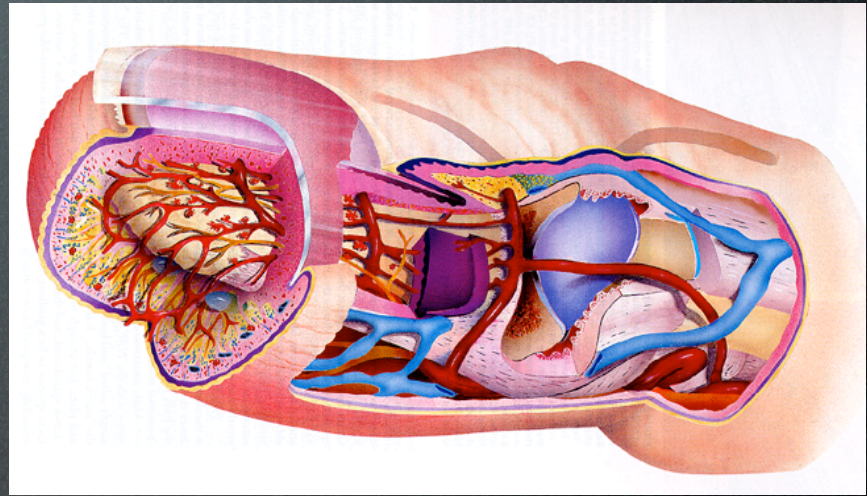


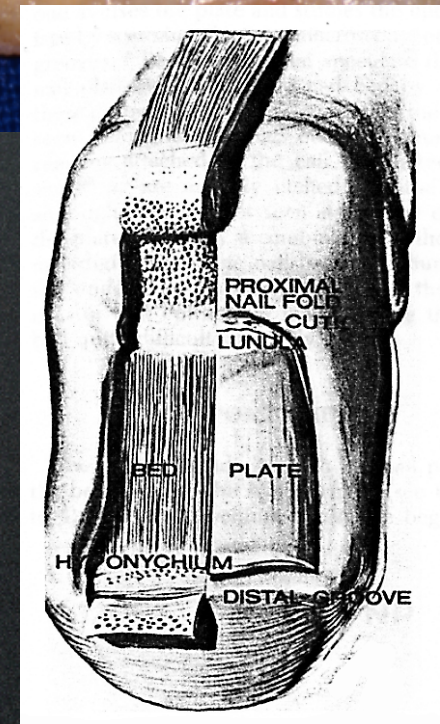
Anatomy and physiology of the nail



Christian Dumontier
Institut de la Main & hôpital saint Antoine,
Paris

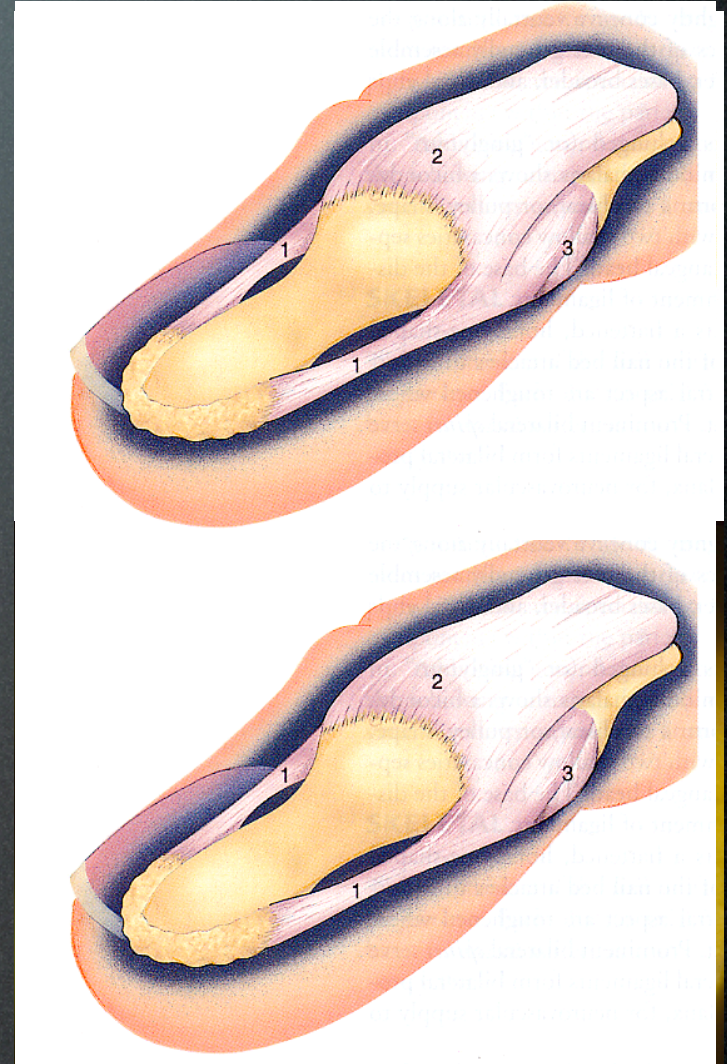
Anatomy of the nail

- The osteo-ligamentous support
- Nail plate
- All surrounding tissues, i.e. the perionychium

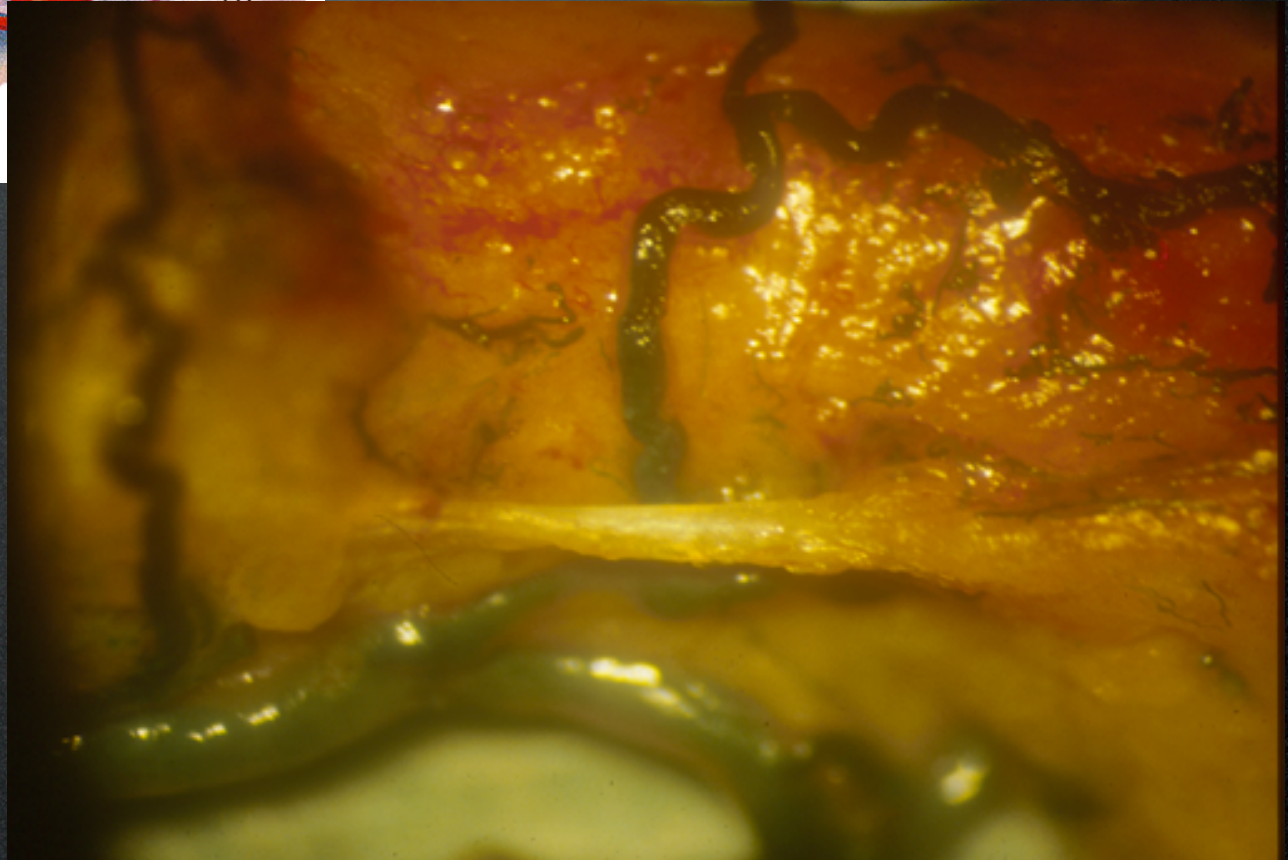
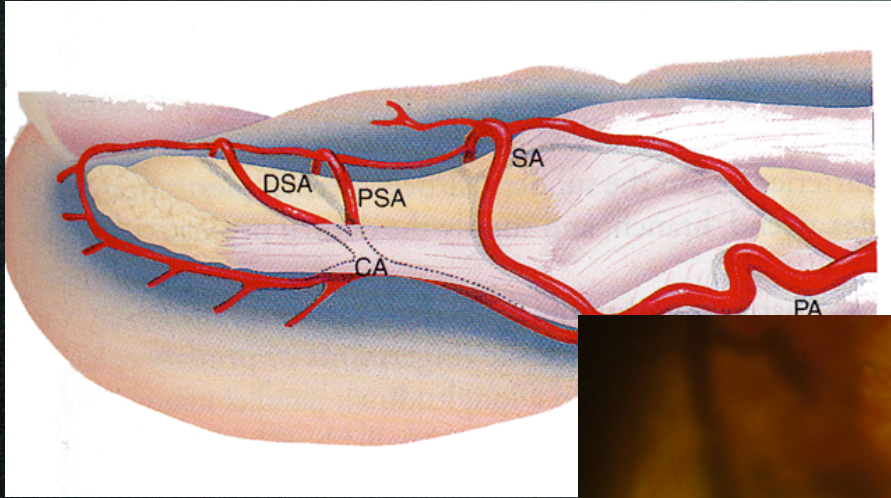


