

Svaly a hlavní kmeny cév a nervů dolní končetiny a hlavní topografické útvary

Ondřej Naňka

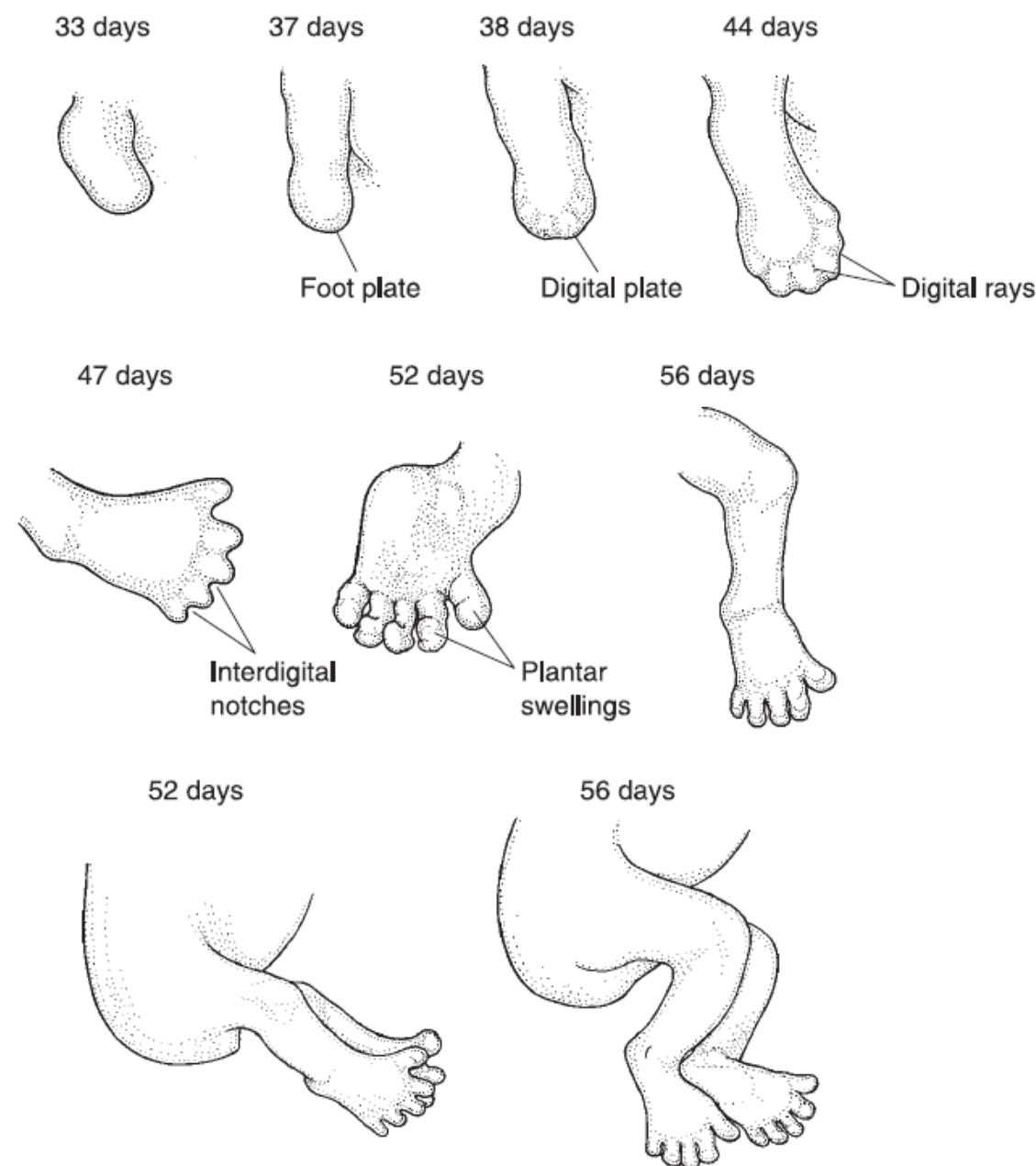


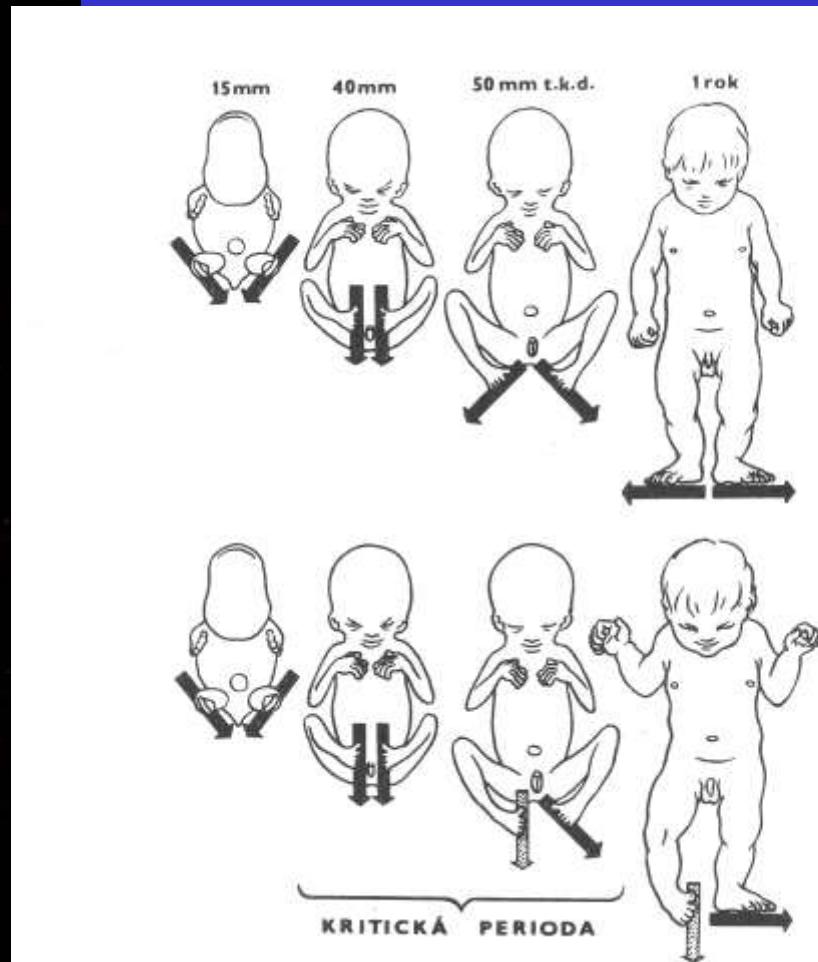
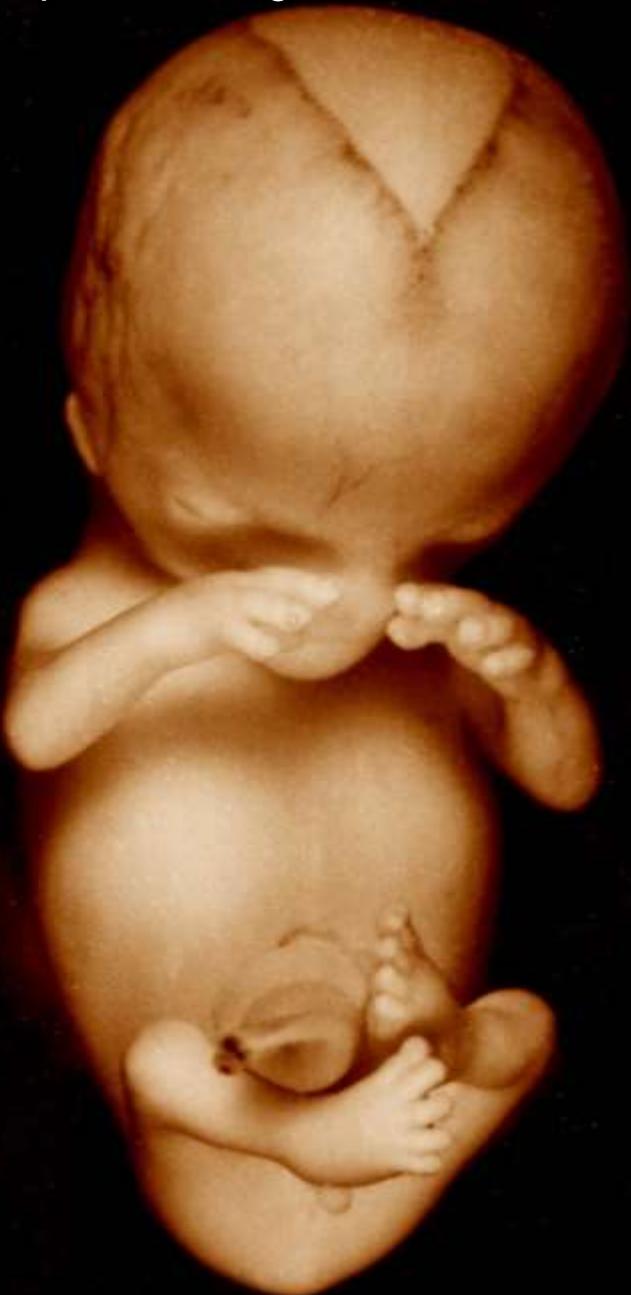
Figure 11.21 The development of the lower limb between 5 and 8 prenatal weeks (redrawn after Larsen, 1993).



Jirásek Jan Ev.: Human Pregnancy and Developmental Stages. Farmakon, 2010

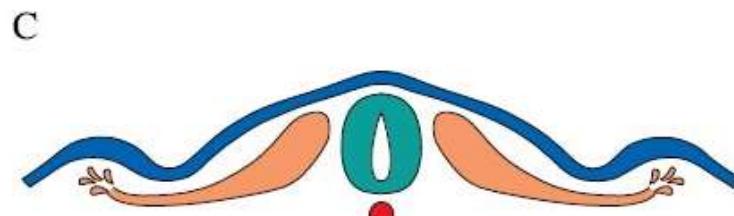
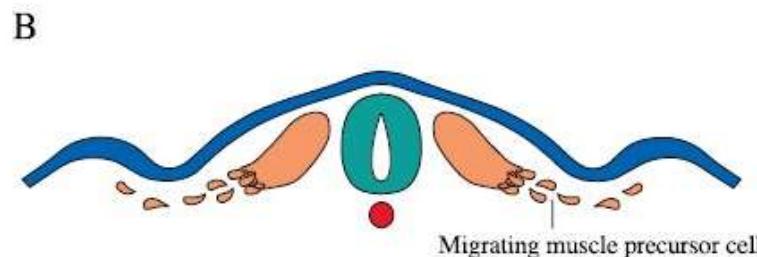
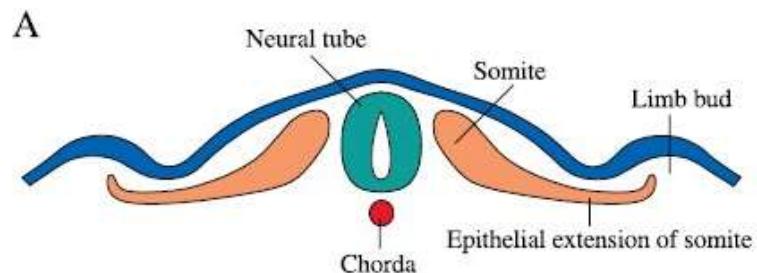


Jirásek Jan Ev.: Human Pregnancy and Developmental Stages. Farmakon, 2010

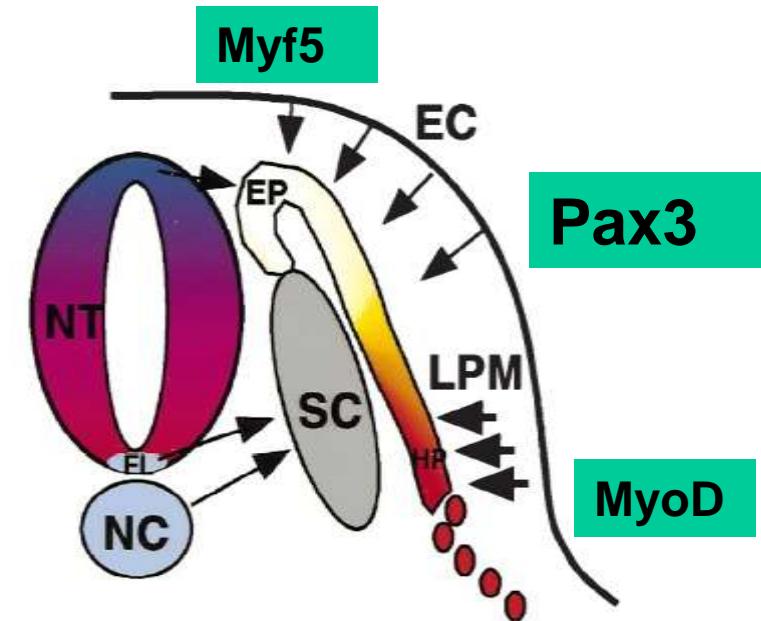


Končetiny jsou tvořeny mesenchymovým jádrem pocházejícím ze somatopleury, ze kterého vznikne skelet a všechny další pojivové tkáně končetiny.

Výchozí buňky ostatních tkání do končetiny migrují (myogenní buňky, melanoblasty, Schwannovy buňky, angioblasty) a vrůstají (nervová vlákna, cévy) z axiálních struktur.



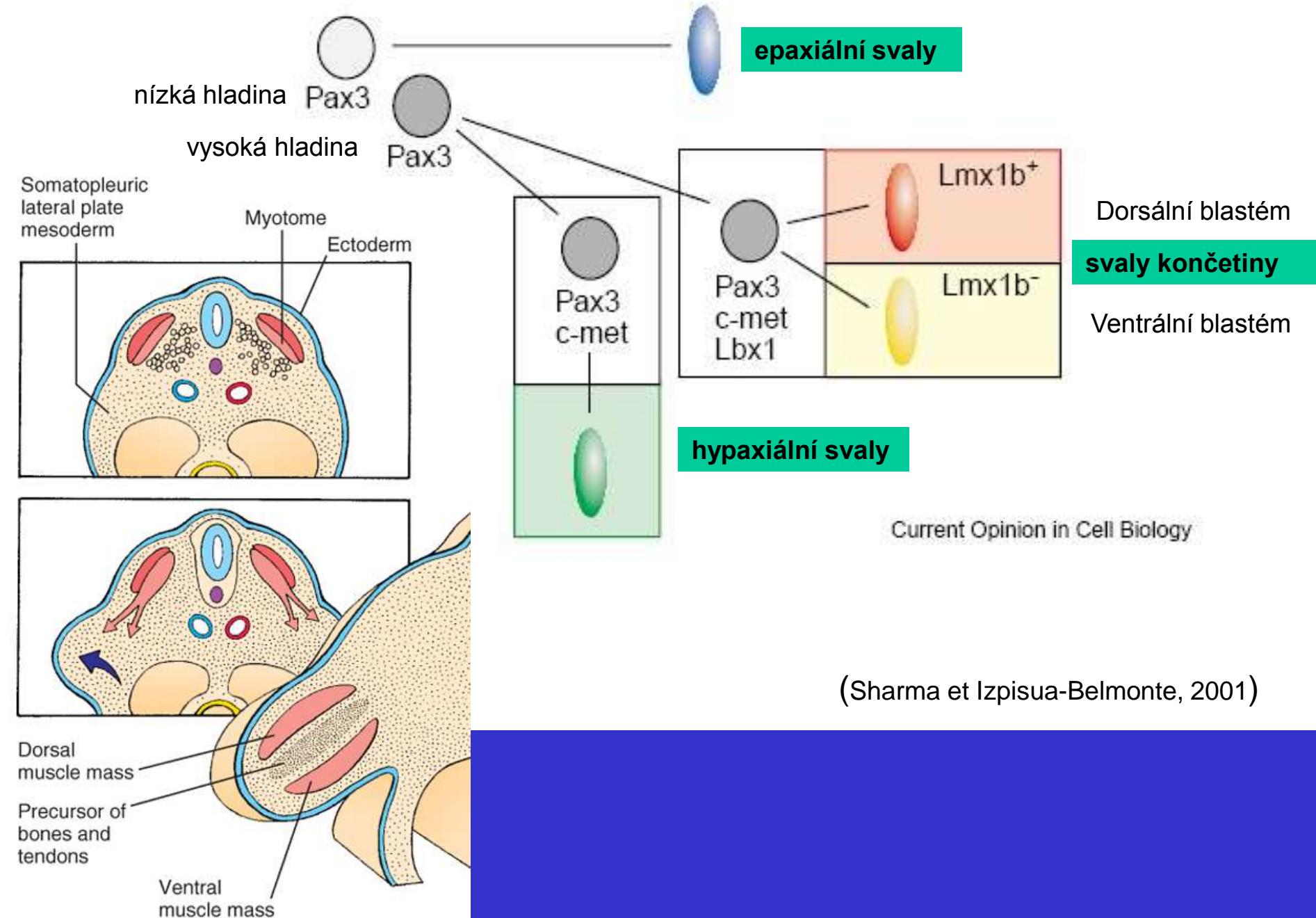
(Gallis, 2001)



(Büscher et Izpisua-Belmonte, 1998)

a subset of lateral precursors expresses *Lbx1* and migrates into the developing limb

Genová regulace vývoje různých svalových skupin



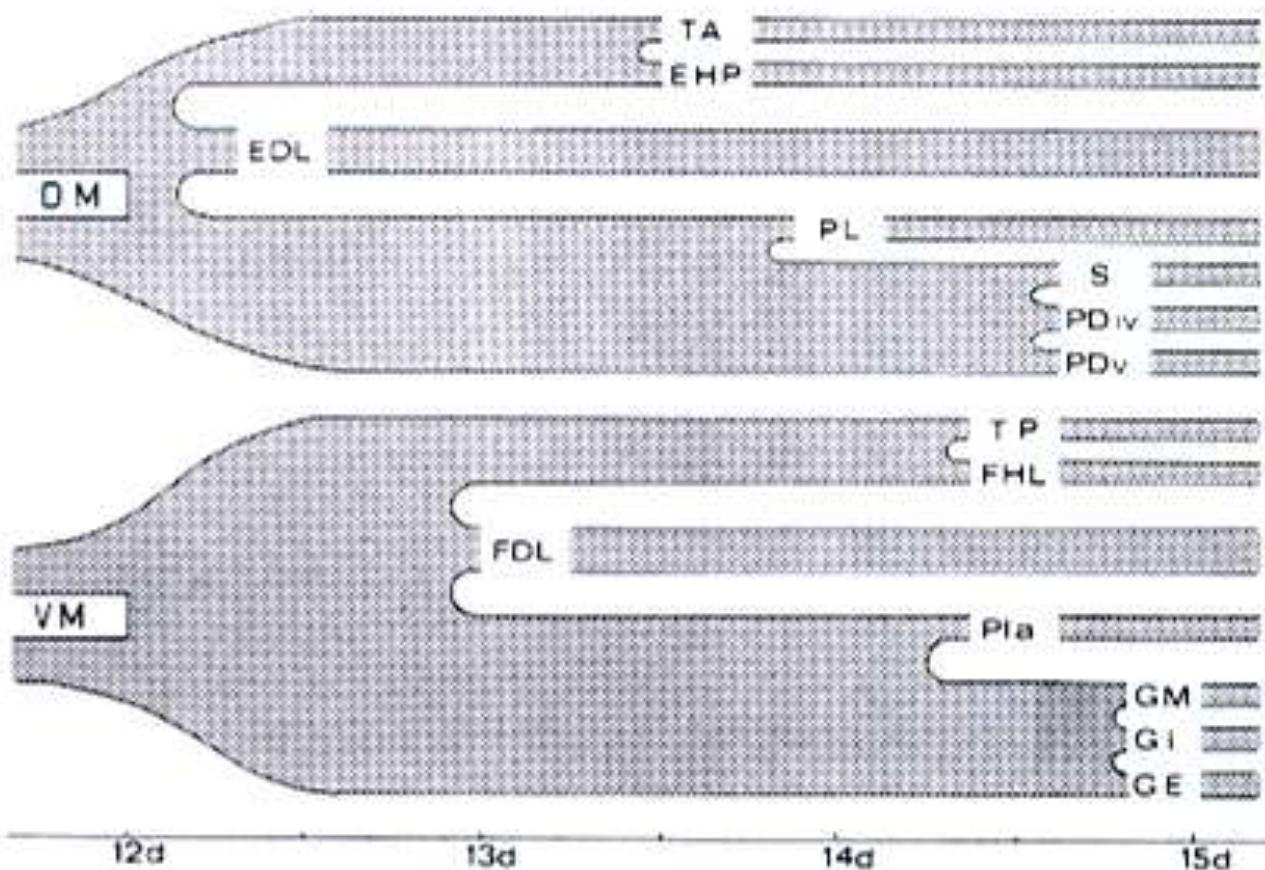
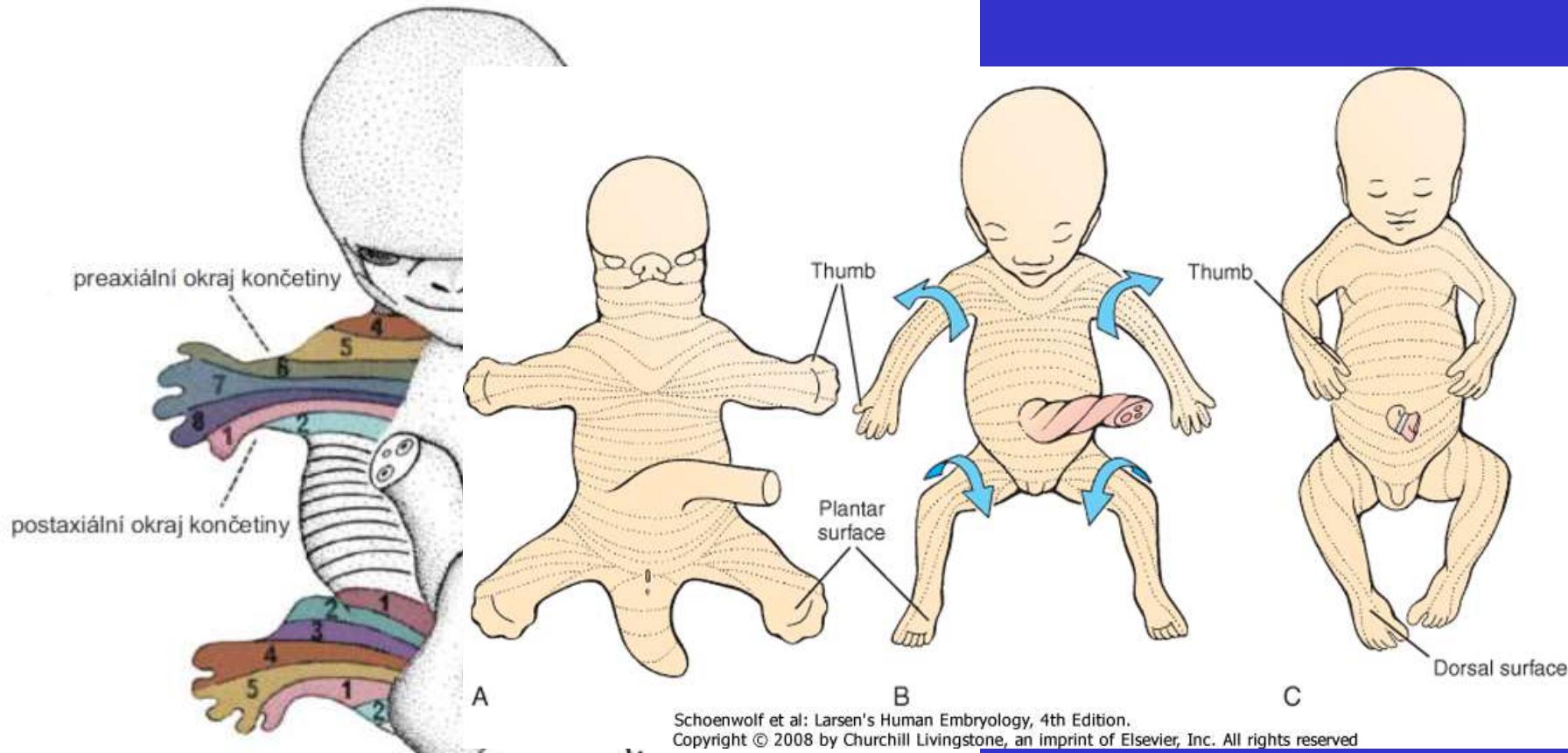
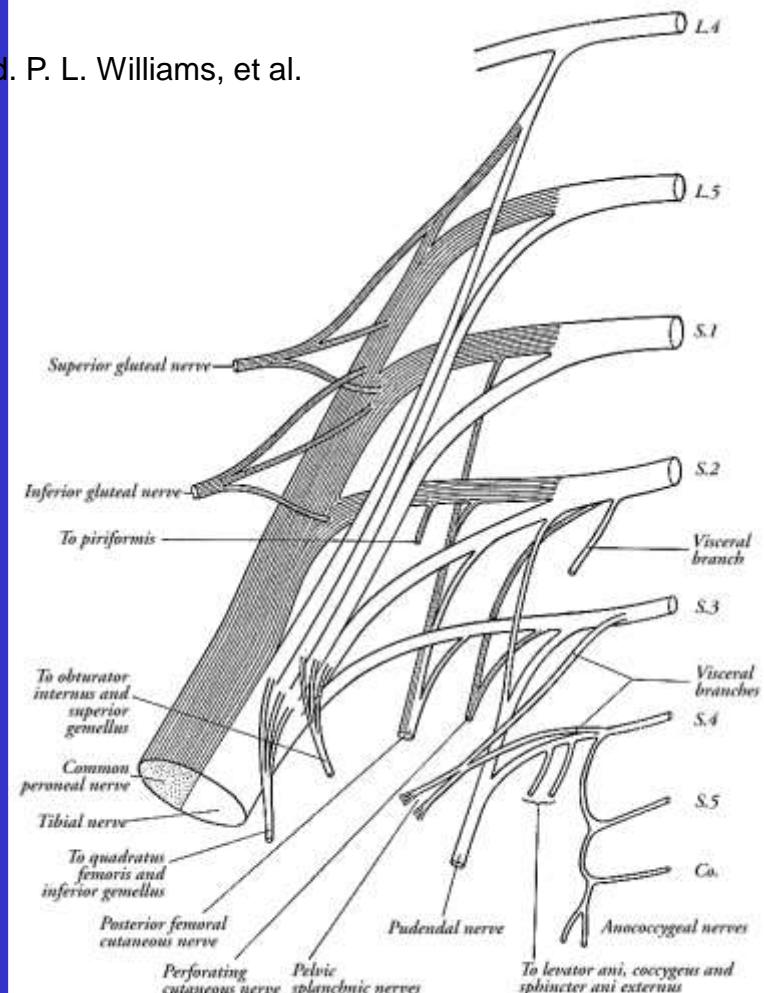
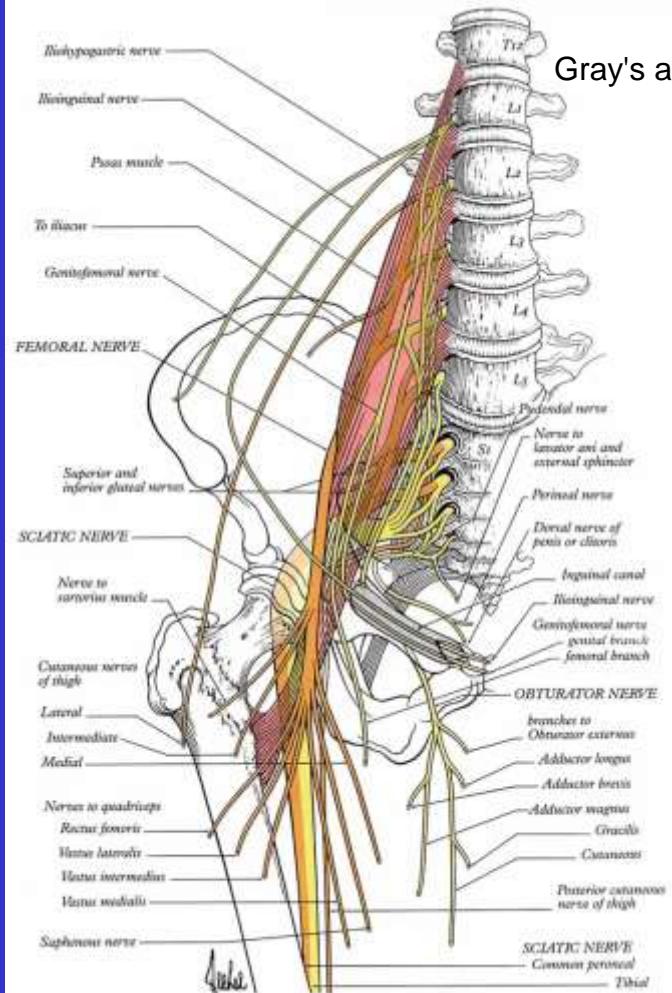


