

BLØDDELENES BIOLOGI OG BETYDNING FOR KNOGLEHELING

15 MIN.

AO TRAUMA COURSE – BASIC PRINCIPLES OF FRACTURE MANAGEMENT

FREDERICIA 24-27/4-2023

JEPPE BARCKMAN



Aarhus Universitetshospital



THERE'S A FRACTURE AND I NEED TO FIX IT!



THERE'S A FRACTURE AND I NEED TO FIX IT!





BLØDDELE !



THOMAS P RÜEDI, MD, PROFESSOR, FOUNDED AND HONORARY MEMBER OF
THE AO FOUNDATION

*“A FRACTURE FIRST AND FOREMOST IS A SOFT-
TISSUE INJURY, IN WHICH THE BONE HAPPENS
TO BE BROKEN”*

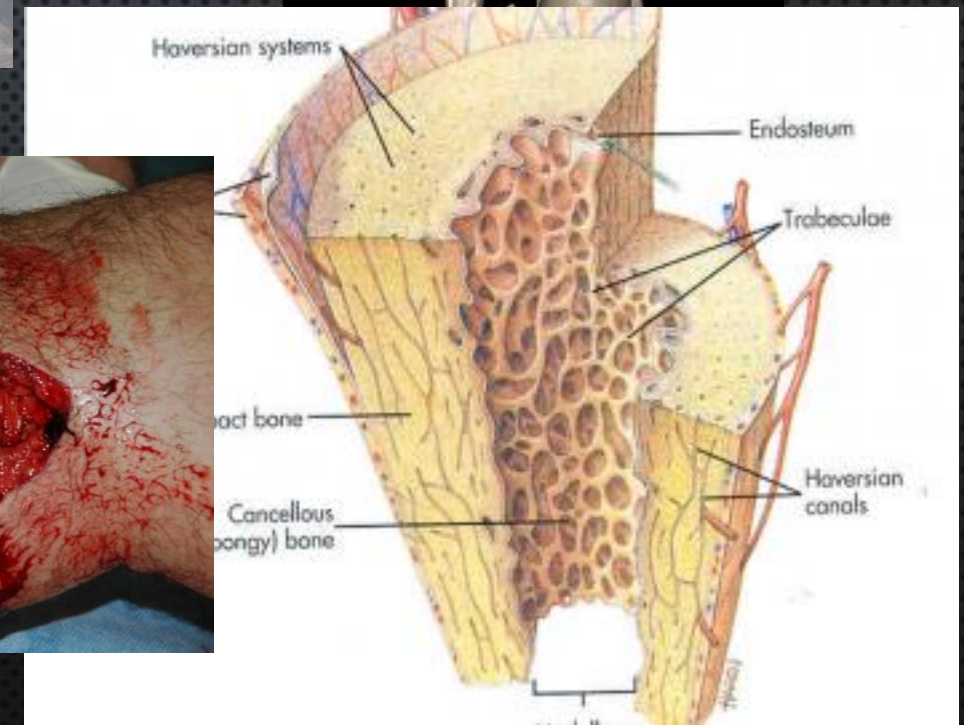
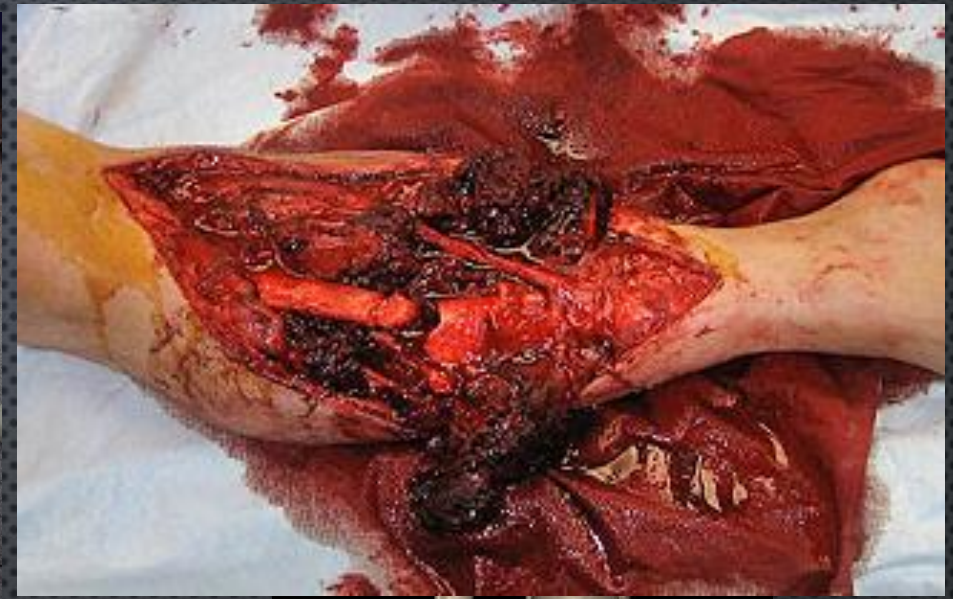


