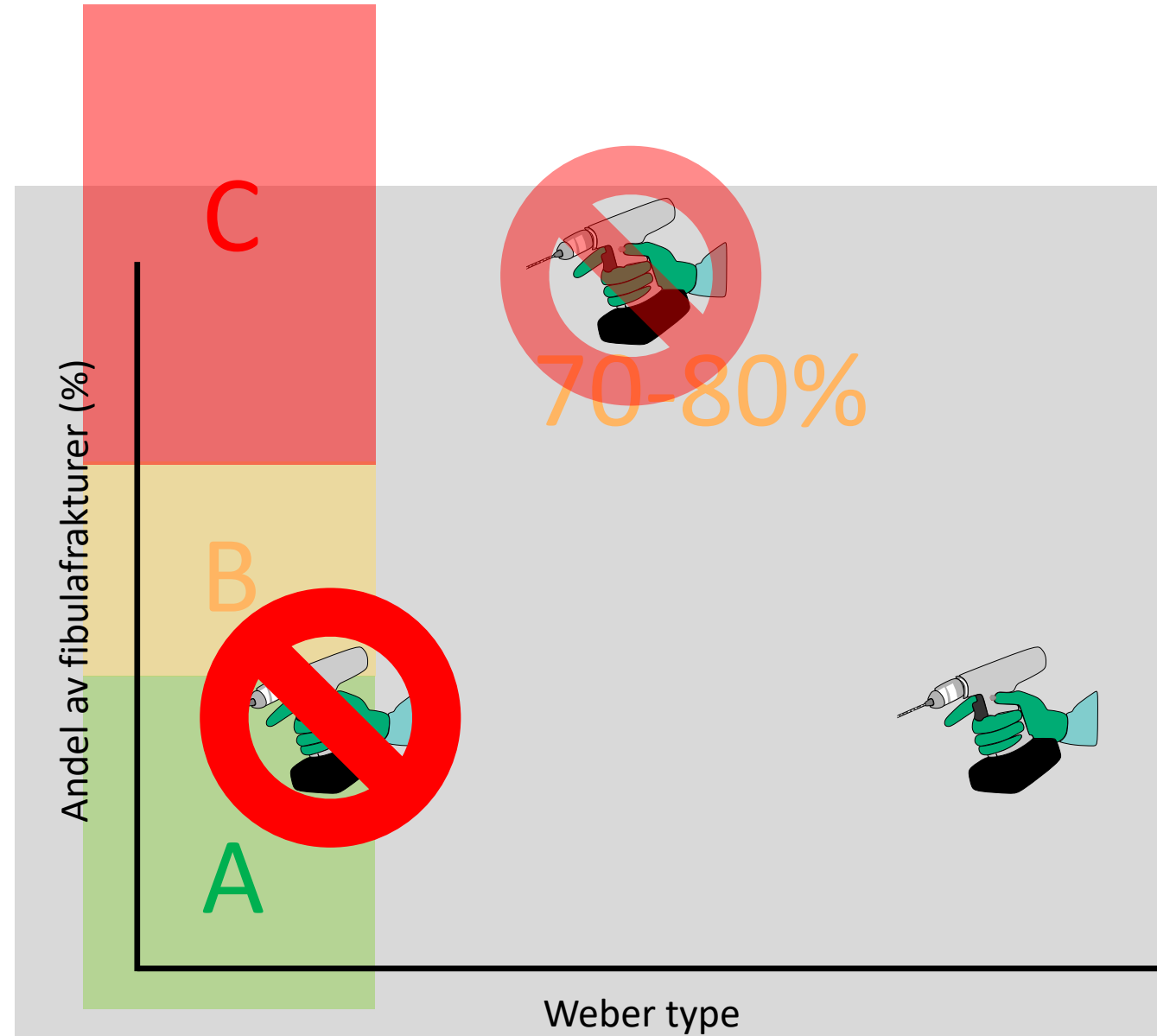
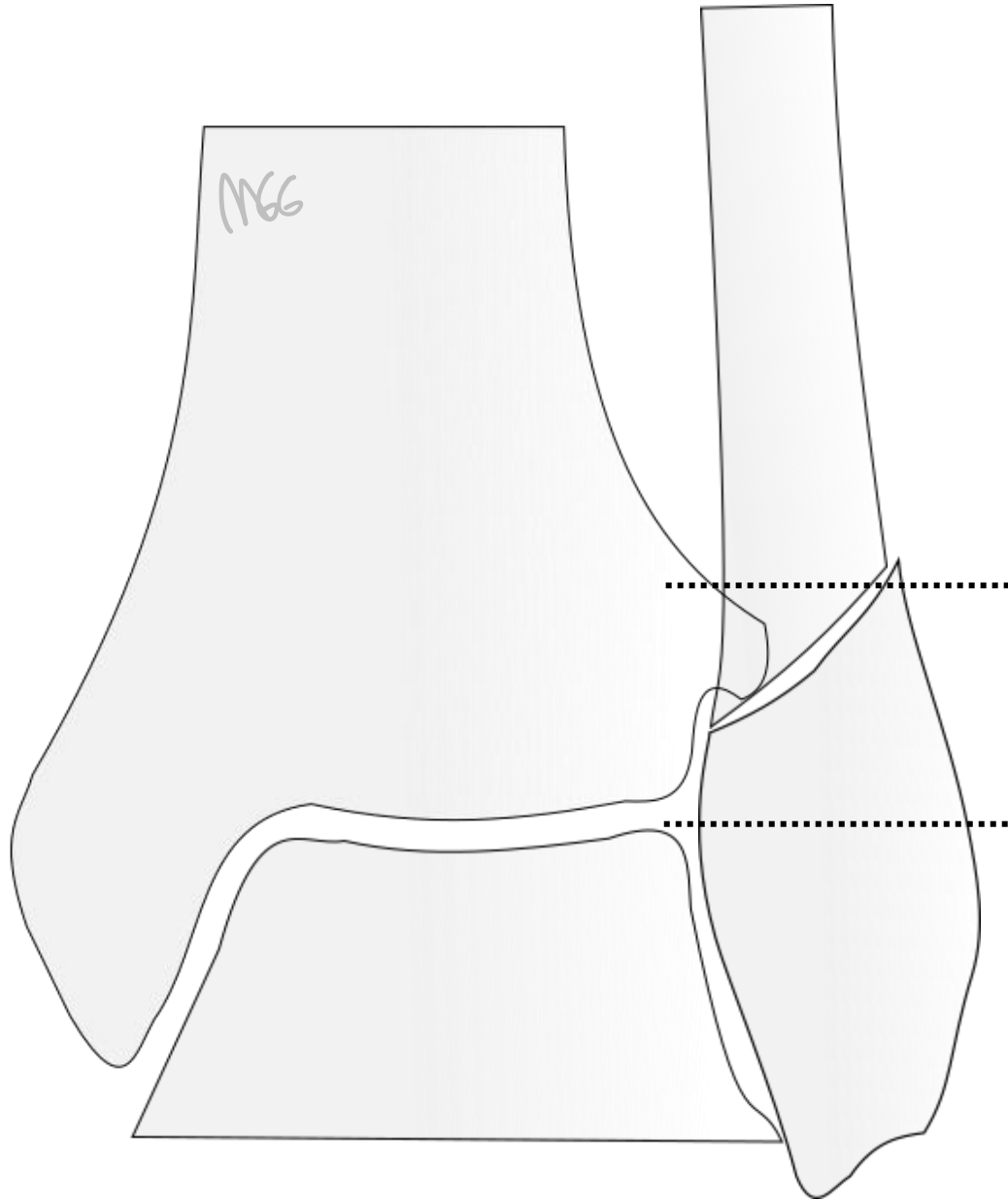


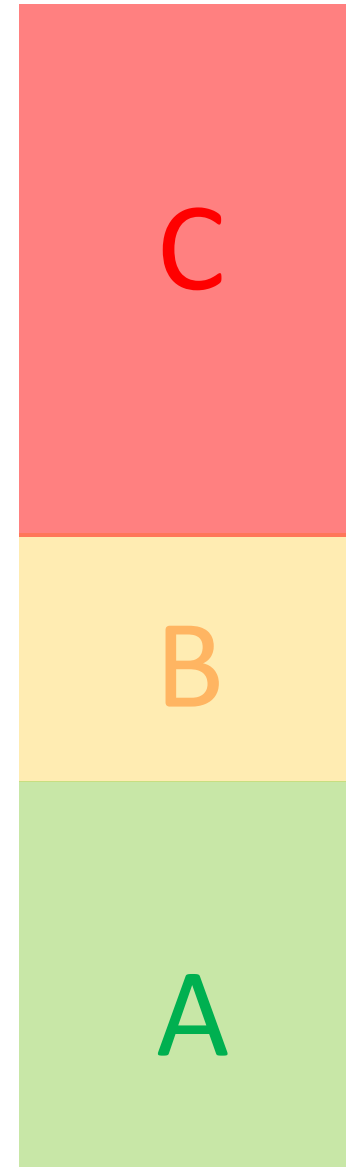
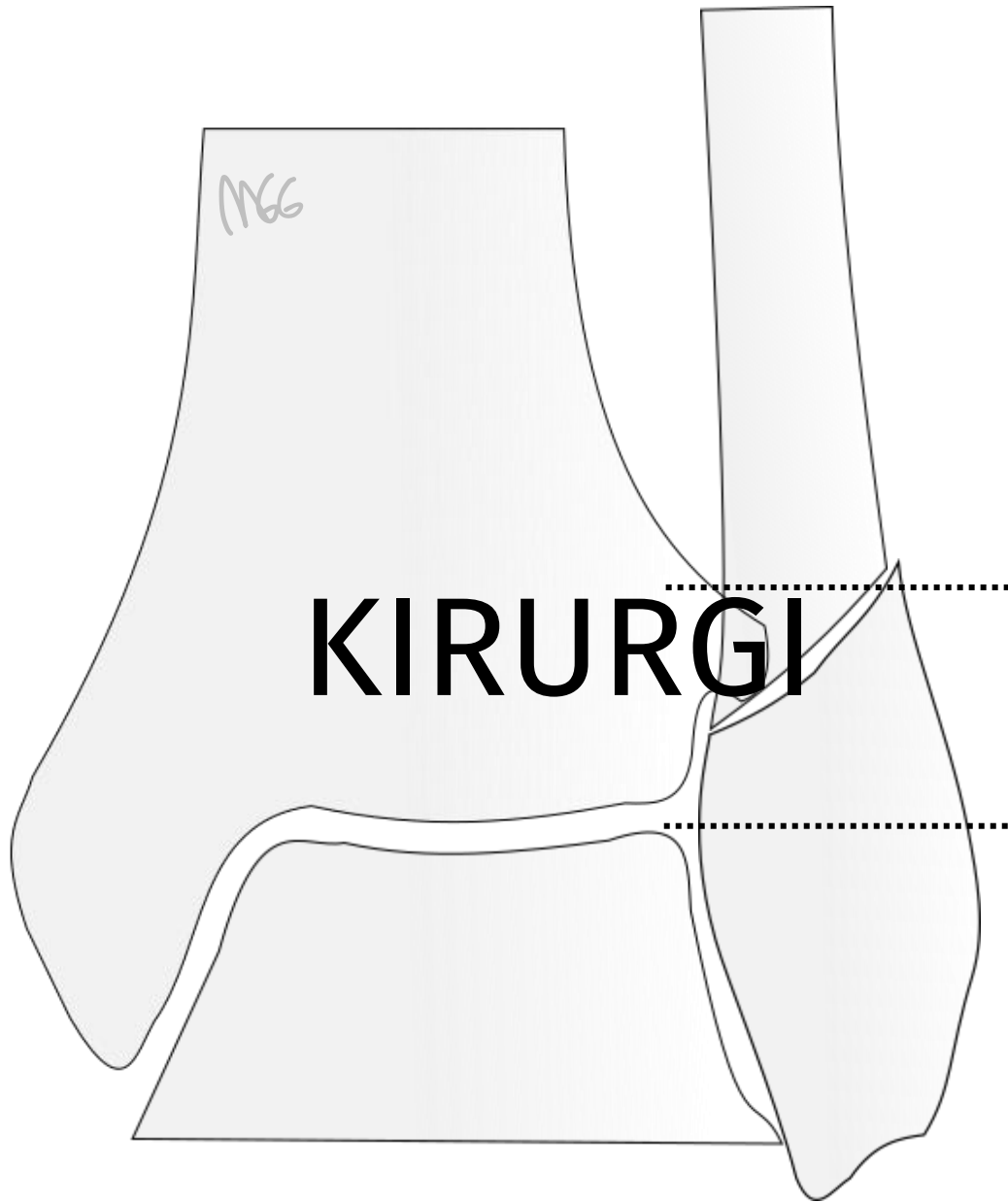
Stabilitet bestemmer

**Feilstilling –
skal åpenbart opereres, haster**

**Ikke feilstilling –
haster ikke, men må utredes for instabilitet**

Weber





C

ALLTID

B

NOEN GANGER

A

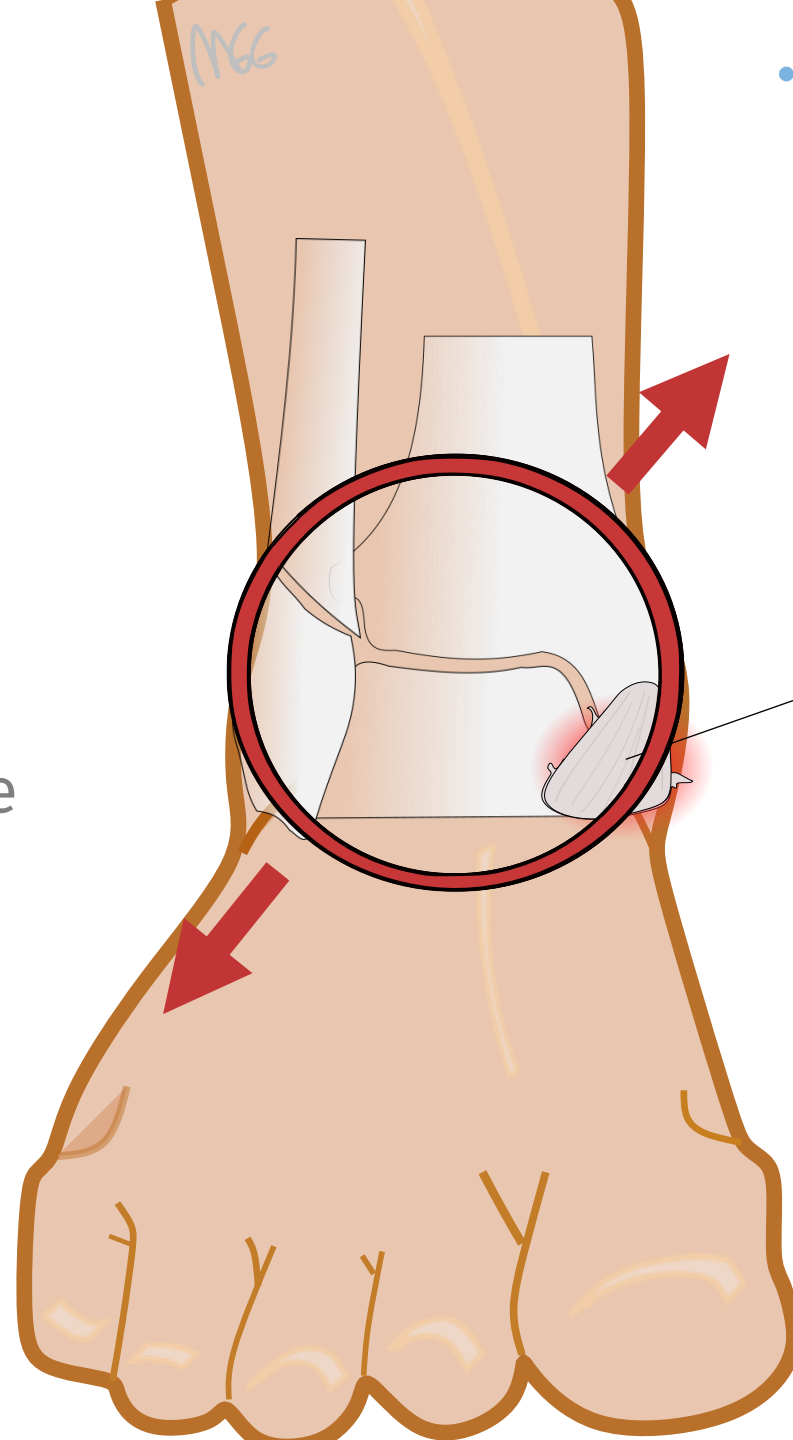
ALDRI

Hva gjør at ankelen
er stabil eller
ustabil?