Fig. 7. Diagrammatic representation of the history of muscle splittings in the mouse lower leg between 12 and 15 days of gestation. DM = Dorsal premuscular mass; VM = ventral premuscular mass. Abbreviations of muscle denominations [nomenclature according to Greene, 1963]: EDL = M. extensor digitorum longus; EHP = M. extensor hallucis proprius; FDL = M. flexor digitorum longus; FHL = M. flexor hallucis longus; GE, GI, and GM = M. gastrocnemius, pars externa, interna, and media; PDIV = M. peroneus digiti quarti; PDV = M. peroneus digiti quinti; PL = M. peroneus longus; Pla = M. plantaris; TA = M. tibialis anterior; TP = M. tibialis posterior; S = M. soleus.



Obr. 10.5 Projekce segmentace trupu do základů končetin. Z příslušných somitů pocházejí myogenní buňky a z odpovídajících míšních segmentů kořenová inervace. V dalším vývoji není segmentová úprava a inervace svaloviny zřetelná, ale segmentová inervace kožních okrsků je zachována. **A.** Pupen horní končetiny ve stáří 5 týdnů. **B.** Horní končetina ve stáří 6 týdnů. **C.** Končetiny ve stáří 7 týdnů.

Sadler: Langmannova lékařská embryologie, Grada, 2011



Na DK jsou extensoria pocházející z dorsálního svalového blastému inervovány z n. femoralis a z n. peroneus communis, které vznikly z dorsálního větvení rami anteriores lumbálních a sakrálních nervů. Naproti tomu **adduktory a flexory pocházející z ventrálního svalového blastému** jsou inervovány z n. obturatorius a n. tibialis, které pocházejí z ventrálního větvení příslušných rr. anteriores. Nervy před vstupem do základu končetiny vytvářejí pleteně a pak teprve vrůstají do ventrálního a dorsálního svalového blastému.

Pl. lumbalis

Th12-L4

N. subcostalis

N. iliohypogastricus

N. ilioinguinalis

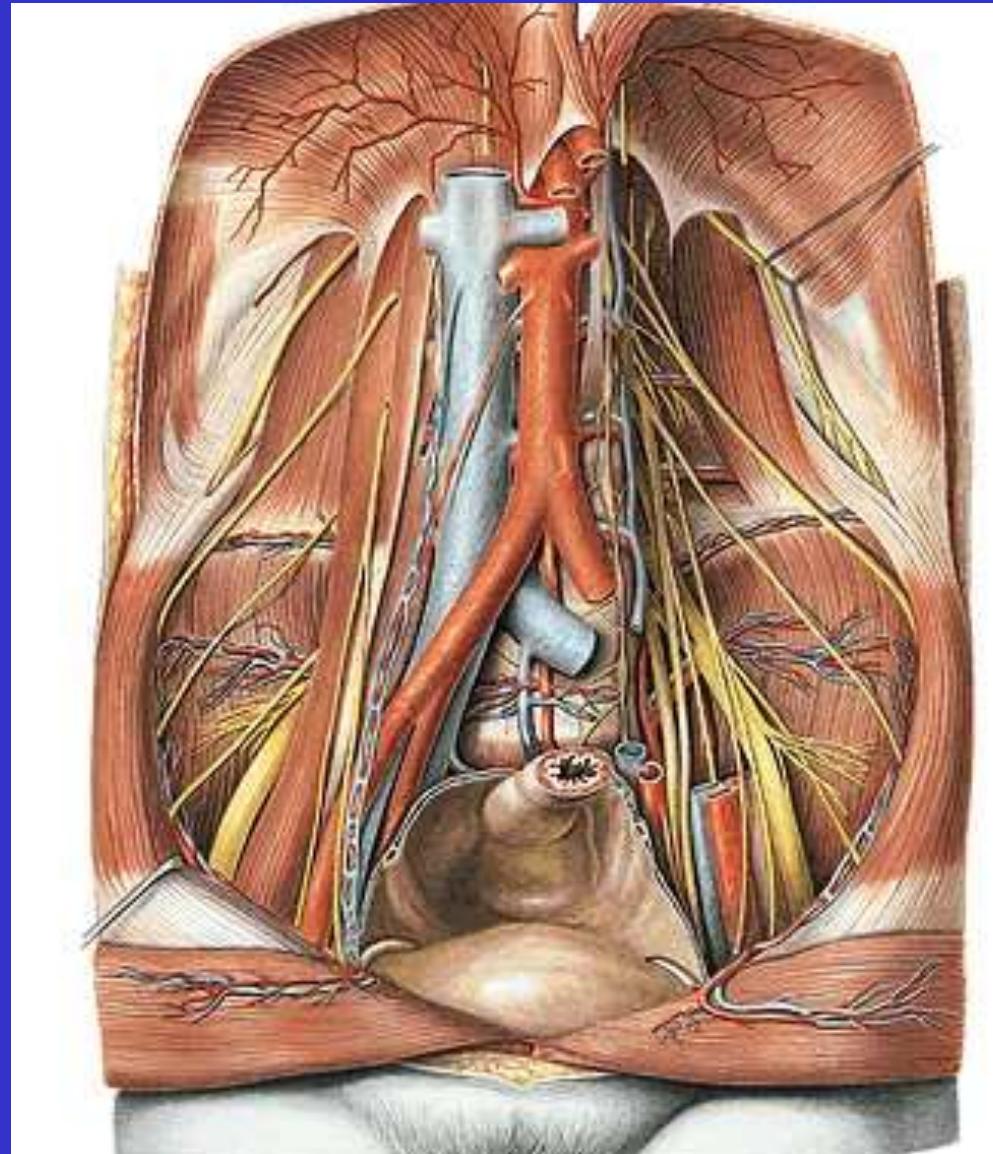
N. cutaneus femoris

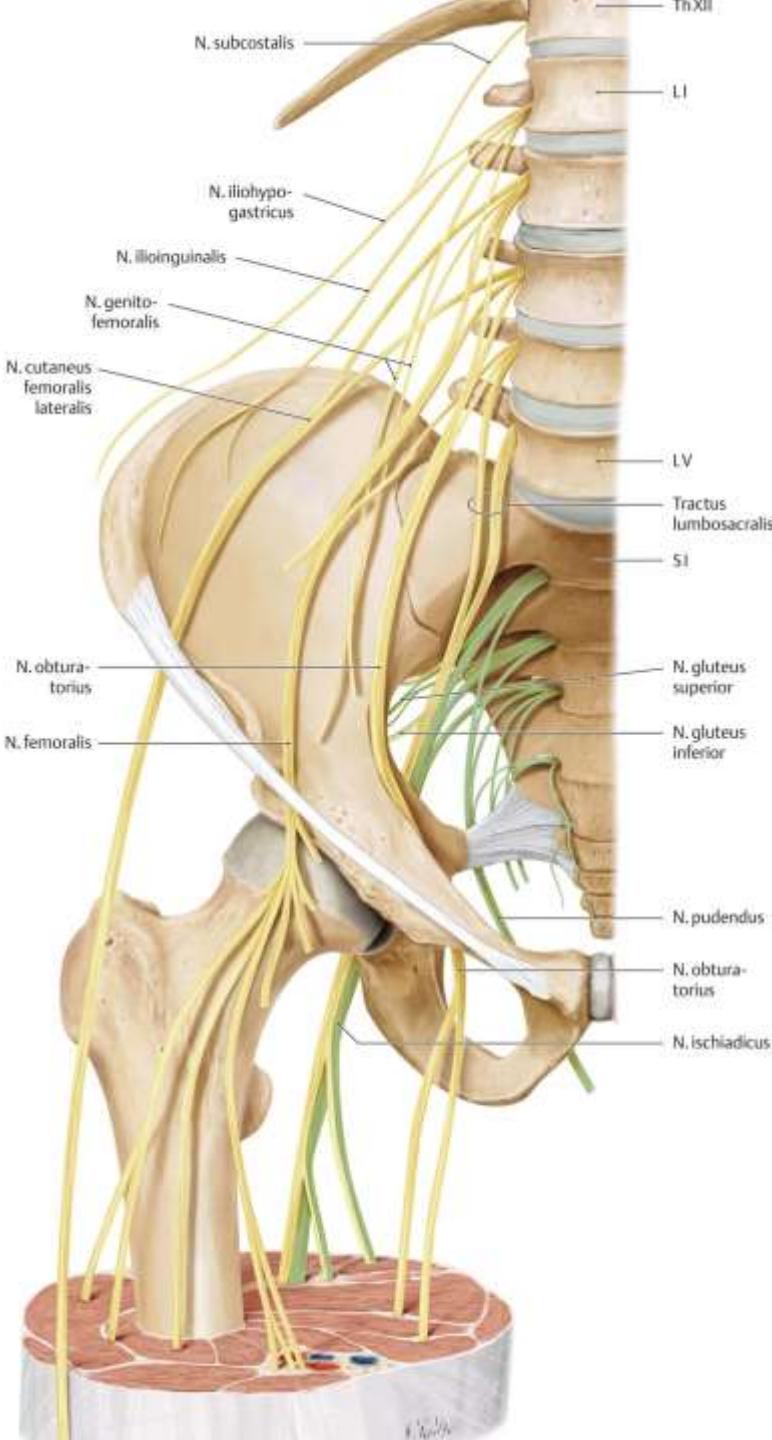
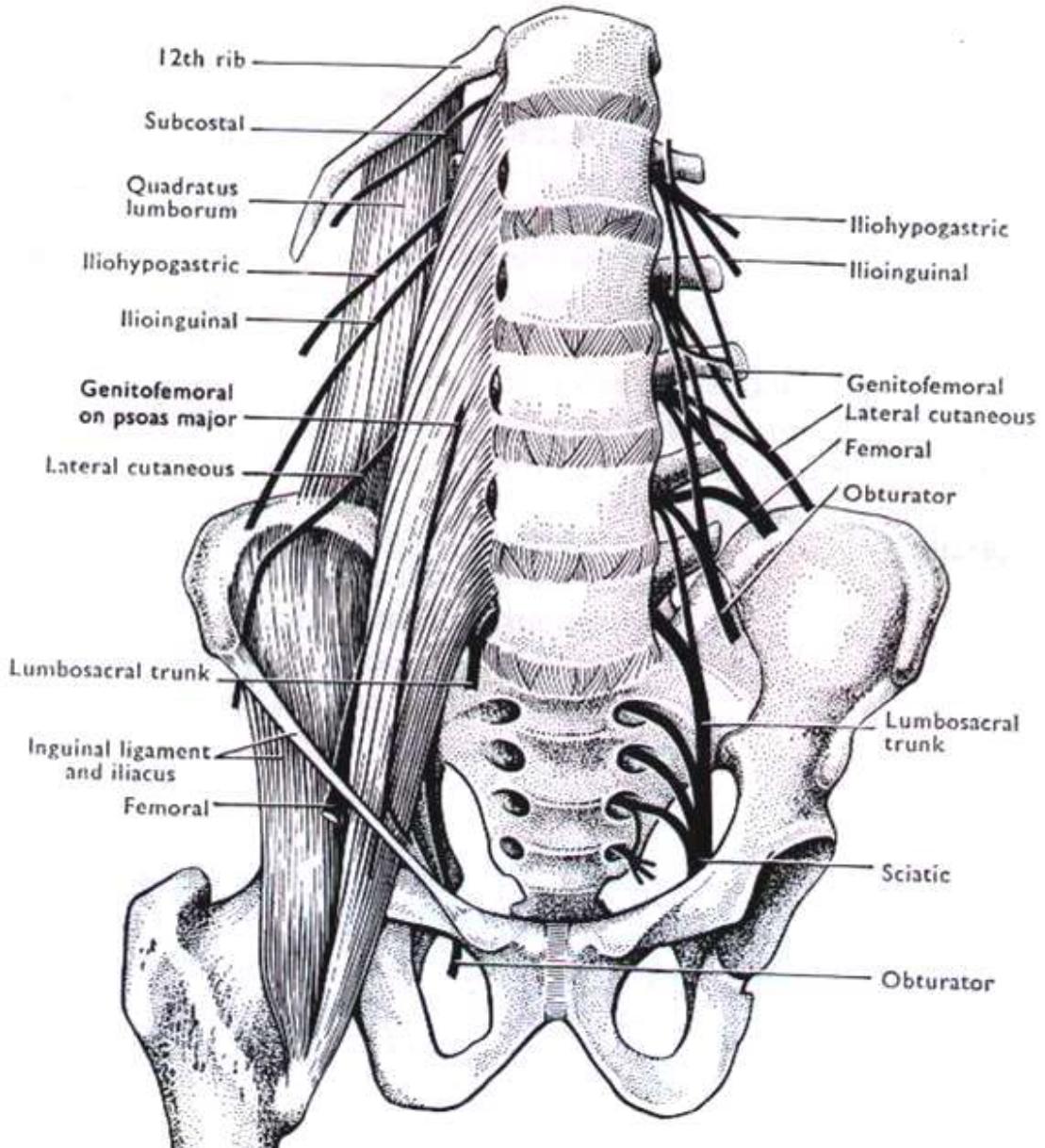
lateralis