“ ... the bone is a plant, with its roots in the soft tissue, and when its vascular connections are damaged, it often requires, not techniques of a cabinet maker, but the patient care and understanding of a gardener”.

Gathorne Girdlestone 1881 - 1950

EN FRAKTUR BESTÅR AF:

- KNOGLE!
- PERIOST
- MUSKEL (MED FASCIE)
- SUBCUTIS
- HUD



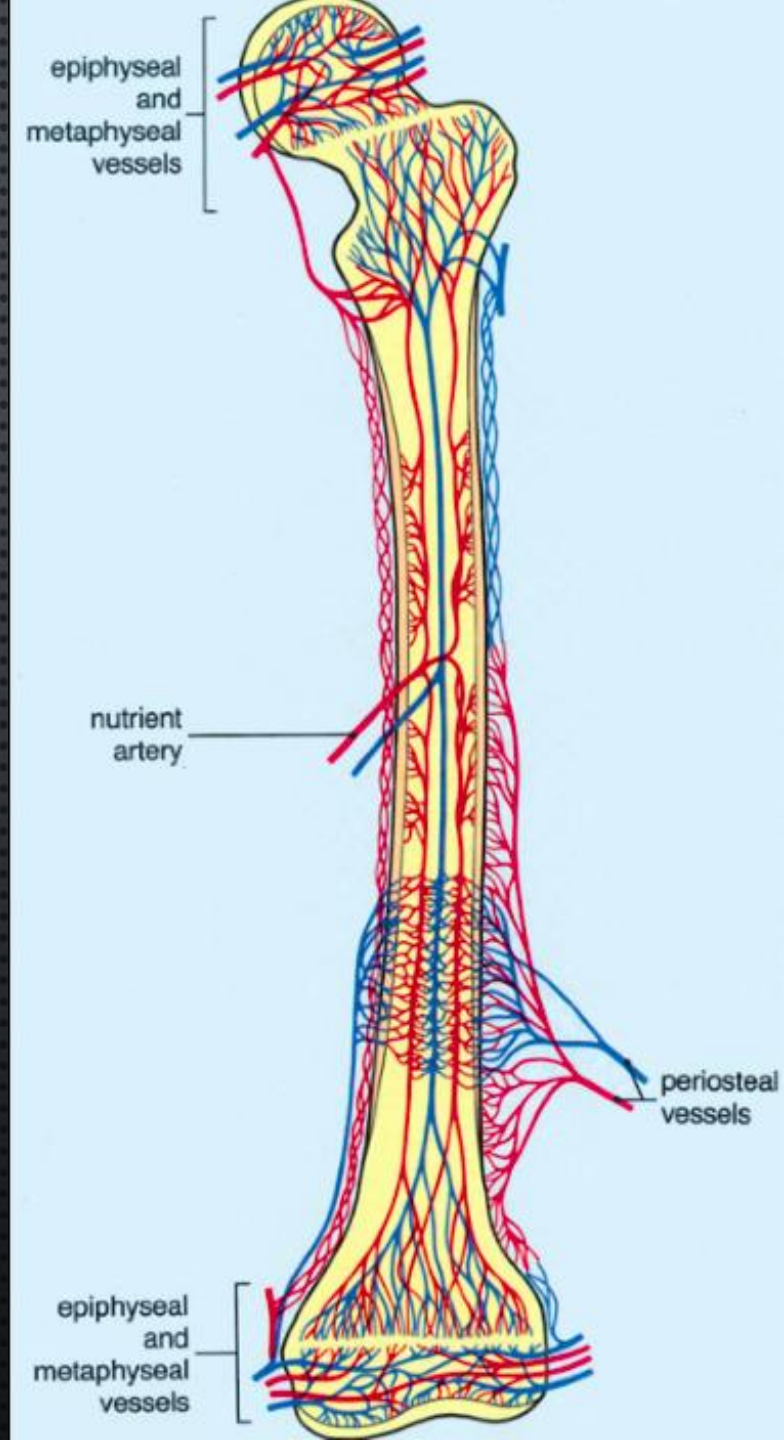
BLODFORSYNINGEN TIL KNOGLEN

YDRE 1/3 - PERIOST

- FORSYNET AF PERIOSTALE KAR FRA NAVNGIVNE ARTERIER
- DISSE KAR PENETRERER DÉR, HVOR FASCIE ELLER LIGAMENT HÆFTER

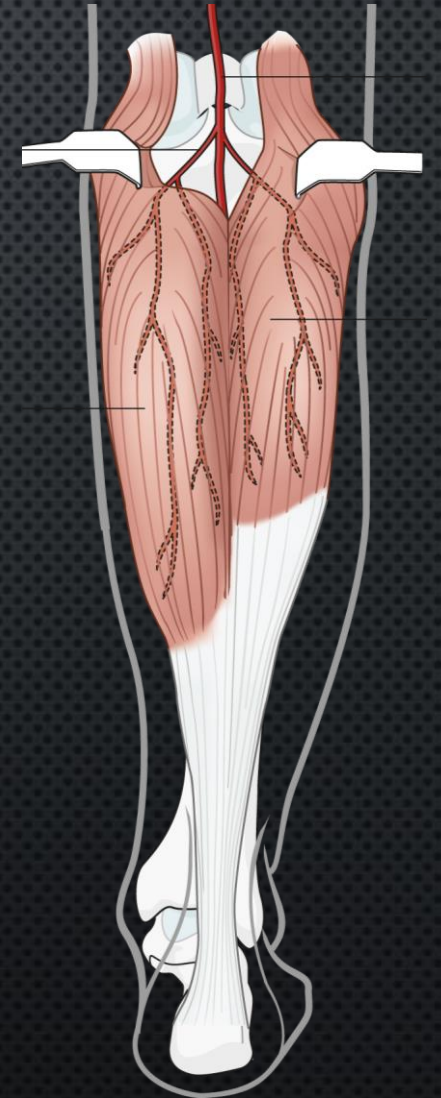
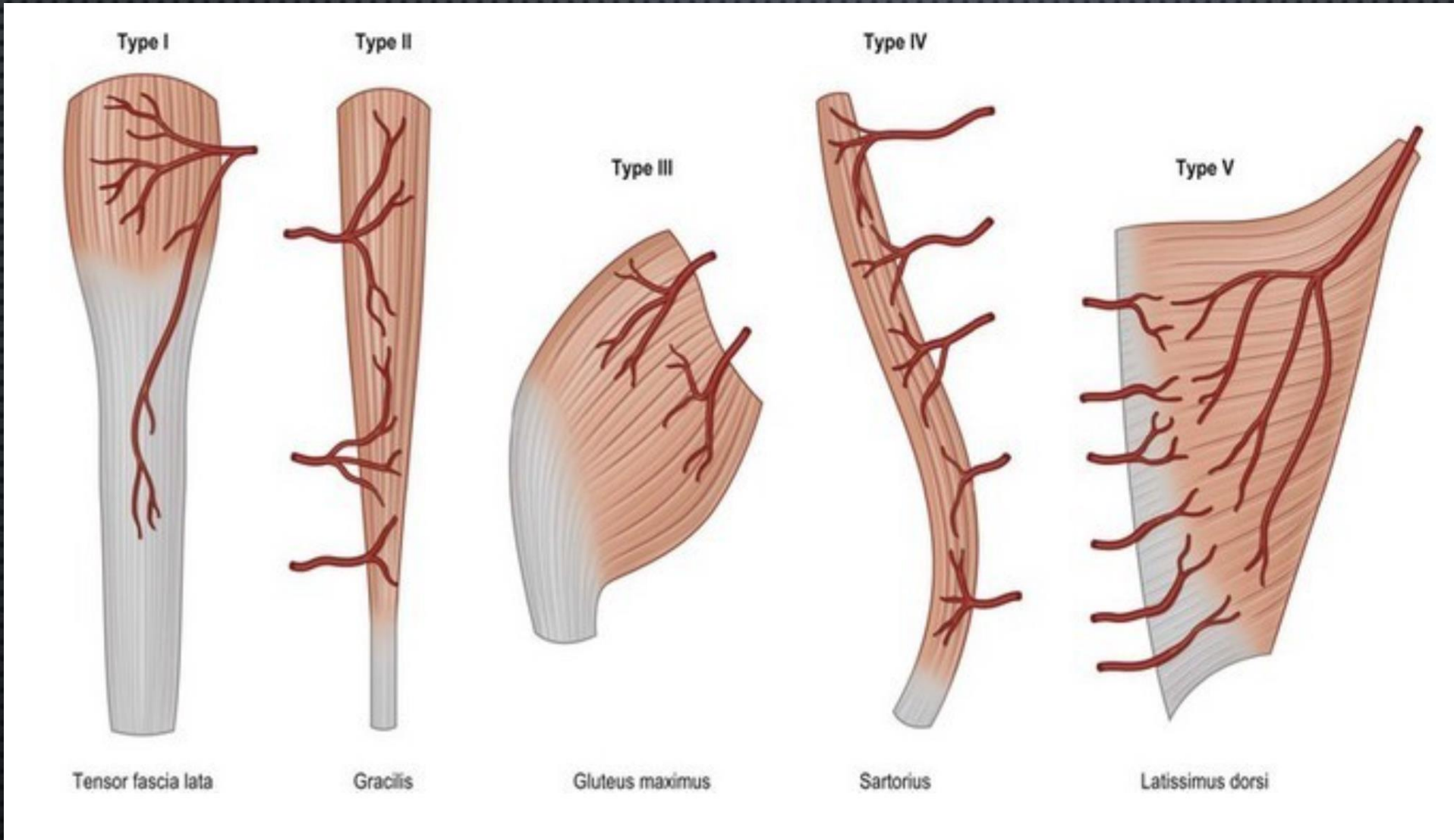
INDRE 2/3 - ENDOST