The distal phalanx

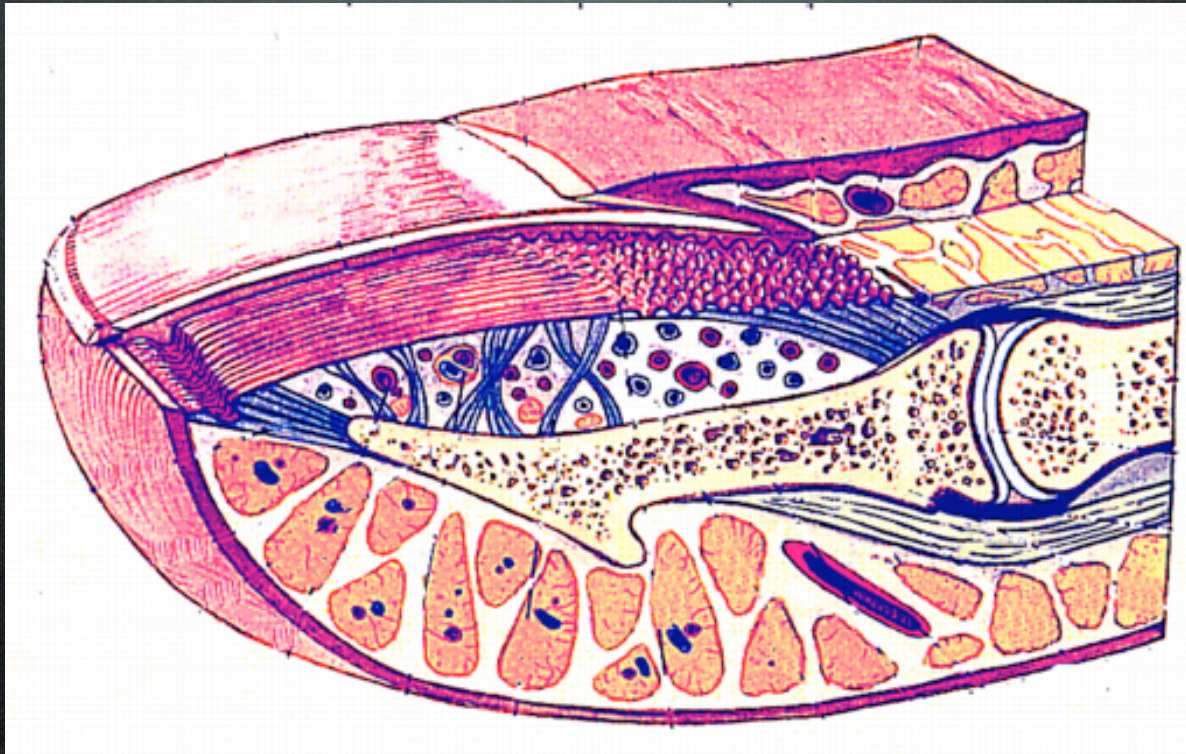
- Is reinforced laterally by the the Flint's ligament
- Which protect the neuro-vascular structures



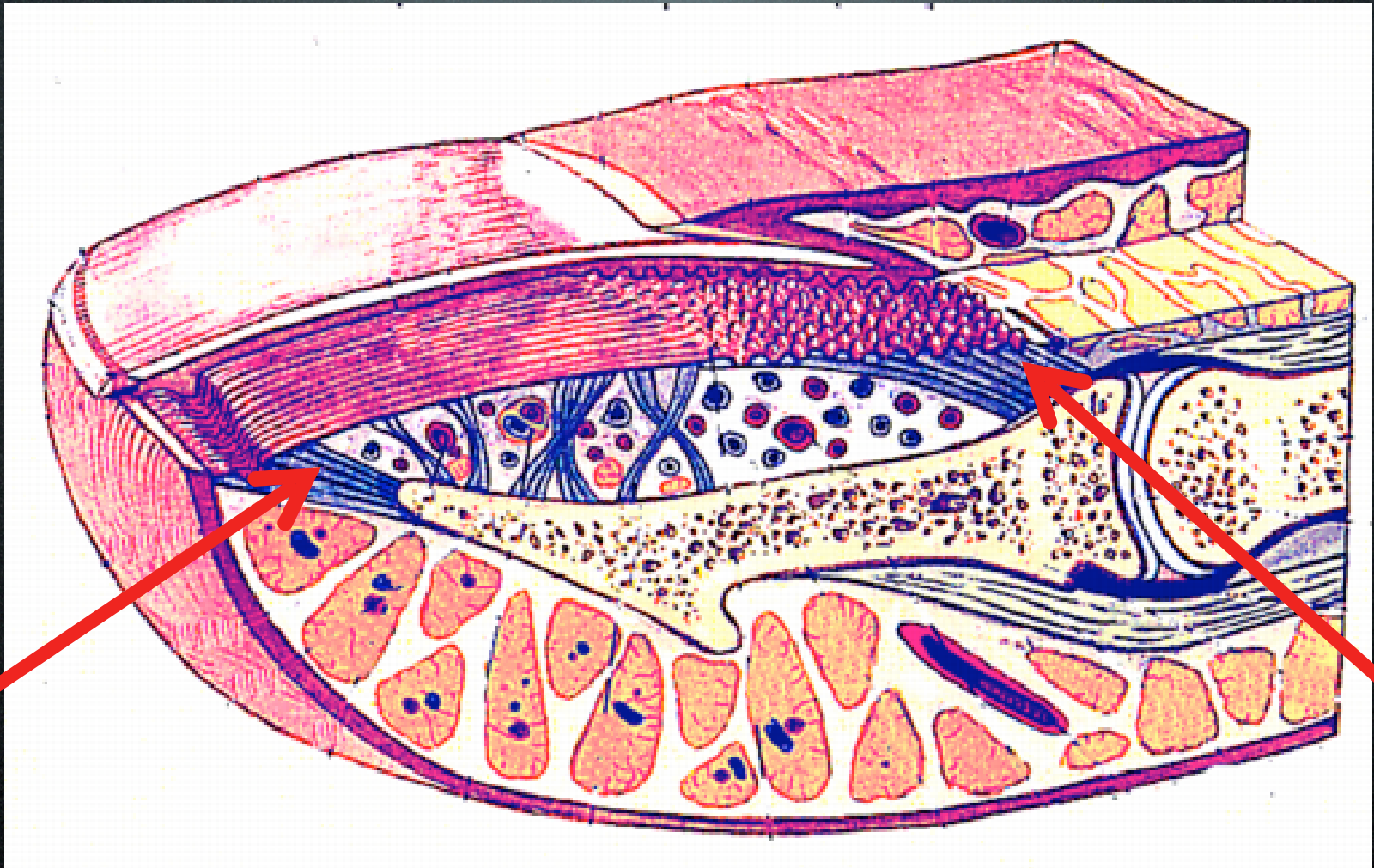
Flint's ligament



The ligamentous support



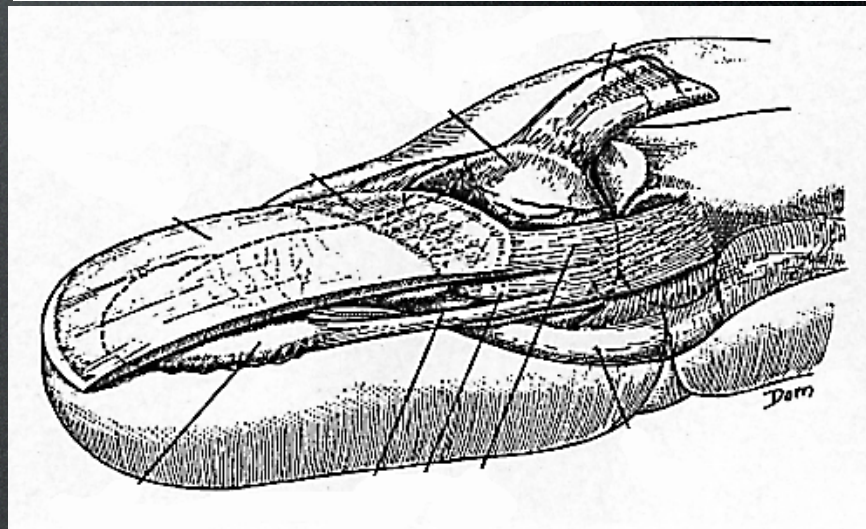
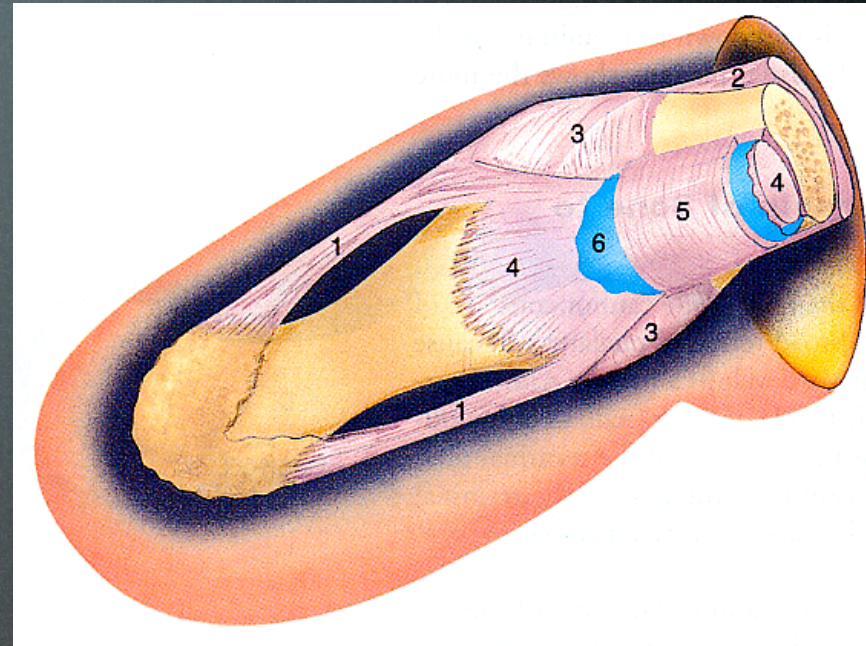
- The nail is fixed onto the bone through a highly vascularized dermis