N. femoralis

N. genitofemoralis

N. obturatorius





Plexus sacralis

L4-S4

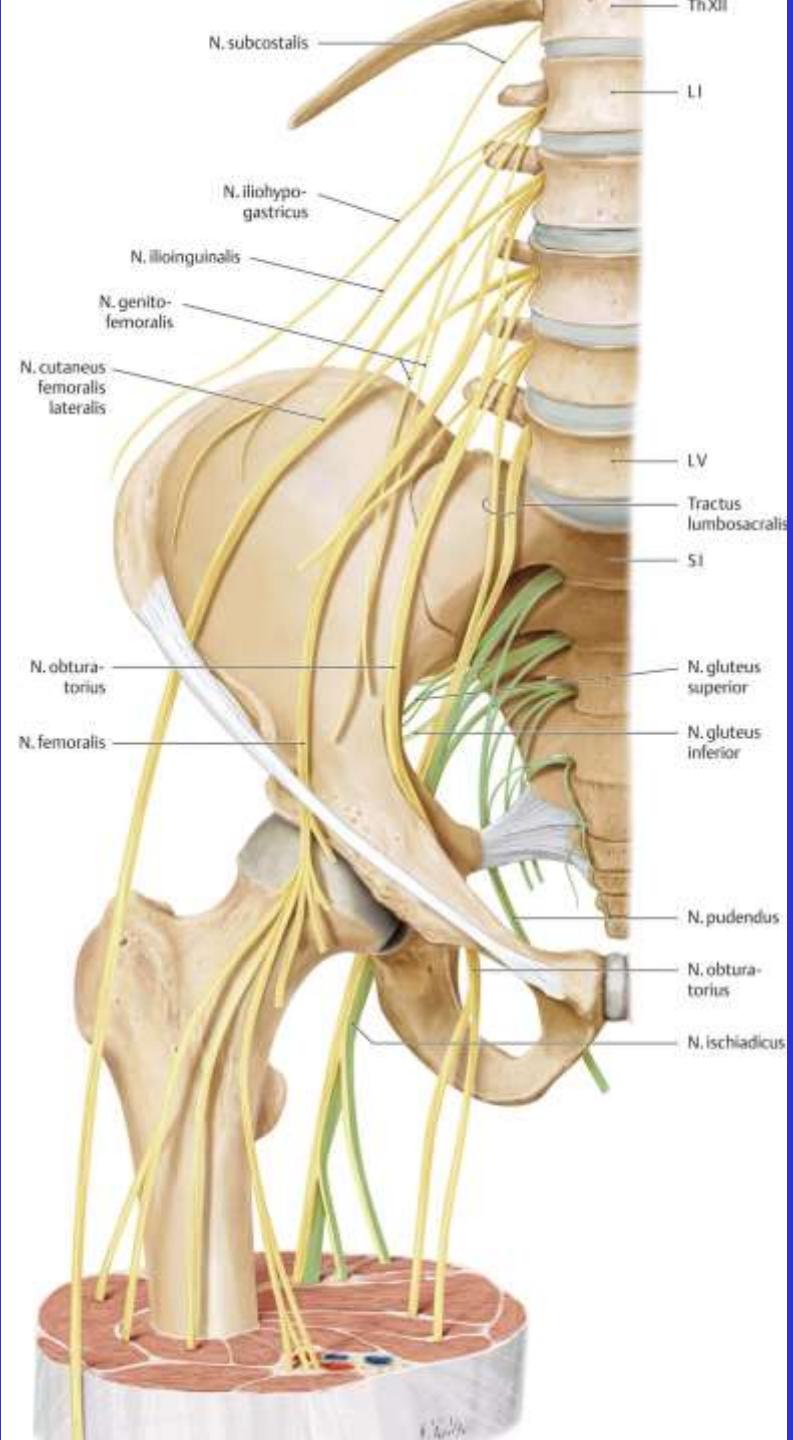
N. gluteus superior

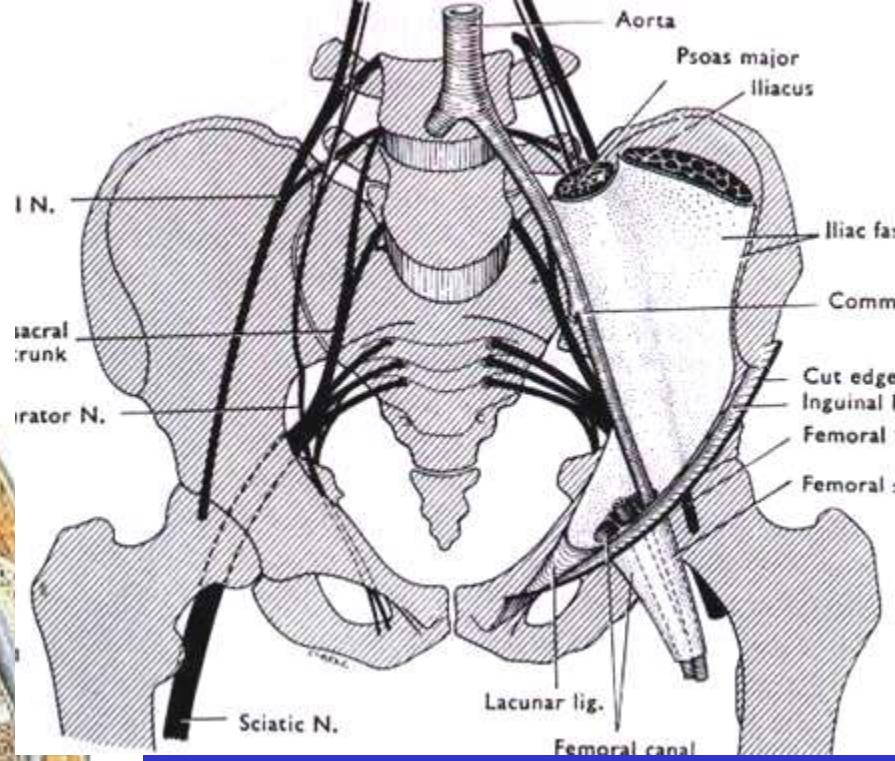
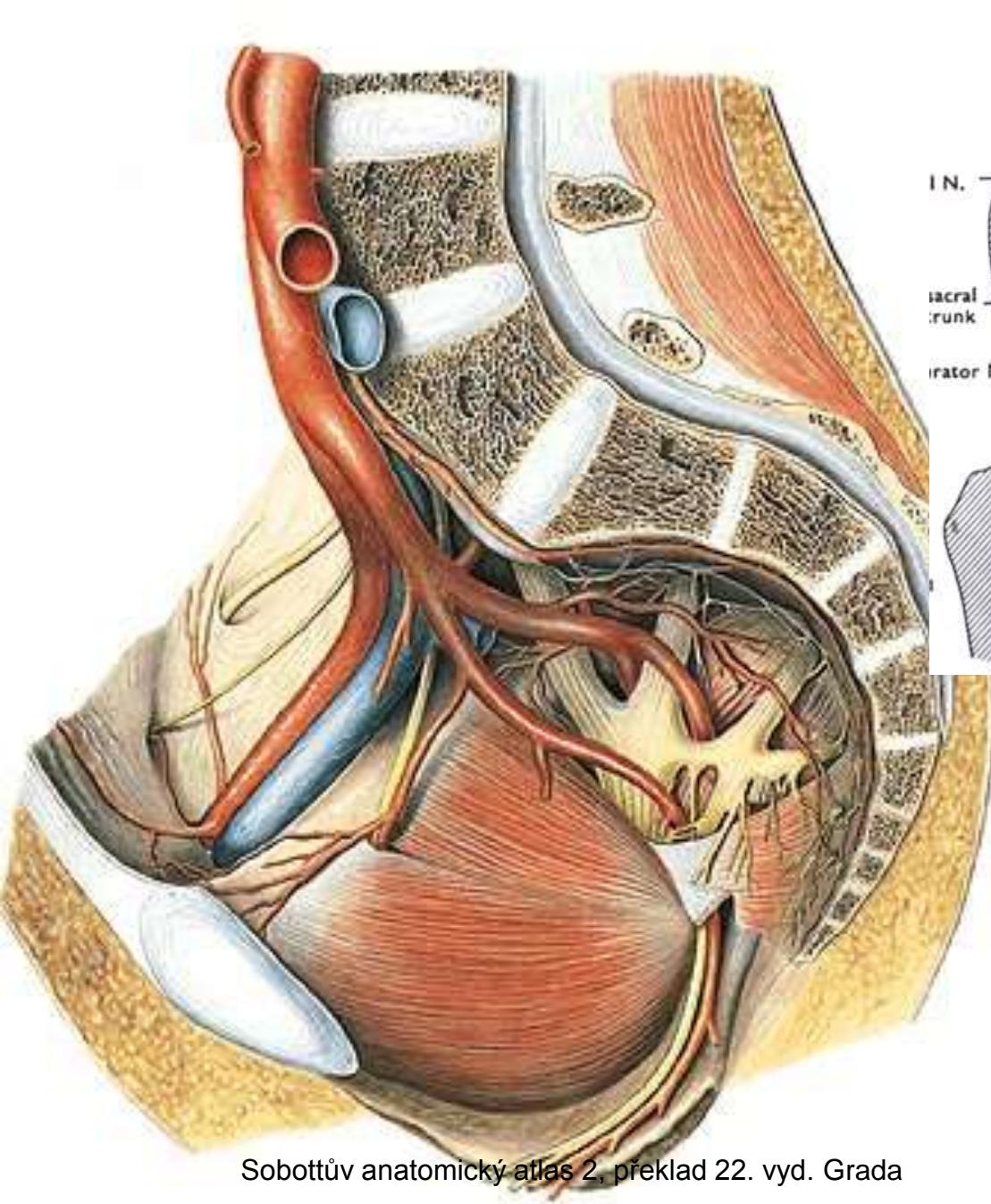
N. gluteus inferior

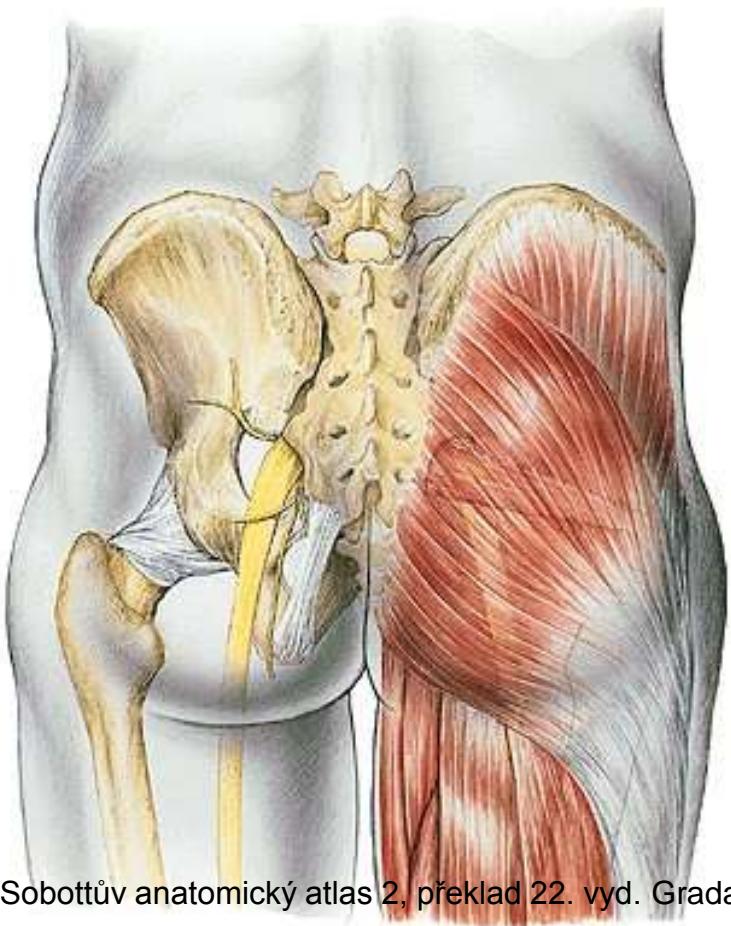
N. cutaneus femoris posterior

N. ischiadicus

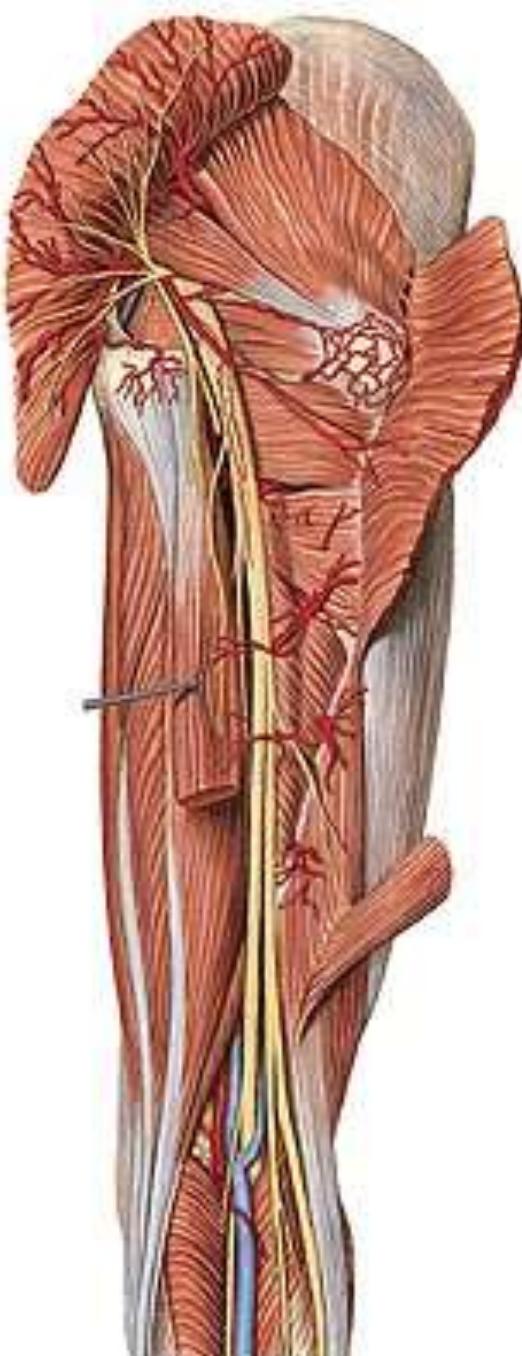
N. pudendus





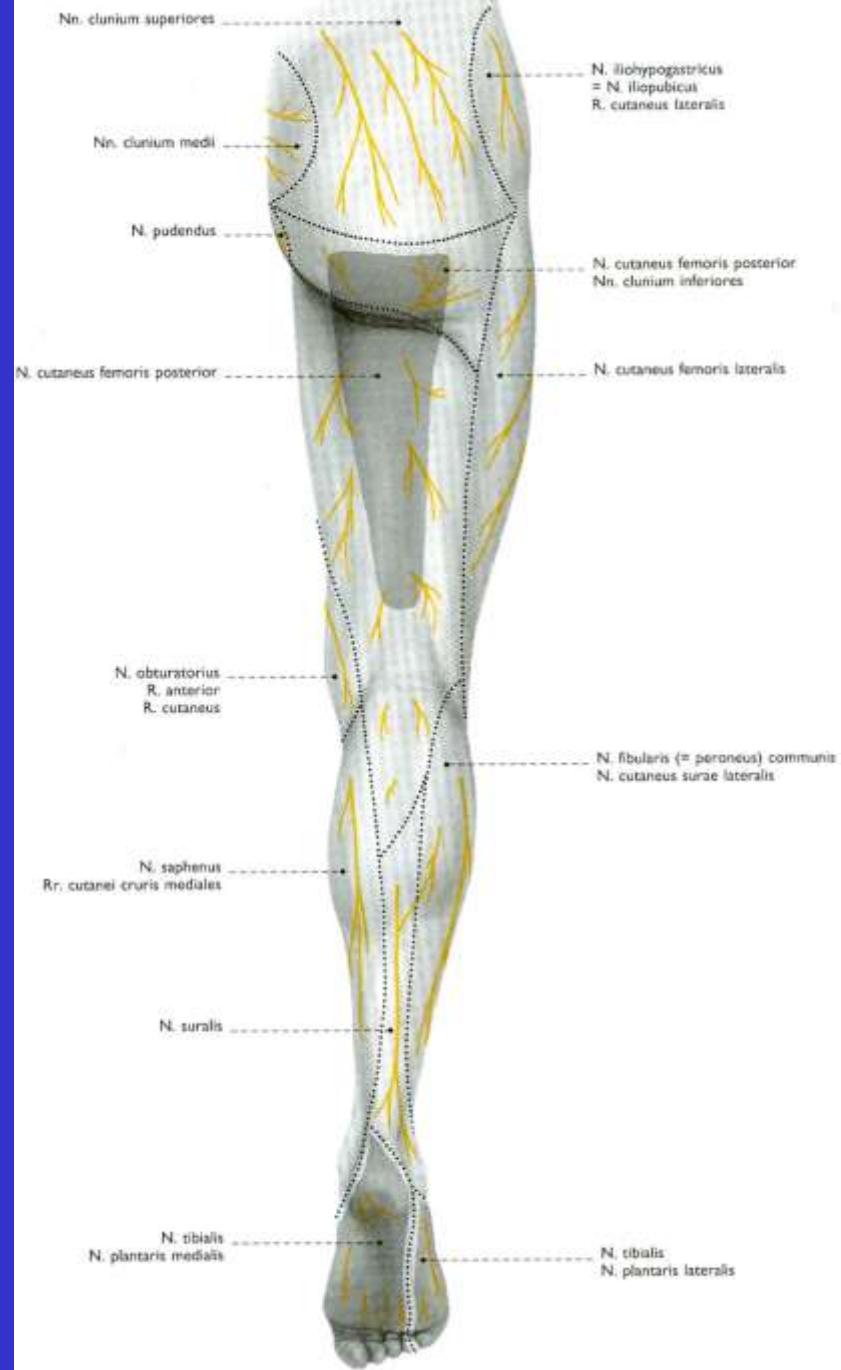
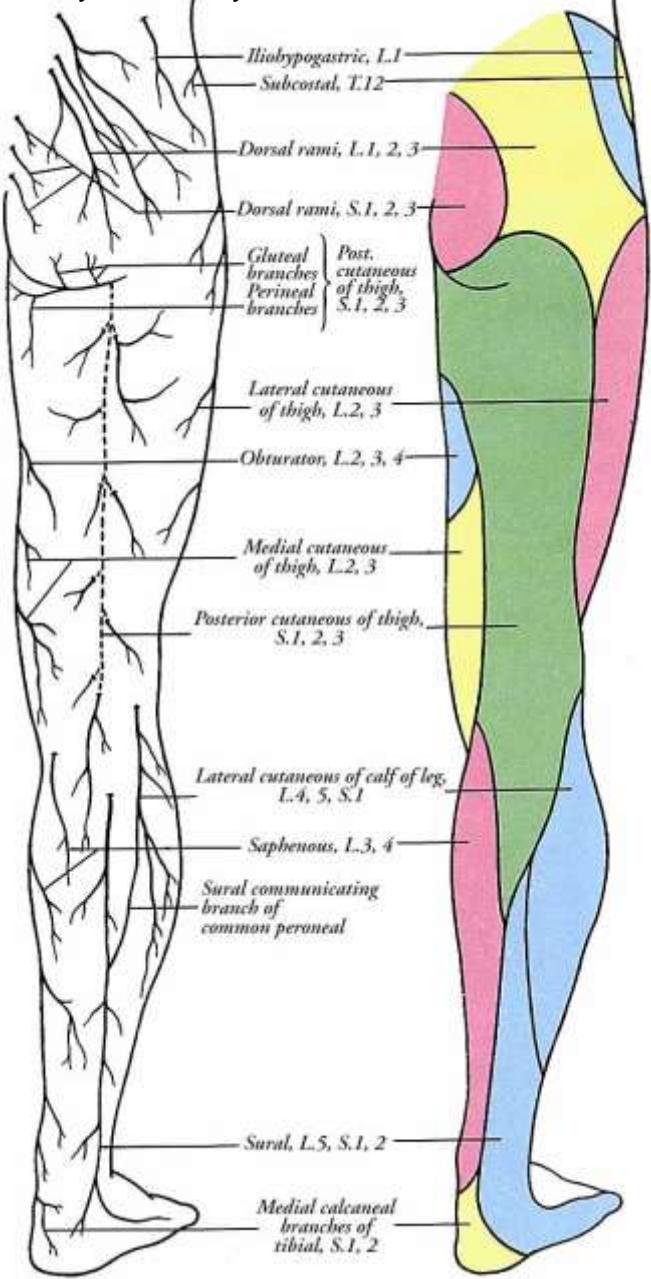


Sobottův anatomický atlas 2, překlad 22. vyd. Grada



Sobottův anatomický atlas 2, překlad 22. vyd. Grada





A. iliaca externa

a. epigastrica inf.

a. circumflexa ilium prof.

A. iliaca interna

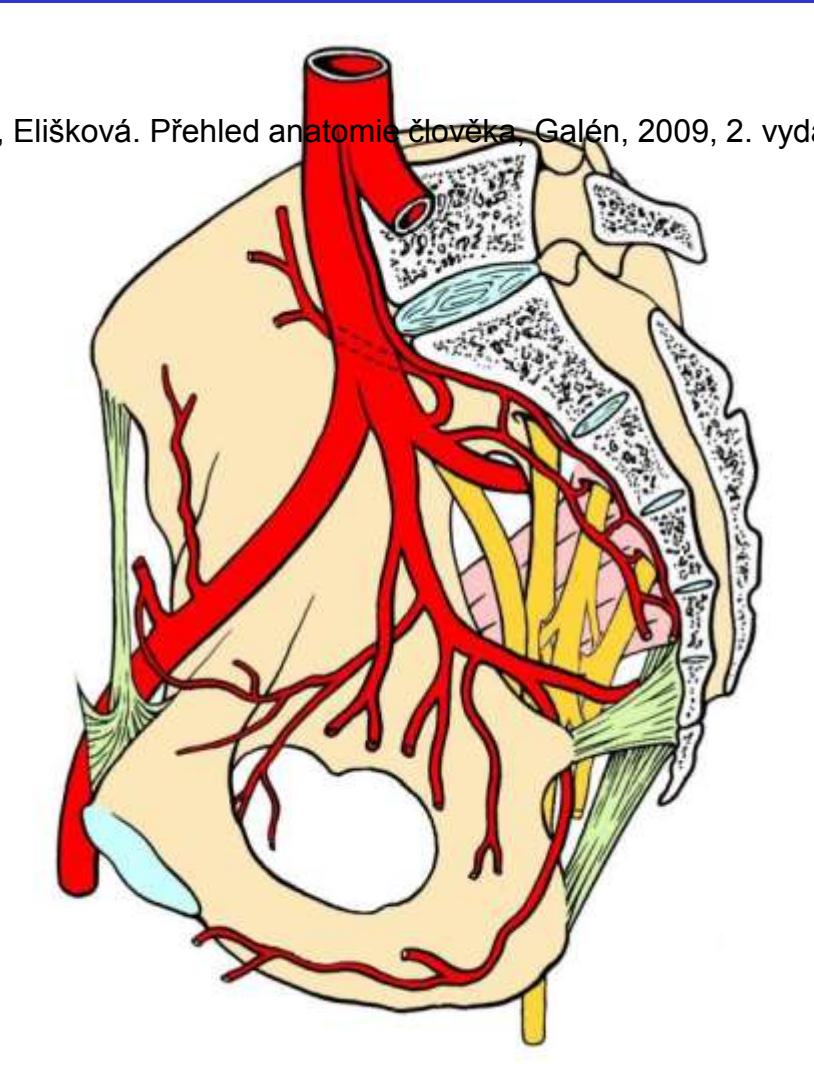
Dorsální kmen

a. glutea sup. et inf.

a. ischiadica

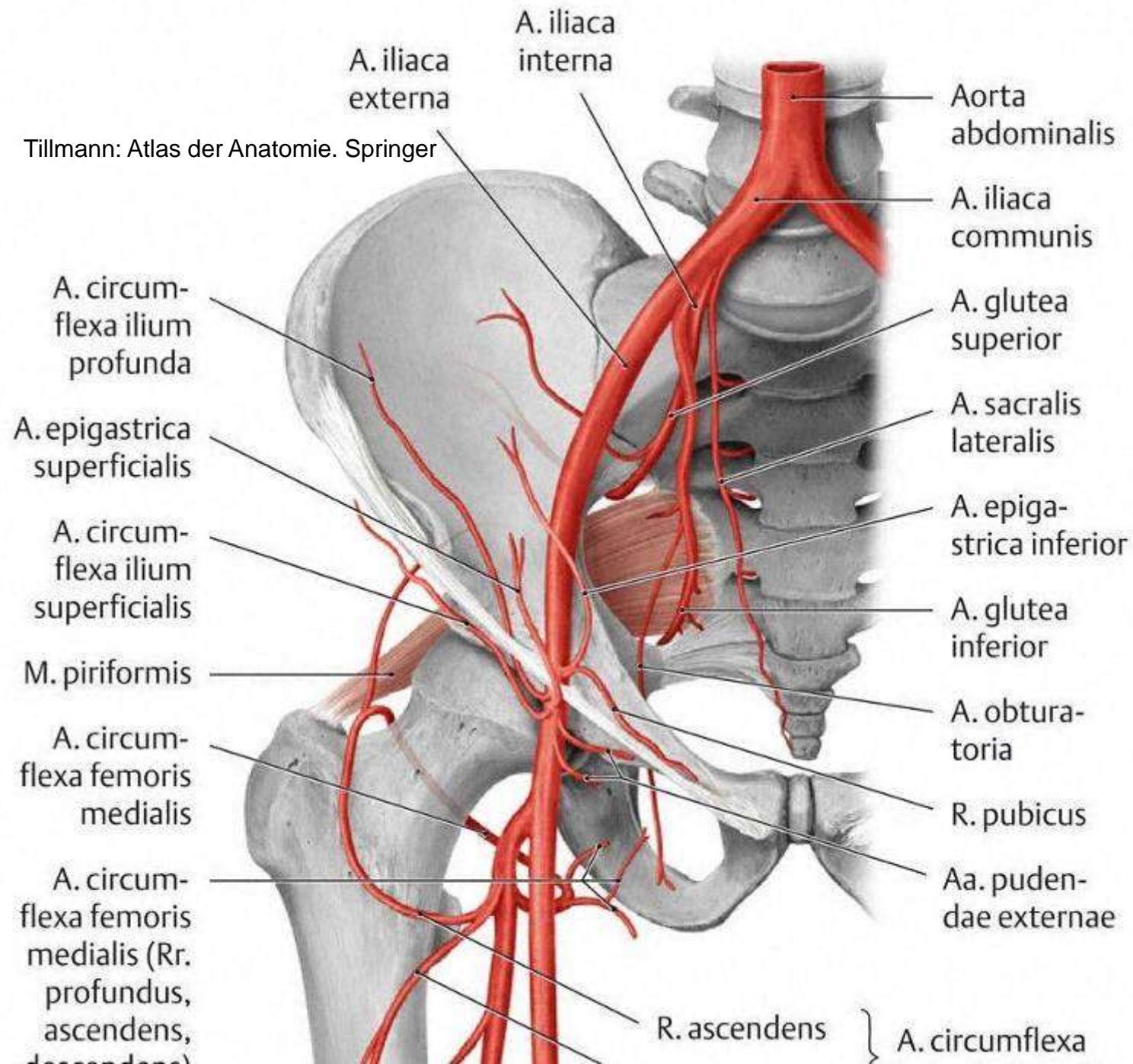
Ventrální kmen

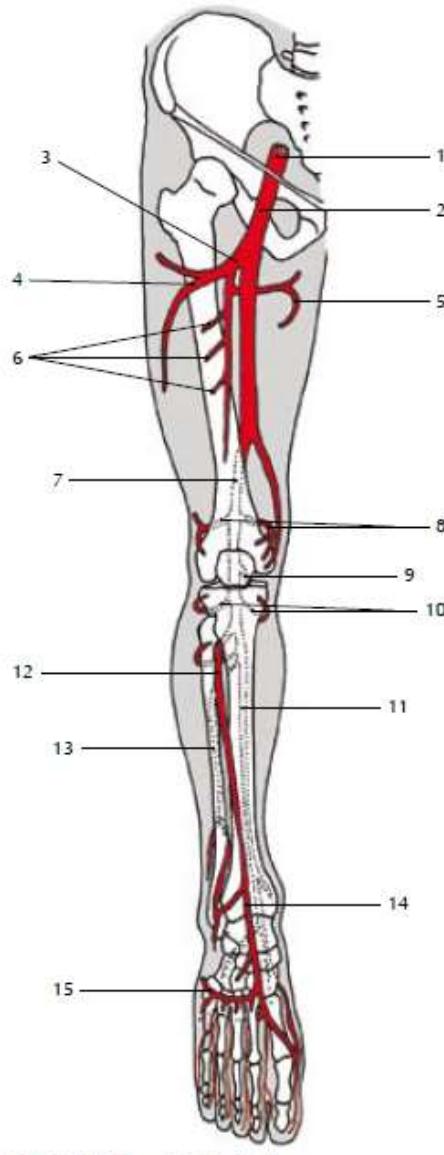
a. pudenda interna



Nařka, Elišková. Přehled anatomie člověka, Galén, 2009, 2. vydání

Tillmann: Atlas der Anatomie. Springer





Obr. 7.11A. Tepny dolní končetiny

- | | |
|-------------------------|----------------------------|
| 1 - a. iliac externa | 8 - aa. genit superiores |
| 2 - a. femoralis | 9 - a. genit media |
| 3 - a. profunda femoris | 10 - aa. genit inferiores |
| lateralis | 11 - a. tibialis posterior |
| medialis | 12 - a. tibialis anterior |
| 5 - aa. perforantes | 13 - a. peronea |
| | 14 - a. dorsalis pedis |
| | 15 - a. plantaris |

A. femoralis

a. circumflexa fem. med.