- FORSYNET AF A. NUTRICAE, DER DELES I ARTERIOLER, SOM SÅ FORSYNER HELE ENDOSTIET

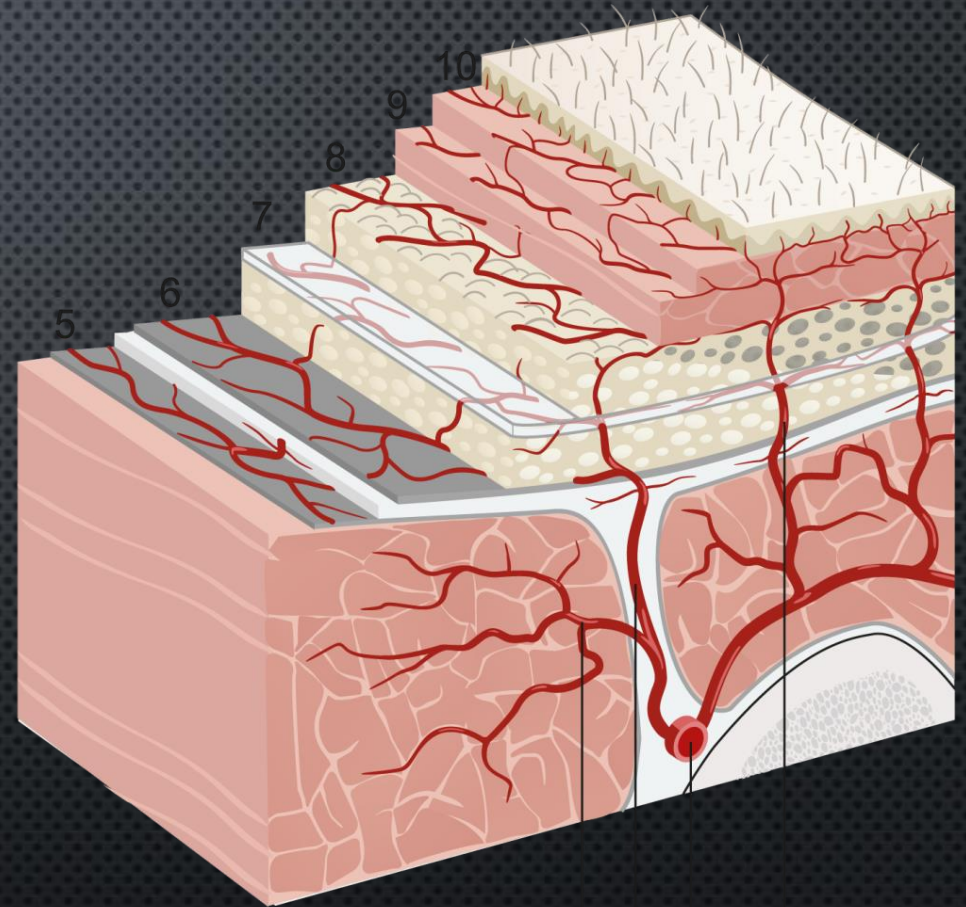
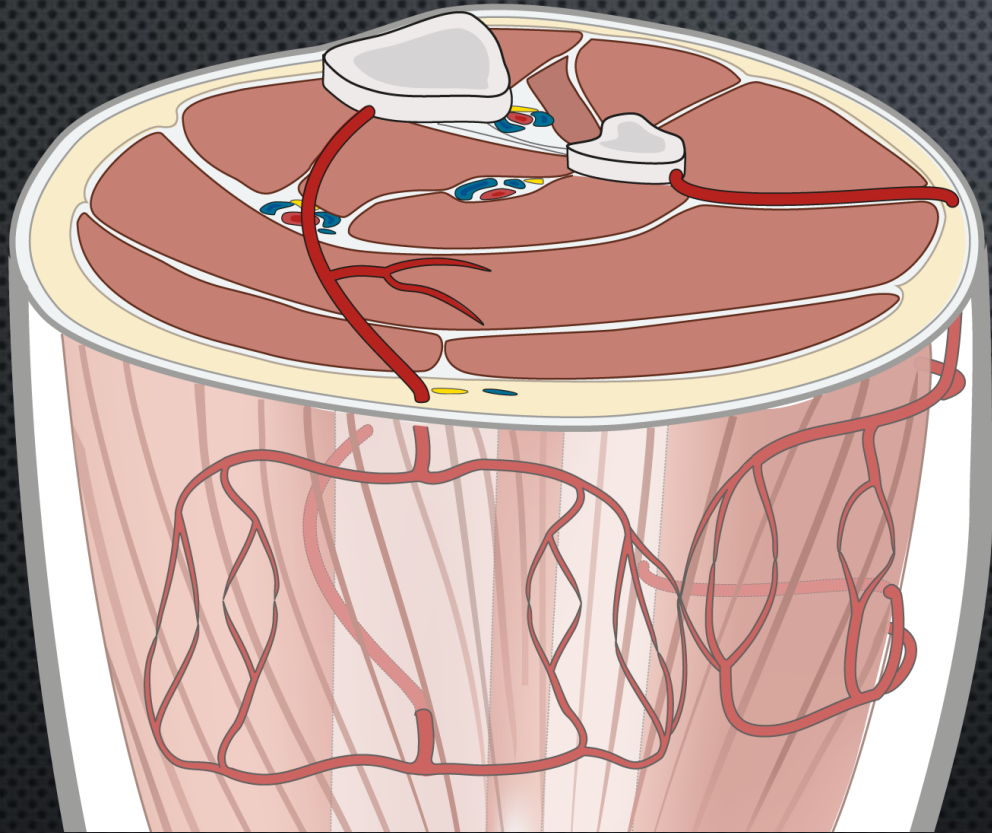


1. Rhinelander FW. Tibial blood supply in relation to fracture healing. *Clin Orthop Relat Res.* 1974 Nov-Dec;(105):34–81.
2. Nelson GE Jr, Kelly PJ, Peterson LF et al. Blood supply of the human tibia. *J Bone Joint Surg Am.* 1960 Jun;42-A:625–636