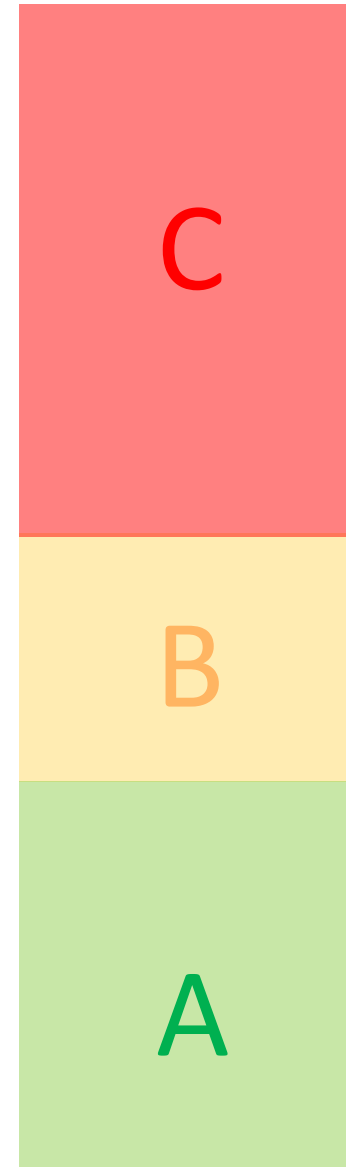
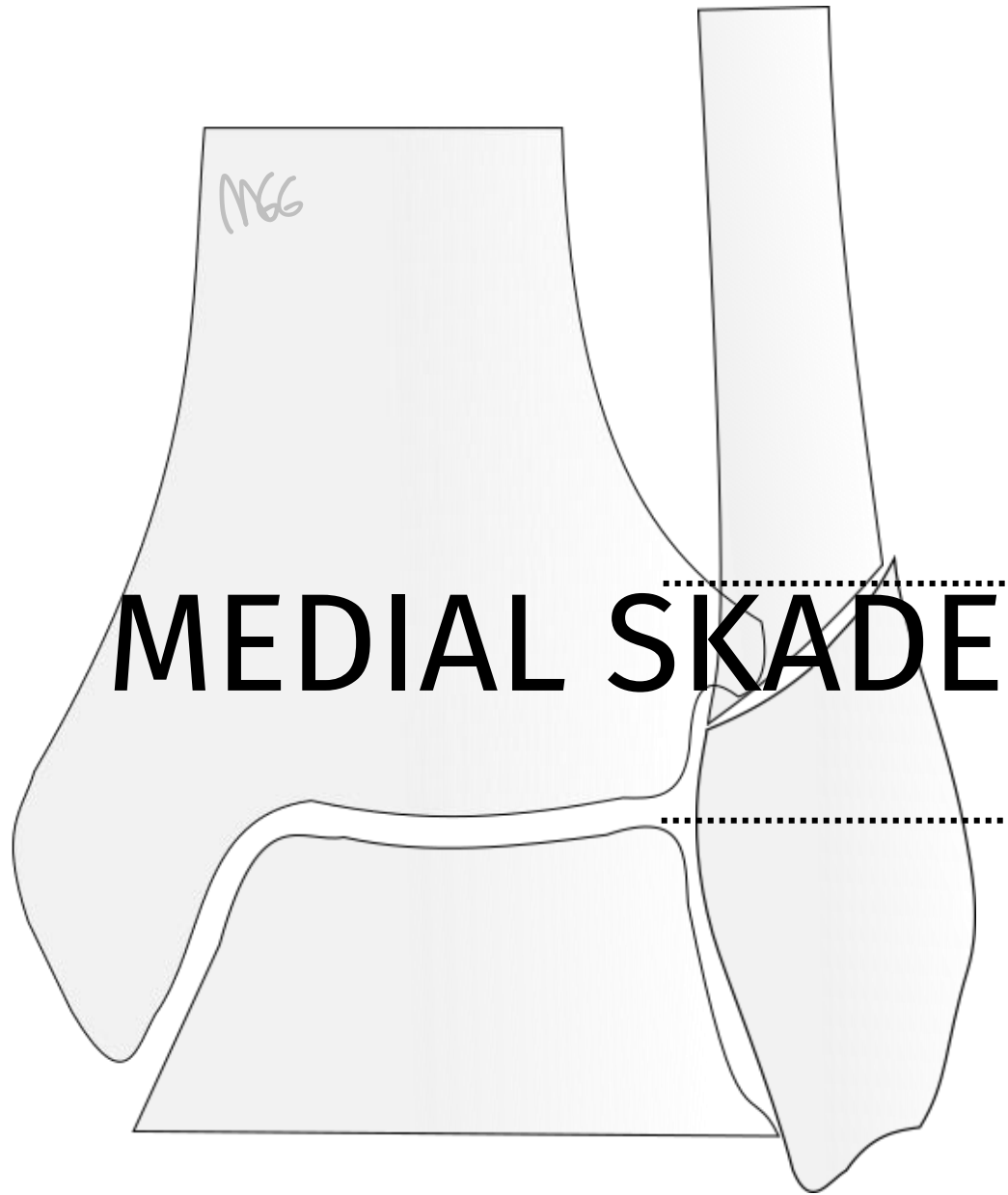
→ Fraktur
ett brudd i ringen

→ Fraktur + medial skade
to brudd i ringen

→ Hvordan vurdere
om det foreligger
medial skade?



Deltoidligamentet
er ankelenes viktigste
stabilisator



ALLTID

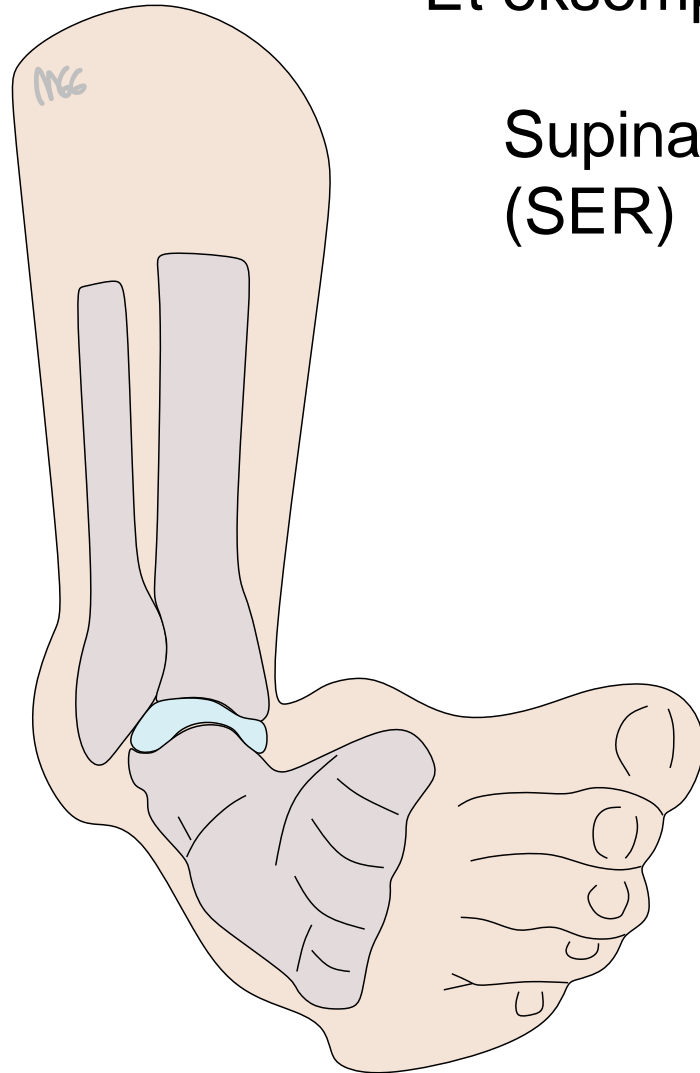
NOEN GANGER

ALDRI

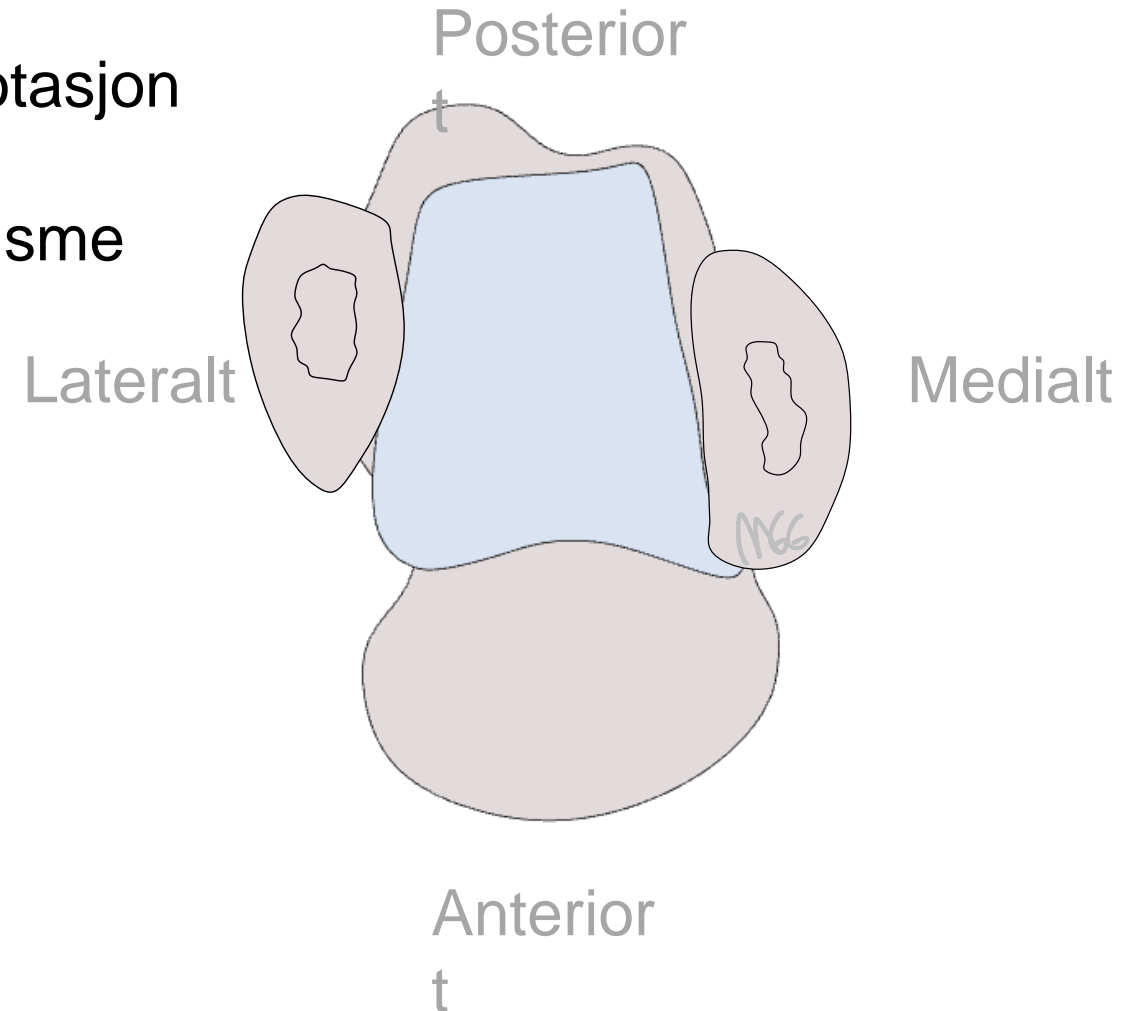
Et eksempel: Weber B oppstår alltid ved

Supinasjon-ekstern rotasjon
(SER)