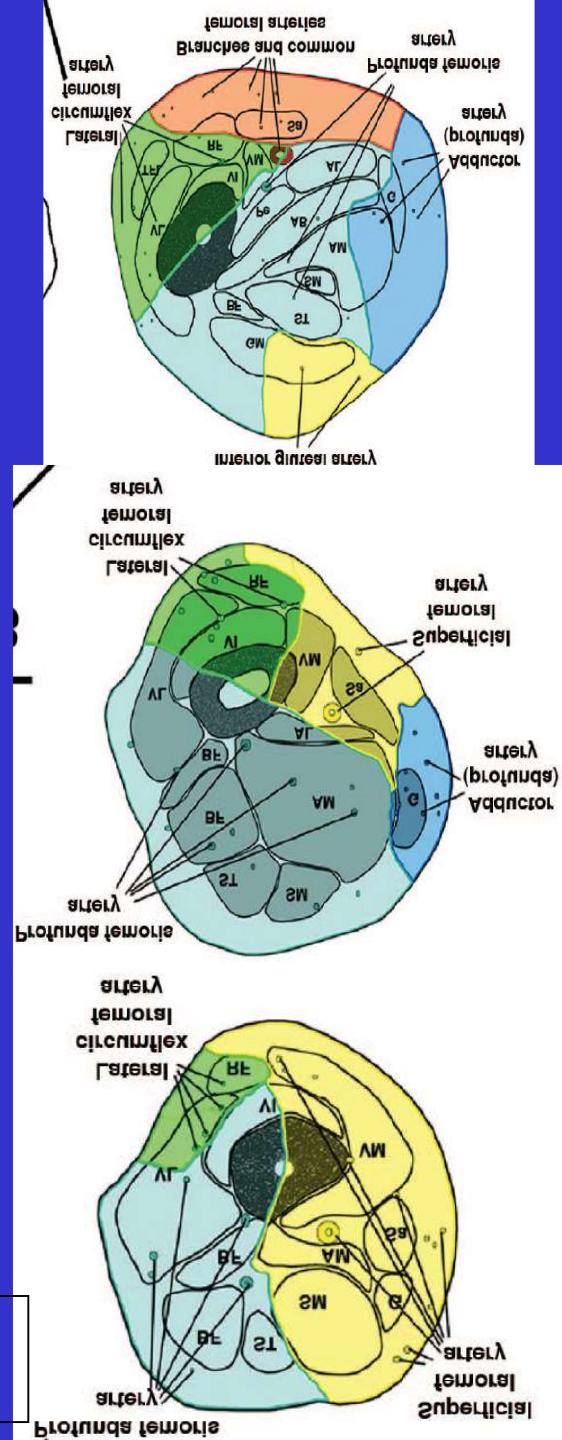
a. circumflexa fem. lat.

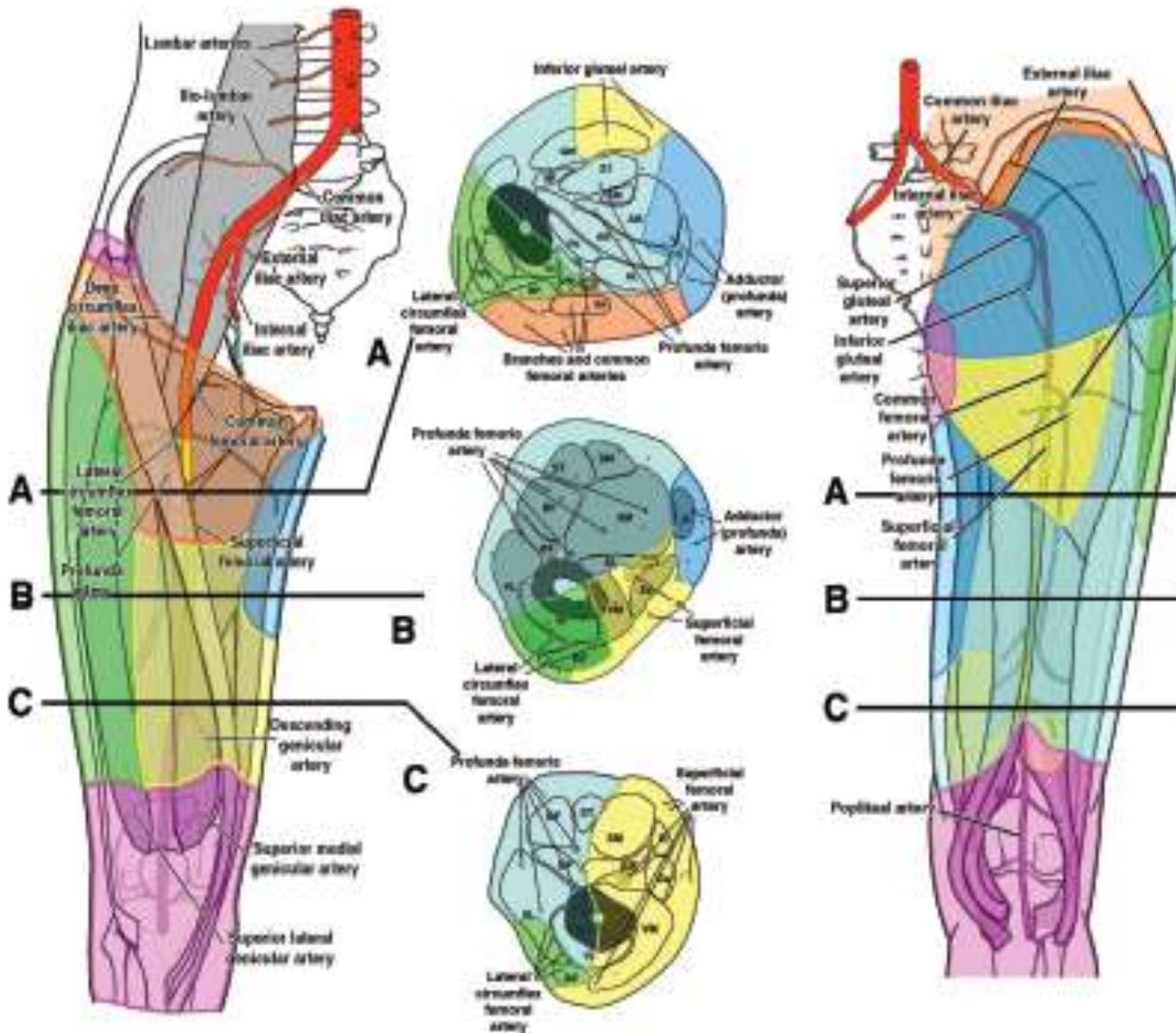
- a. profunda femoris
 - aa. perforantes I-III

a. genus decensdens

Angiosomy

Taylor, G; Pan, Wei: **Angiosomes of the Leg: Anatomic Study and Clinical Implications.** Plastic & Reconstructive Surgery. 102:599-616, 1998.





Taylor, G; Pan, Wei: **Angiosomes of the Leg: Anatomic Study and Clinical Implications**. Plastic & Reconstructive Surgery. 102:599-616, 1998.

Fig. 9. Anterior (left) and posterior (right) views of the thigh with cross-sections (center) at three levels, viewed distally. They show the angiosomes of the common femoral (orange), lateral circumflex femoral (green), inferior gluteal (yellow in section A), profunda femoris (aqua), adductor (blue), and superficial femoral (yellow in sections B and C) angiosomes. Note that in each case the angiosome territories extend from the skin to the bone and their borders, defined by anastomotic vessels, and usually meet within tissues (especially the muscles) rather than between them. Compare them with Figure 8.

A. poplitea

a. genus sup. m. + l.

a. genus media

a. genus inf. m. + l.

aa. surales

a. tibialis posterior

 a. peronea

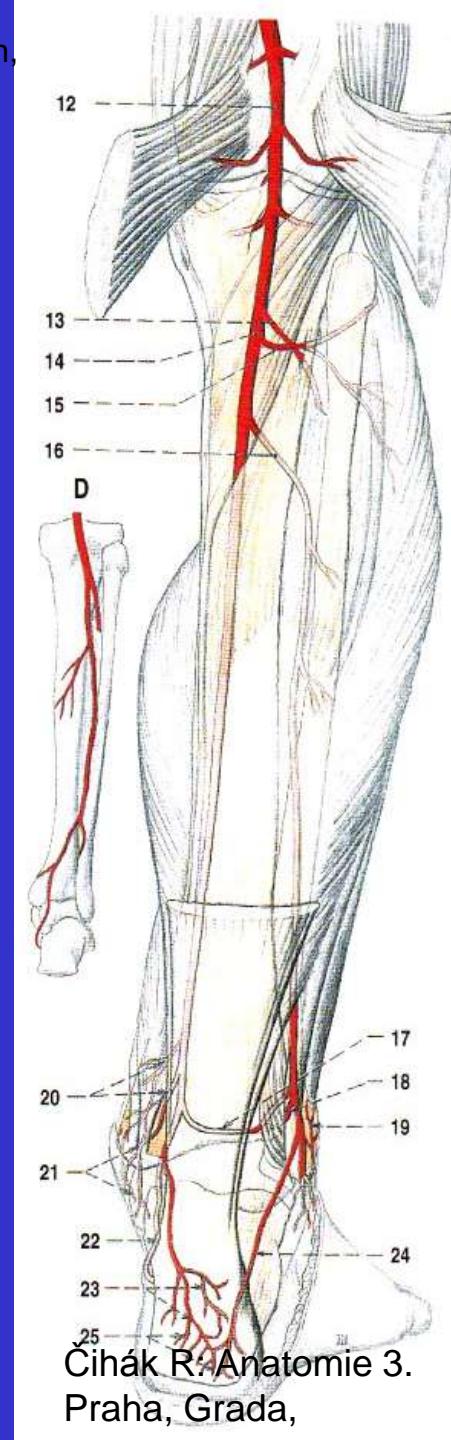
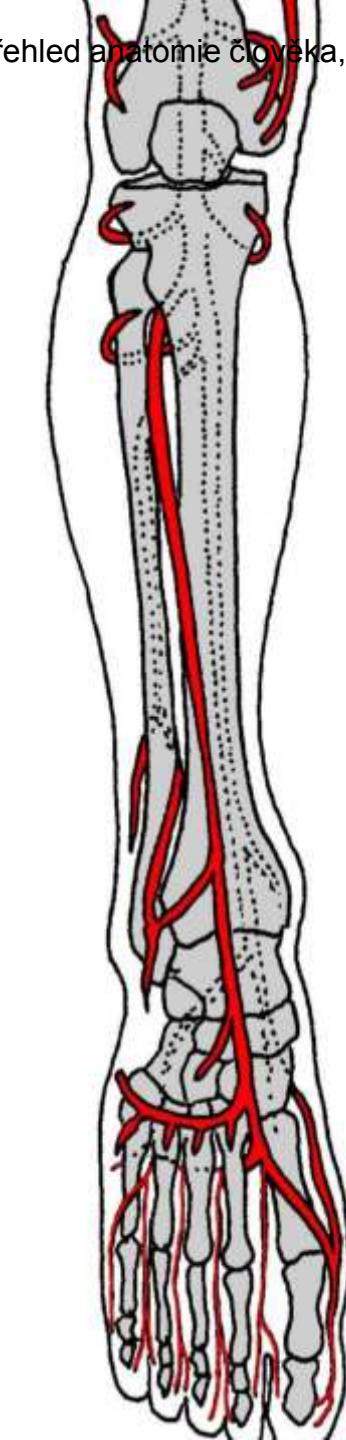
 a. plantaris med.

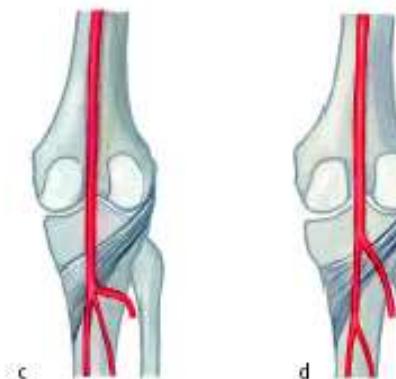
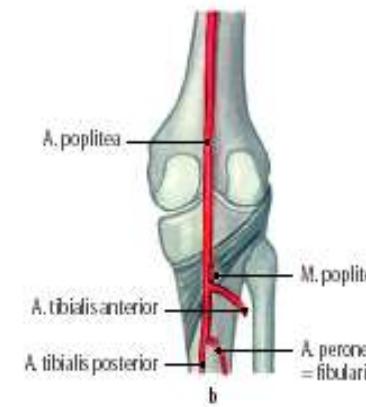
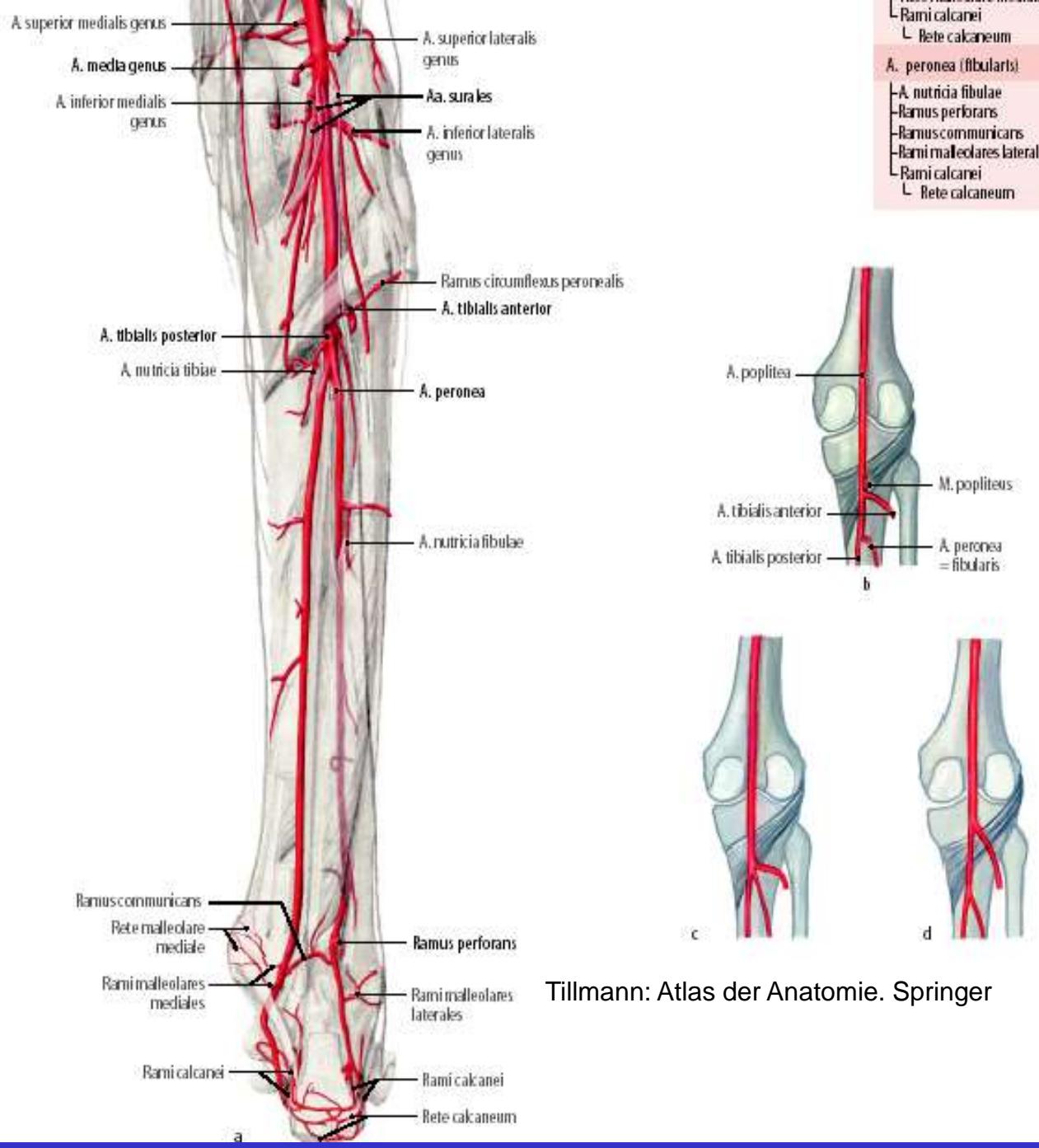
 a. plantaris lat.

a. tibialis anterior

 a. malleolaris ant. med.

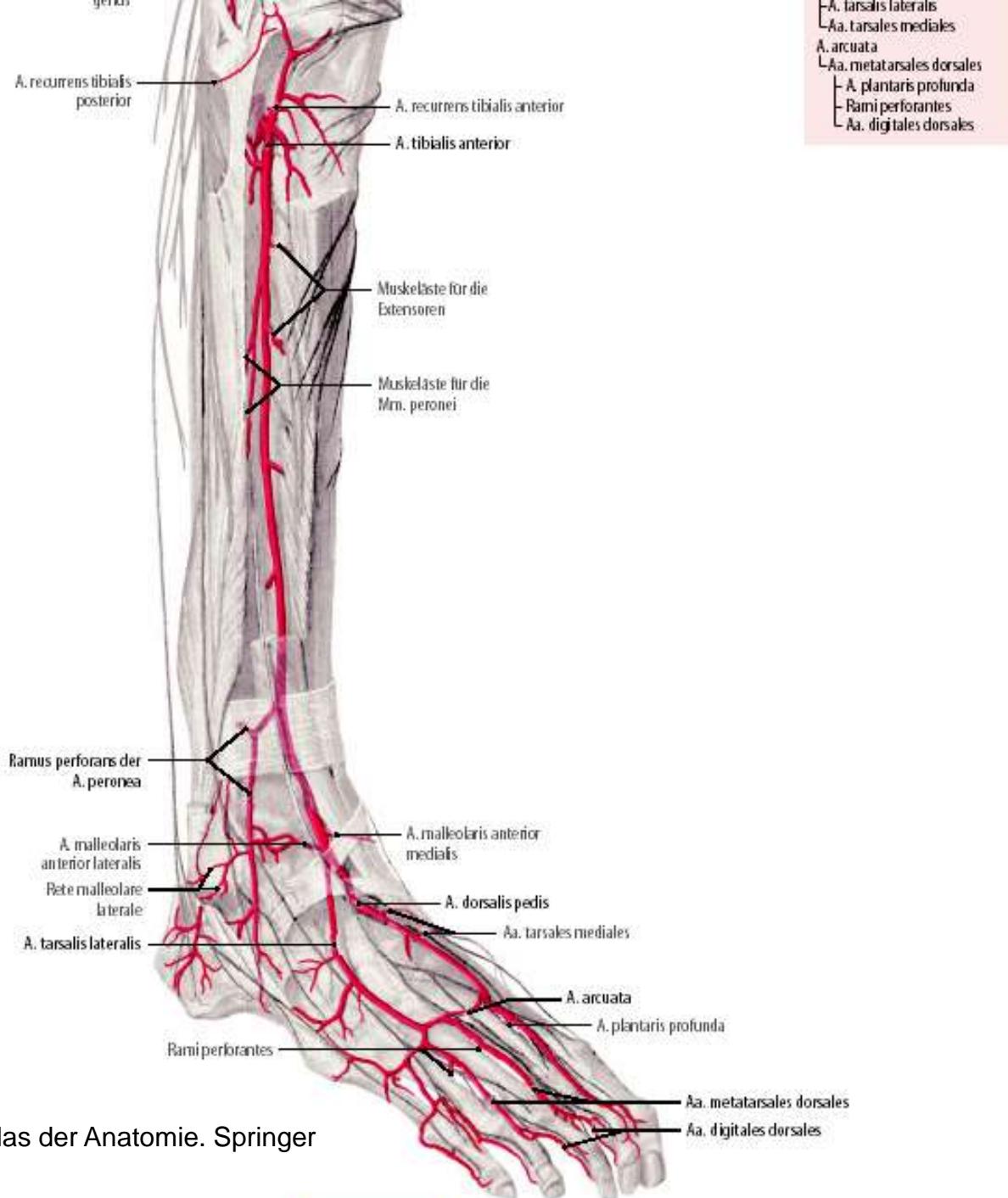
 a. malleolaris ant. lat.