BLODFORSYNING TIL MUSKLEN



BLODFORSYNINGEN TIL HUDEN



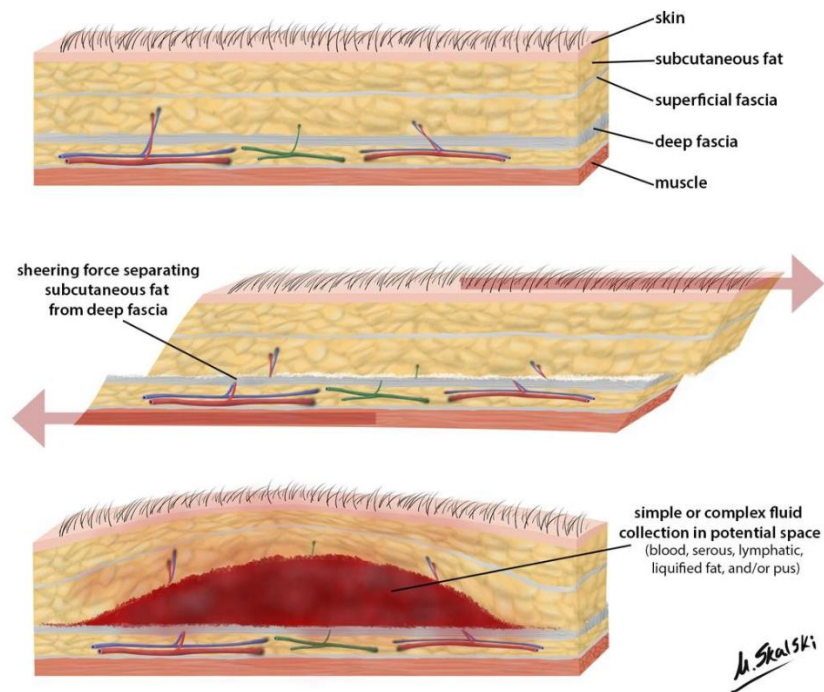
BLODFORSYNINGEN TIL HUDEN



BLODFORSYNINGEN TIL HUDEN

Morel-Lavallée lesion

Morel-Lavallée mechanism



- Lukket degloving bloddelsskade, hvor der separation af hud og subkutane væv fra fascia.
- MRI eller CT for radiologisk us.
- Tidligt diagnose!! for at undgå komplikationer såsom infektion eller hudnekrose.

ALT KIRURGI VILLE VÆRE LETTERE UDEN BLØDDELE, MEN...

- **HUD** ER DEN PRIMÆRE BARRIER IFHT. INFEKTION
- **MUSKEL**
 - SØRGER FOR BLODFORSYNING TIL HUDEN
 - ER NØDVENDIG FOR BEVÆGELSE
 - BESKYTTER KNOGLEN
- **PERIOST**
 - SØRGER FOR BLODFORSYNING TIL KNOGLE (YDRE 1/3)
 - SØRGER FOR OSTEOPROGENITOR CELLER TIL KNOGLE

ALTSÅ RESPEKTÉR BLØDDELENE – KIRURGISKE TEKNIKKER!



BESKRIVELSE AF BLØDDELE EFTER SKADE

- RENT DESKRIPTIV
- AO SOFT-TISSUE CLASSIFICATION
- GUSTILO KLASSIFIKATION (ÅBNE FRAKTURER)



AO SOFT-TISSUE CLASSIFICATION

INTEGUMENTUM CLOSED (IC)

- IC 1 = NO SKIN INJURY
- IC 2 = CONTUSION WITHOUT SKIN LACERATION
- IC 3 = LOCAL DEGLOVING
- IC 4 = EXTENSIVE, CLOSED DEGLOVING
- IC 5 = NECROSIS DUE TO DEEP CONTUSION

Integumentum open (IO)

- IO 1 = skin perforated from inside out
- IO 2 = skin perforation from outside < 5 cm
- IO 3 = local degloving, contusion > 5 cm
- IO 4 = loss of skin, deep contusion
- IO 5 = open degloving

Neurovascular injury (NV)

- NV 1 = no injury
- NV 2 = isolated nerve injury
- NV 3 = local vascular injury
- NV 4 = combined neurovascular injury
- NV 5 = sub/total amputation

Muscle and tendon injury (MT)

- MT 1 = no injury
- MT 2 = isolated (one group)
- MT 3 = two or more groups
- MT 4 = loss of muscle groups, tendon
- MT 5 = compartment/crush syndrome

OPEN FRACTURE CLASSIFICATION

Gustilo	
Type I	<ul style="list-style-type: none">• Low energy• Minimal soft-tissue damage• Wound < 1 cm
Type II	<ul style="list-style-type: none">• Higher energy• Laceration > 1 cm• No flaps/crushing minimal contamination• Slight comminution
Type IIIA	<ul style="list-style-type: none">• High energy• Adequate soft-tissue coverage despite flaps/lacerations• Comminution/segmental fracture
Type IIIB	<ul style="list-style-type: none">• High energy• Extensive soft-tissue stripping• Inadequate cover• Massive contamination
Type IIIC	<ul style="list-style-type: none">• Vascular injury requiring repair