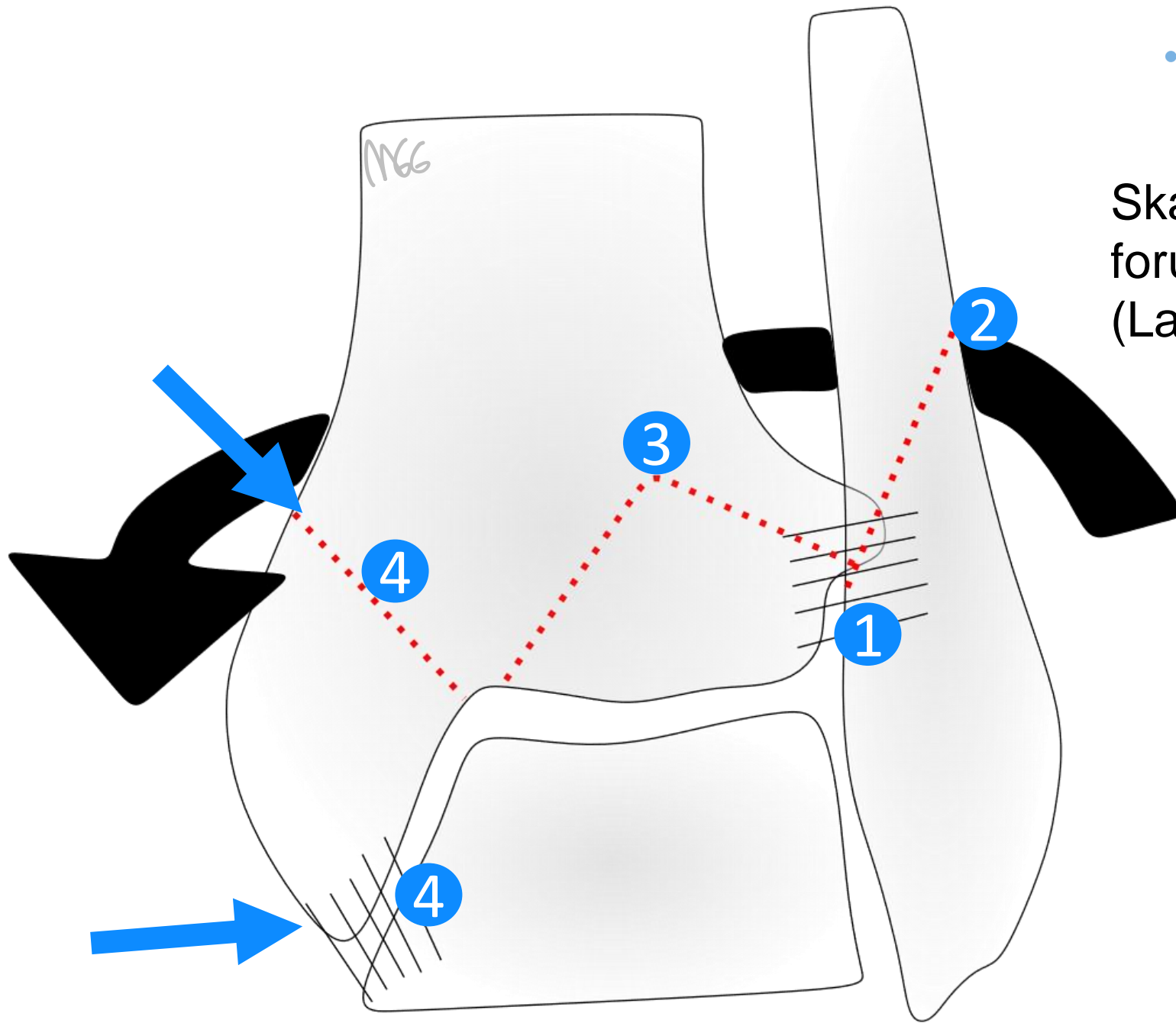
skademekanisme



Foten fiksert supinert i underlaget



Talus utadroterer relativt til tibia og fibula

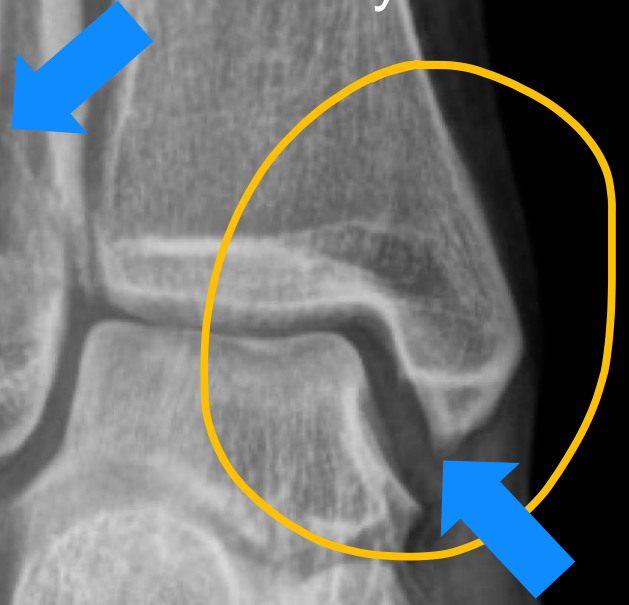


Skademekanismen gir en forutsigbar skadesekvens (Lauge Hansen)

Vanlig, ubelastet røntgen

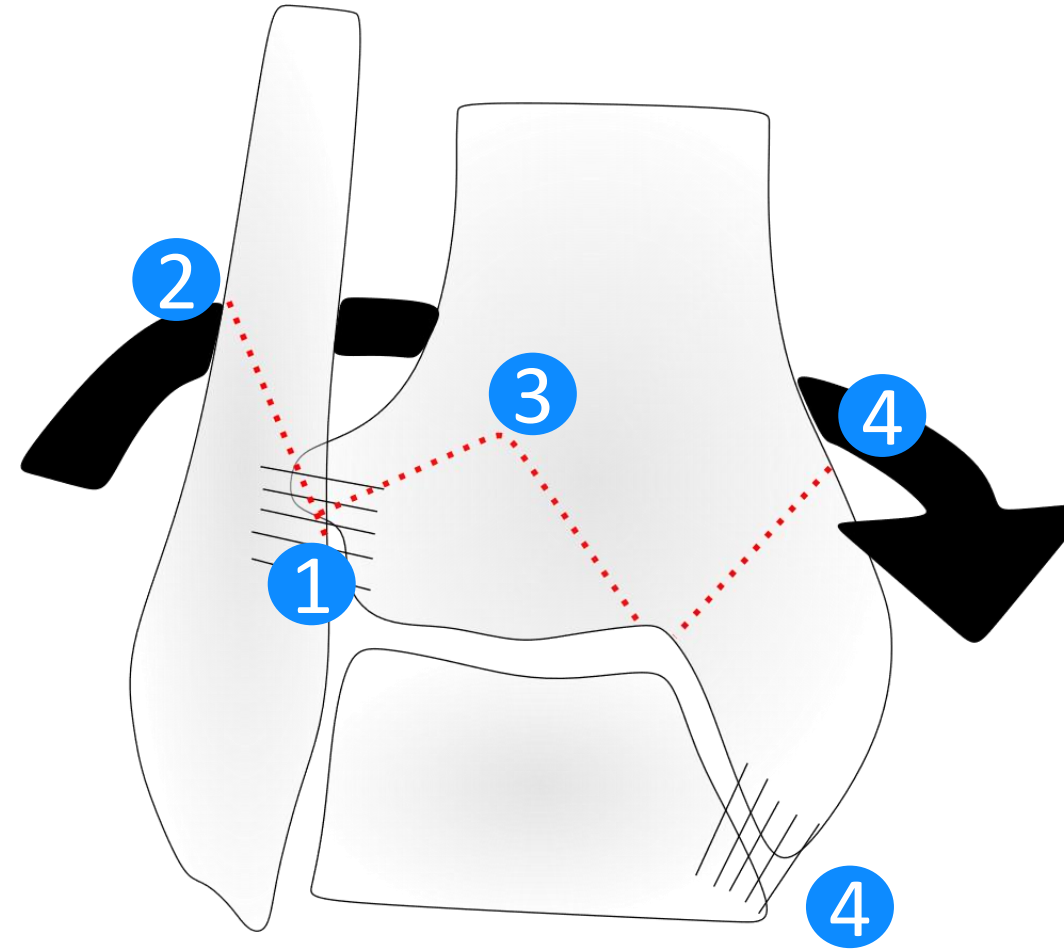
Er den stabil eller ustabil?
Konservativt eller kirurgi?

Fraktur i syndesmosenivå 2

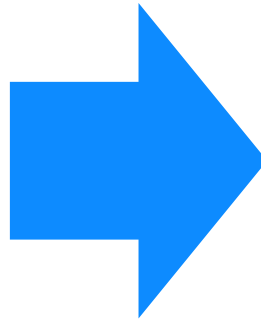
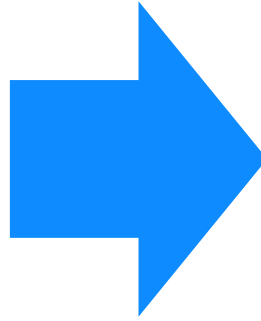
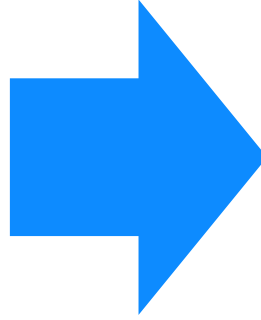


Bare en stabil 2 eller ustabil ligamentær 4 ?

Supinasjon-ekstern rotasjon (SER)



Hvilken er ustabil?





Isolert fibulafraktur i syndesmosenivå uten sikre tegn til medial skade

Da må vi gjøre ytterligere undersøkelser for å vurdere om deltoid er intakt



Hvilken metode bør vi bruke?

MR?

Vanskelig å vurdere nyskadet ankel

Dyrt

Kapasitet

Ultralyd?

Vanskelig gjennomførbart i praksis

Medial klinikk_(smerte, hevelse, blødning)?

Bevist å være omtrent like bra som ren gjetting

Røntgen stresstester?

Sannsynligvis veien å gå, men med utfordringer...

Røntgen stresstester

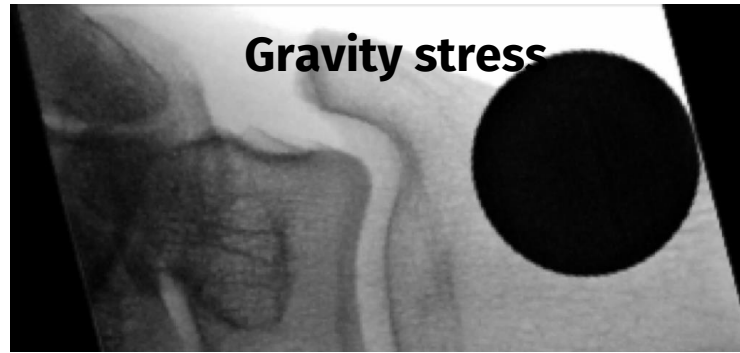
Gravity stress røntgen:



Belastningsrøntgen:



Det er enkelt når:



Three week versus six week immobilisation for stable Weber B type ankle fractures: randomised, multicentre, non-inferiority clinical trial

Tero Kortekangas,^{1,2} Heidi Haapasalo,³ Tapio Flinkkilä,^{1,2} Pasi Ohtonen,^{2,4} Simo Nortunen,^{1,2} Heikki-Jussi Laine,³ Teppo LN Järvinen,^{5,6} Harri Pakarinen^{1,2}

thebmj Visual Abstract

Randomised controlled trial

Immobilising ankle fractures

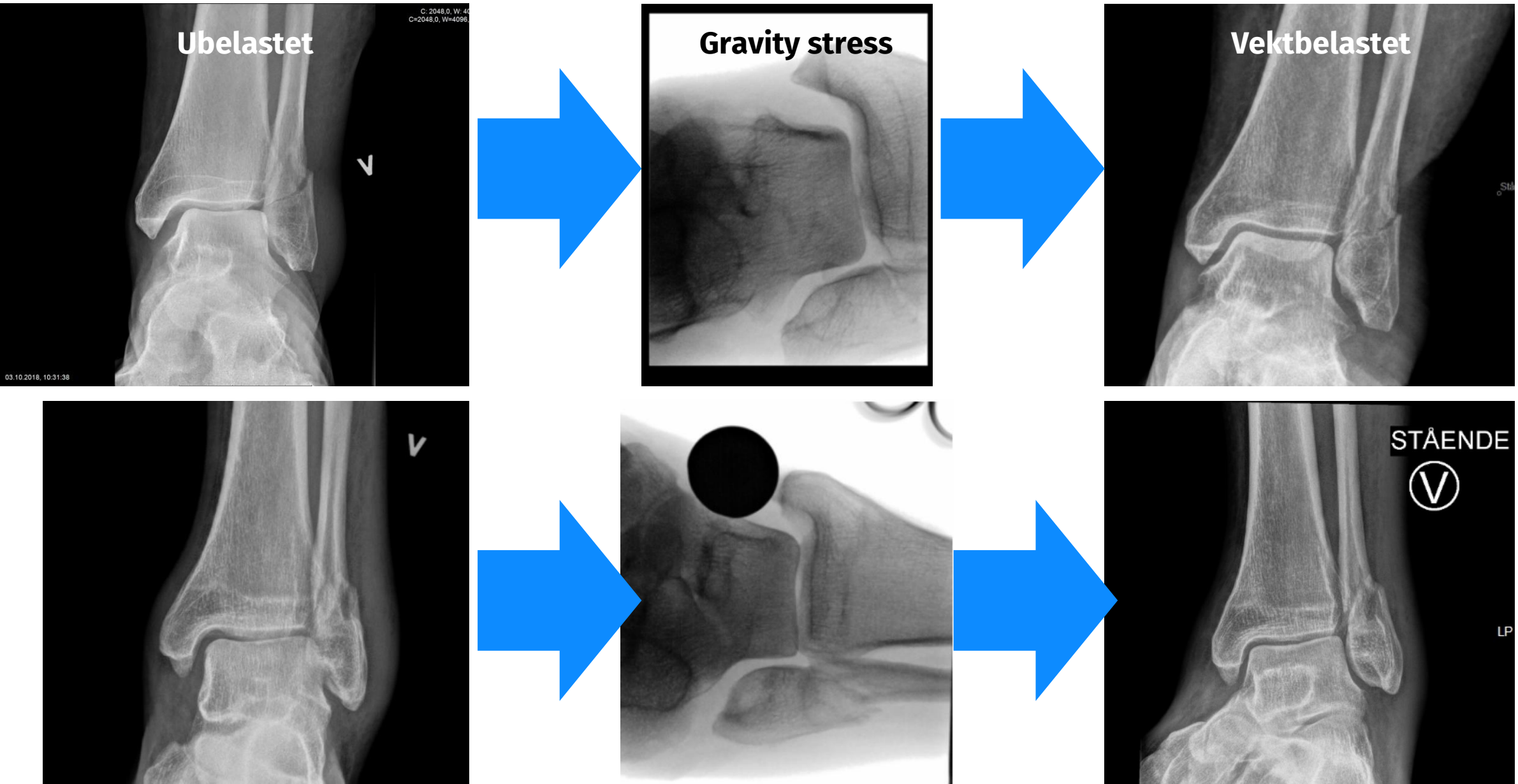
How long should casts or orthoses be used to restrict movement after a break?

Summary A shorter 3 week period of immobilisation proved non-inferior to traditional 6 weeks of cast immobilisation.