Tillmann: Atlas der Anatomie. Springer





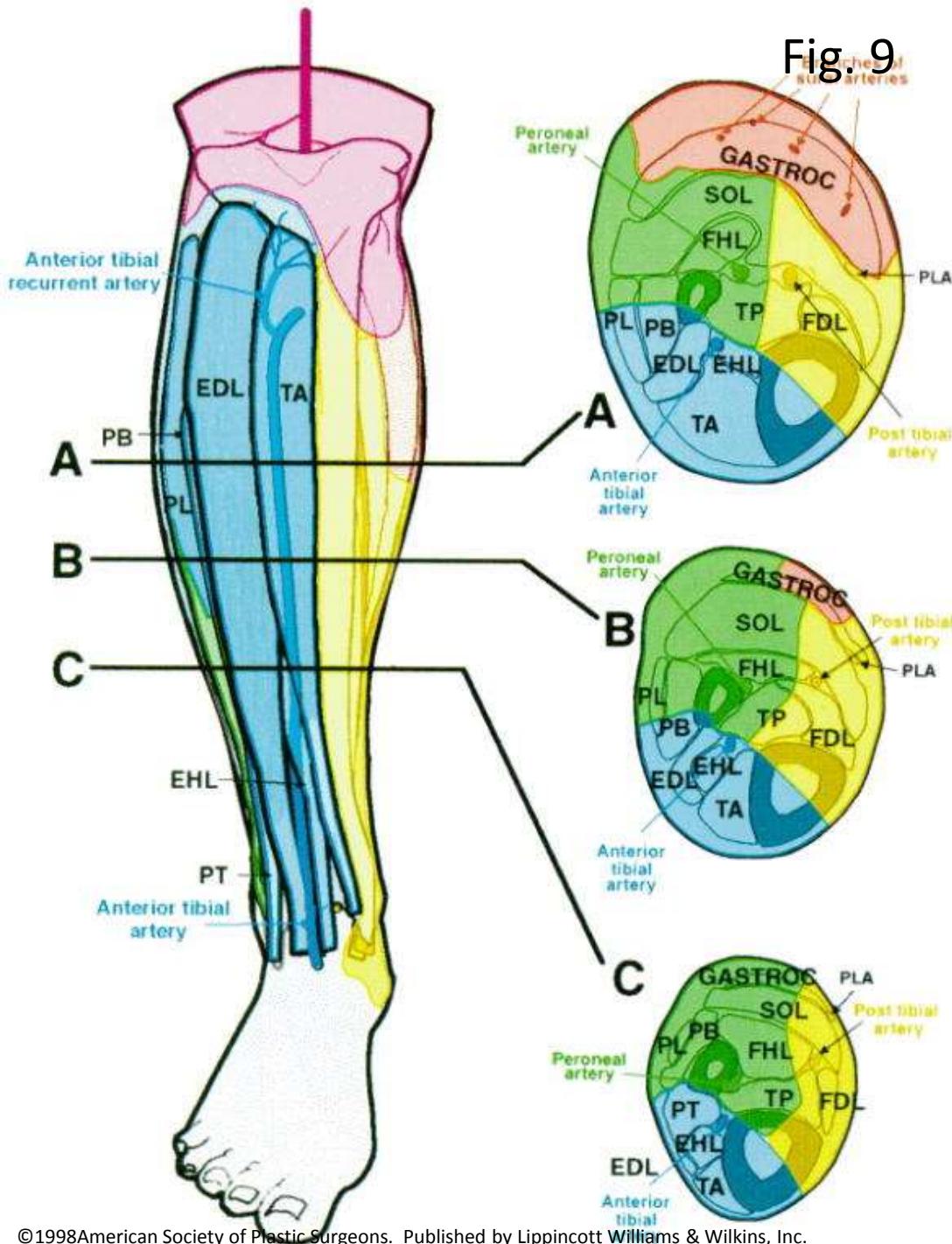


Fig. 9

Angiosomes of the Leg: Anatomic Study and Clinical Implications.

Taylor, G; Pan, Wei

Plastic & Reconstructive Surgery. 102(3):599-616, September 1998.

Fig. 9 . Anterior view of the leg with cross-sections at three levels, viewed distally. They show the angiosomes of the anterior tibial (blue), posterior tibial (yellow), peroneal (green), and sural (orange) angiosomes. Note that, in each case, the angiosome territories extend from the skin to the bone and their borders, defined by anastomotic vessels, and meet usually within tissues, especially the muscles, rather than between them. EDL, extensor digitorum longus; EHL, extensor hallucis longus; FDL, flexor digitorum longus; FHL, flexor hallucis longus; GASTROC, gastrocnemius; PB, peroneus brevis; PL, peroneus longus; PLA, plantaris; PT, peroneus tertius; SOL, soleus; TA, tibialis anterior; TP, tibialis posterior.

A. tibialis anterior

a. malleolaris ant. med.

a. malleolaris ant. lat.

a. dorsalis pedis

a. tarsalis lat.

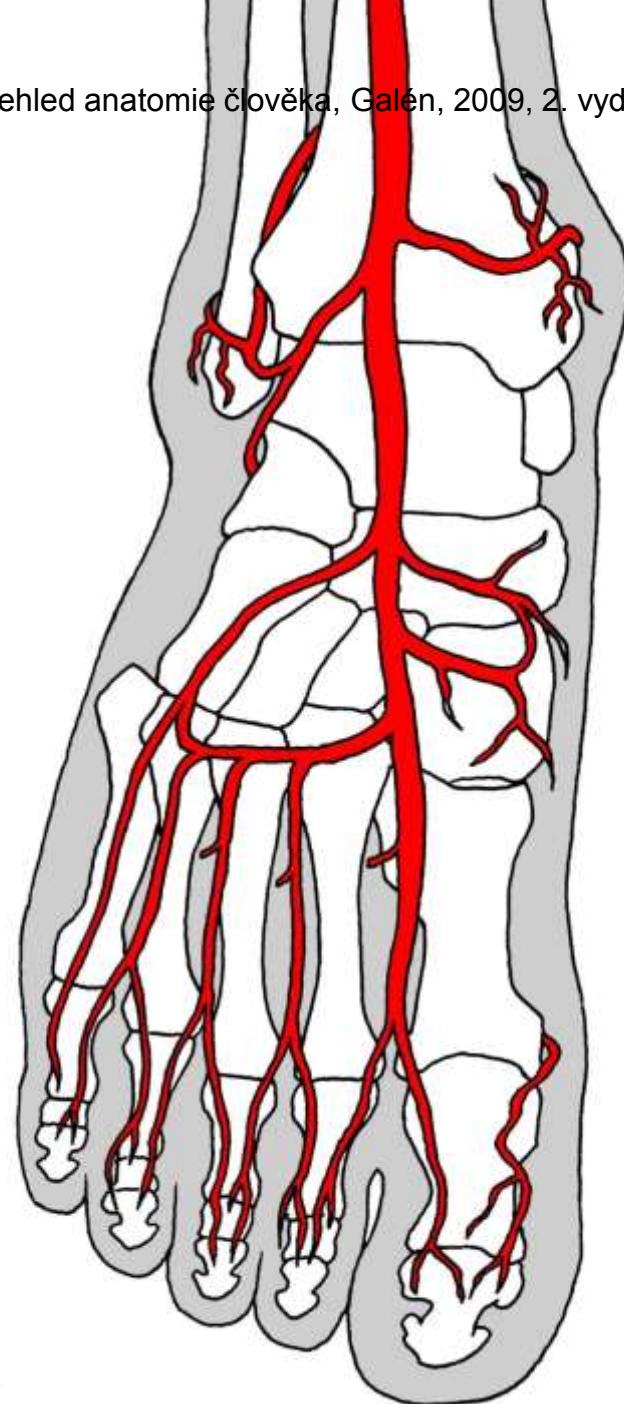
a. tarsales med.

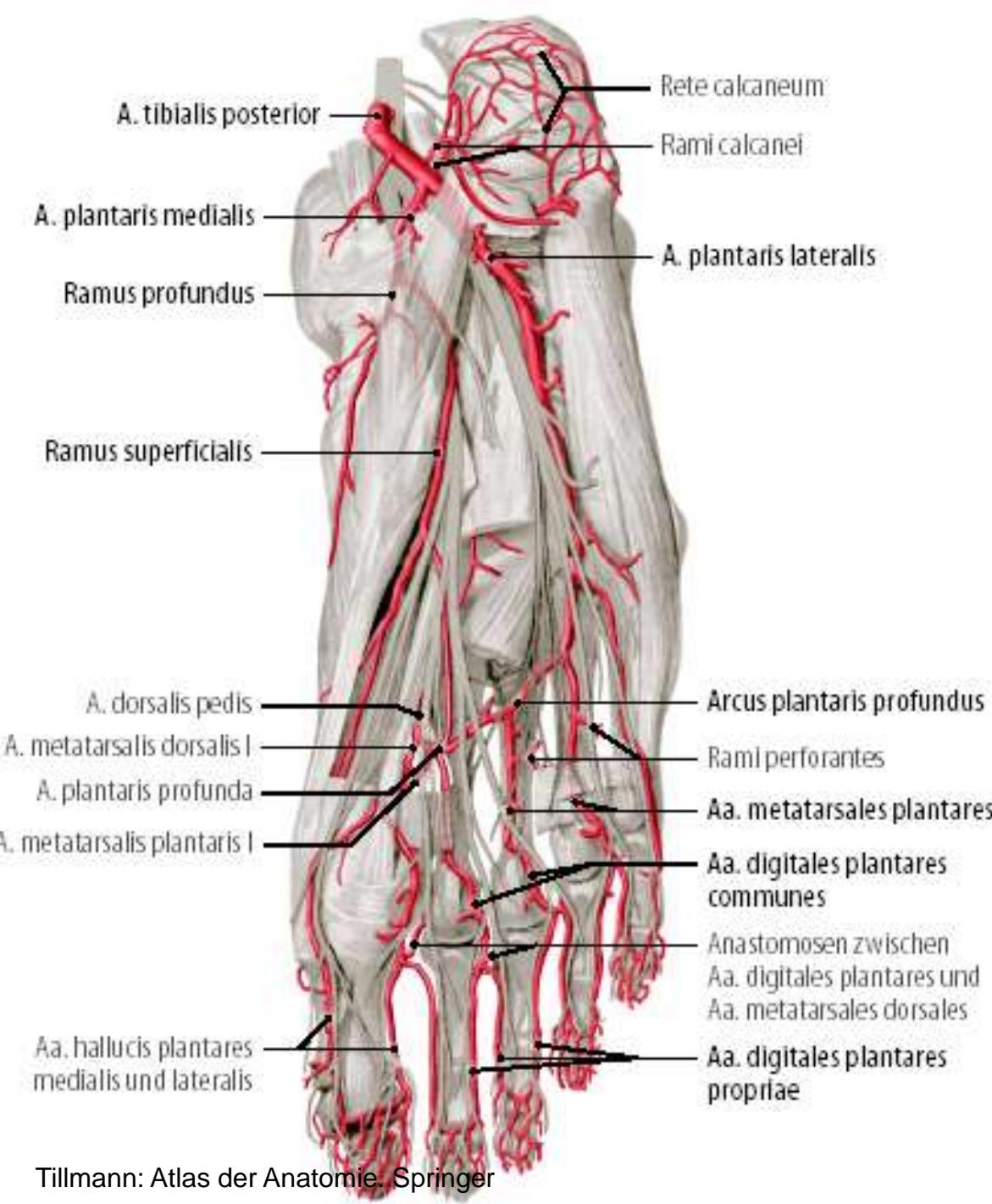
a. arcuata

aa. metatarsales dorsales

aa. digitales dorsales

a. plantaris profunda





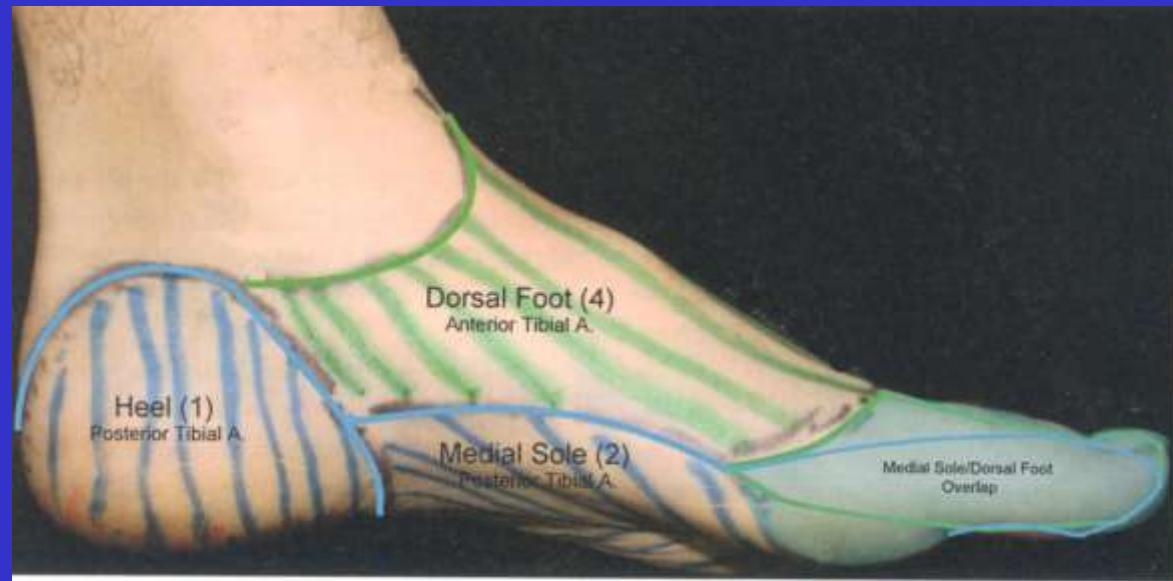
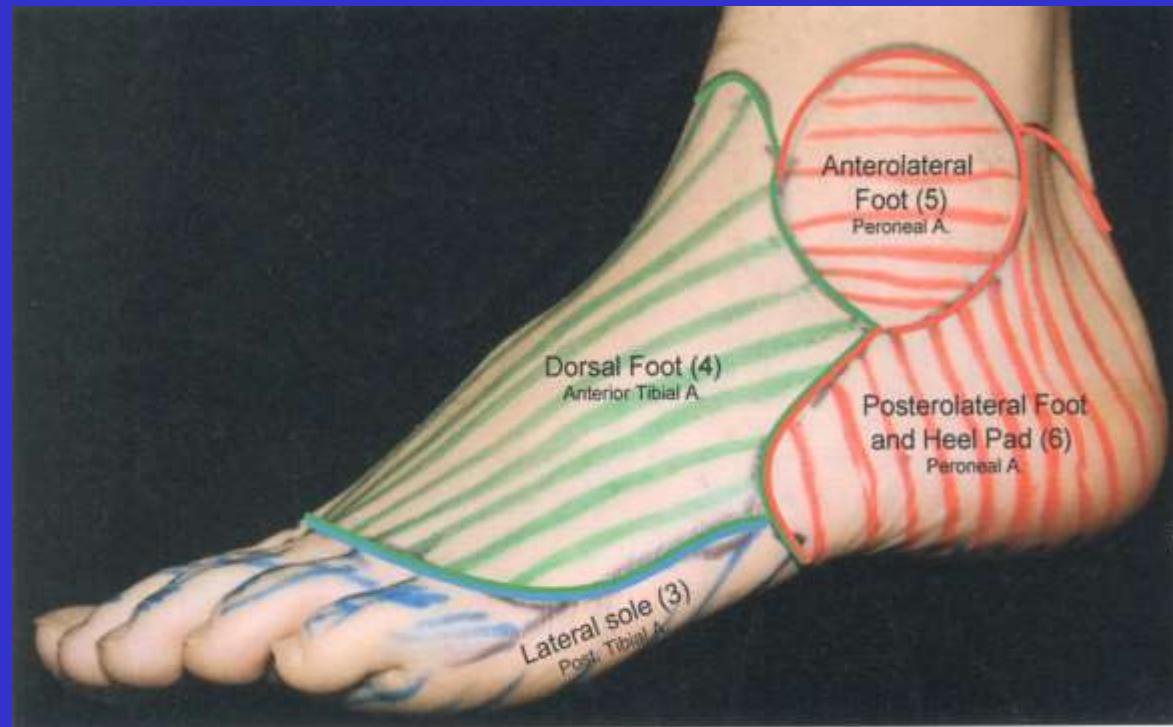
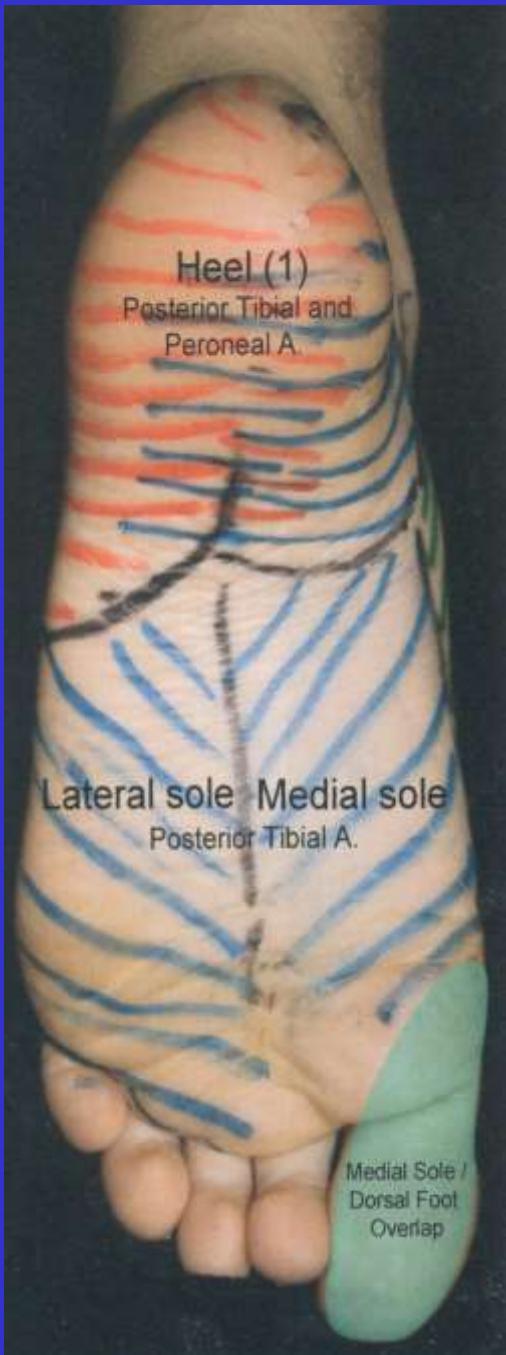
a. tibialis posterior