- The nail is fixed onto the bone through two strong ligaments

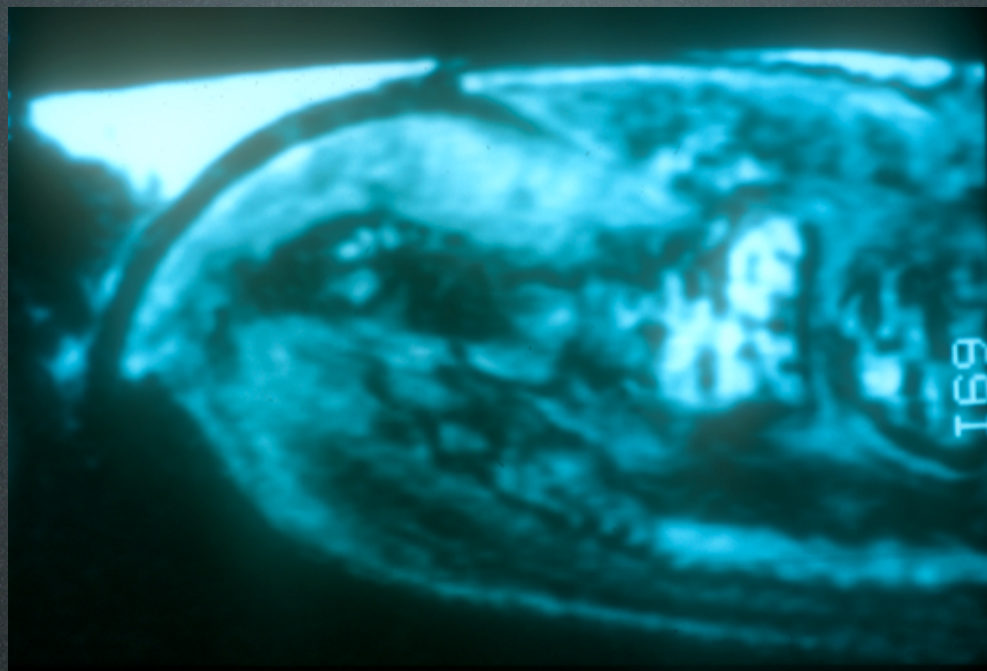
The ligamentous structures

- All the ligaments merge together with
 - The extensor tendon
 - The flexor tendon
 - The collateral ligaments
 - Flint's ligament
 - Guero's dorsal ligament
 - (Hyponychial ligament)



Clinical implications

- A normal nail cannot grow on an abnormal support +++
 - Large phalanx = racket nails
 - bony malunion = nail dystrophy
 - arthrosis = Pincer nail,...



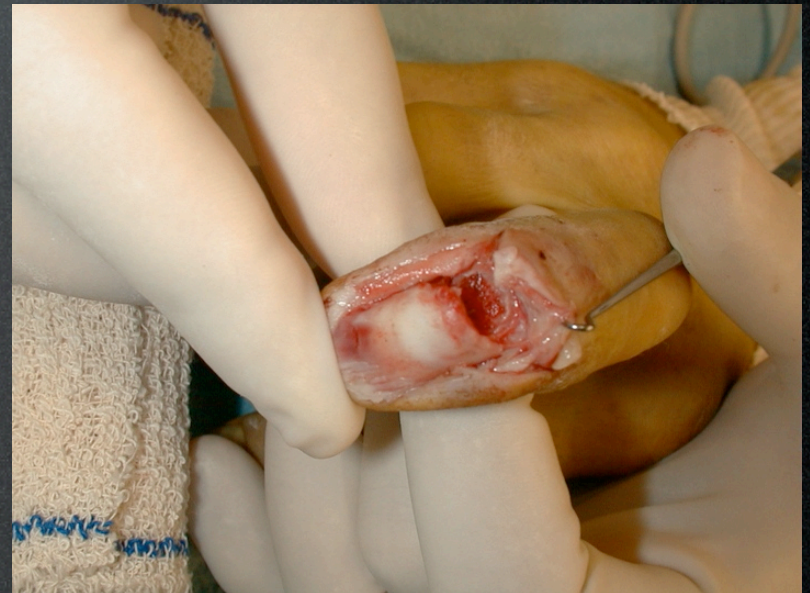
The nail plate

- Is produced by the germinal matrix
- ✓ *Its shape depends on the*
 - Keratinic structure, *partial support and the*
curved by the soft tissue
around it
- Three different layers
- 0,5 mm thickness, 20% of water



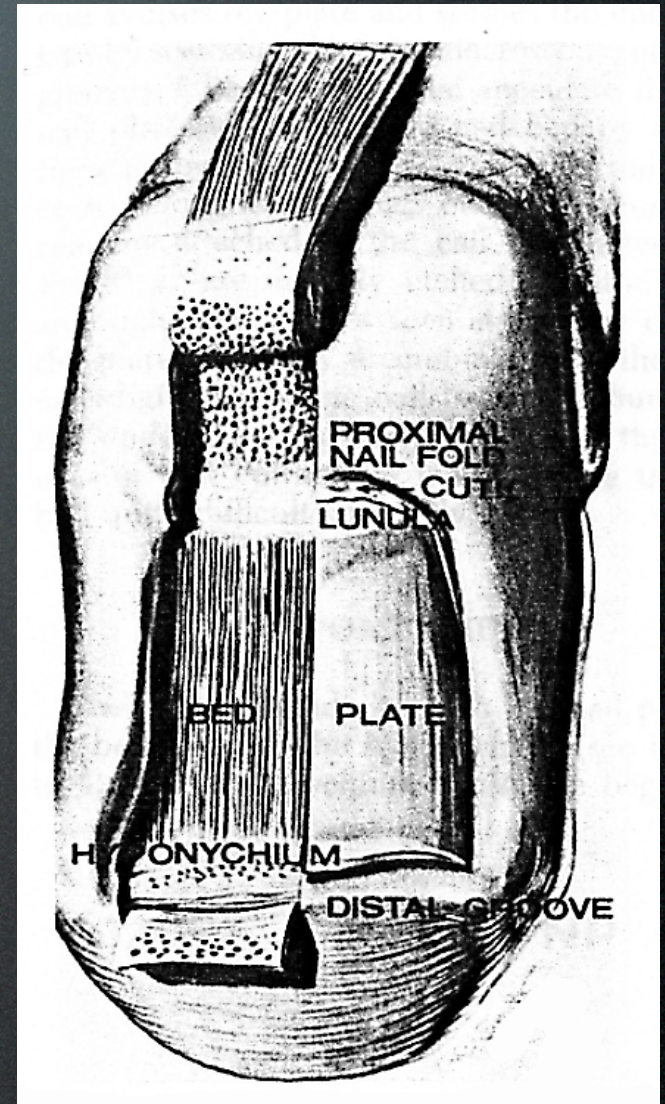
Clinical applications

- The nail plate is often intact in crushing trauma due to its flexibility
- And must be removed in order to explore all the lesions +++

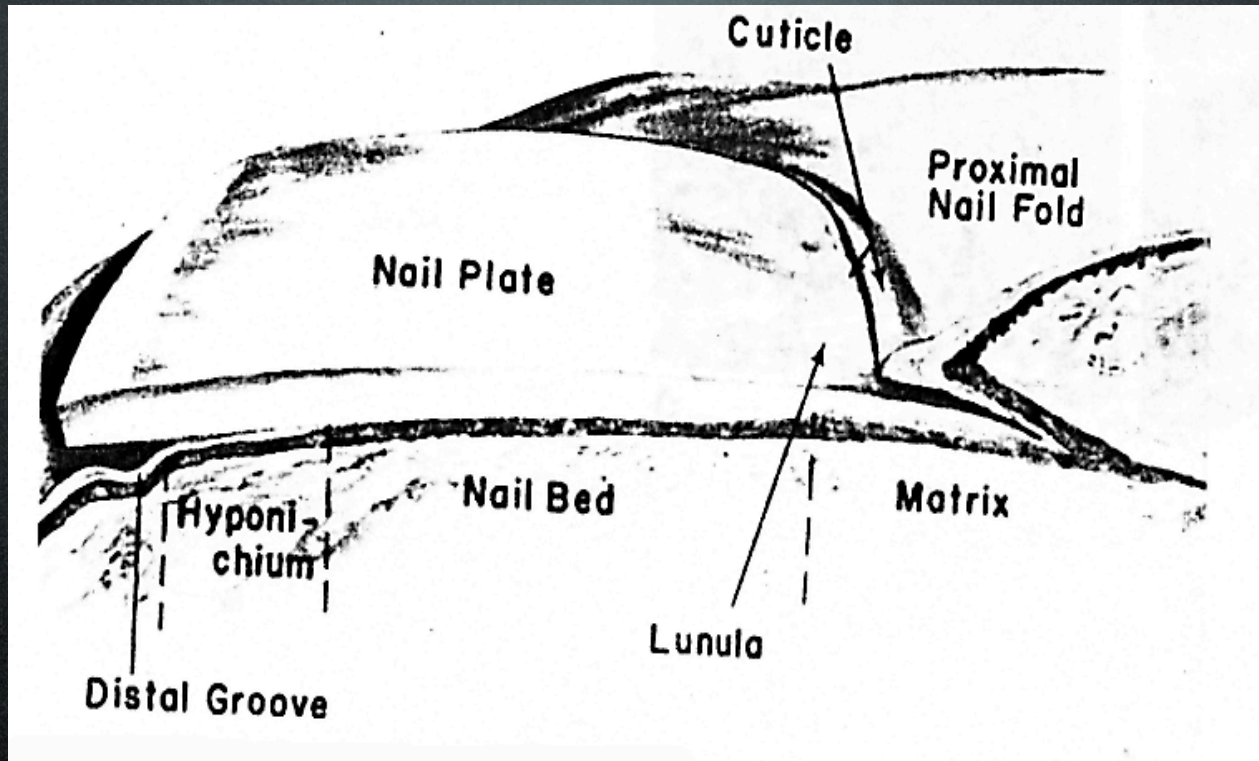


The perionychium

- Include all the soft-tissues located under the nail plate
 - Nail (germinal) matrix,
 - Nail bed,
 - Hyponychium