Population Skeletally mature patients with an isolated, stable weber B type fibula fracture

247 51% male Age: 16–85 years Multicentre trial

Mer forvirrende når:



Ubelastet

Gravity stress

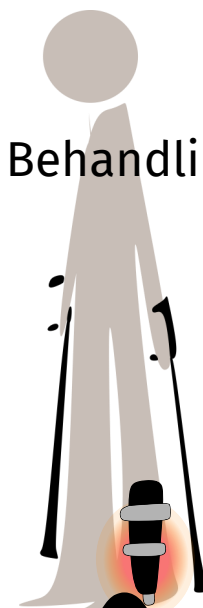
Belastning

Stabilitet

= Behandling



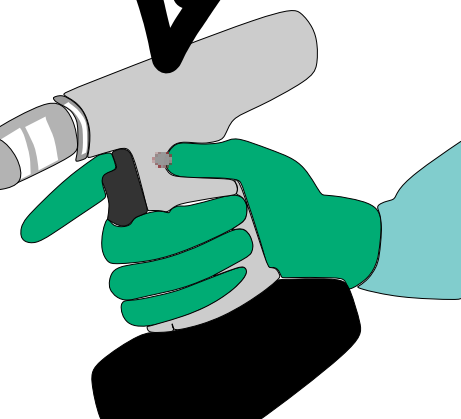
Stabil



Delvis ustabil



Ustabil

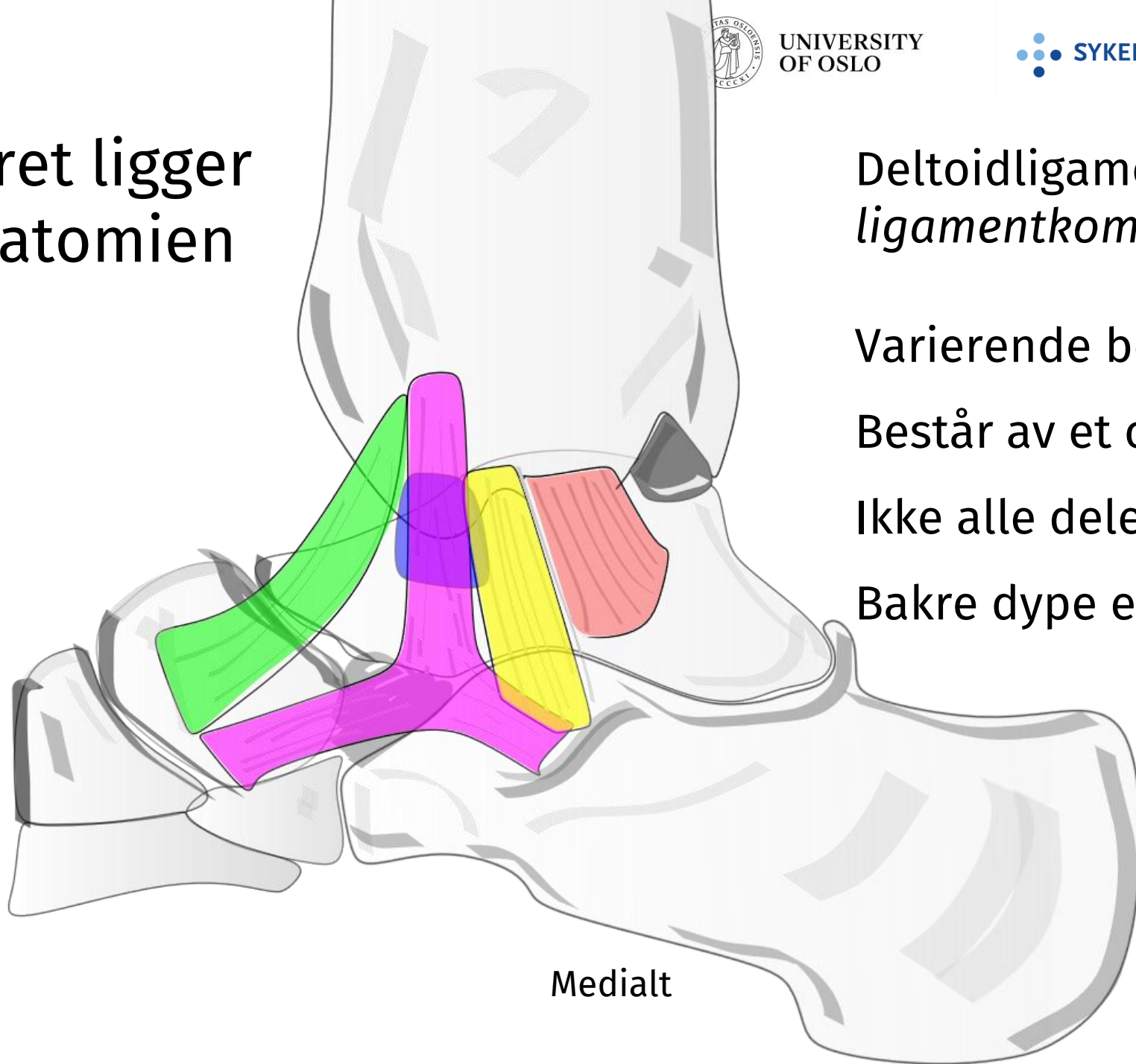


En test viser klar instabilitet mens den andre viser helt anatomisk ledd

Bare ved å endre leggens orientering og belastning lagt til



Svaret ligger
i anatomen



Deltoidligamentet er et
ligamentkompleks

Variierende beskrivelser, men

Består av et overfladisk og et dypt lag

Ikke alle deler er konstante

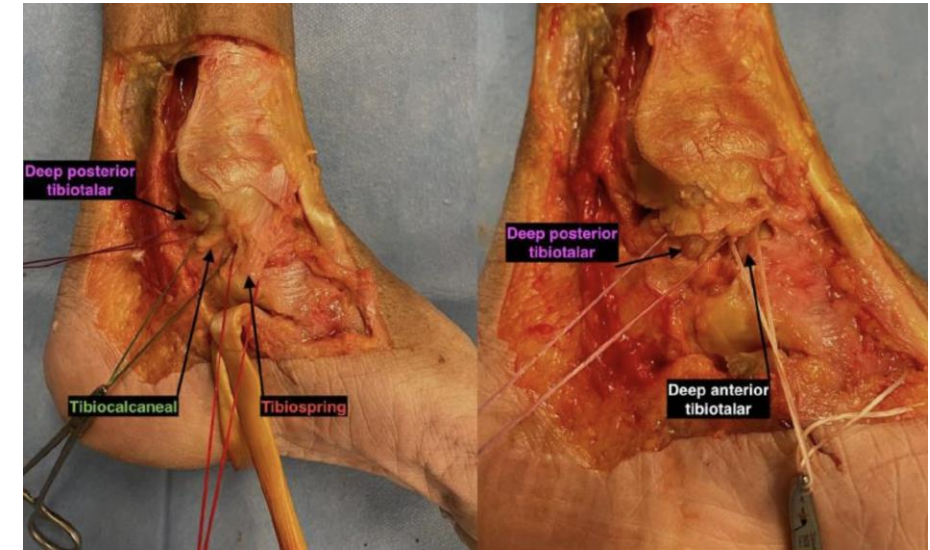
Bakre dype er tykke og konstant

Boss & Hintermann, 2002, Foot Ankle Int
Hintermann & Ruiz, 2021, Foot Ankle Clin
Milner & Soames, 1998, Foot Ankle Int

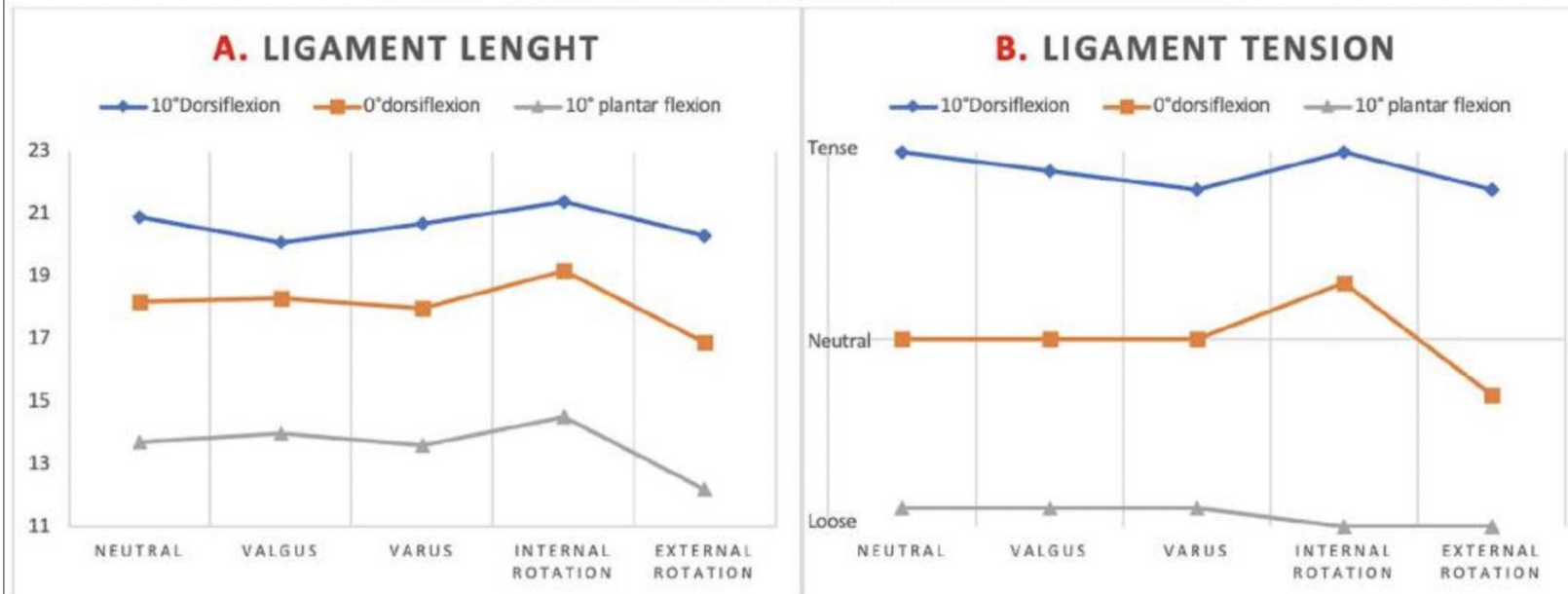
> *Foot Ankle Orthop.* 2022 Jun 14;7(2):24730114221104078. doi: 10.1177/24730114221104078. eCollection 2022 Apr.

The Anatomy and Function of the Individual Bands of the Deltoid Ligament—and Implications for Stability Assessment of SER Ankle Fractures

Martin G Gregersen ¹, Andreas Fagerhaug Dalen ², Fredrik Nilsen ³, Marius Molund ³



DEEP POSTERIOR TIBIOTALAR LIGAMENT



2. Testet ligament lengde og tensjon (n=10):

Stram i plantarfleksjon:

TNL TSL dATTL

Stram i utadrotasjon:

TNL TSL dATTL

I FARE

Slakk i plantarfleksjon:

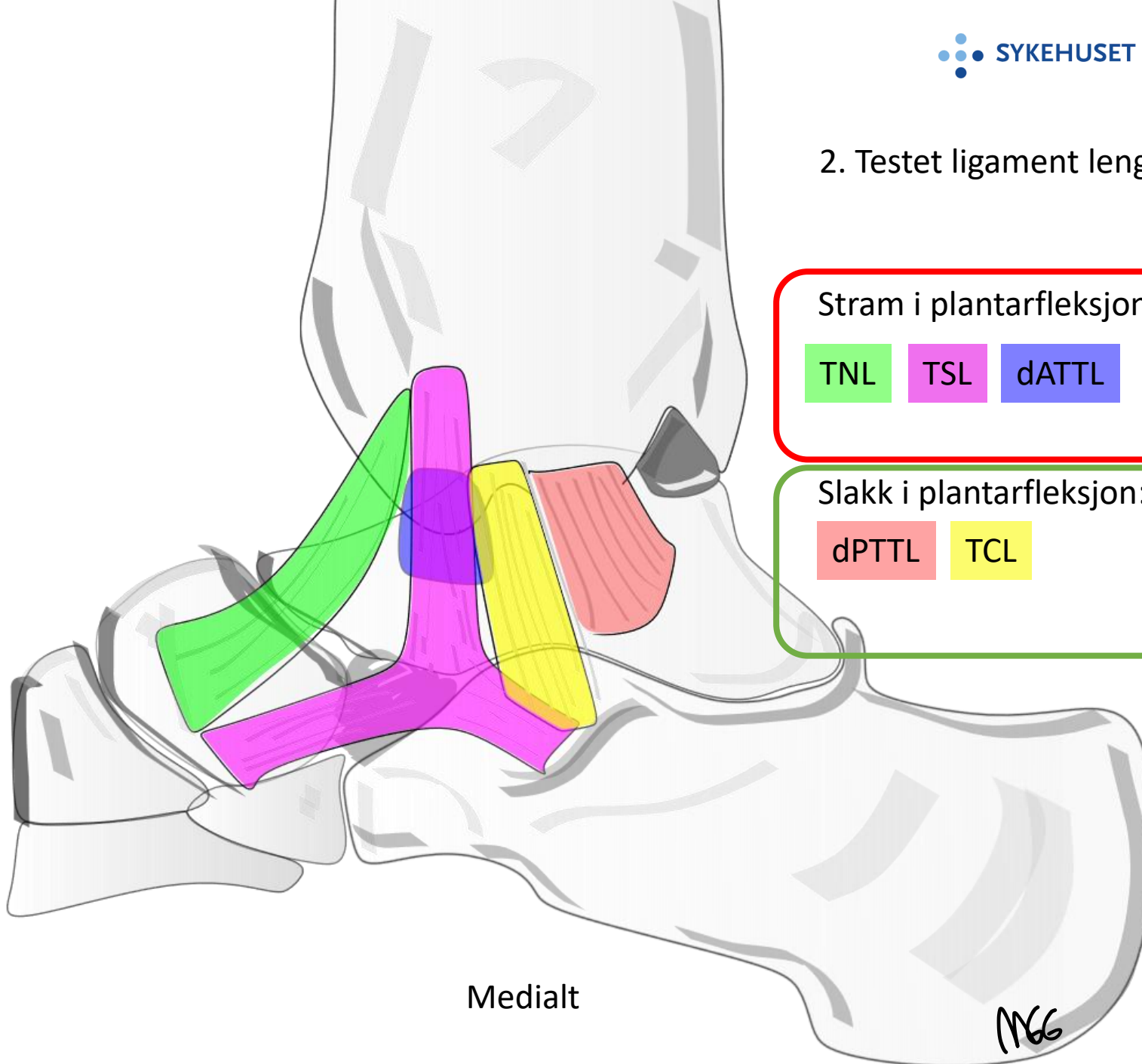
dPTTL TCL

Slakk i utadrotasjon:

dPTTL TCL

BESKYTTET

Anatomisk studie



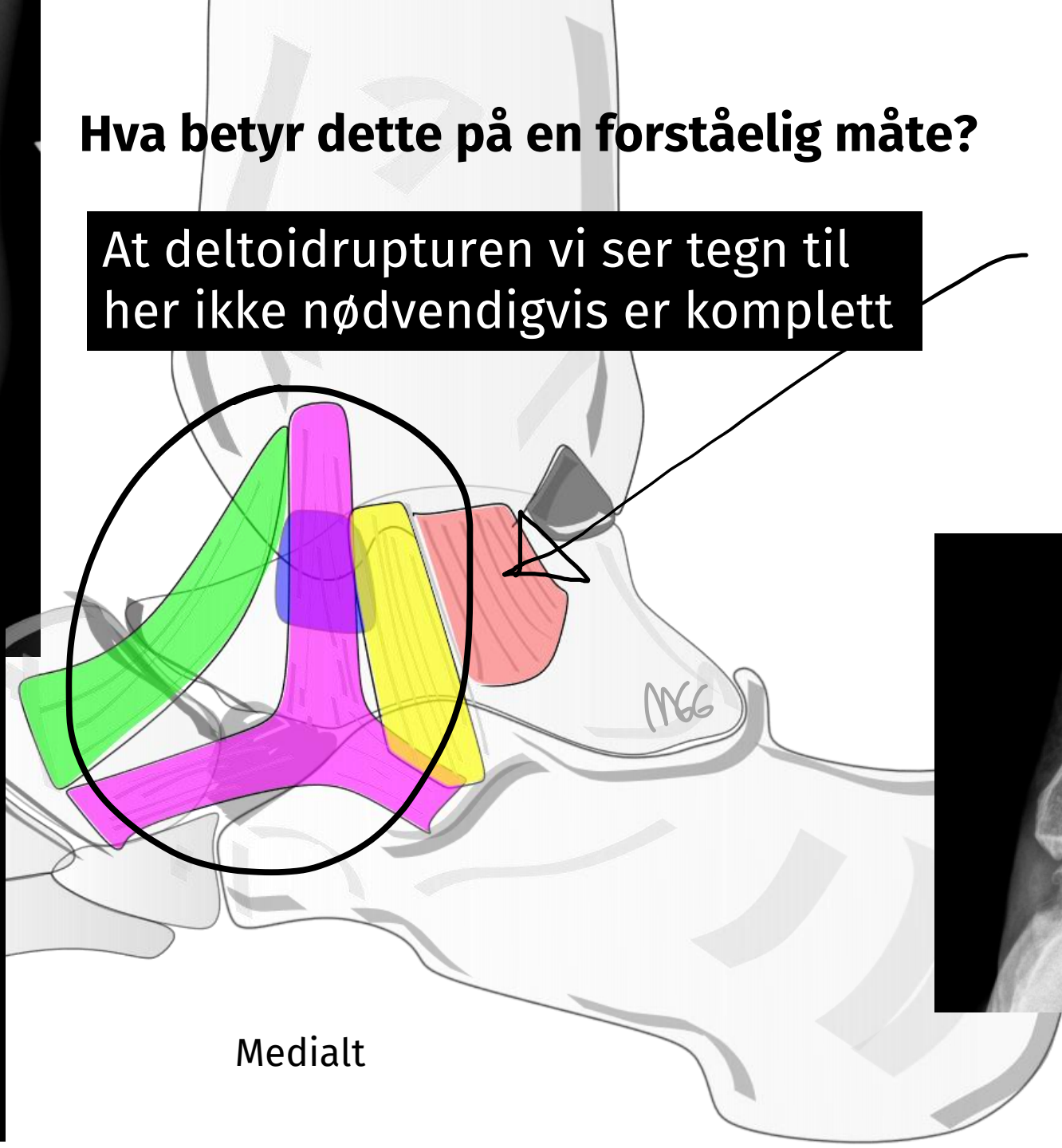
i en SER skademekanisme



Hva betyr dette på en forståelig måte?

At deltoidrupturen vi ser tegn til her ikke nødvendigvis er komplett

BAKRE
DYPE
(PTTL)

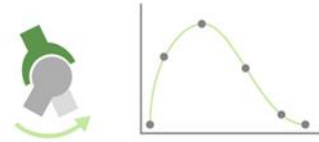


Weber B med bare bakre
dype intakt

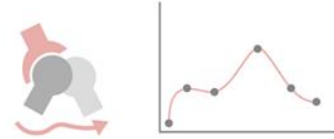


Er dette stabilt nok?

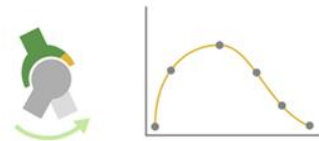
Hvor stabile eller ustabile er egentlig
ankelbruddene med ulik grad av deltoidskade?



Step 1: Collect data on **normal joint movement**.



Step 2: Collect data on **injured joint movement**.



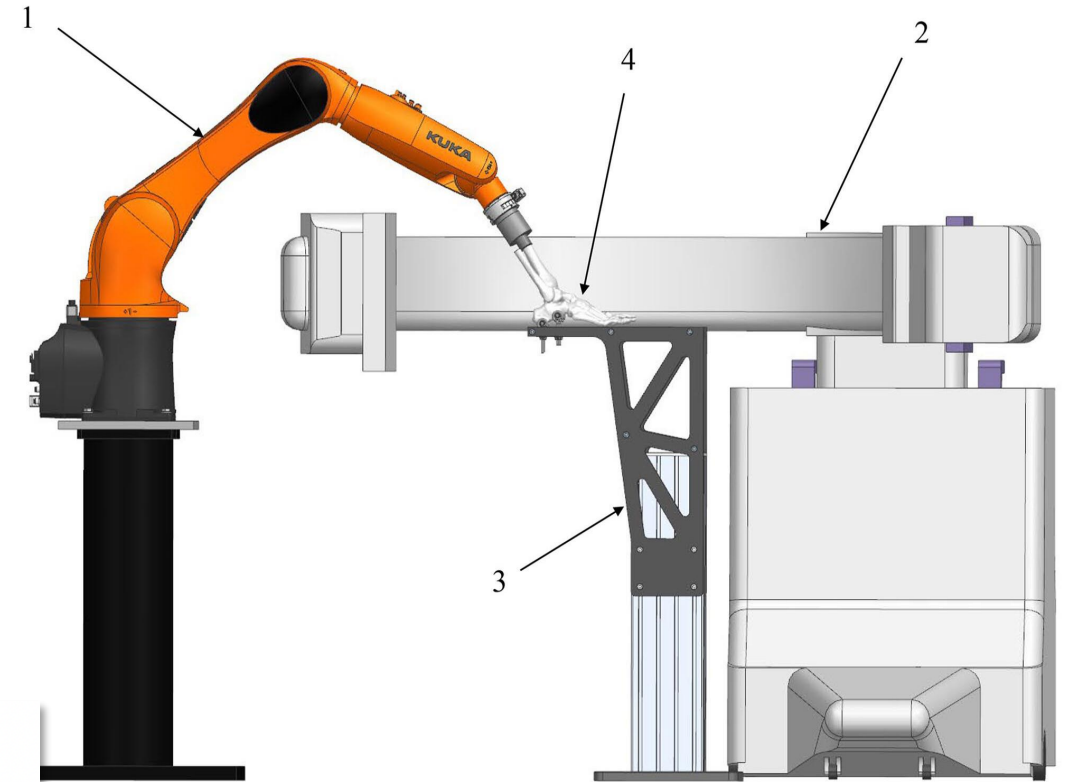
Step 3: Collect data on **surgically repaired joint**.

> [Foot Ankle Int.](#) 2023 Jul 21;10711007231180212. doi: 10.1177/10711007231180212.

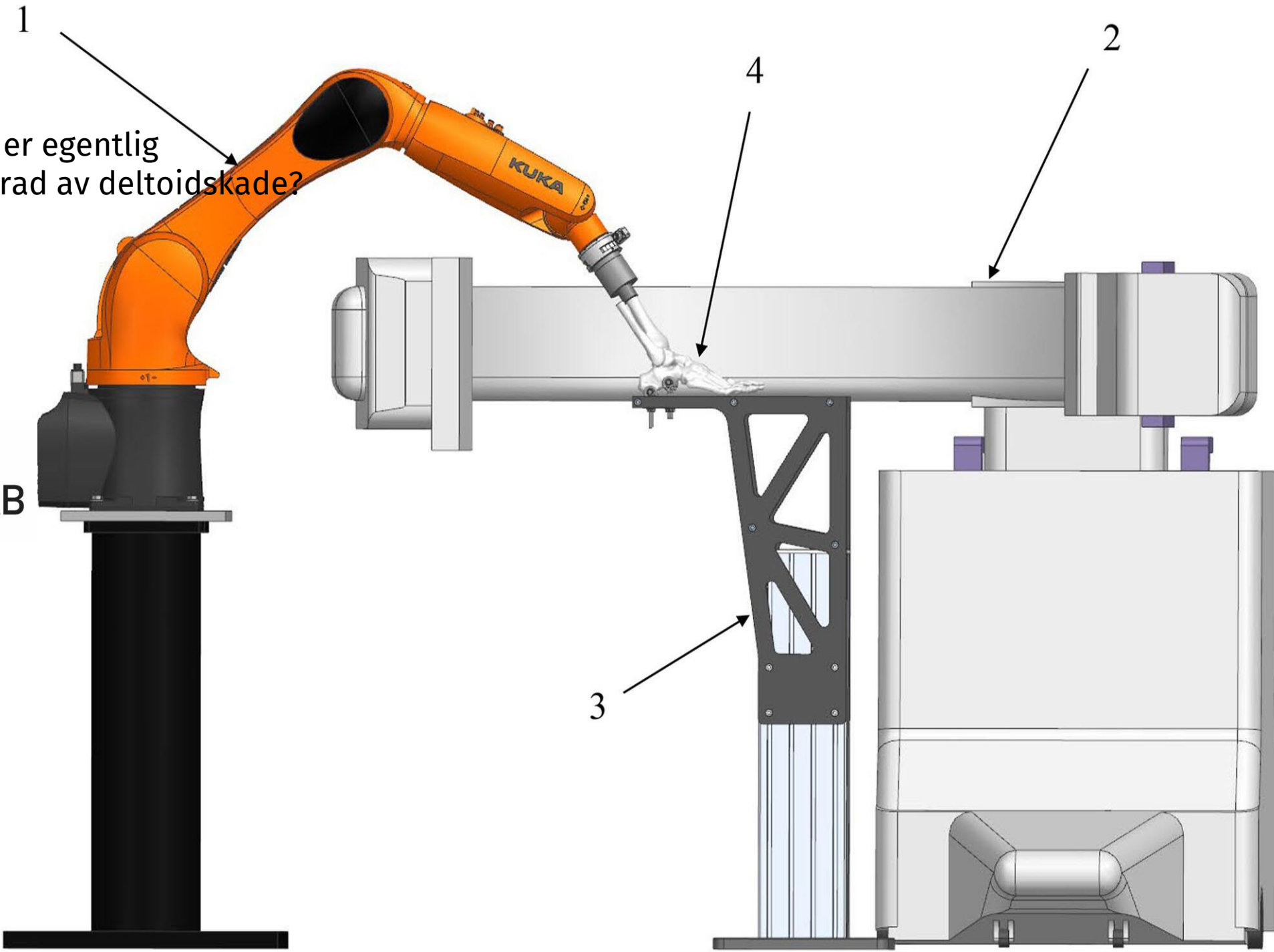
Online ahead of print.

Effects of Progressive Deltoid Ligament Sectioning on Weber B Ankle Fracture Stability

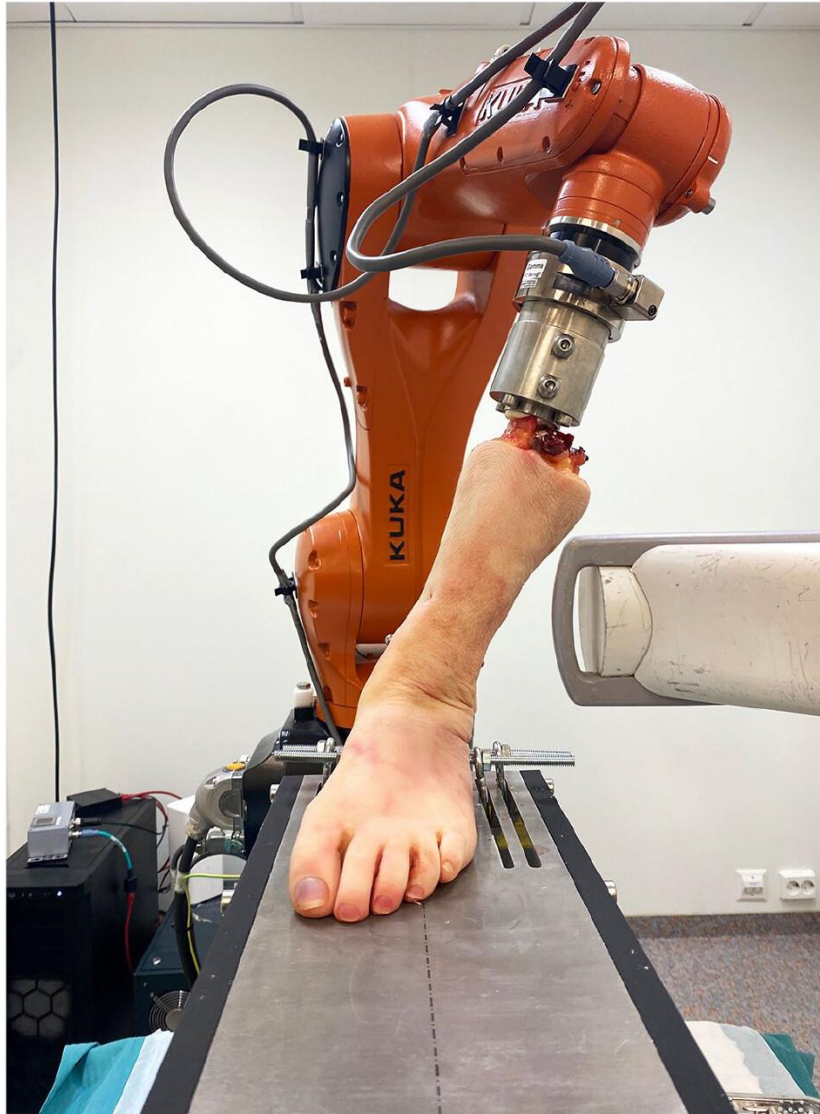
Andreas F Dalen ^{1 2}, Martin G Gregersen ^{3 4}, Aleksander L Skrede ⁵, Øystein Bjelland ⁵,
Tor Åge Myklebust ^{1 6}, Fredrik A Nilsen ⁷, Marius Molund ⁷



Hvor stabile eller ustabile er egentlig ankelbruddene med ulik grad av deltoidsskade?