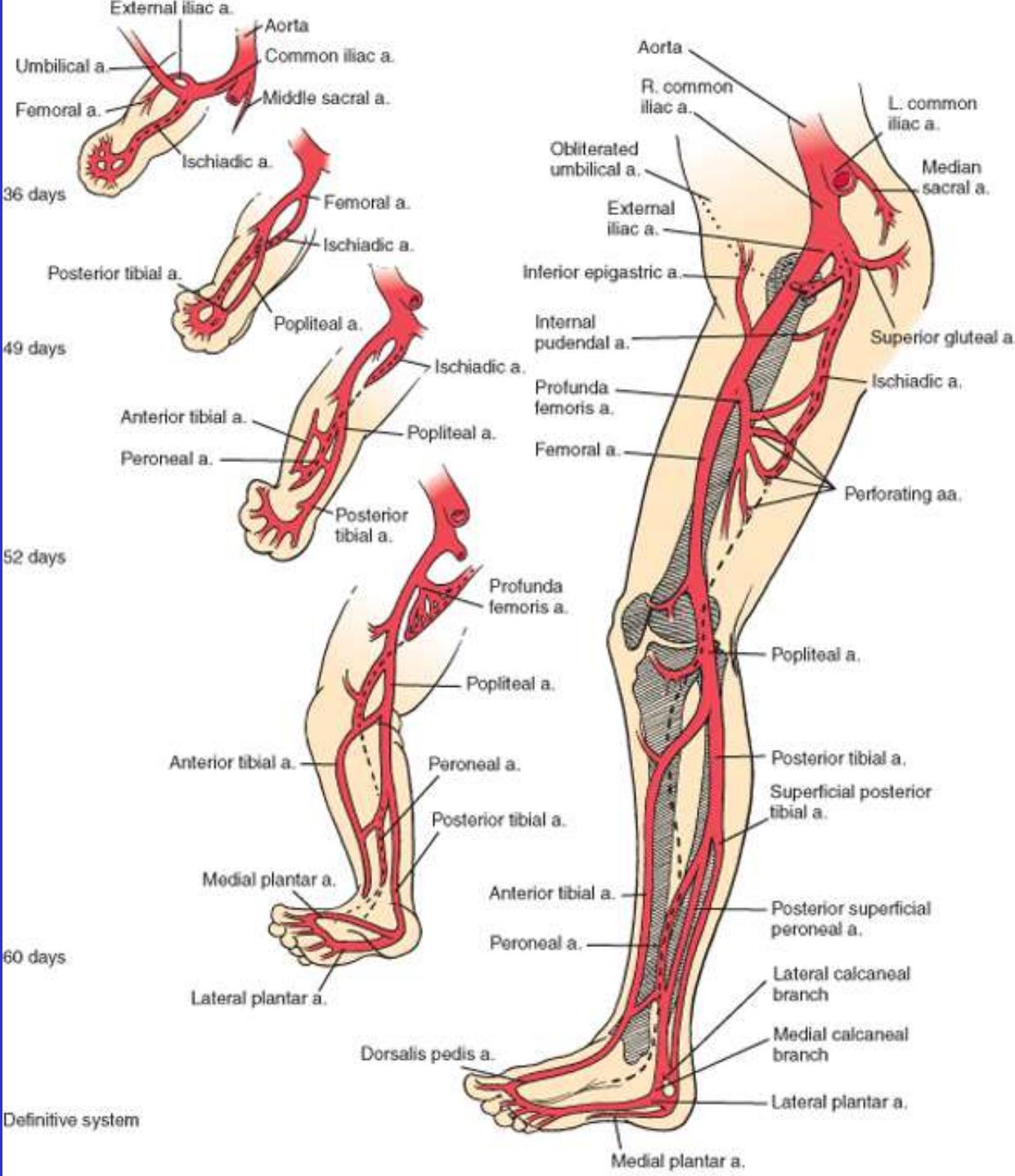
**a. plantaris med.
r. spfc. et prof.**

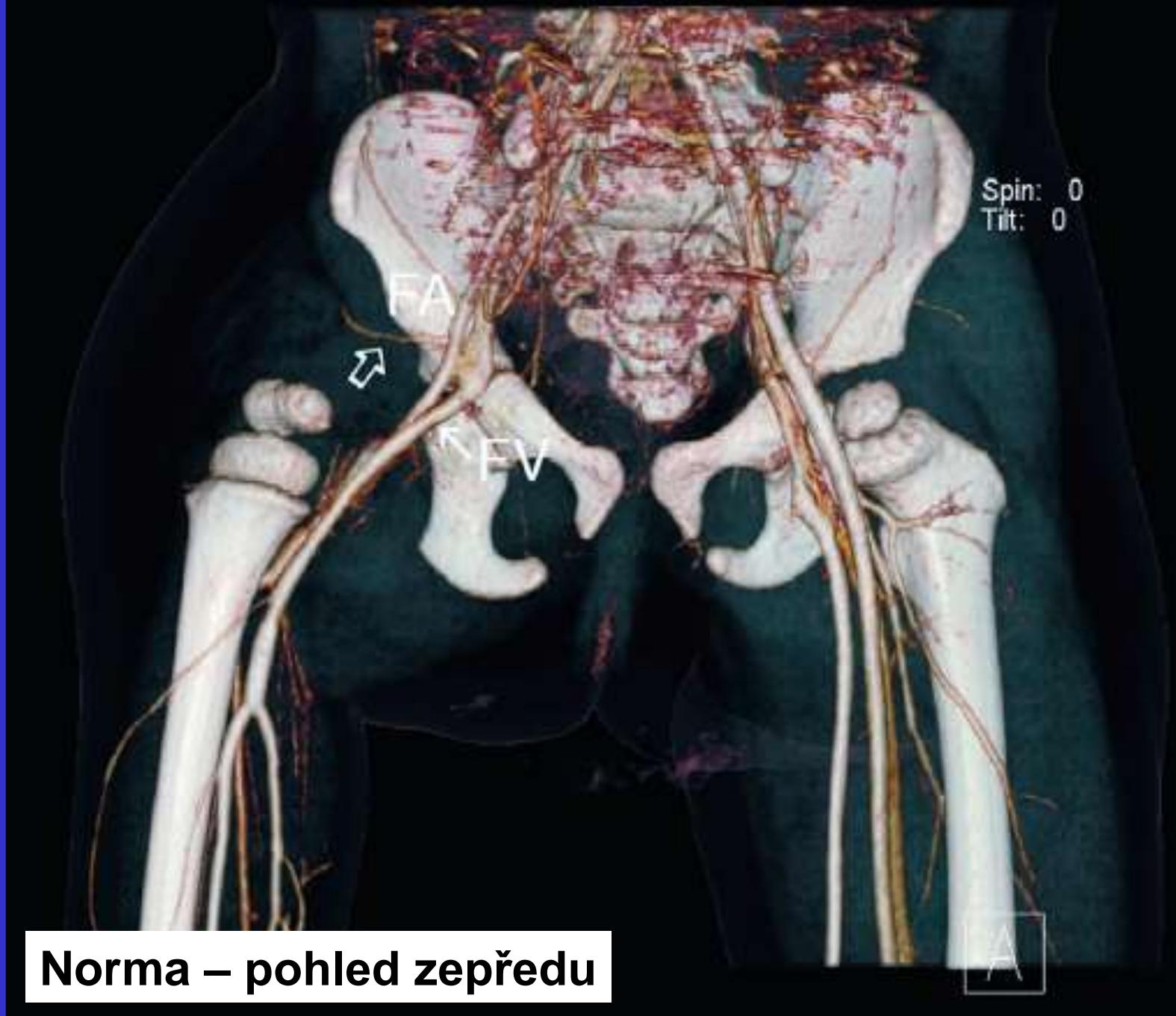
**a. plantaris lat.
z ní vzniká**

**Arcus plantaris
aa. metatarsales
plantares**

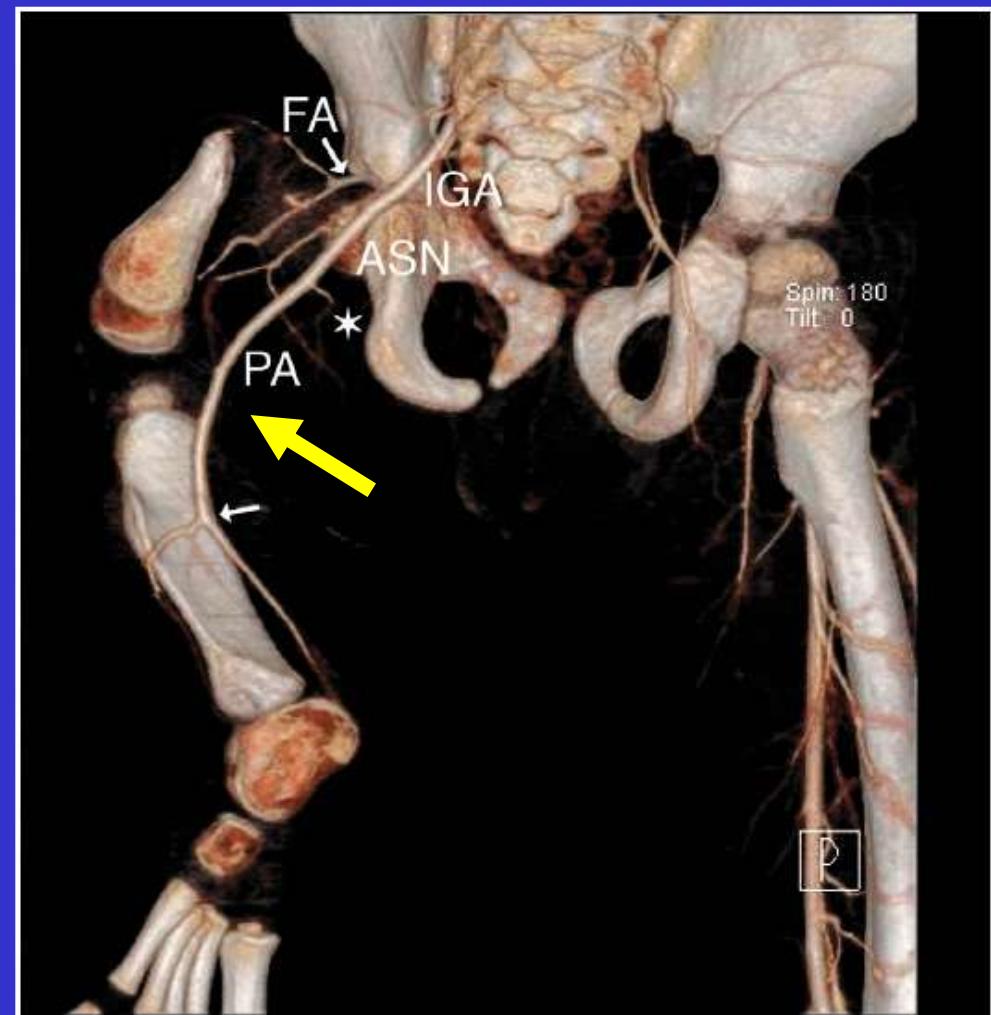
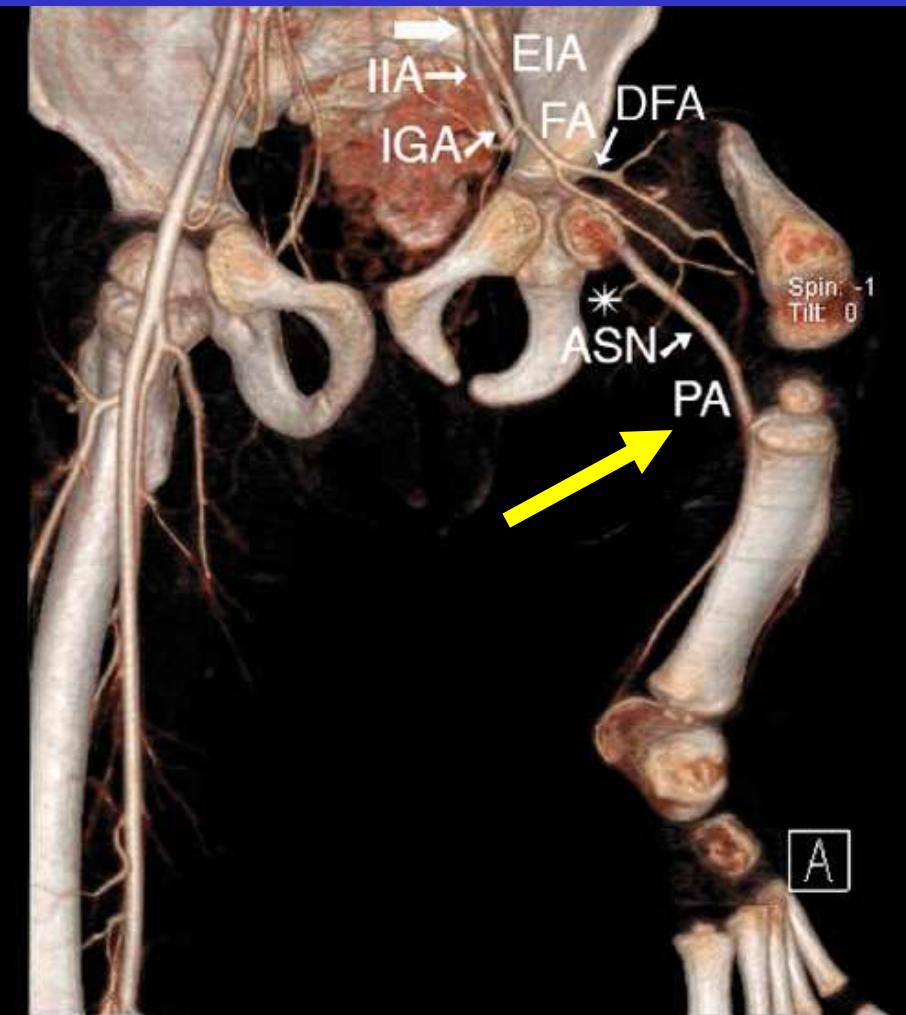
**aa. digitales
plantares
communes et
propriae**







Norma – pohled zepředu



Pohled zepředu

Pohled zezadu

anastomosis, arteriogenesis shear stress

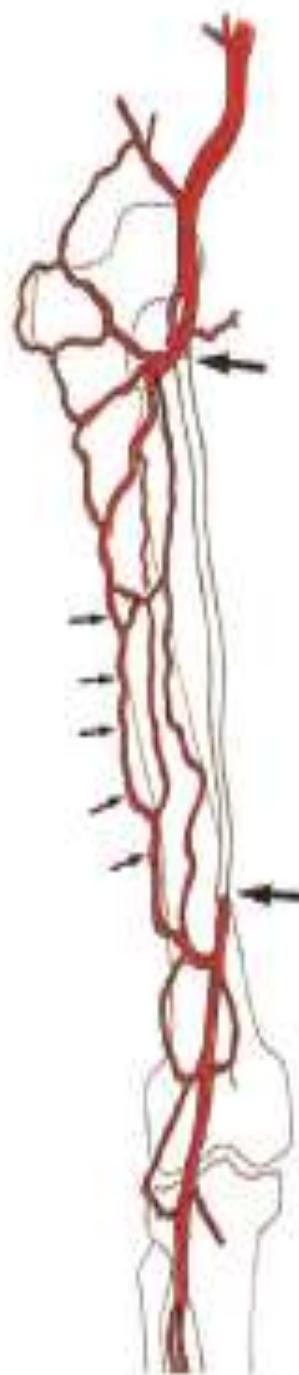
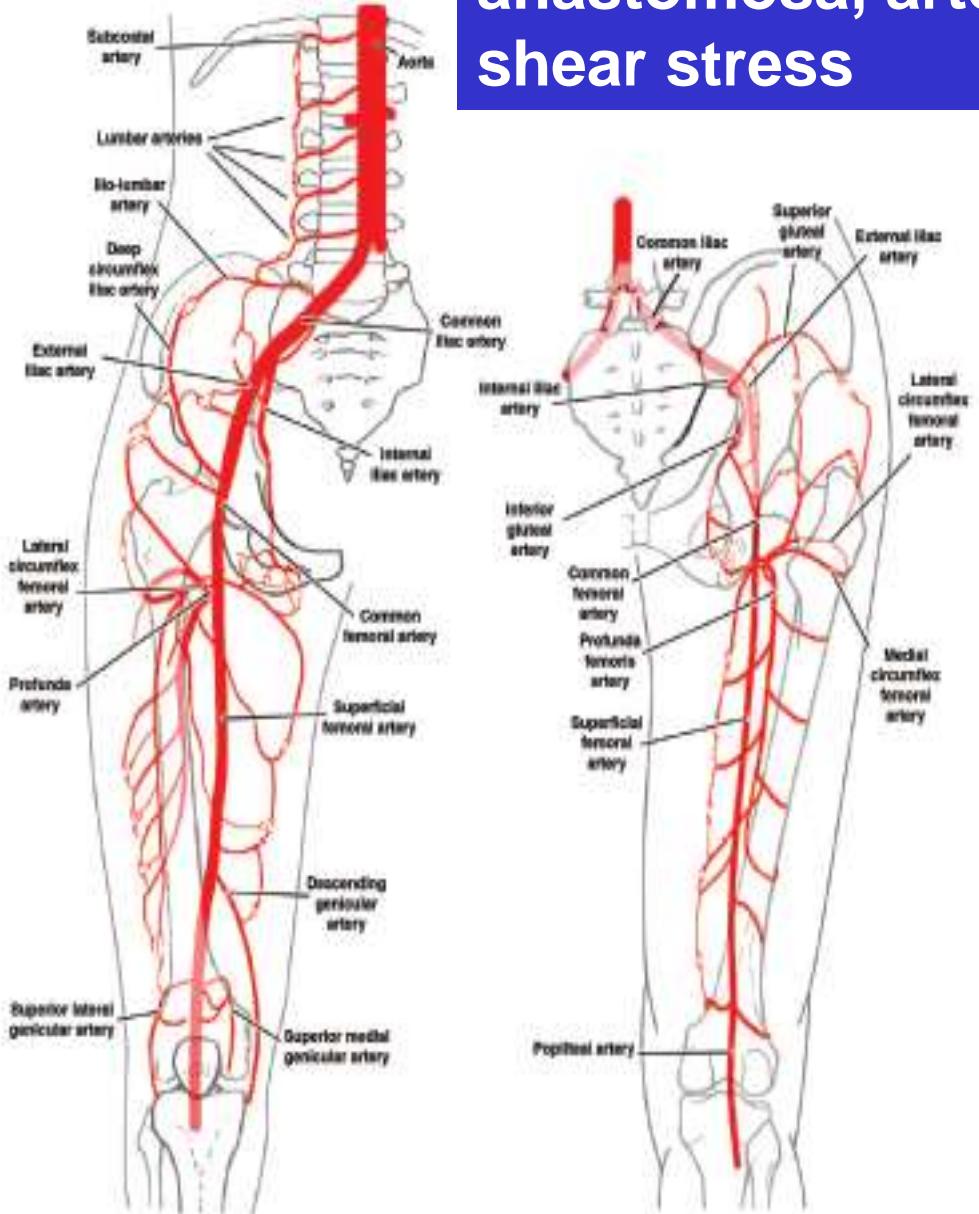
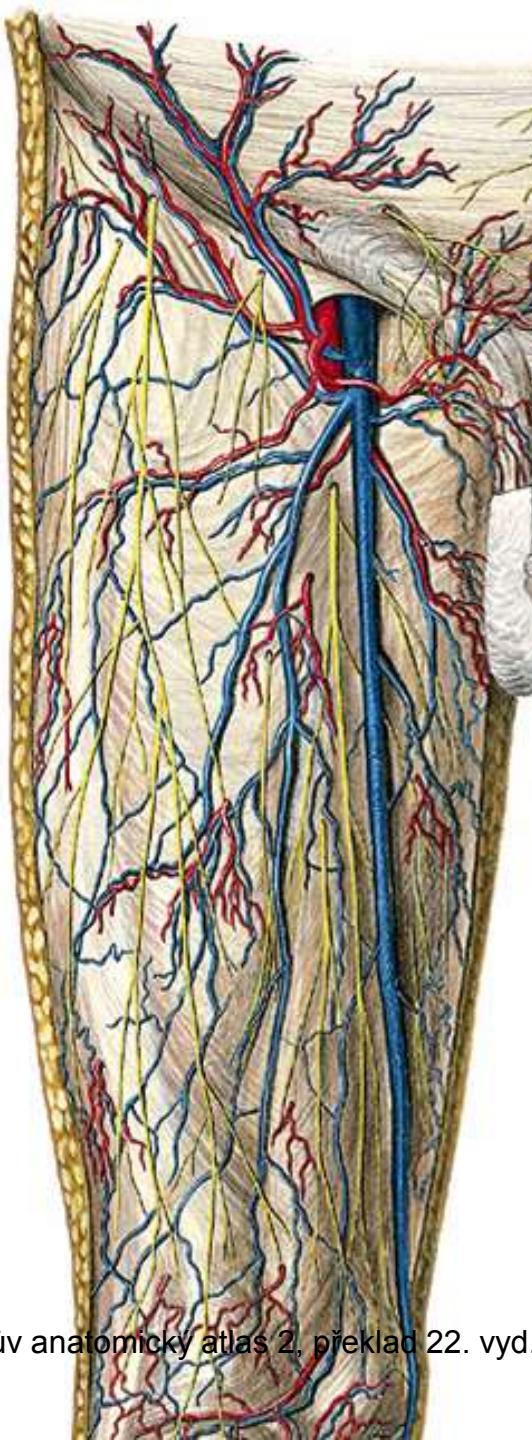


Fig. 10. Illustration of the anastomosis around the hip joint and thigh forming a bypass shunt between the aorta and the popliteal artery.

Hiatus saphenus

Lamina cribrosa fasciae
latae femoris

v. saphena magna
v. circumflexa ilium spfc.
v. epigastrica spfc.
vv. pudendae ext.



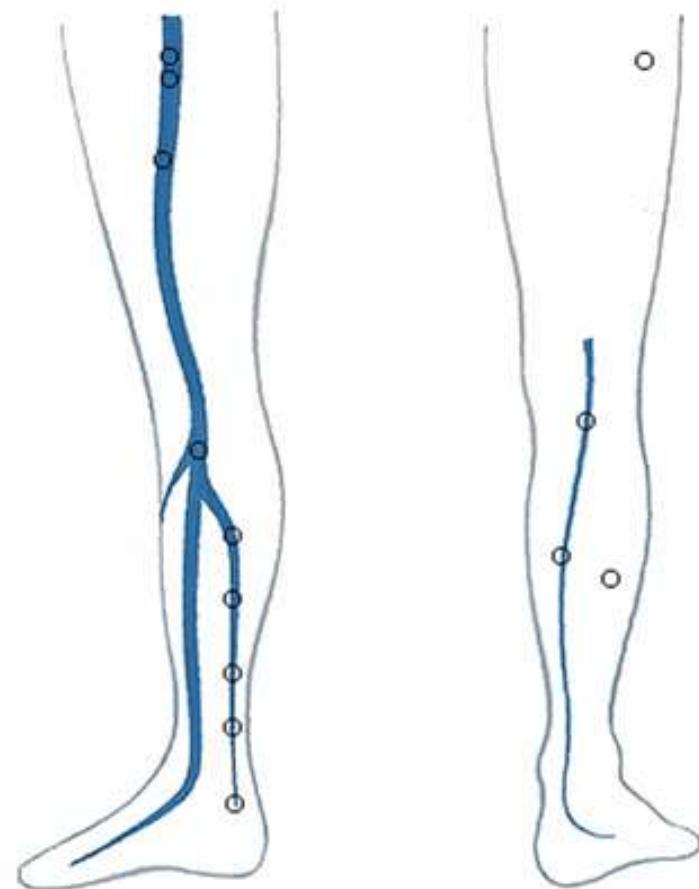


Sobottův anatomický atlas 2, překlad 22. vyd. Grada

v. saphena parva

v. femoropoplitea

perforátory



- **Svaly kyčelního kloubu**

- **Přední skupina**

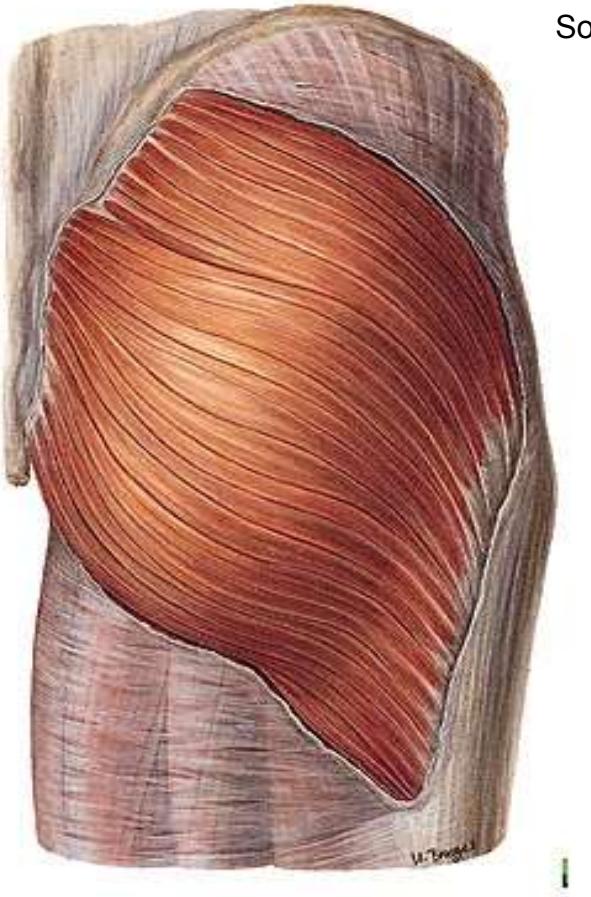
m. iliopsoas, m. obturatorius ext.

n. femoralis + n. obturatorius

- **Zadní skupina**

mm. glutei – nn. glutei

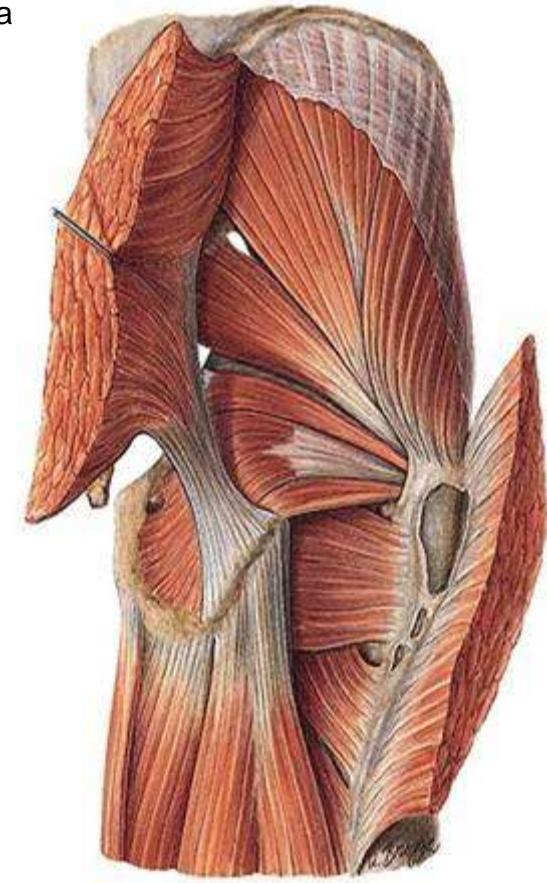
pelvitrochanterické svaly – pl. sacralis