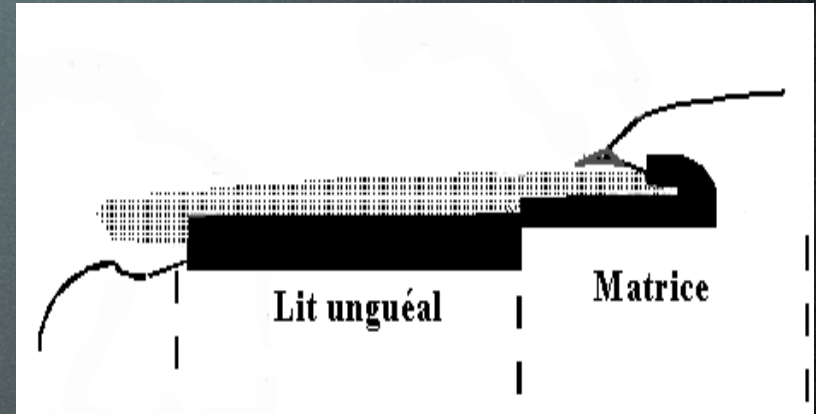
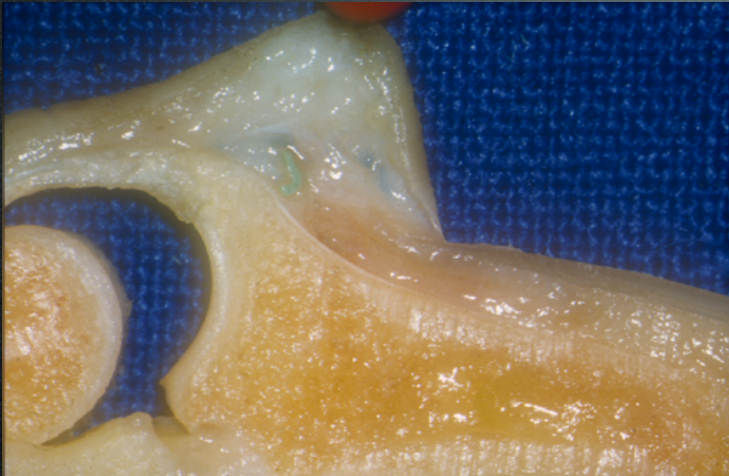


The perionychium

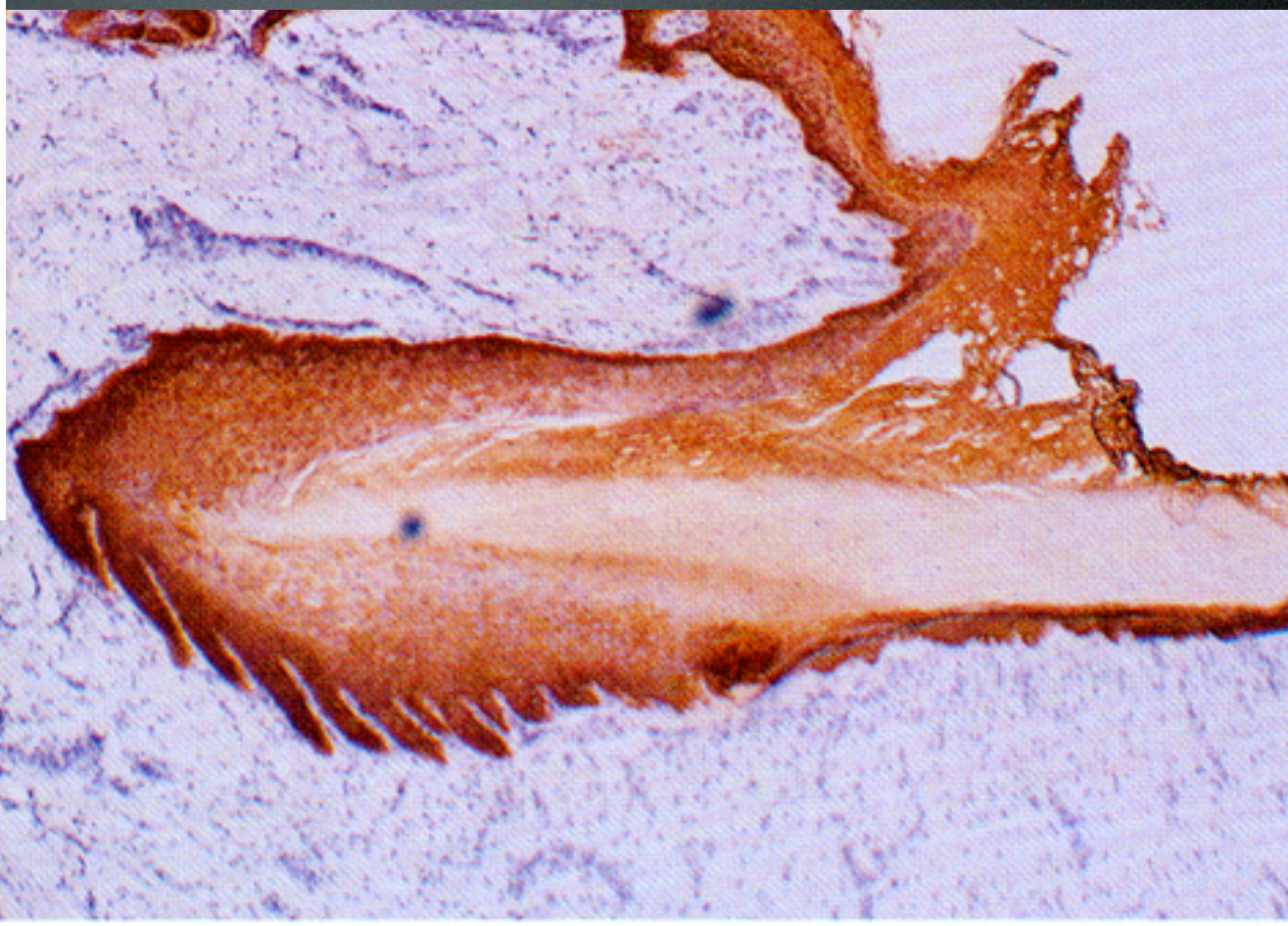
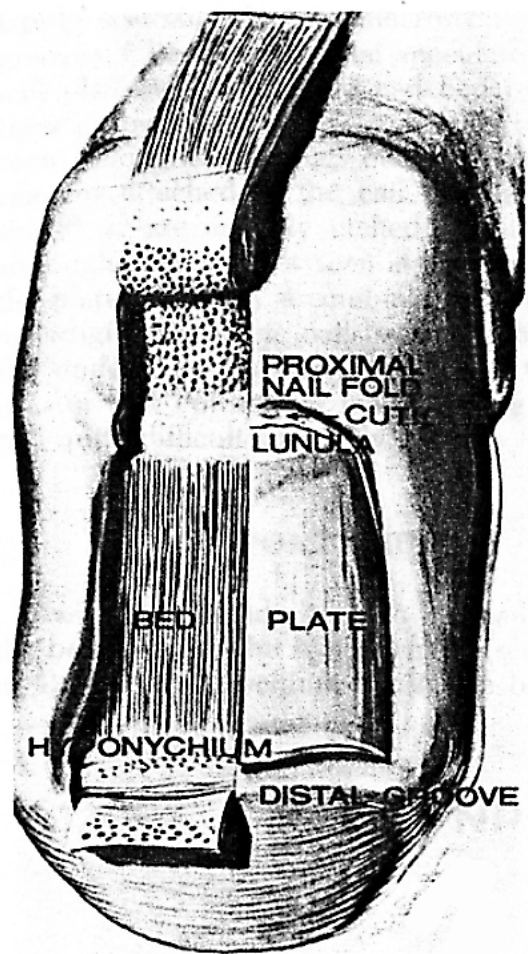


- Soft-tissues around the plate (paronychium) proximal and lateral nail wall (fold) and the cuticle

The (germinal) nail matrix

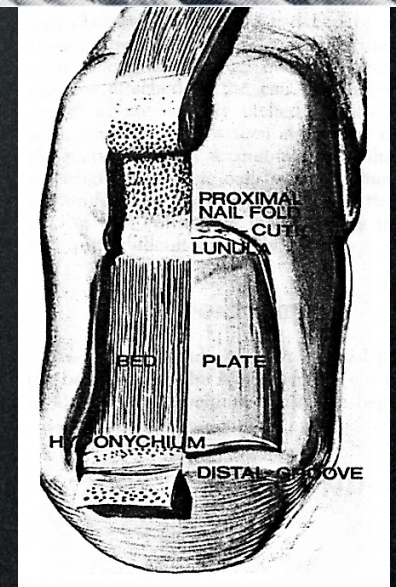
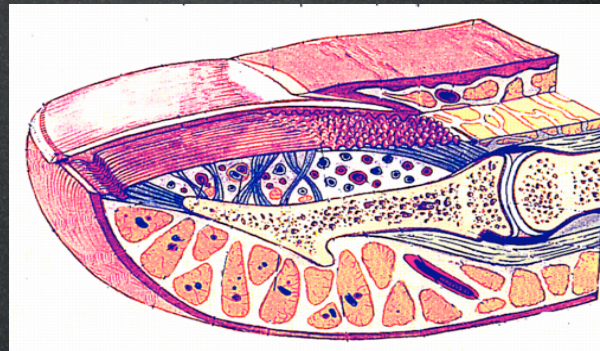
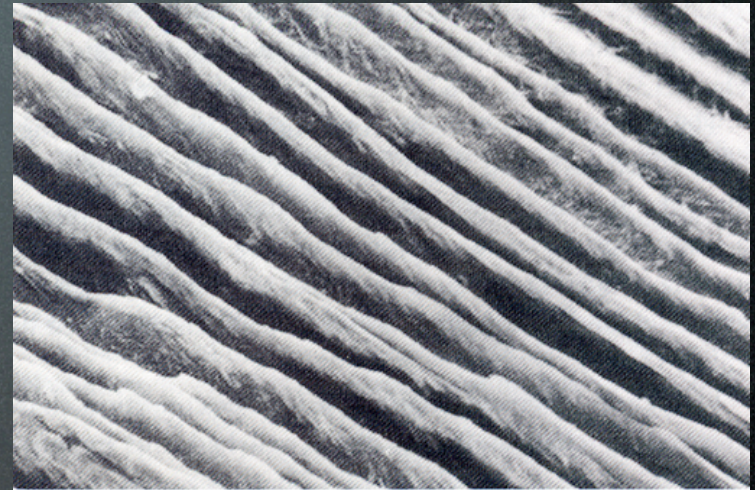