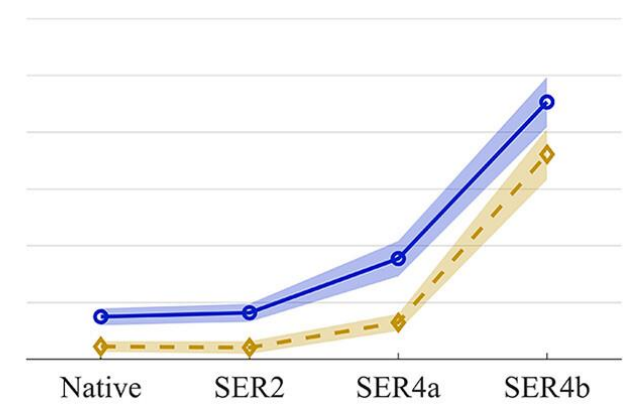
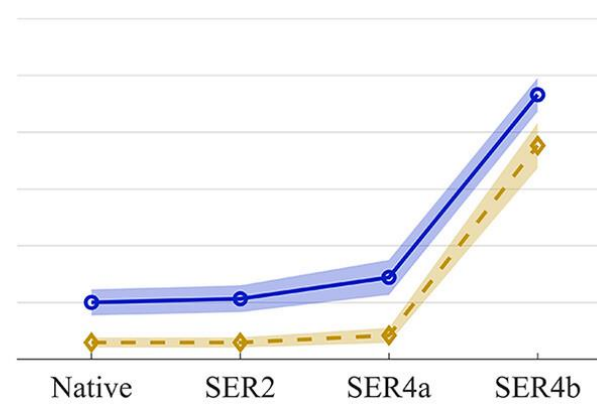
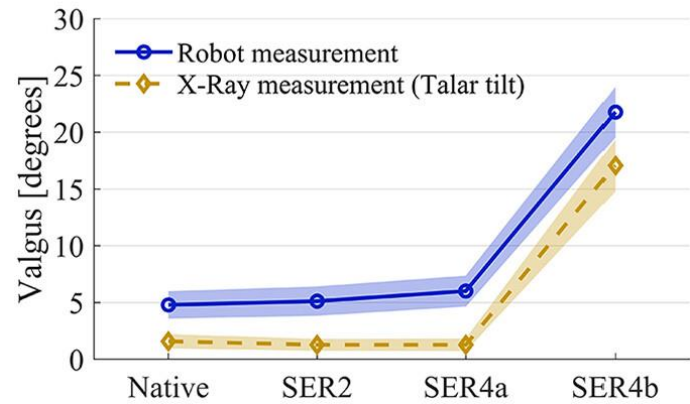
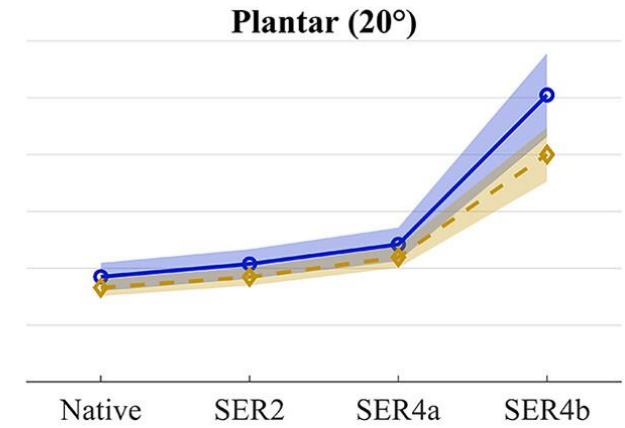
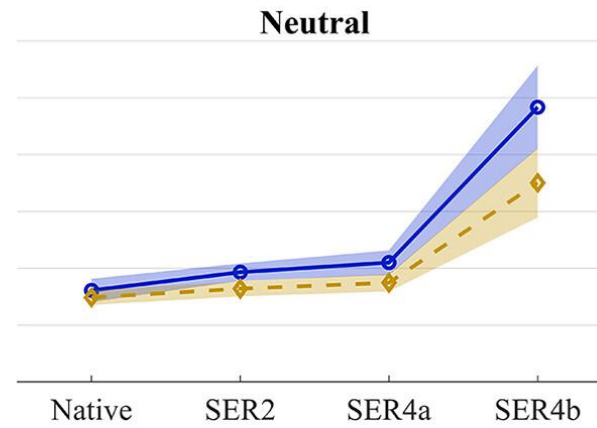
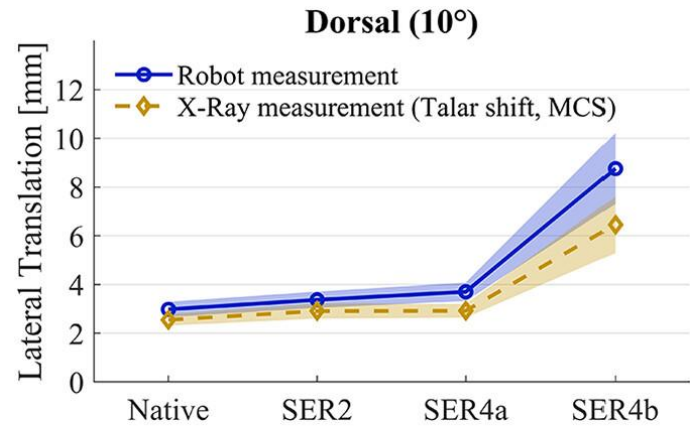


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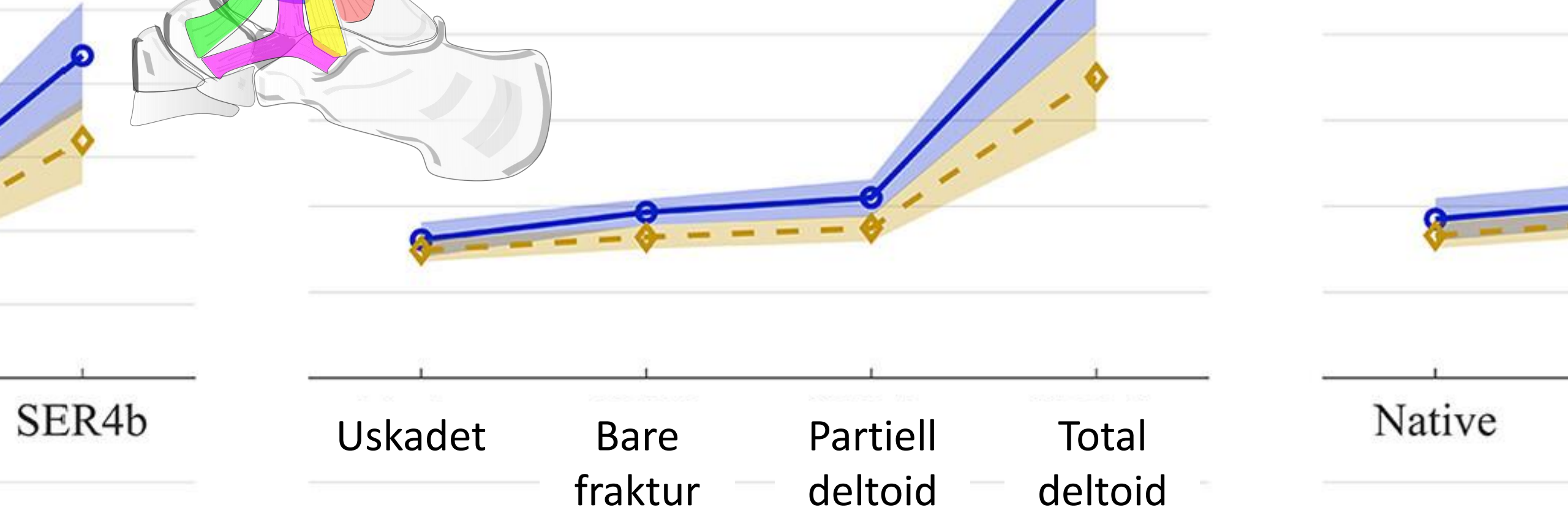
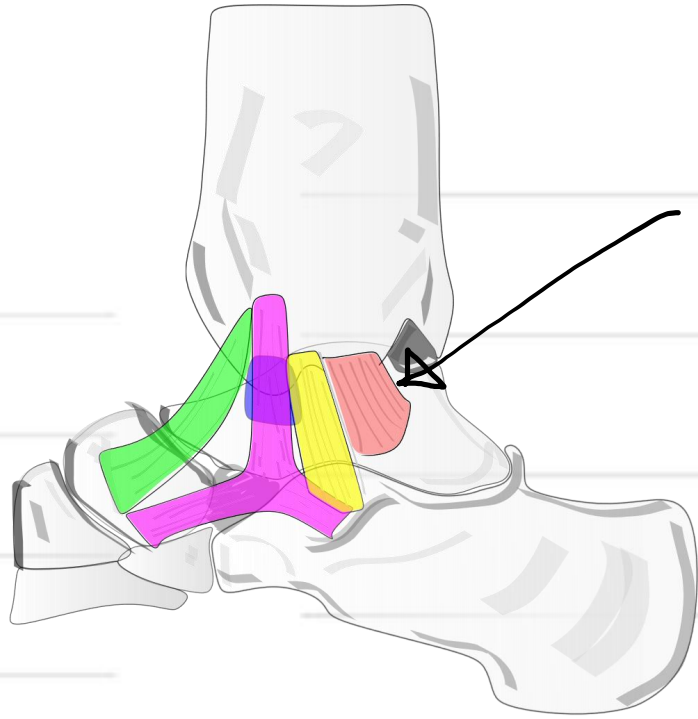


Resultater



Neutral

MCS)



SER4b

Uskadet

Bare fraktur

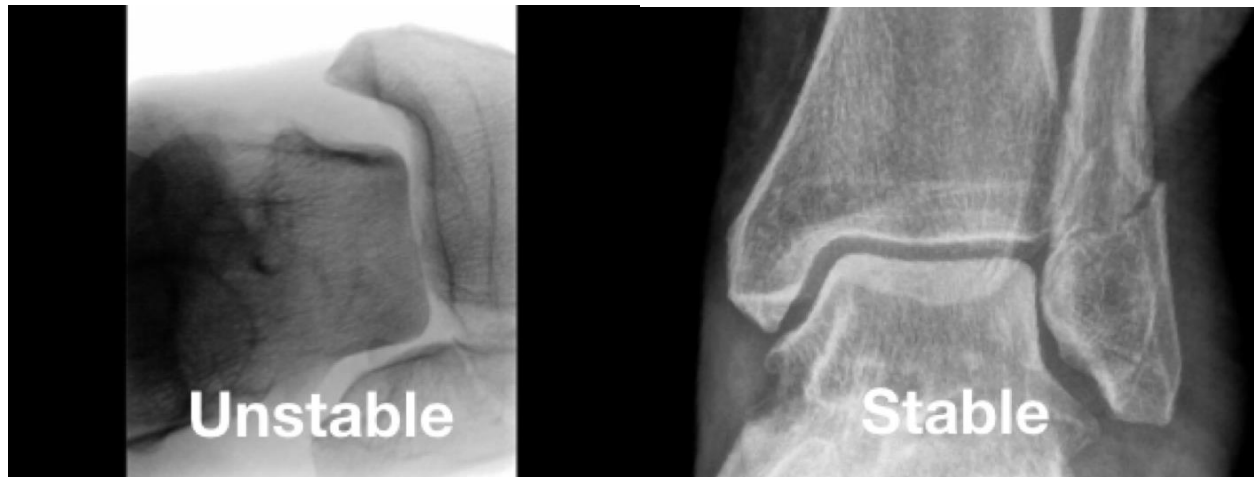
Partiell deltoid

Total deltoid

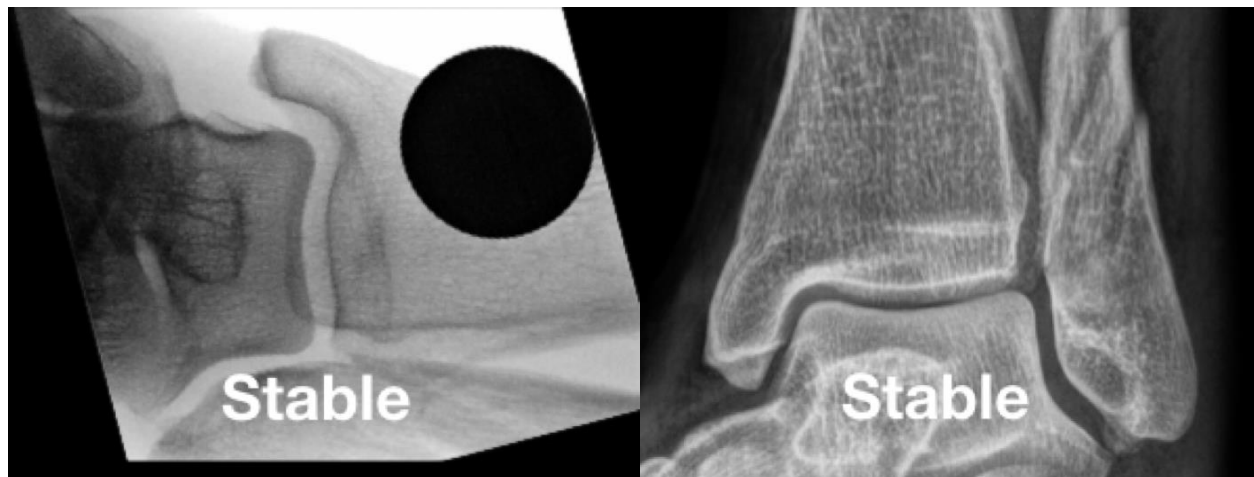
Native

Det kliniske spørsmålet

Går det like bra med disse...



...som med disse?



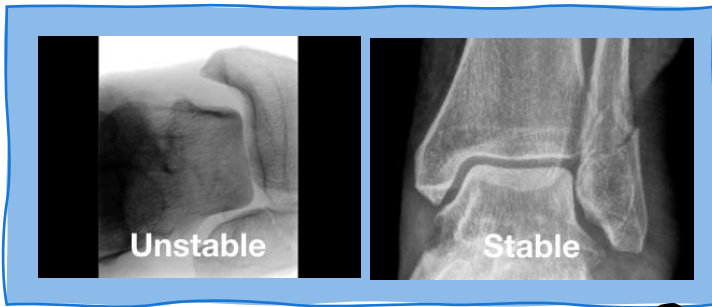
hvis de får den samme konservative behandlingen?

151 pasienter

2 ustabile på belastet røntgen - ble operert

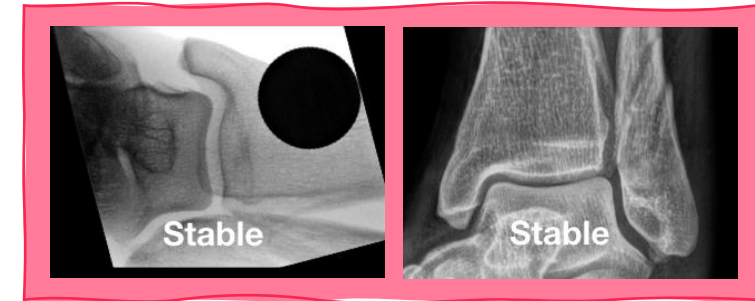
149 var stabile på belastet røntgen

Delvis ustabil

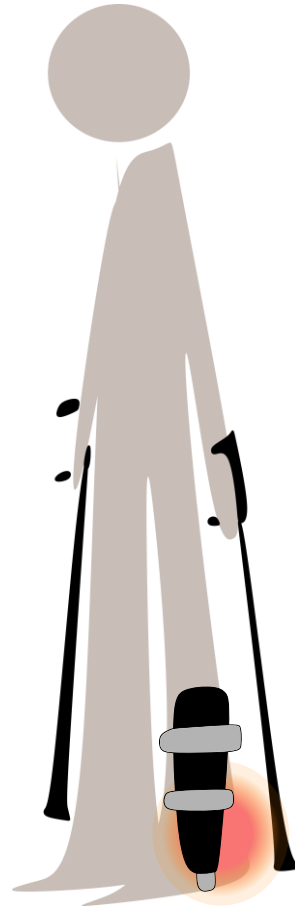


n = 61

Stabil



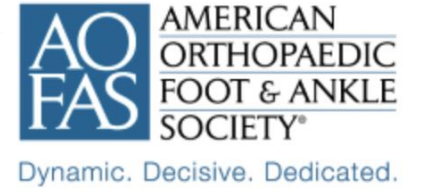
n = 88



2 års oppfølgig - Blir de like bra?