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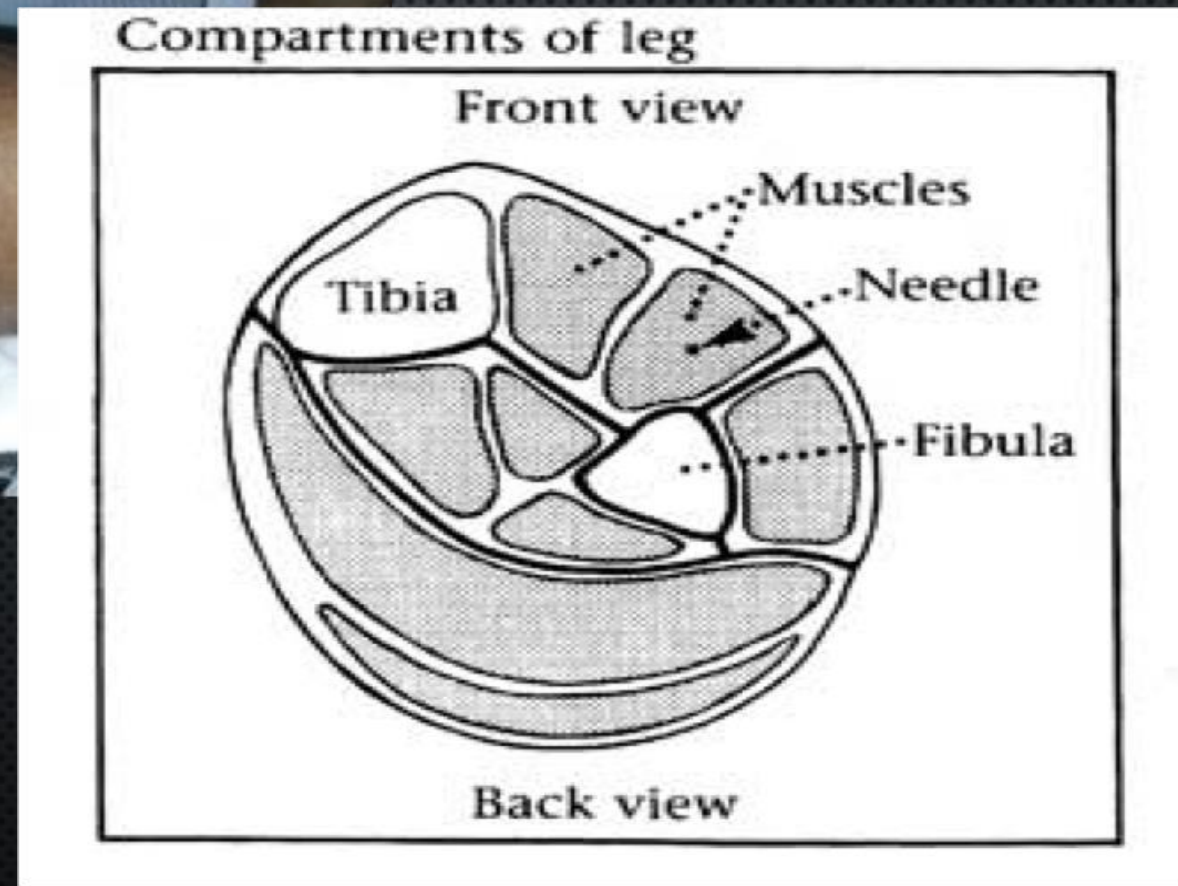
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INITIAL BEHANDLING?



COMPARTMENT SYNDROM



TAKE HOME MESSAGE

- EN FRAKTUR ER (DESVÆRRE) IKKE BARE EN BRÆKKET KNOGLE
- ANERKEND BLØDDELENES BETYDNING FOR KNOGLEHELING
- HAV KENDSKAB TIL BLODFORSYNING TIL BÅDE HUD, MUSKEL OG KNOGLE
- VÆR I STAND TIL AT VURDERE OG BESKRIVE BLØDDELENE
- KEND BEHANDLINGSTEKNIKKER – OG HVEM DER SKAL TAGE SIG AF DE KOMPLEKSE CASES
- IDENTIFICERE COMPARTMET SYNDROM OG KENDE TIL PRINCIPPERNE I BEHANDLING