- The only site of production of the nail plate
- Extend distally to the lunula
- Also extend over the nail plate
- Cannot be replaced by any other tissue +++



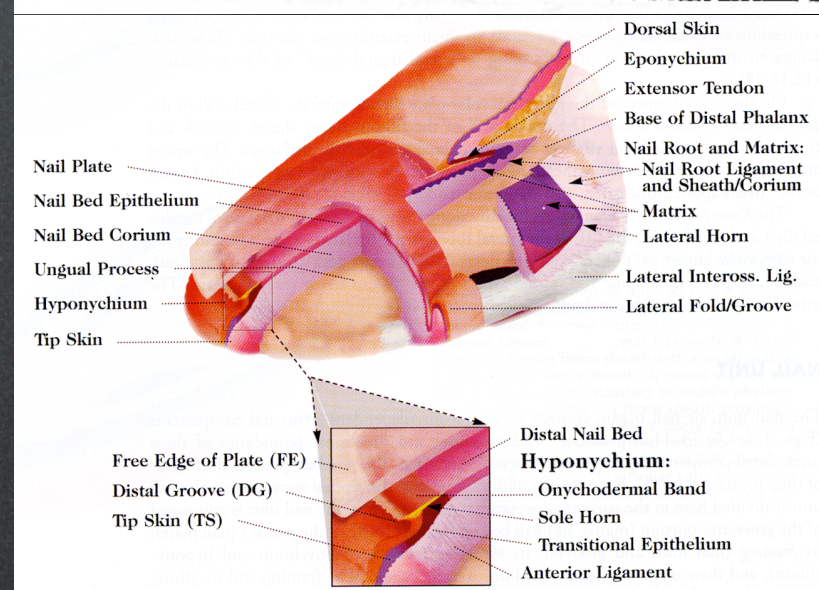
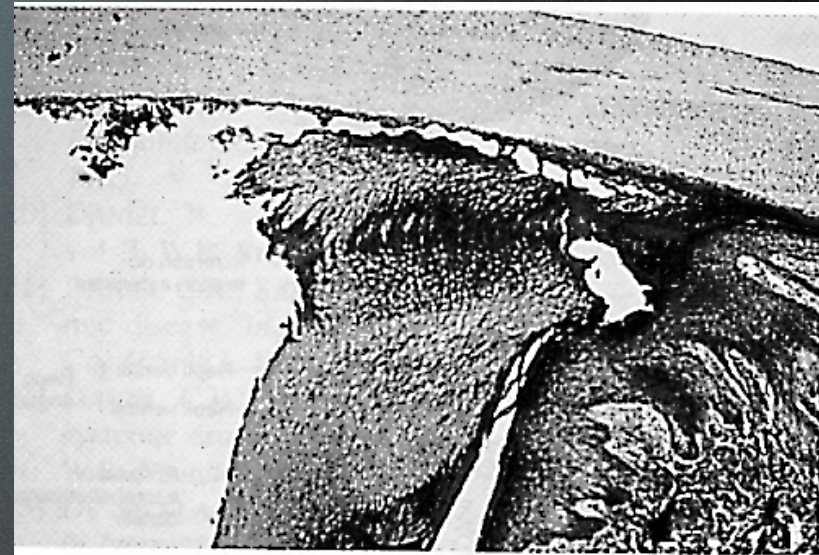
The nail bed

- Specialized structure responsible for:
 - Nail plate adhesion
 - Nail plate shape
- May sometimes be replaced by another tissue



Hyponychium

- Transitional zone where the nail plate lost its adhesion +++
- Acts as a barrier against microbial infection
- Its loss is responsible for a painful attachment of the plate to the pulp

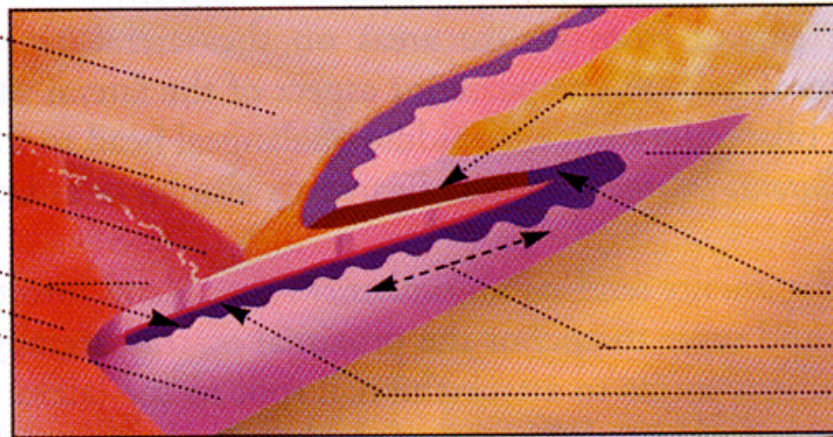


Proximal nail fold



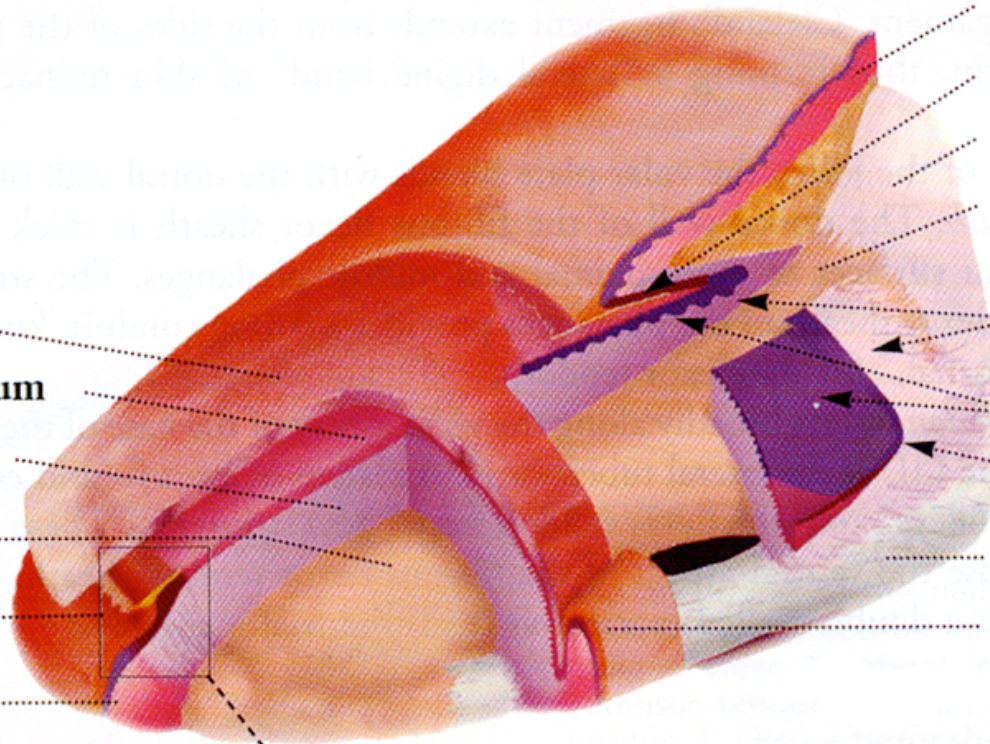
- It covers the plate and participates to its shape by molding the plate and pushing it distally
- It is fixed to the plate through the cuticle

Proximal Nail Fold
False Cuticle
True Cuticle
Lunula
Nail Plate
Nail Bed Corium
(Proximal)



Extensor Tendon
Eponychium
Root Sheath/Ligament
Matrix:
Dorsal
Intermediate
Keratogenous Zone

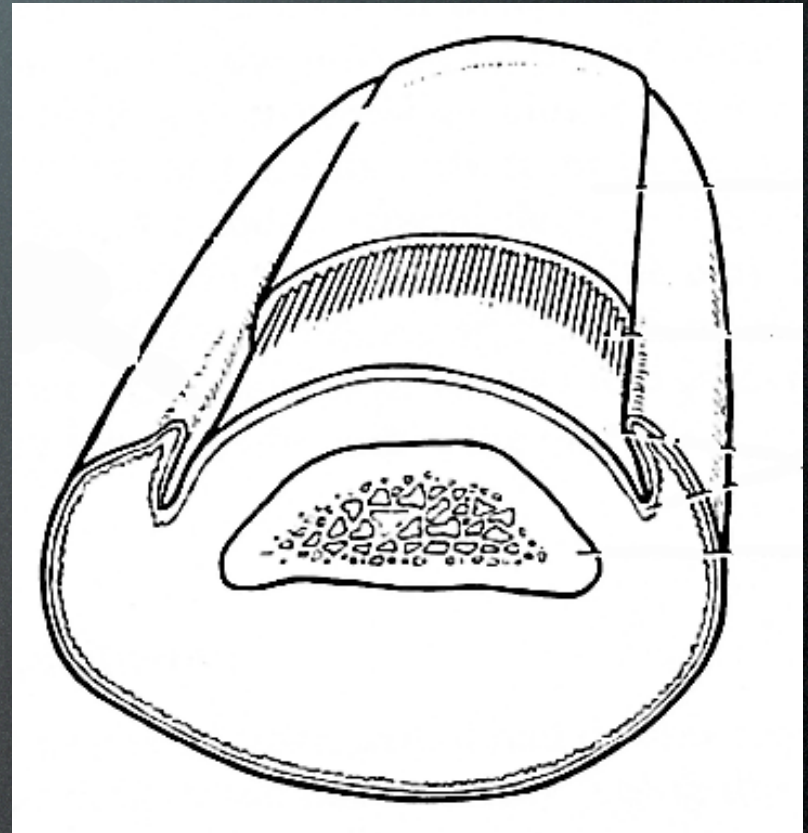
Nail Plate
Nail Bed Epithelium
Nail Bed Corium
Ungual Process
Hyponychium
Tip Skin