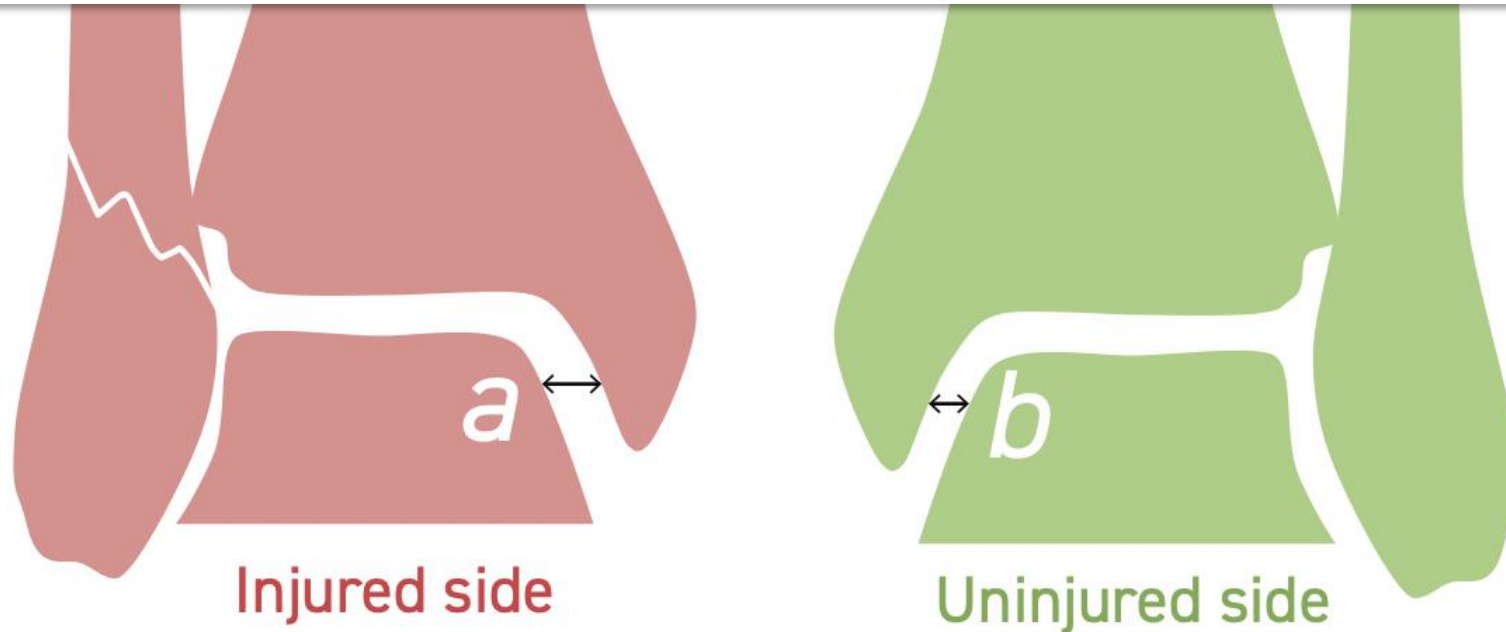
Gror de med normal stilling?

AOFAS Annual Meeting 2021



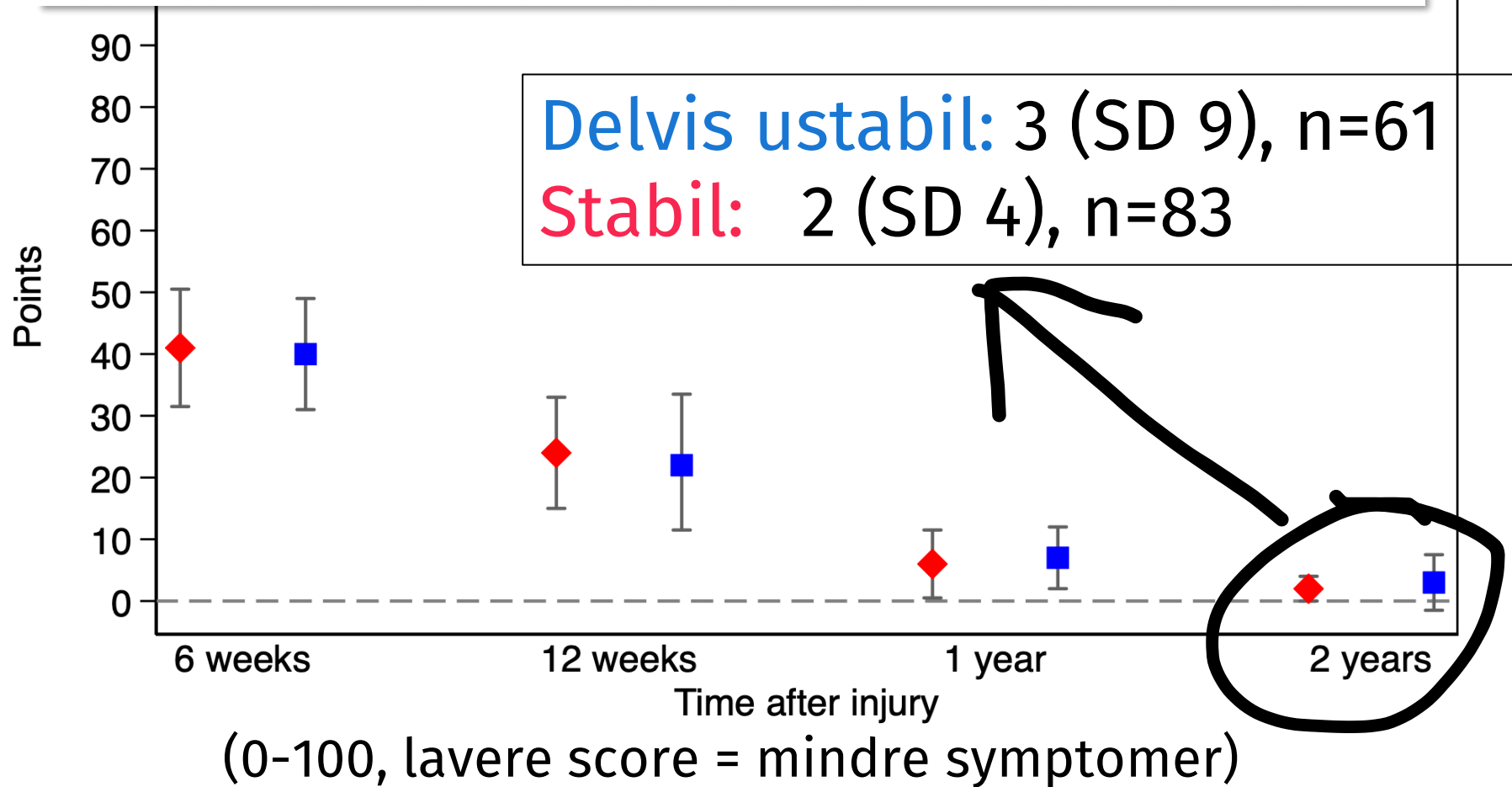
2021 IFFAS Award for Excellence Winner: Weightbearing Radiographs Reliably Predict Normal Ankle Congruence in Weber B/SER2 and 4a Fractures: A Prospective Case-Control Study

Martin G. Gregersen, PT, MSc; Marius Molund, MD, PhD



Concomitant Unstable and Stable Gravity Stress Tests on Weight-Bearing Stable Weber B Ankle Fractures Treated Nonoperatively A 2-Year Outcome Study

Gregersen, Martin G. PT, MSc;  Robinson, Hilde Stendal PT, PhD;  Molund, Marius MD, PhD

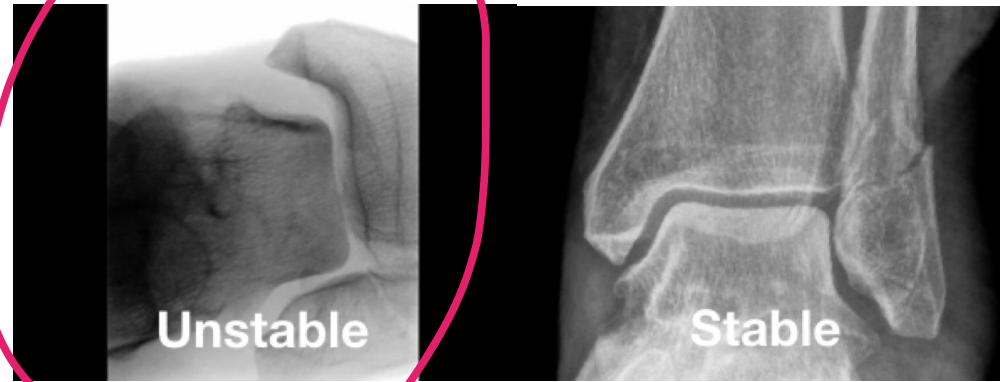


SCIENTIFIC ARTICLES

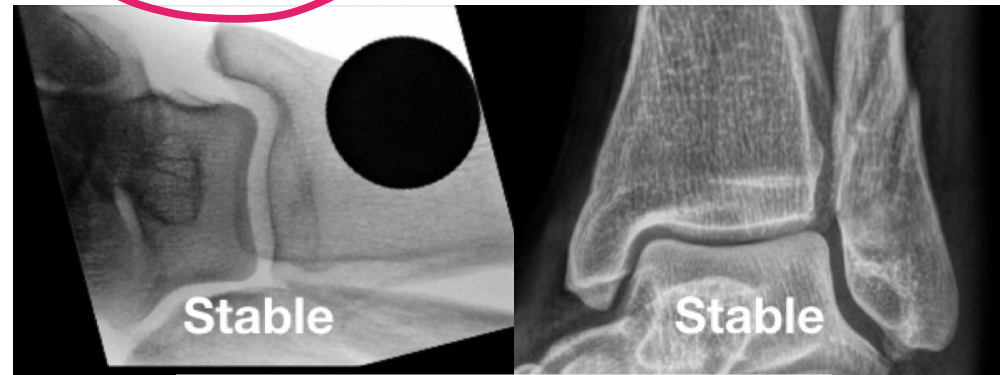
Concomitant Unstable and Stable Gravity Stress Tests on Weight-Bearing Stable Weber B Ankle Fractures Treated Nonoperatively A 2-Year Outcome Study

Gregersen, Martin G. PT, MSc; Robinson, Hilde Stendal PT, PhD; Molund, Marius MD, PhD

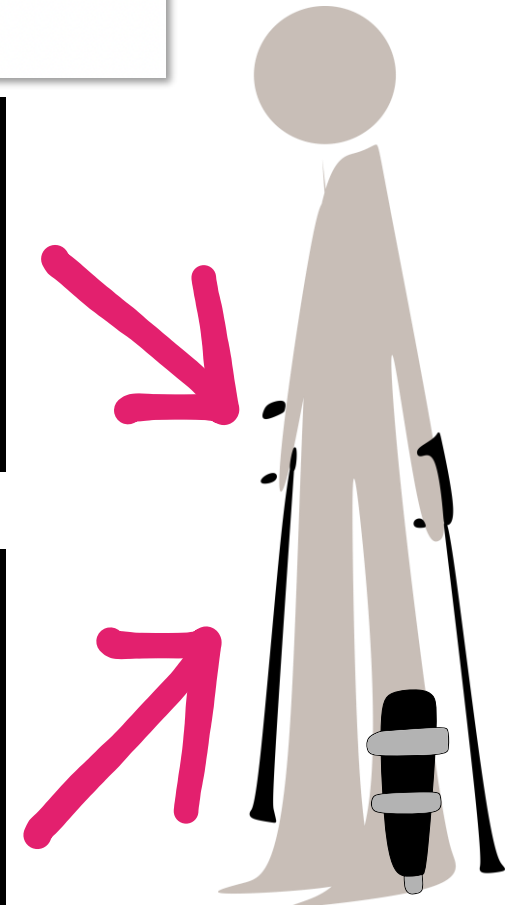
Det går like bra med disse...



...som med disse!

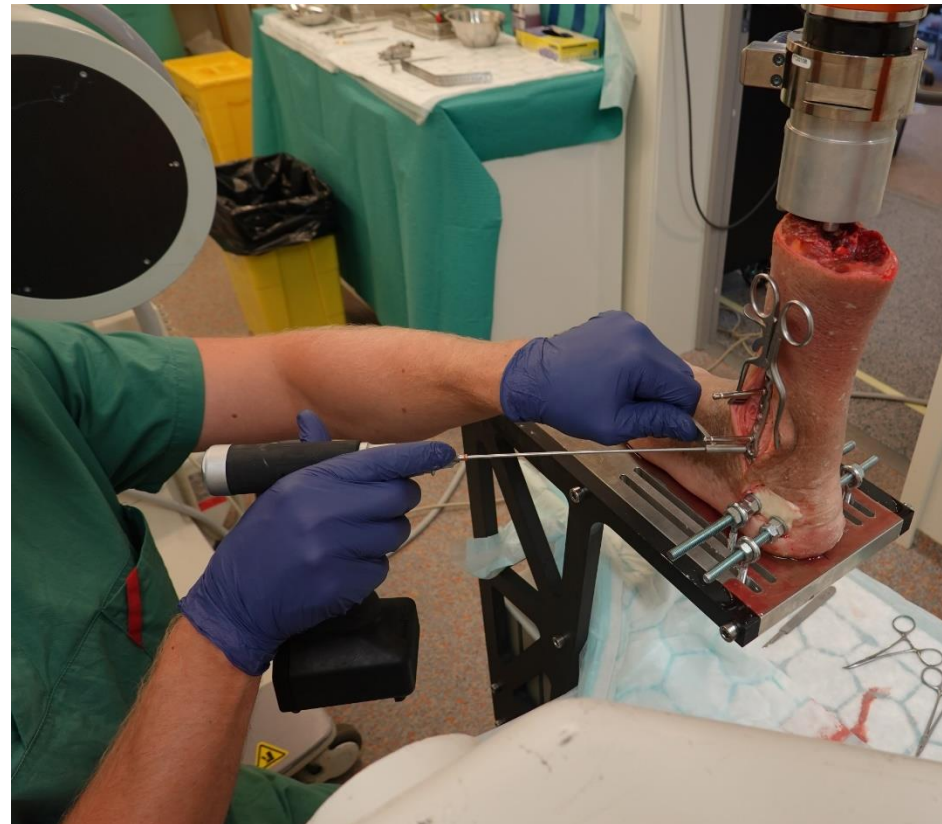


2 år etter skaden



Men skal man ikke bare legge på en plate for sikkerhets skyld da?

Hjelper det egentlig?