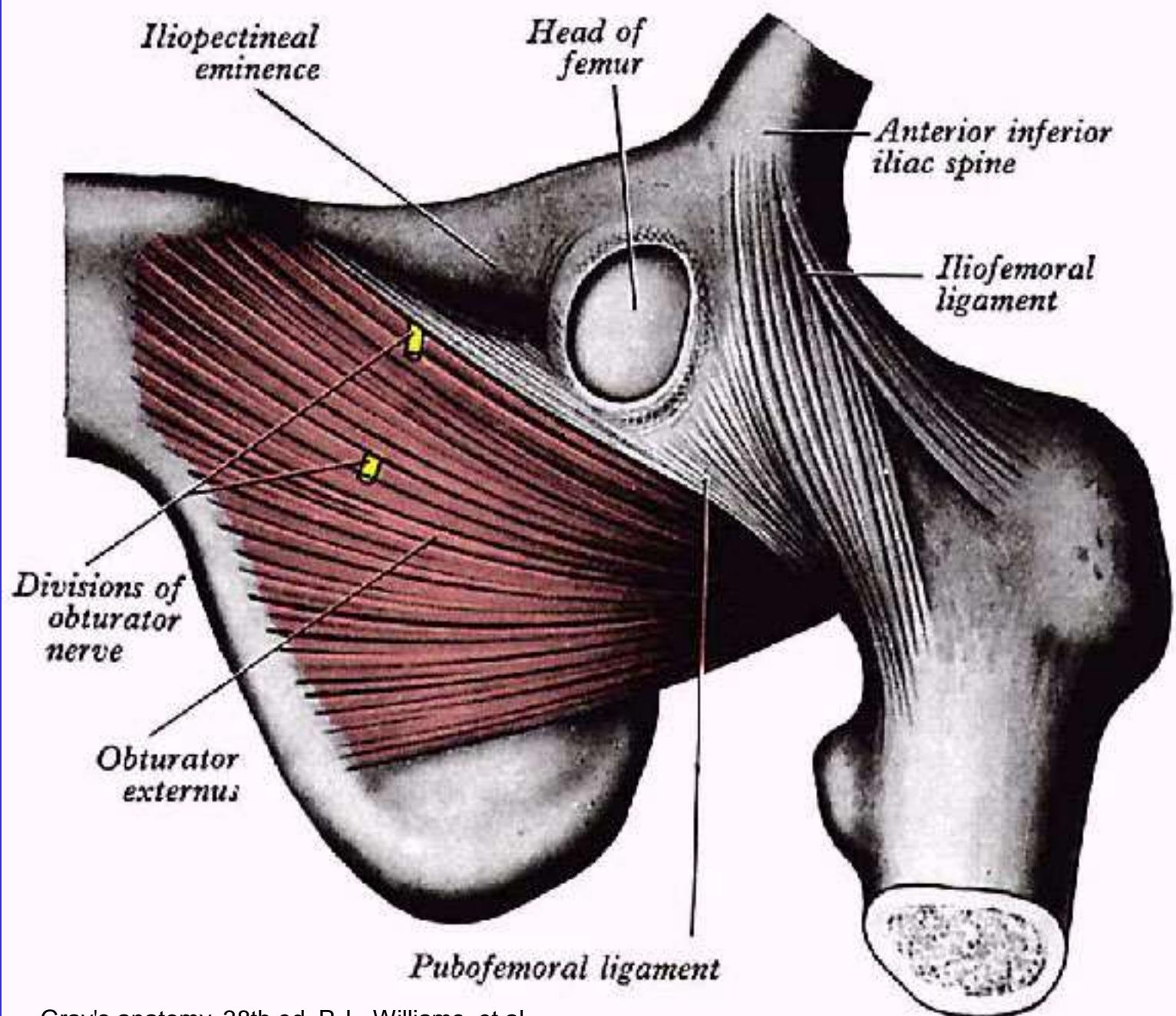


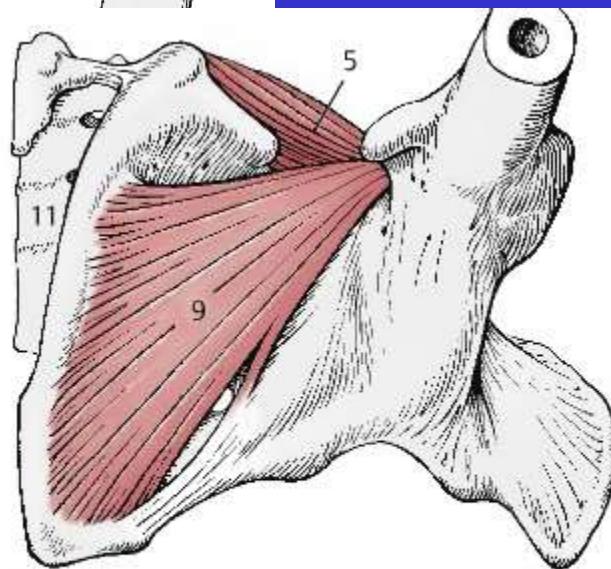
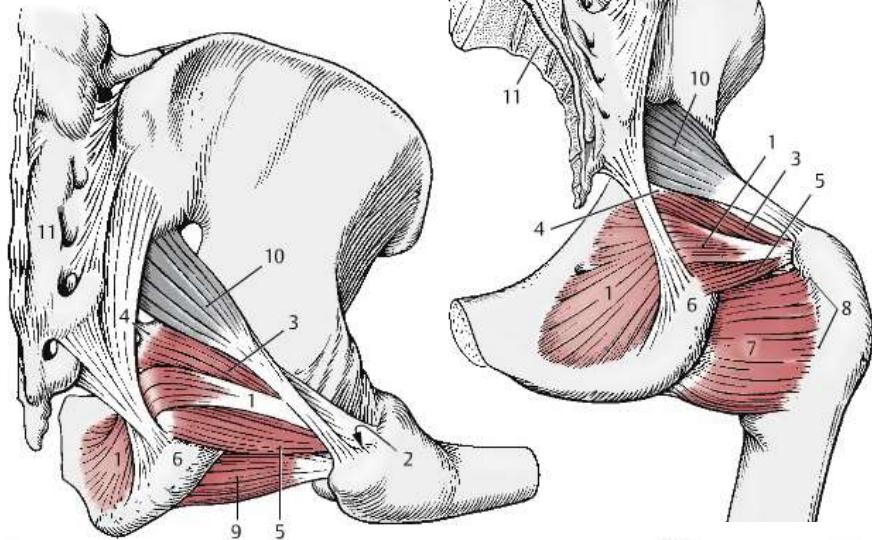
Gluteální svaly
m. gluteus maximus,
medius et minimus
m. tensor fasciae latae
+ tractus iliotibialis



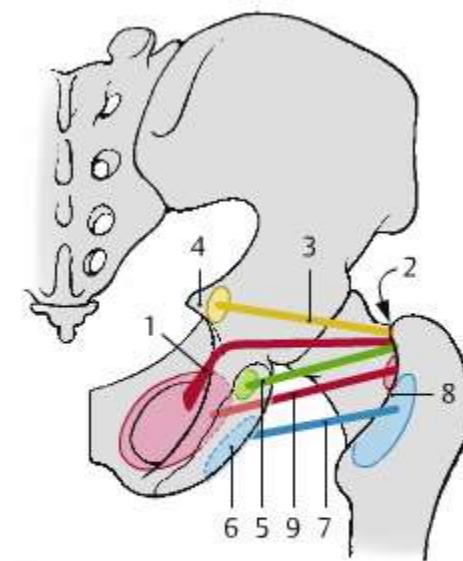
Pelvitrochanterické svaly
m. piriformis
m. gemmelus sup. et inf.
m. quadratus femoris





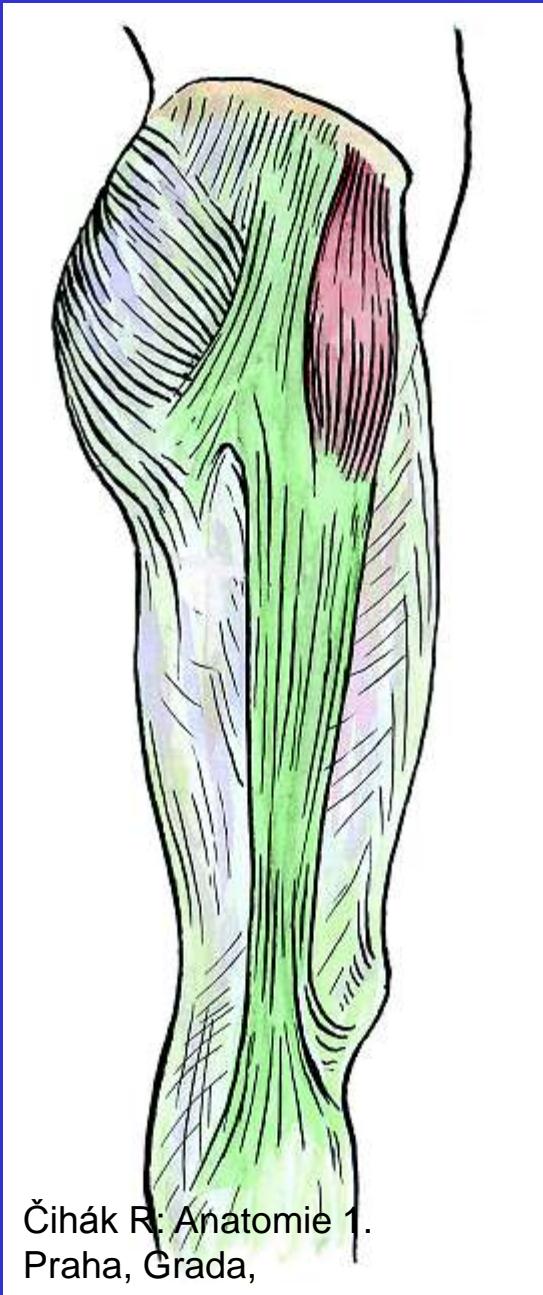


C Distal view of obturator
externus muscle



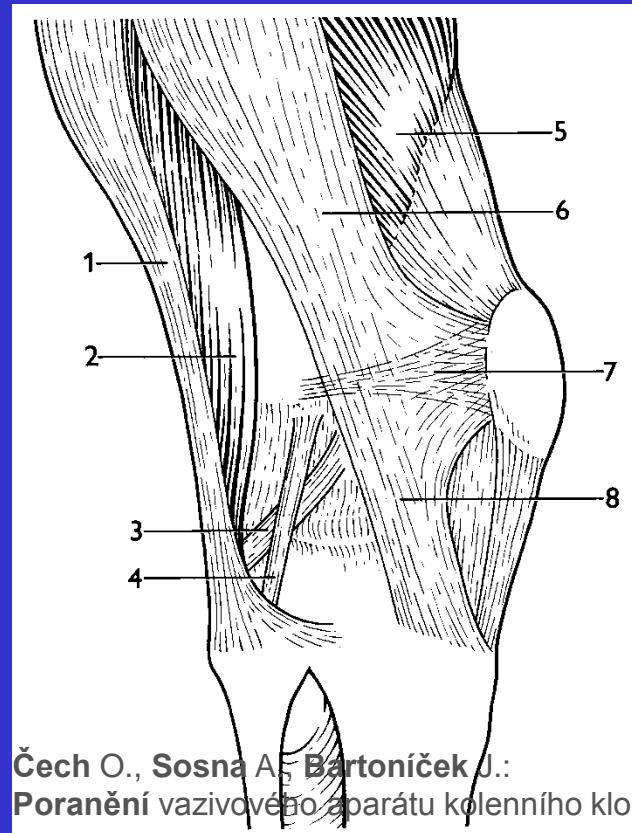
Platzer W: Locomotor Systém. Thieme 6th ed

D Diagram of origin, course,
and insertion of muscles

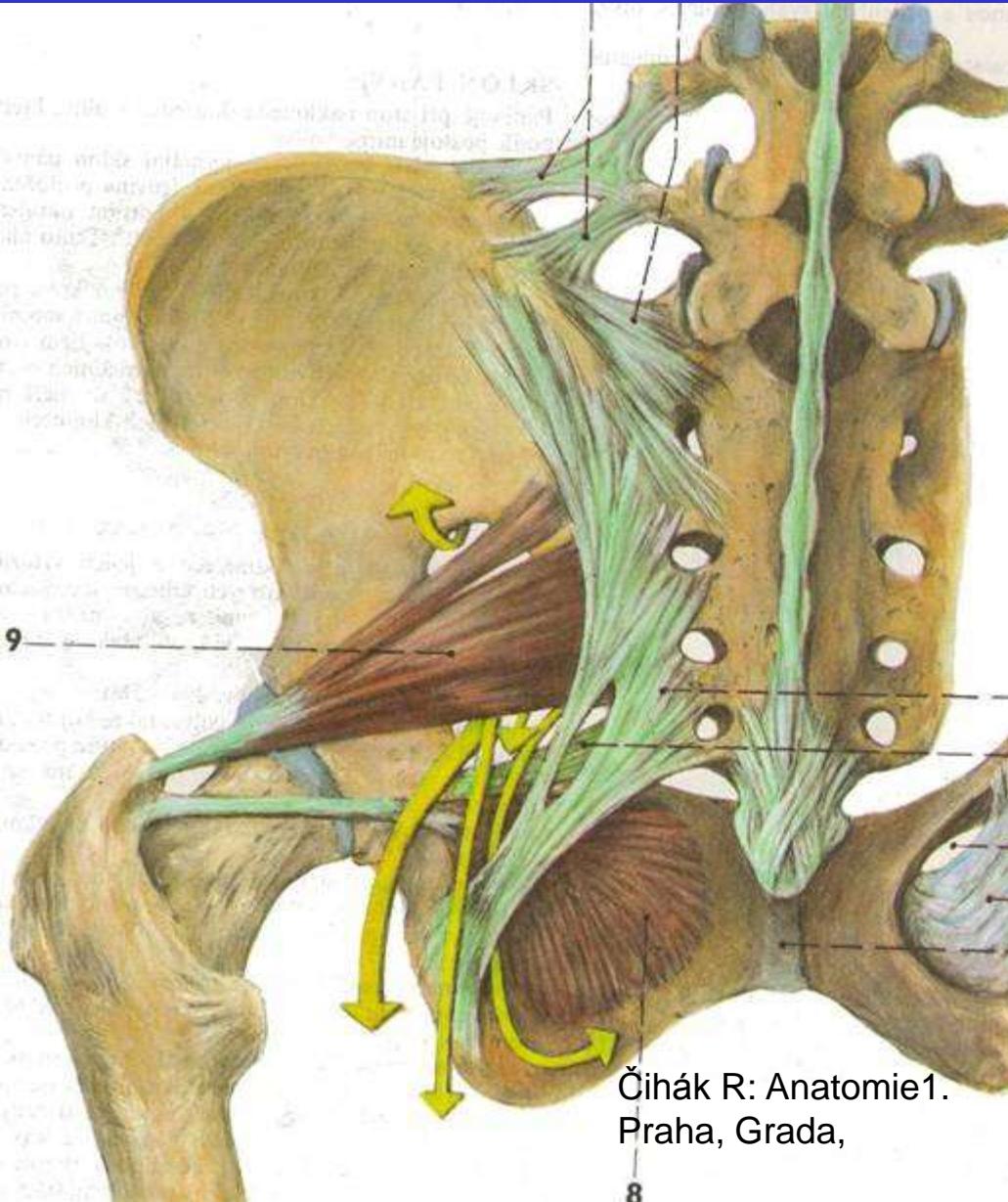


Čihák R: Anatomie 1.
Praha, Grada,

M. tensor fasciae latae Tractus iliotibialis



Čech O., Sosna A., Bartoníček J.:
Poranění vazivového aparátu kolenního kloubu

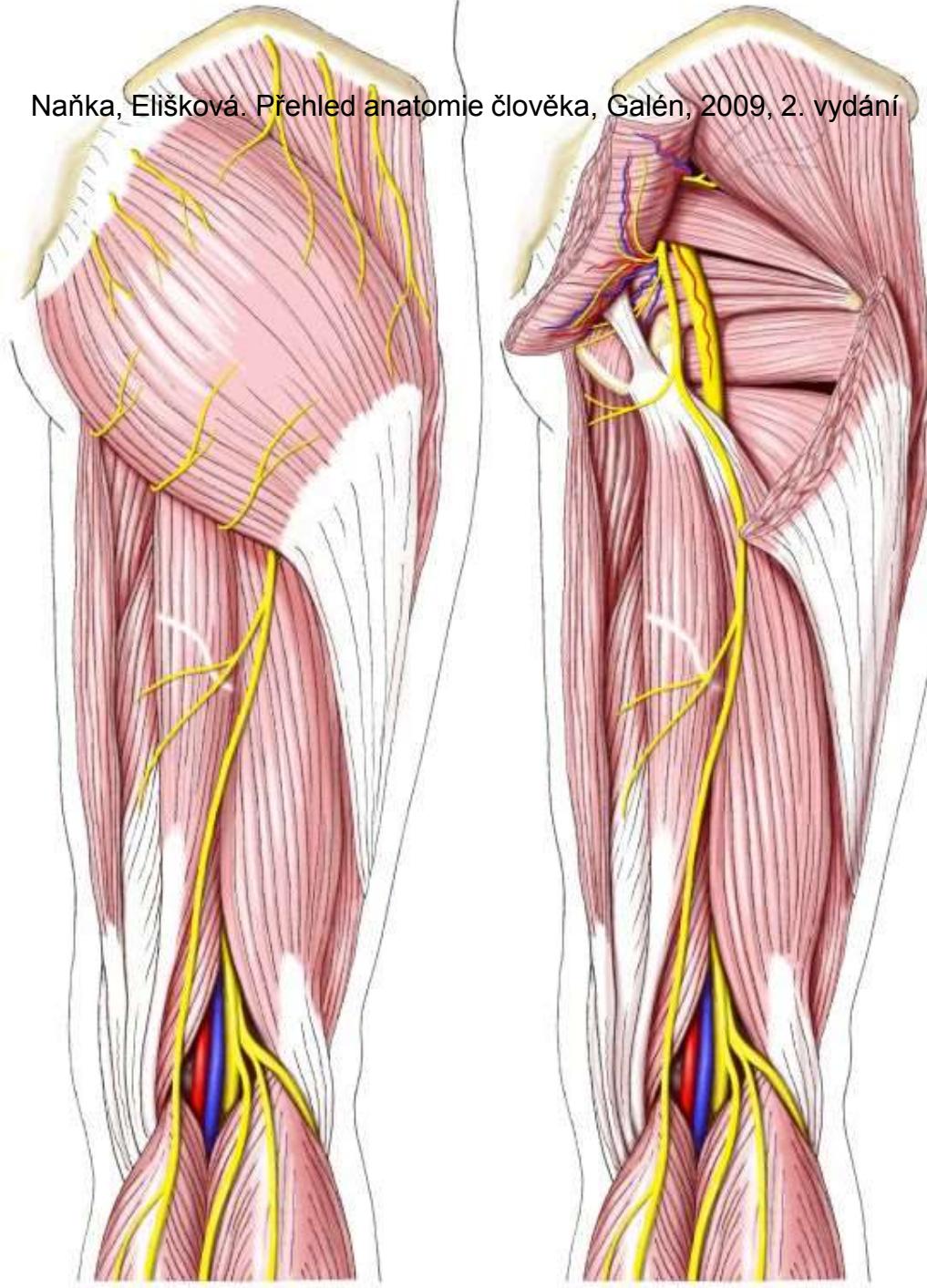


For. suprapiriforme
a.+v. + n. gluteus sup.

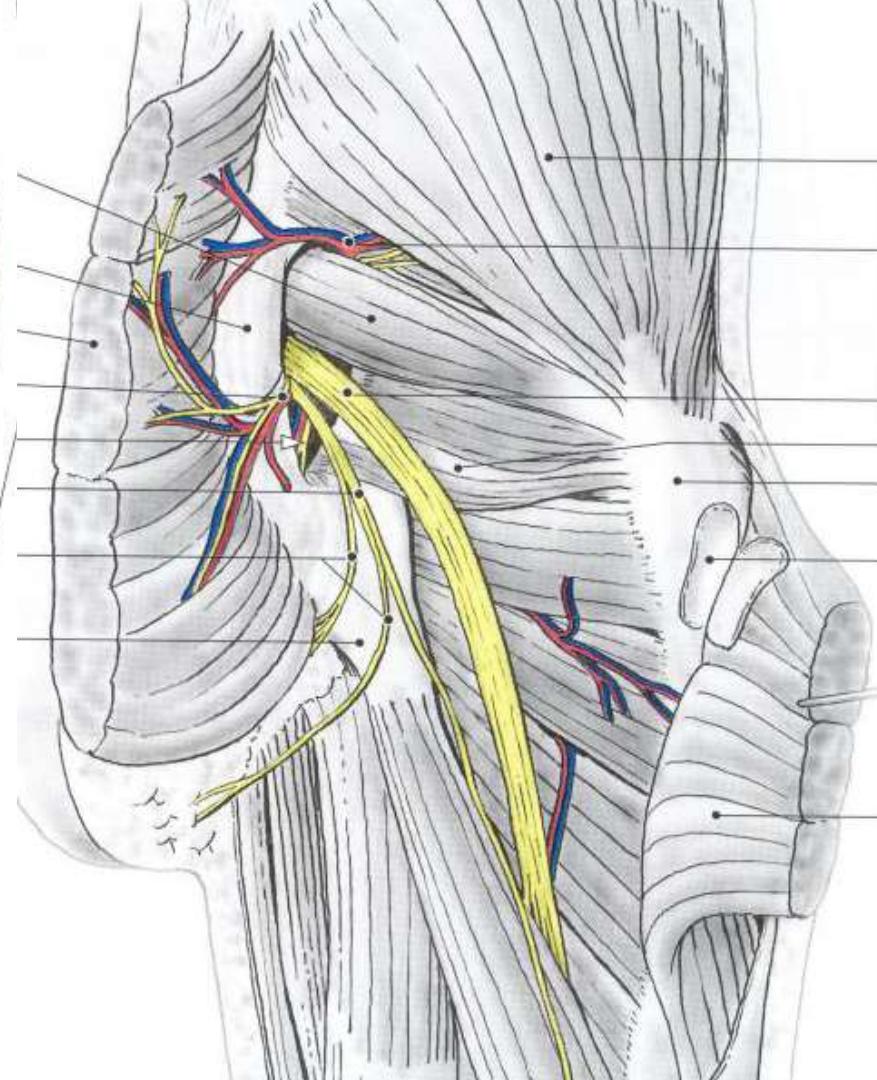
For. infrapiriforme
a.+v. + n. gluteus inf.
n. Ischiadicus
n. cut. femoris post.
a.+ v. pudenda int.
n. pudendus

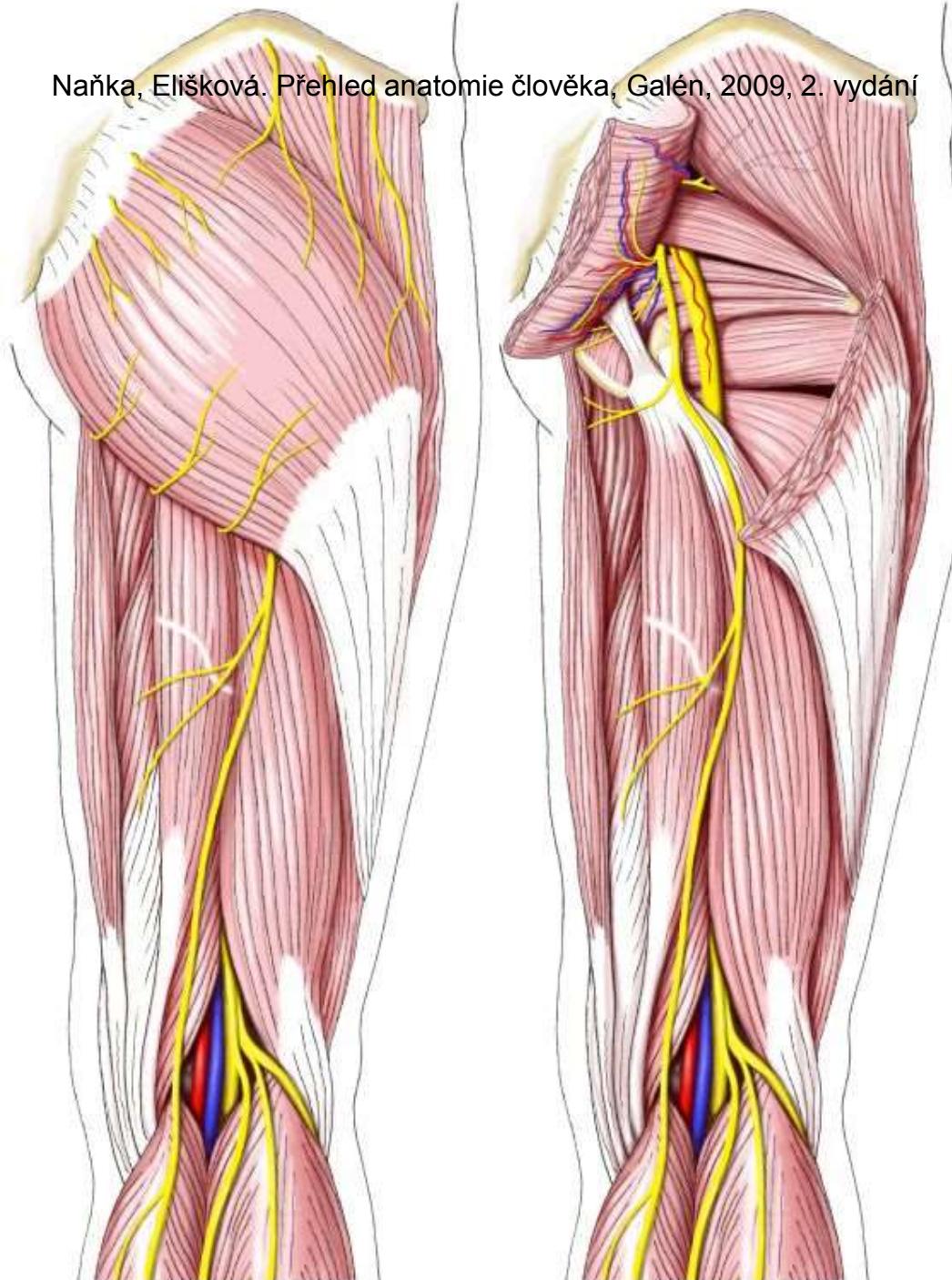
For. ischiadicum min.
a.+ v. pudenda int.
n. pudendus

Nařka, Elišková. Přehled anatomie člověka, Galén, 2009, 2. vydání



Druga R, Grim M, Stingl J: Základy anatomie V, Galén.