Dorsal Skin
Eponychium
Extensor Tendon
Base of Distal Phalanx
Nail Root and Matrix:
Nail Root Ligament
and Sheath/Corium
Matrix
Lateral Horn
Lateral Inteross. Lig.
Lateral Fold/Groove

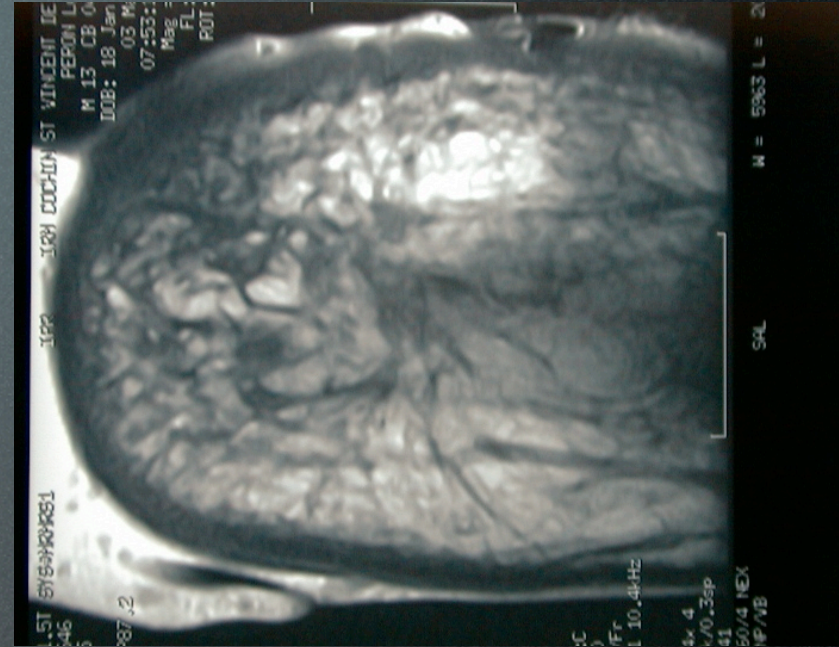
Lateral nail folds

- Hold the nail plate and give it its shape and direction

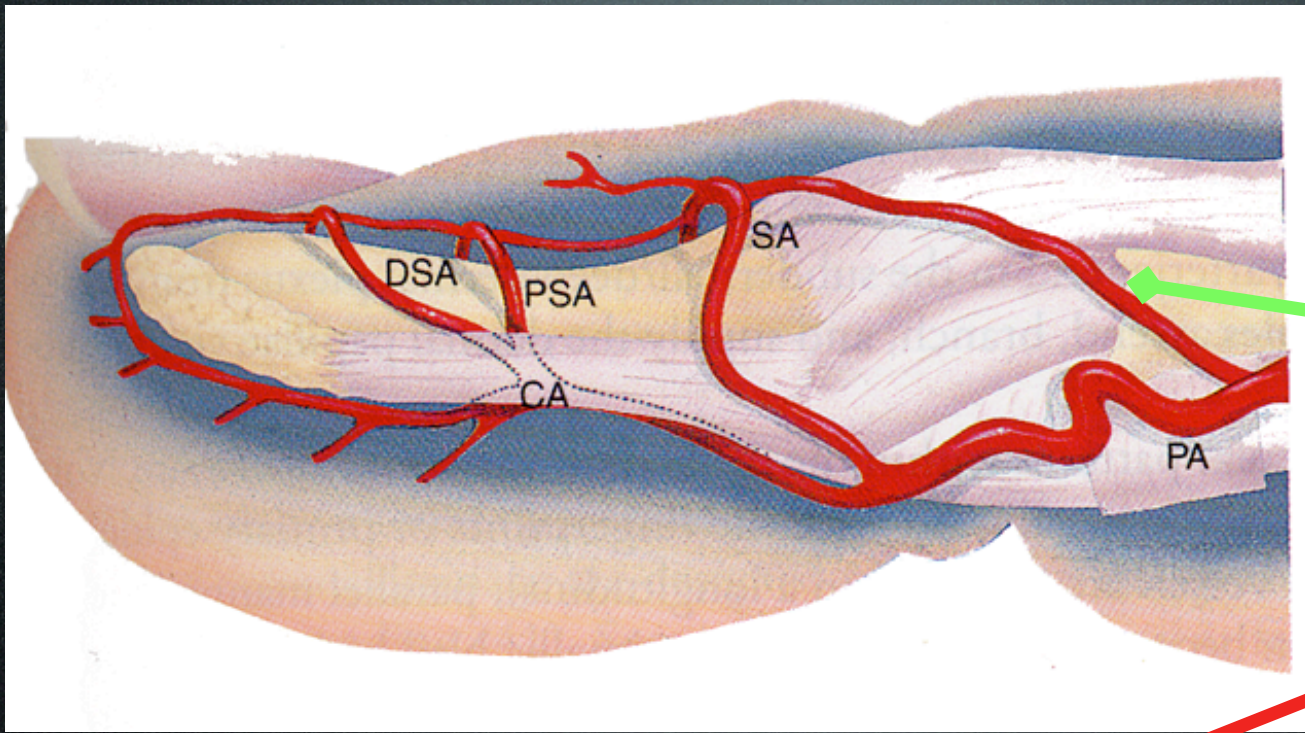


Vascularization

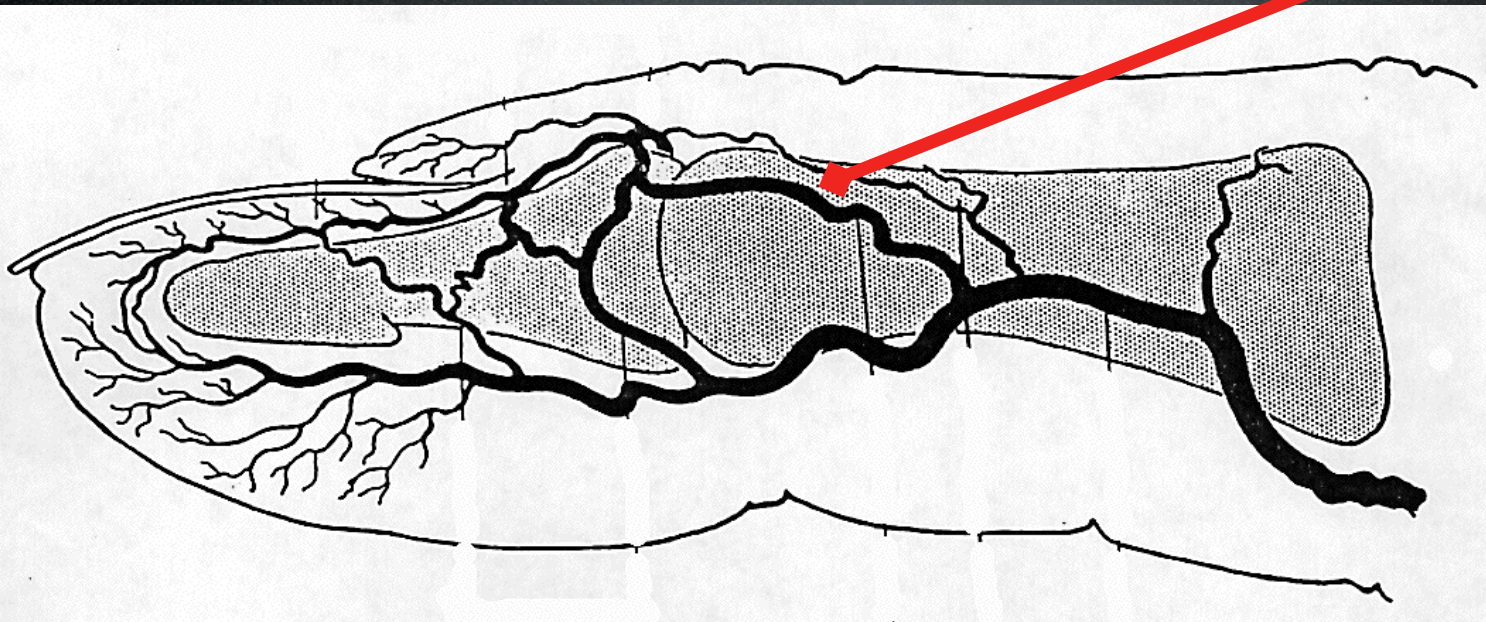
- 4 origins
 - Flint's artery
 - Arch of the proximal fold
 - Transverse arches under flint's ligament
 - Distal arteries coming from the pulp