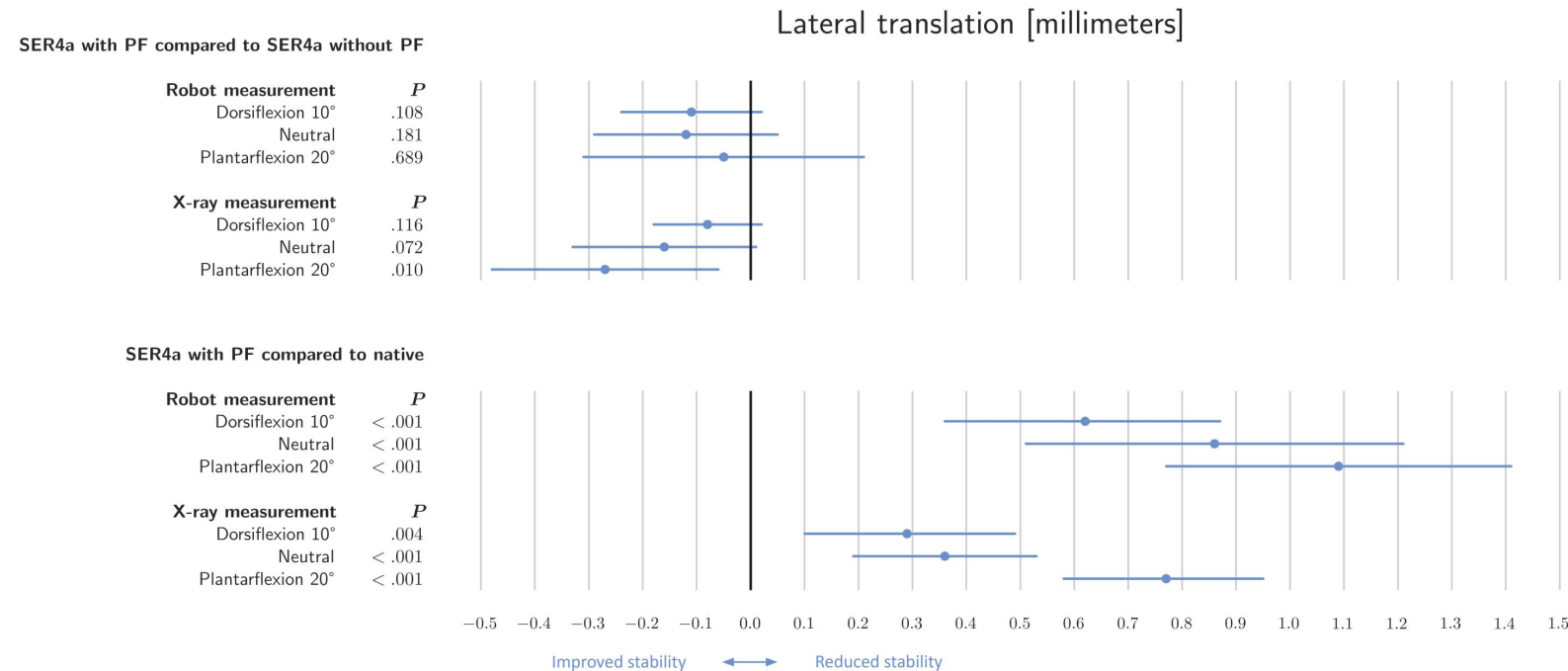


Men skal man ikke bare legge på en plate for sikkerhets skyld da?

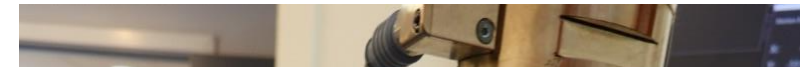
> [Foot Ankle Int.](#) 2024 Mar 19:10711007241235903. doi: 10.1177/10711007241235903.
Online ahead of print.

Effects of Fibular Plate Fixation on Ankle Stability in a Weber B Fracture Model With Partial Deltoid Ligament Sectioning

Martin G Gregersen^{1 2}, Andreas F Dalen^{3 4}, Aleksander L Skrede^{3 5}, Øystein Bjelland^{3 5}, Fredrik A Nilsen⁶, Marius Molund⁶

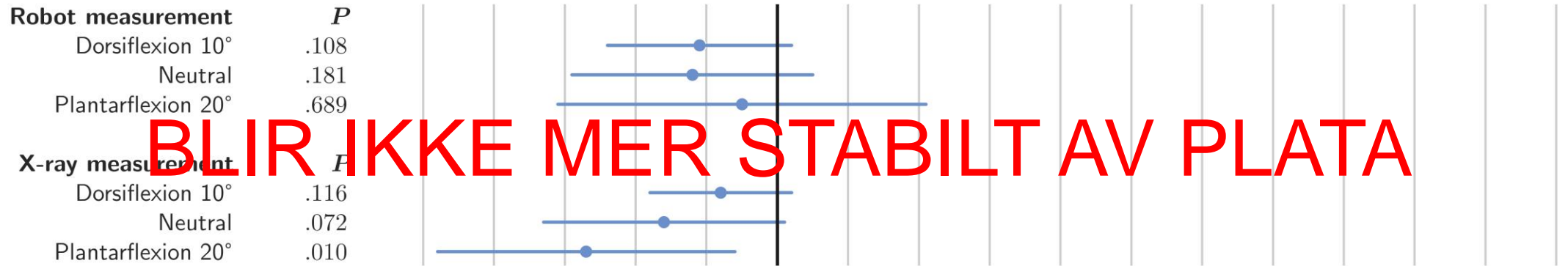


Men skal man ikke bare legge på en plate for sikkerhets skyld da?



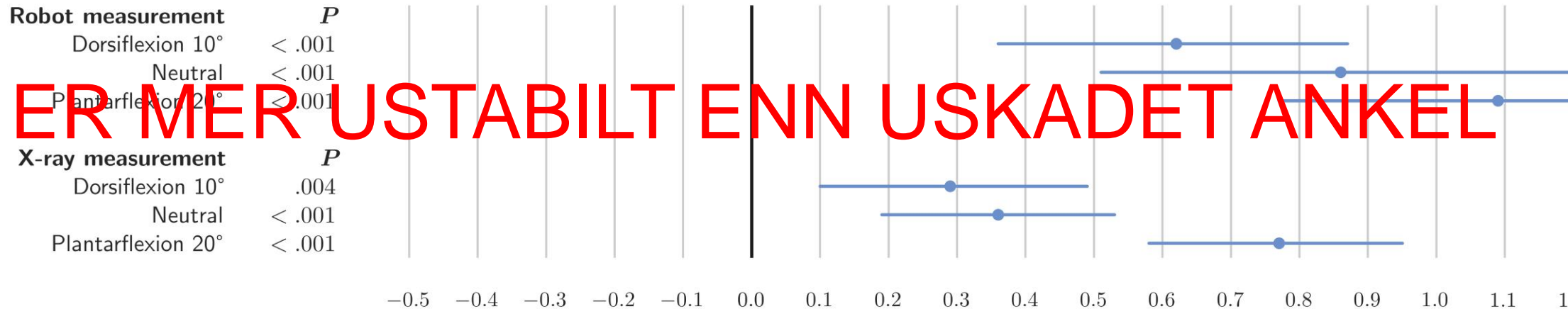
Lateral translation [millimeters]

SER4a with PF compared to SER4a without PF



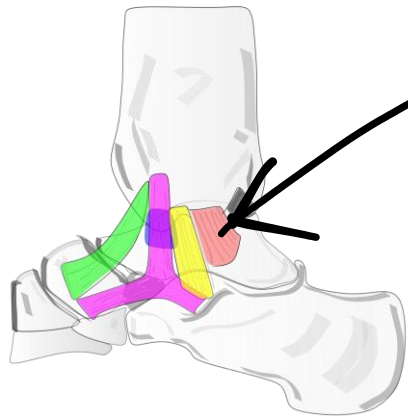
BLIR IKKE MER STABILT AV PLATA

SER4a with PF compared to native

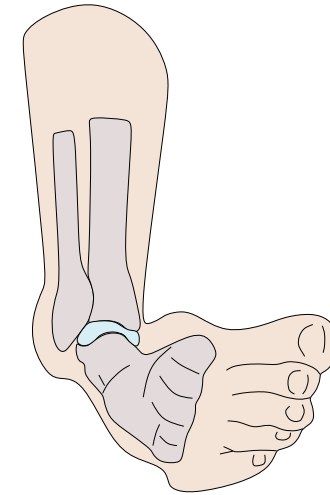


ER MER USTABILT ENN USKADET ANKEL

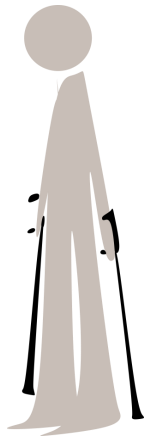
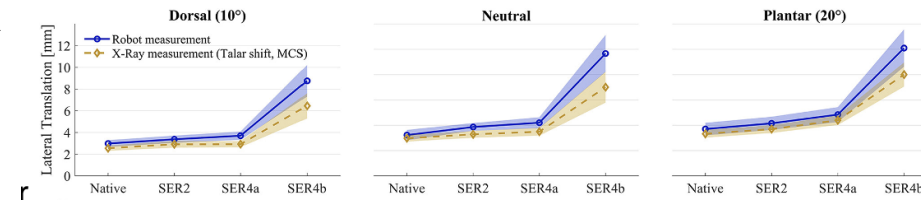
Improved stability ← → Reduced stability



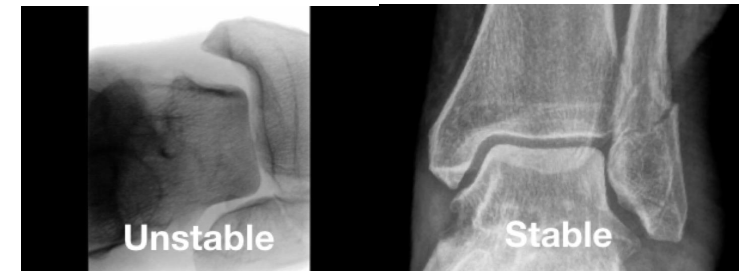
1. Anatomisk data støtter at det bakre dype deltoidligamentet er beskyttet når ankelen brykker



2. Biomekanisk data viser at ankelen er ganske stabil så lenge det bakre dype er intakt, selv om resten av deltoidligamentet har røket



3. Belastningsstabile ankelfrakturer får generelt utmerkede kliniske resultater med funksjonell ortose og belastning

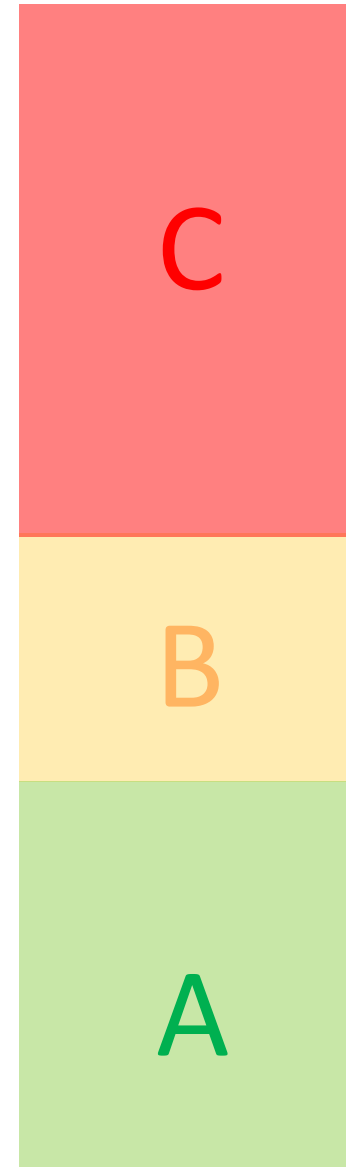
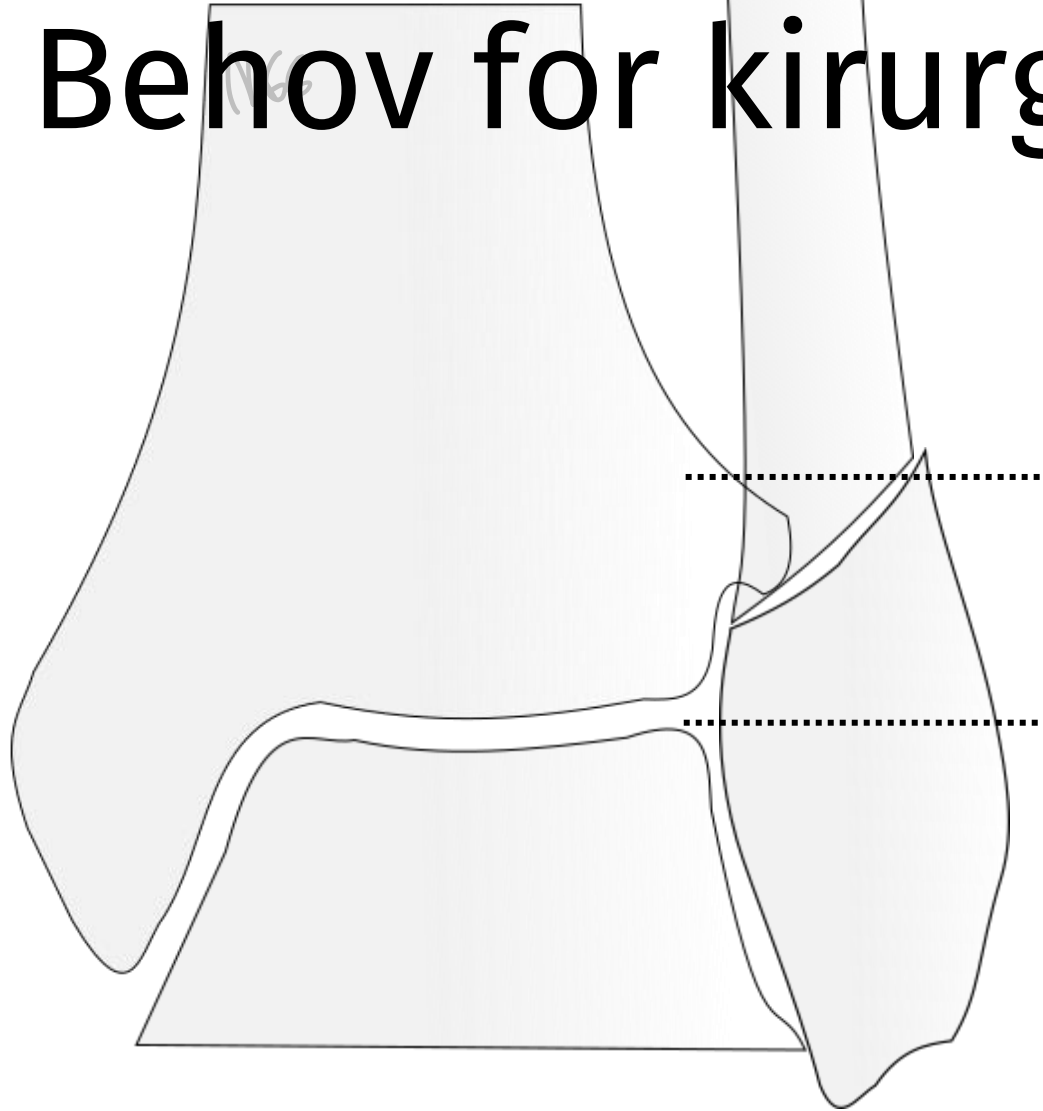


4. Samtidig ustabil gravity stress test påvirker ikke resultatet så lenge belastet røntgen er stabilt



Nesten alle (98%) Weber B ankelfrakturer kan behandles funksjonelt med utmerket klinisk og radiologisk resultat basert på stabilt belastet røntgen

MEDIAL SKADE/ Behov for kirurgi



C

ALLTID?

B

SJELDEN?

A

ALDRI

Takk!

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