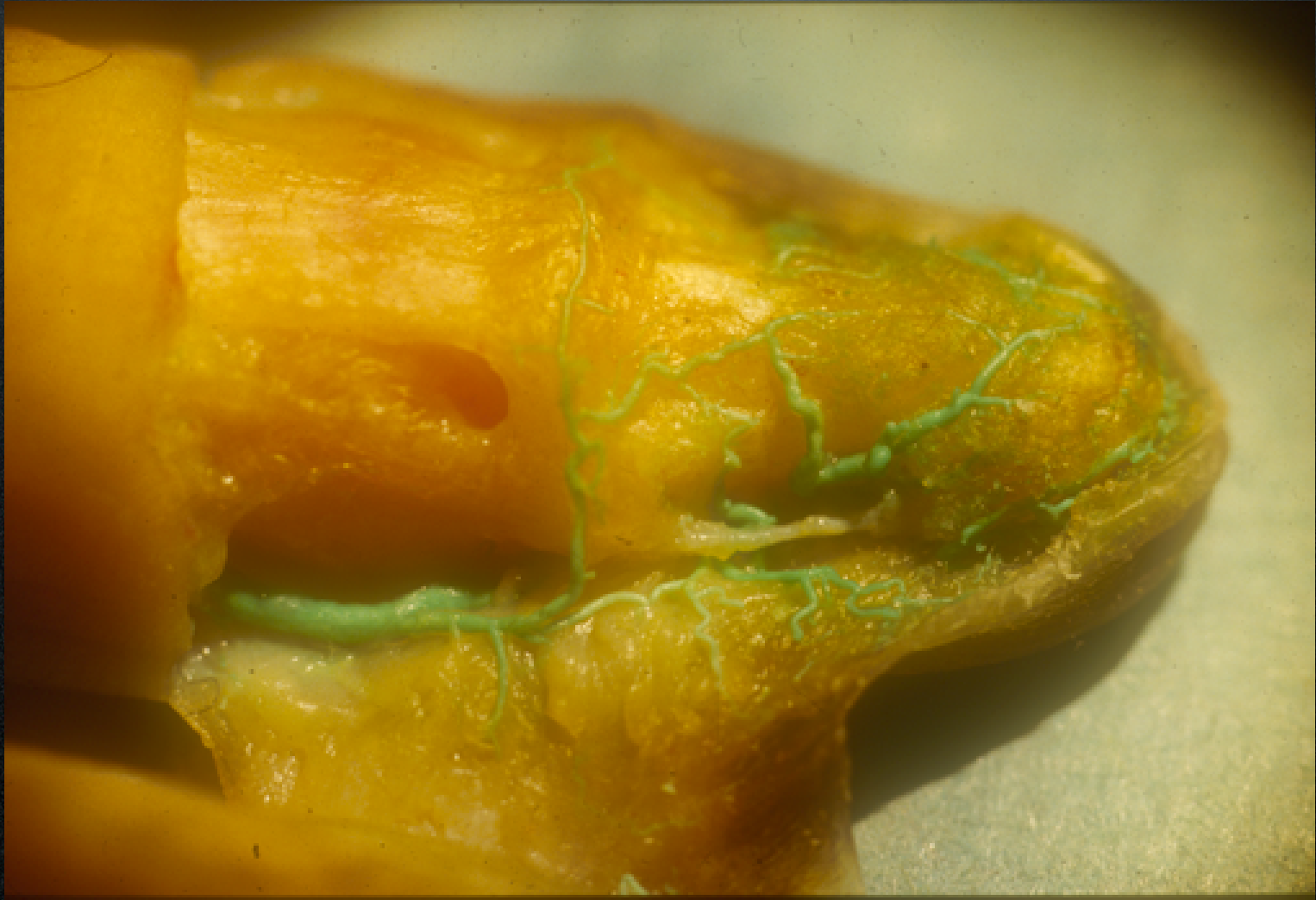
All those vessels are anastomotic



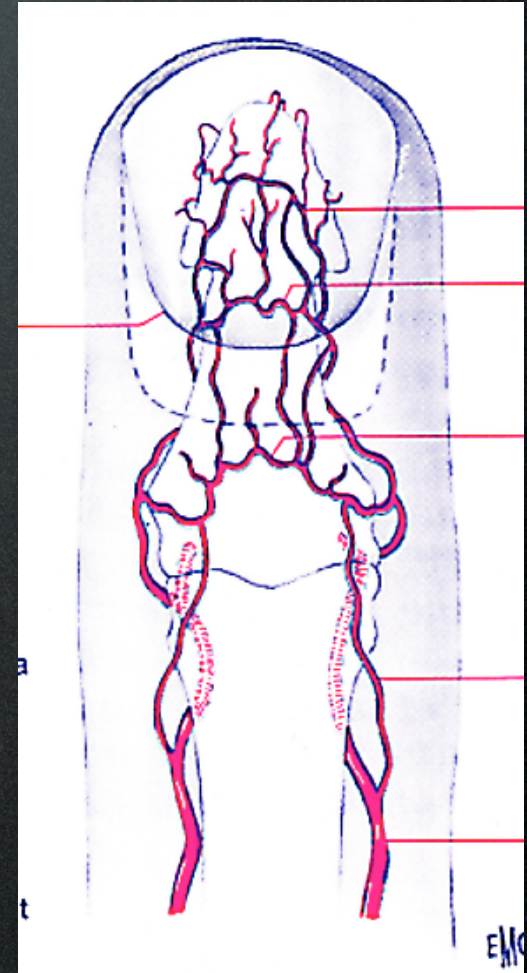
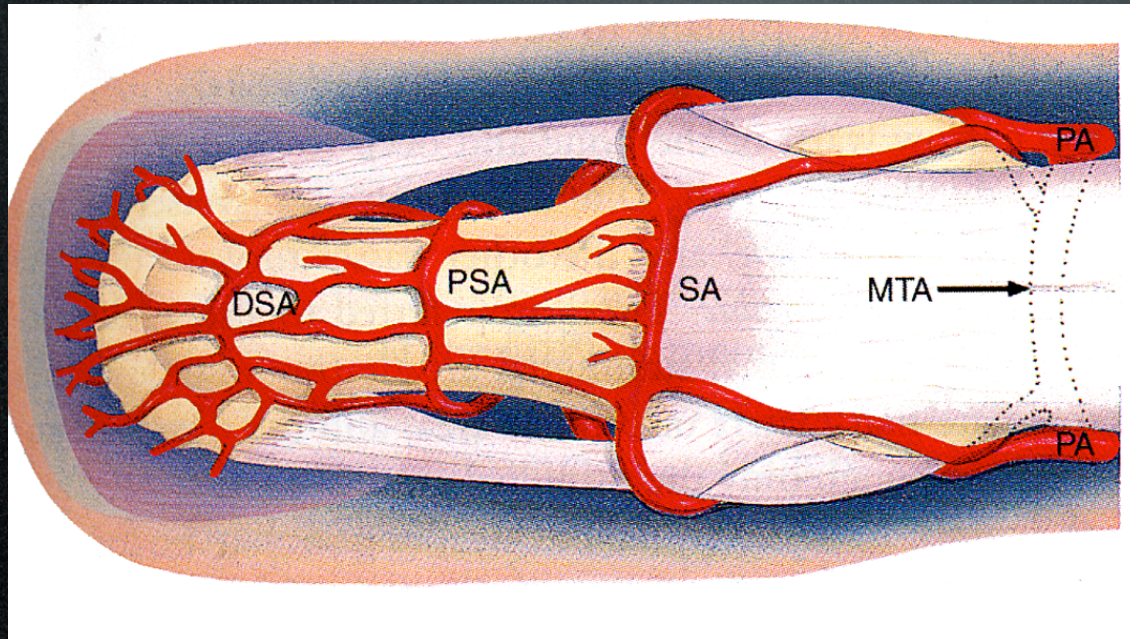
Flint's
a.



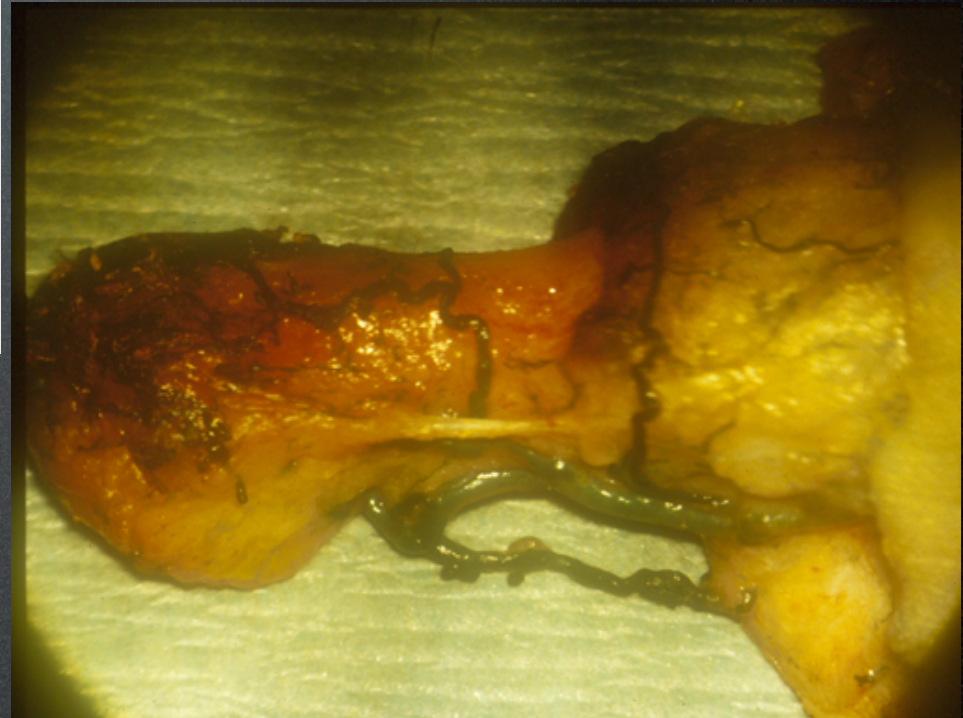
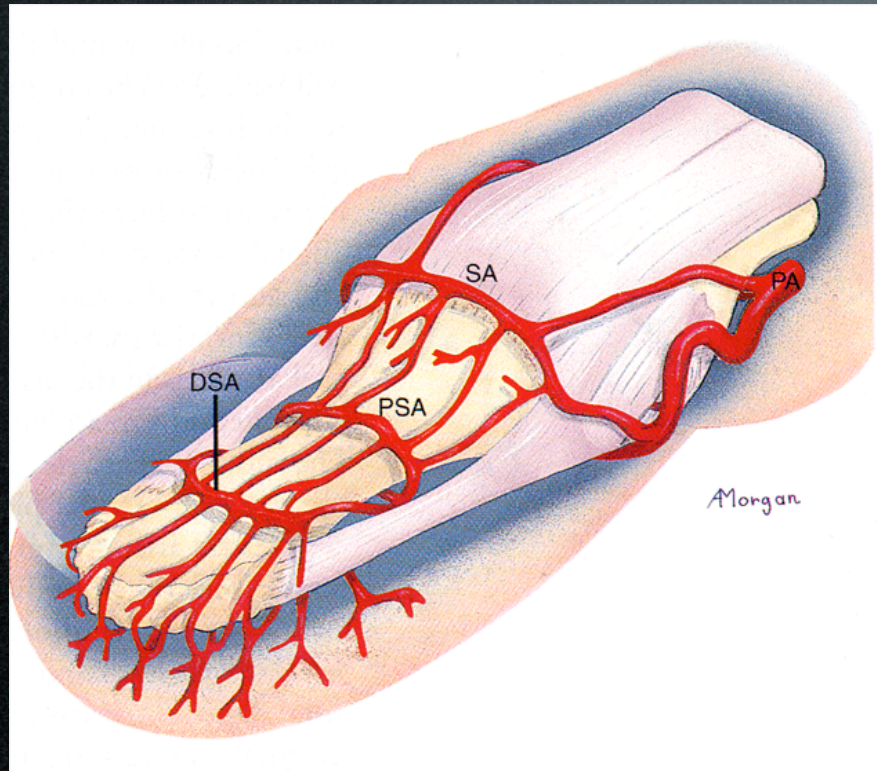
Proximal nail fold arch



Transverse arches



Distal vessels from the pulp

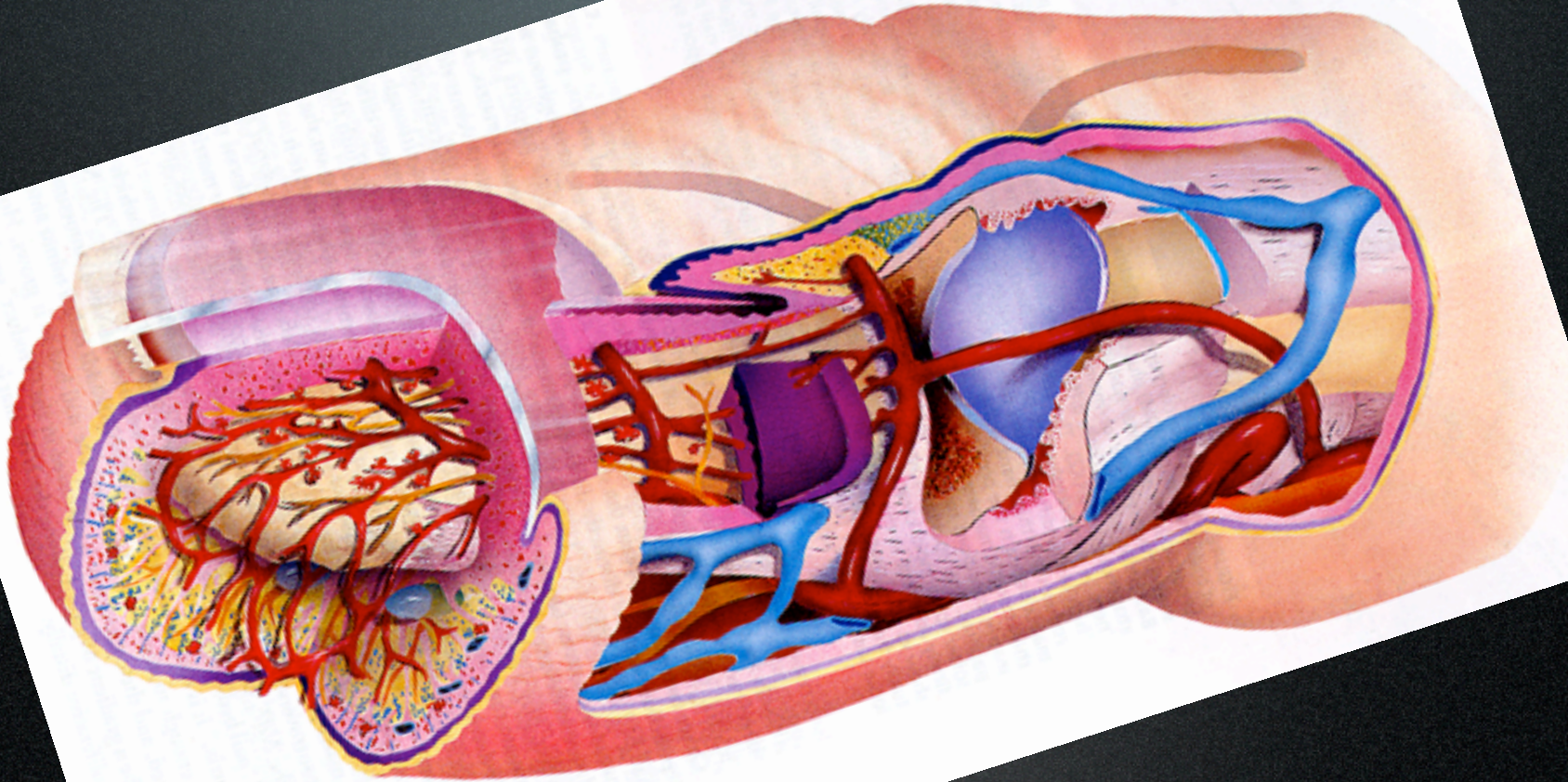


Venous drainage

- Very rich
- Non systematized
- Only around the DIP joint can we find veins that diameter is compatible with microsurgical anastomoses



To summarize !



Innervation

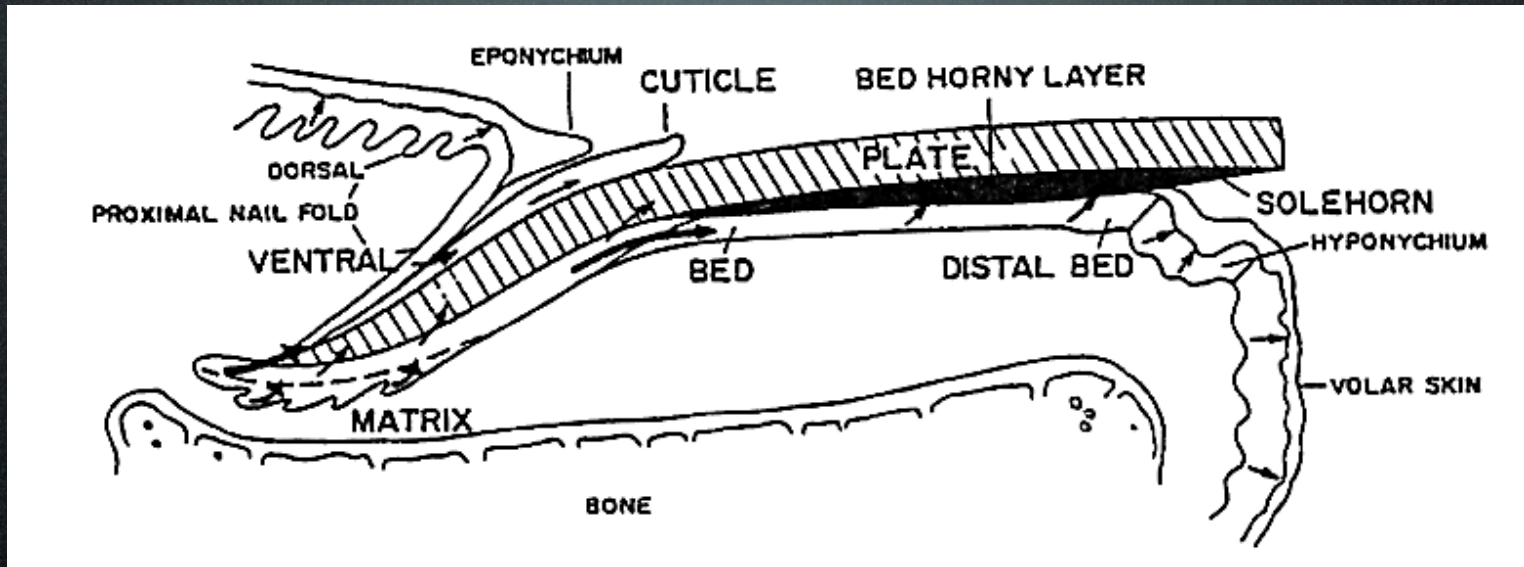
- Very rich
- Nerves usually follow the arteries



Physiology of the nail

- Mostly unknown +++
 - Sketchy knowledge
 - Little possibilities of animal experimentation
 - Little surgical works

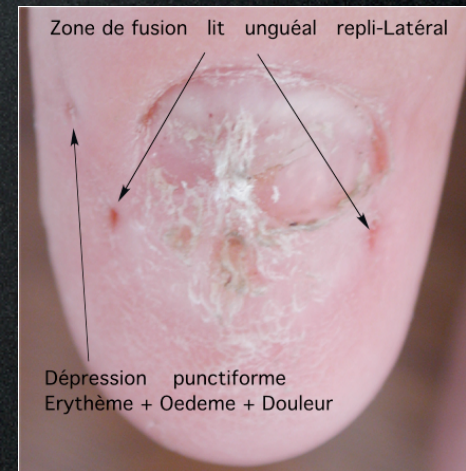
Nail growth



- The nail plate is produced by the nail matrix
- Normal growth is about 1,9 to 4,4 mm/month (0,3 mm per day)

Clinical consequences

- It needs two month for the plate to exit the proximal nail fold
- It needs 6 months for a complete nail plate re-growth
- The first plate is always irregular, so clinical results can only be evaluate at one year follow-up



After a trauma

- Nail plate growth stops for 3 weeks
- The proximal part of the plate thicken
- The growth accelerates for 50 days (the nail plate gets thinner)
- Then the nail growth is slower for 30 days

After a trauma

- Apparition of a transverse line on the nail plate: the Beau's line
- Which width is related to the duration of the trauma
- Which moves distally with time



Clinical consequences

- A matrix lesion (or a scar) cannot produce nail plate
- The plate will appear separated or with a crack. A scar on the proximal fold will induce a pterygion
- Maximum loss of substance without sequelae is 3 mm



Clinical consequences

- Nail bed lesions will limit the nail plate growth and adhesion
 - Onycholysis
 - Fissure, cracking,...
 - Nail fragility (onychoschyzy)



The nail is a complete organ

- Shape of the plate
- Depends of the folds (proximal > lateral)
- but also of the nail bed
- And of the bony structures under it