Foramen ischiadicum majus

For. suprapiriforme
vasa glutea sup.

For. infrapiriforme
vasa glutea inf.
n. cut. femoris post.
n. ischiadicus
n. pudendus
vasa pudenda int.

For. ischiadicum minus

m. obturatorius int.
n. pudendus
vasa pudenda int.

Přední skupina svalů kyče

m. Iliopsoas

Přední sk. stehna

m. sartorius

m. quadriceps

femoris

m. rectus femoris

m. vastus

medialis

lateralis

intermedius

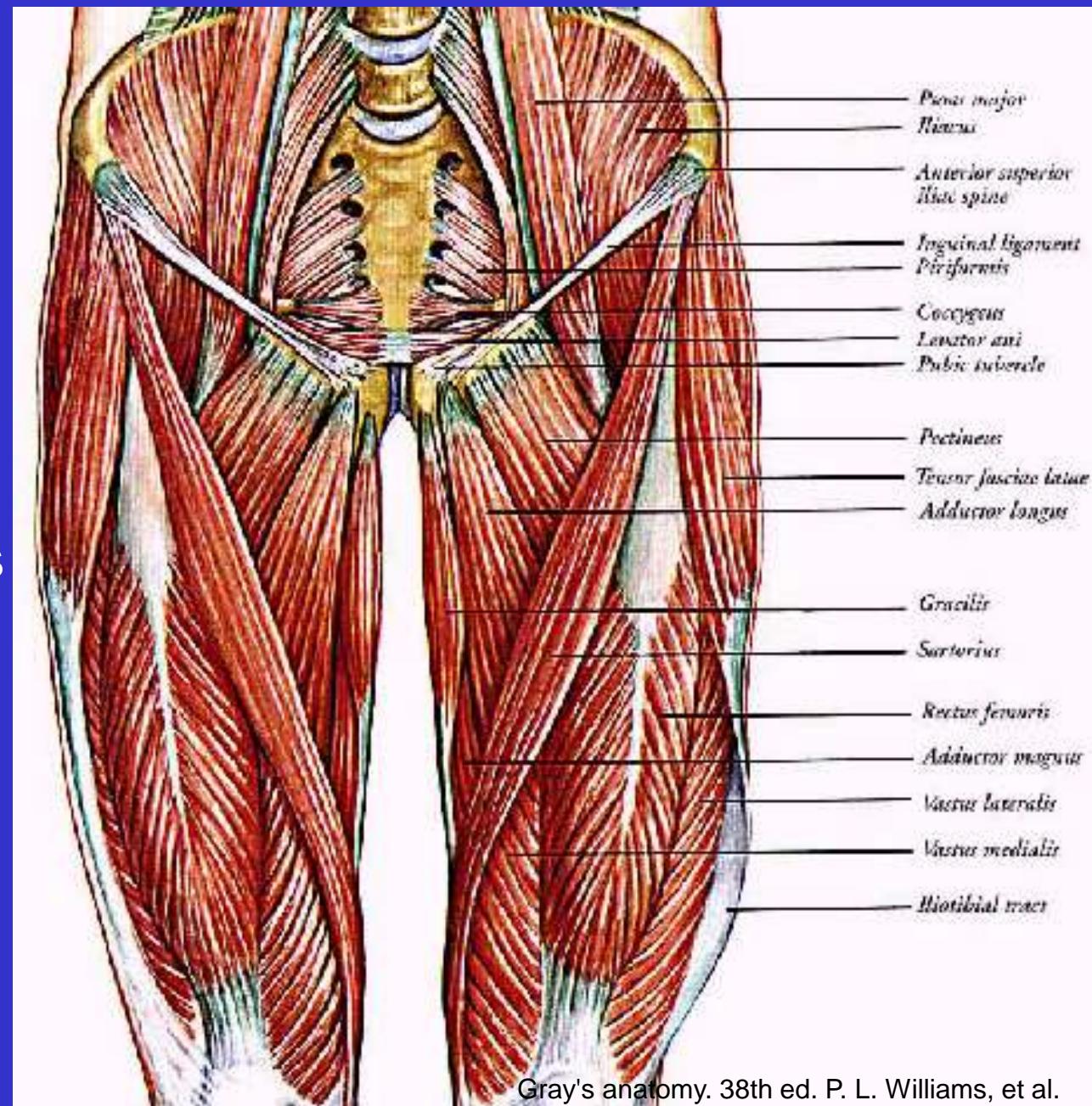
n. femoralis



Mediální skupina Adduktory

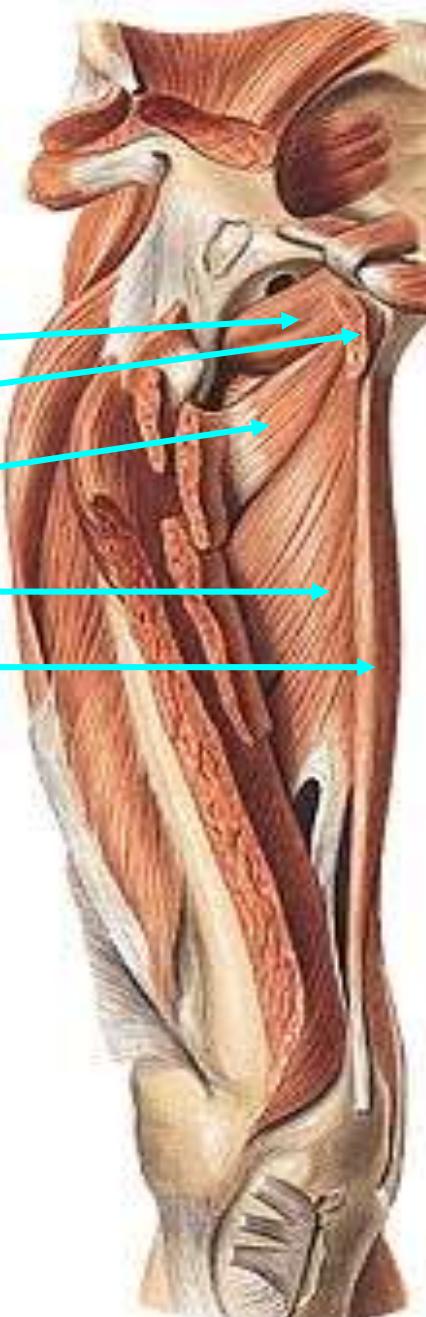
m. gracilis,
m. pectineus,
m. adductor longus,
m. adductor brevis,
m. adductor magnus

n. obturatorius
(+n. femoralis
+ n. ischiadicus)



Mediální skupina Adduktory

m. pectineus, ——————
m. adductor longus ——————
m. adductor brevis ——————
m. adductor magnus ——————
m. gracilis ——————

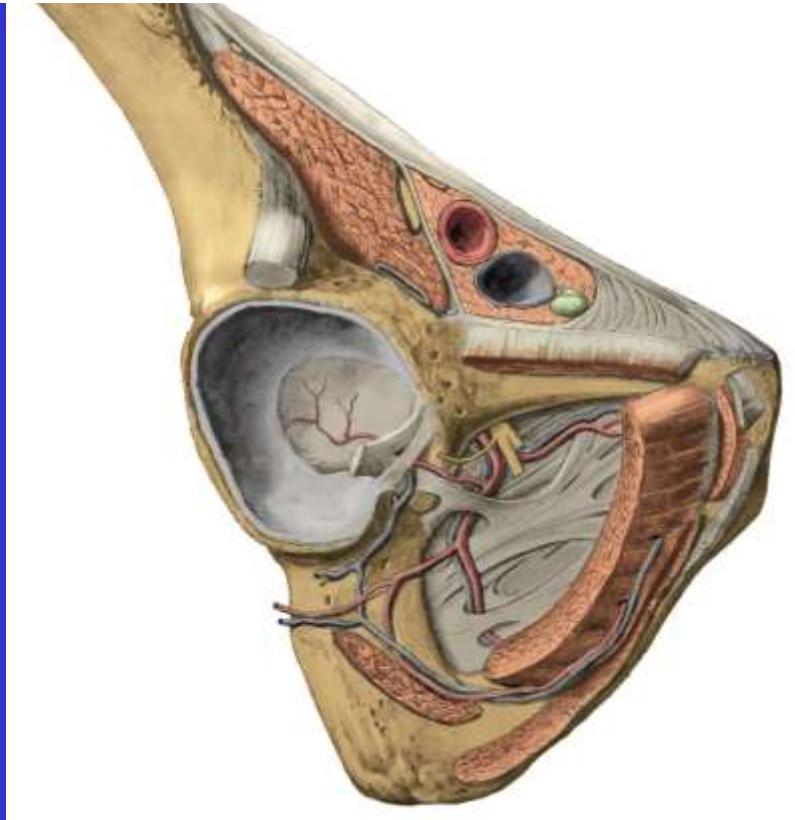


inervace

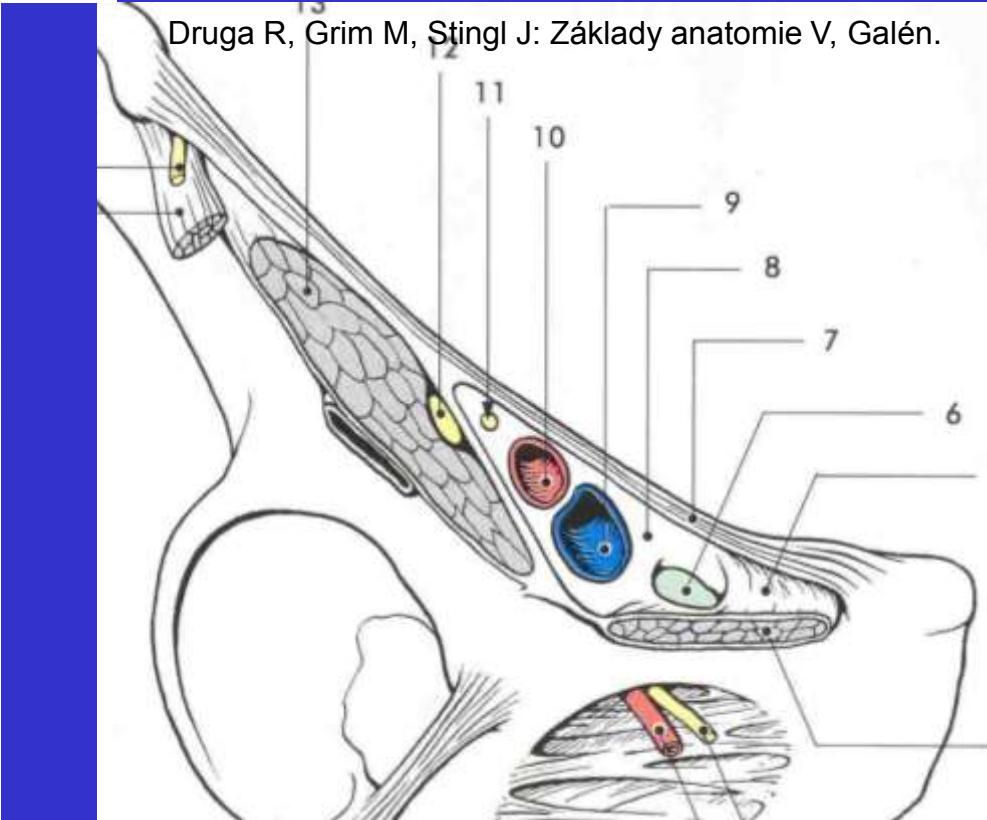
n. obturatorius
(+n. femoralis
+ n. ischiadicus)

Lacuna vasorum et lacuna musculorum

Grim, Naňka, Helekal: Atlas Anatomie člověka I, Grada 2014



Drugá R, Grim M, Stingl J: Základy anatomie V, Galén.



Arcus iliopectineus, lig. inguinale

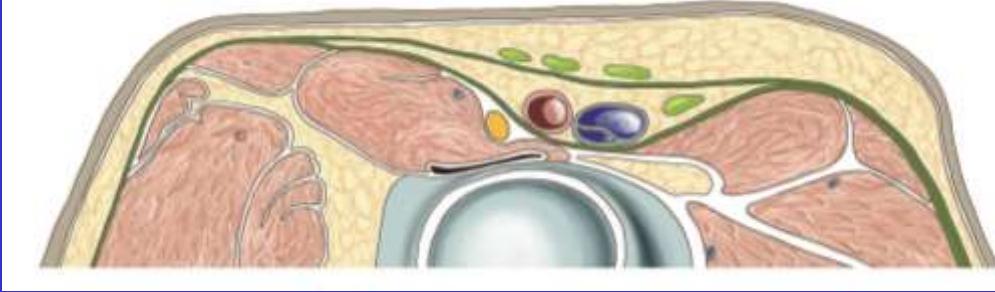
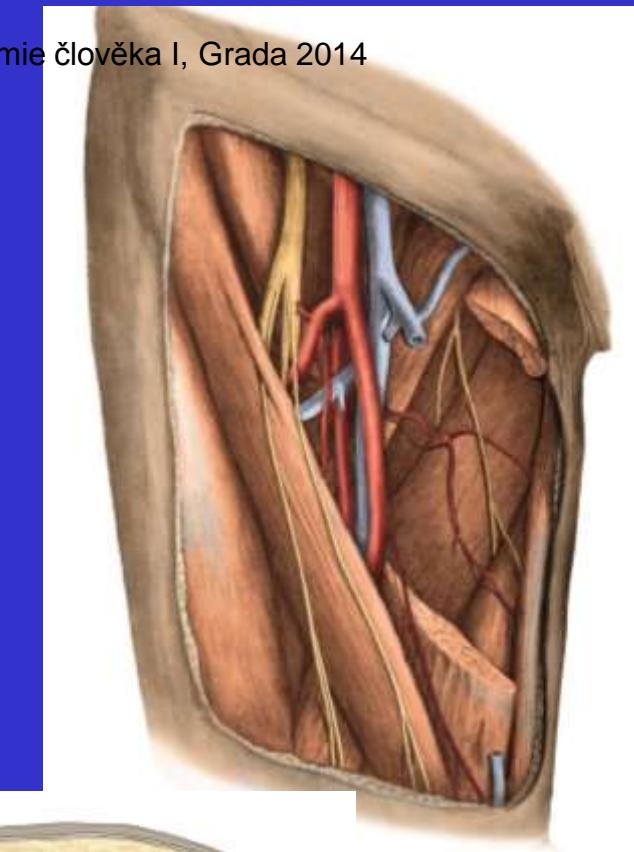
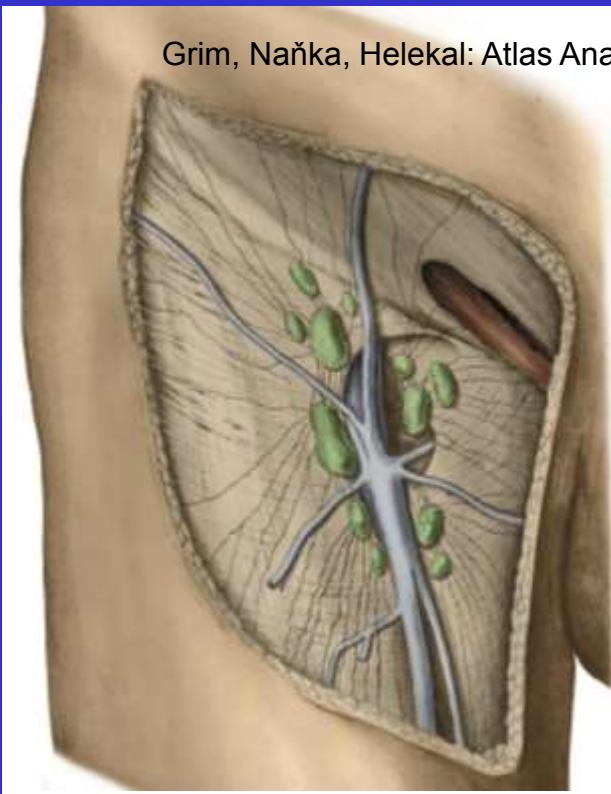
lacuna musculorum – m. psoas major, m. iliacus a n. femoralis,

lacuna vasorum – vasa femoralis

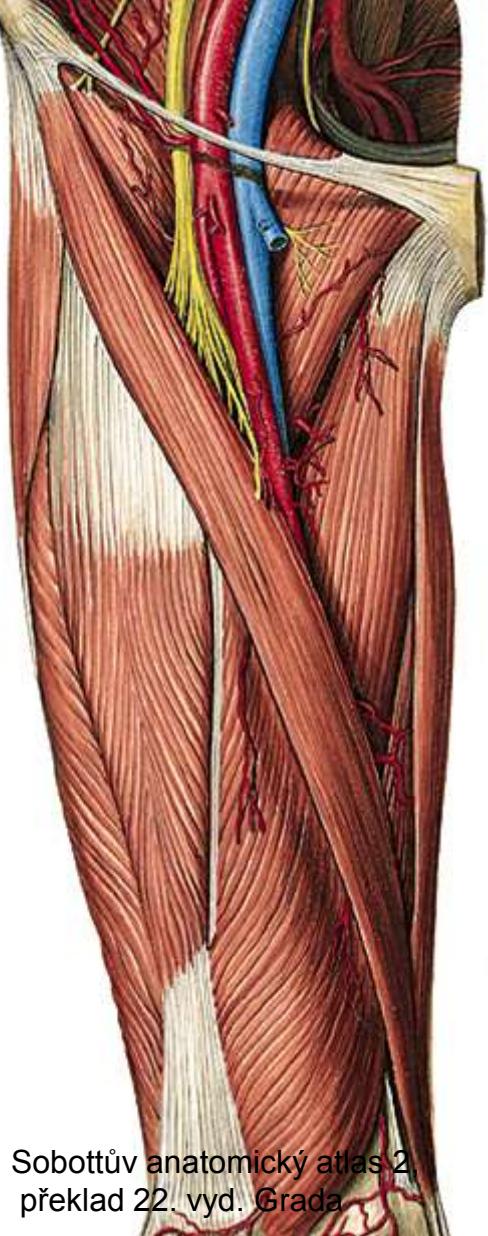
Septum femorale, lig. lacunare



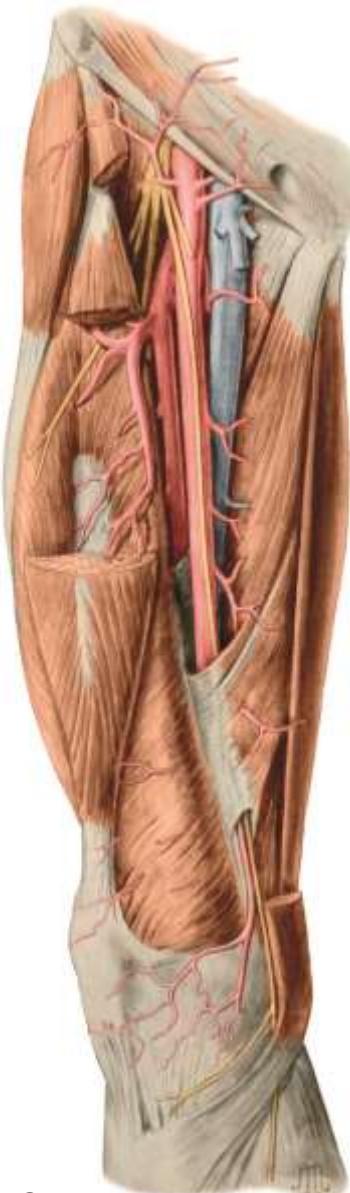
Grim, Naňka, Helekal: Atlas Anatomie člověka I, Grada 2014



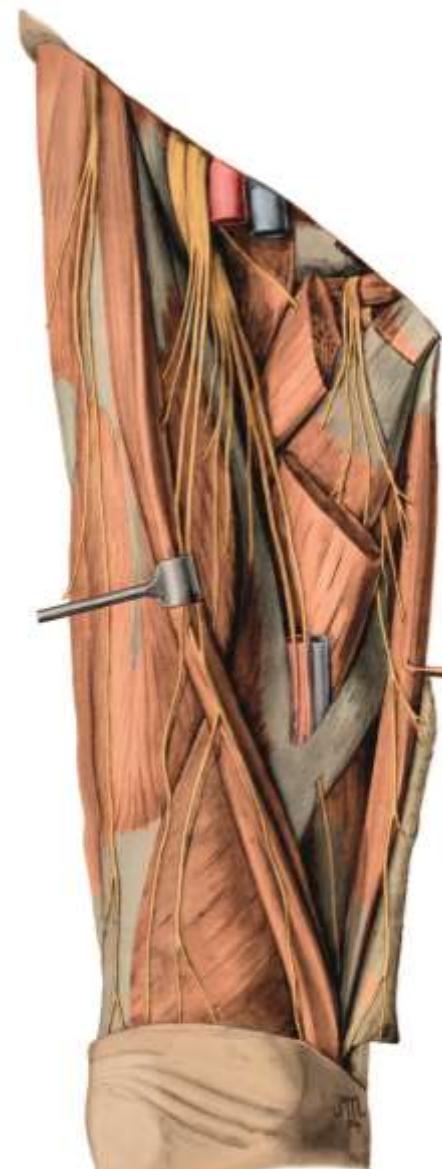
Hiatus saphenus
Lamina cribrosa fasciae latae
Trigonum femorale
Fossa iliopectinea



Sobottův anatomický atlas 2.
překlad 22. vyd. Grada



Grim, Naňka, Helekal: Atlas Anatomie člověka I, Grada 2014



n. saphenus

**Trigonum femorale et fossa iliopectinea
Canalis vastoadductorius
Lamina vastoadductoria**

Zadní skupina ("hamstringy")

m. biceps femoris,
m. semitendinosus,
m. semimembranosus,

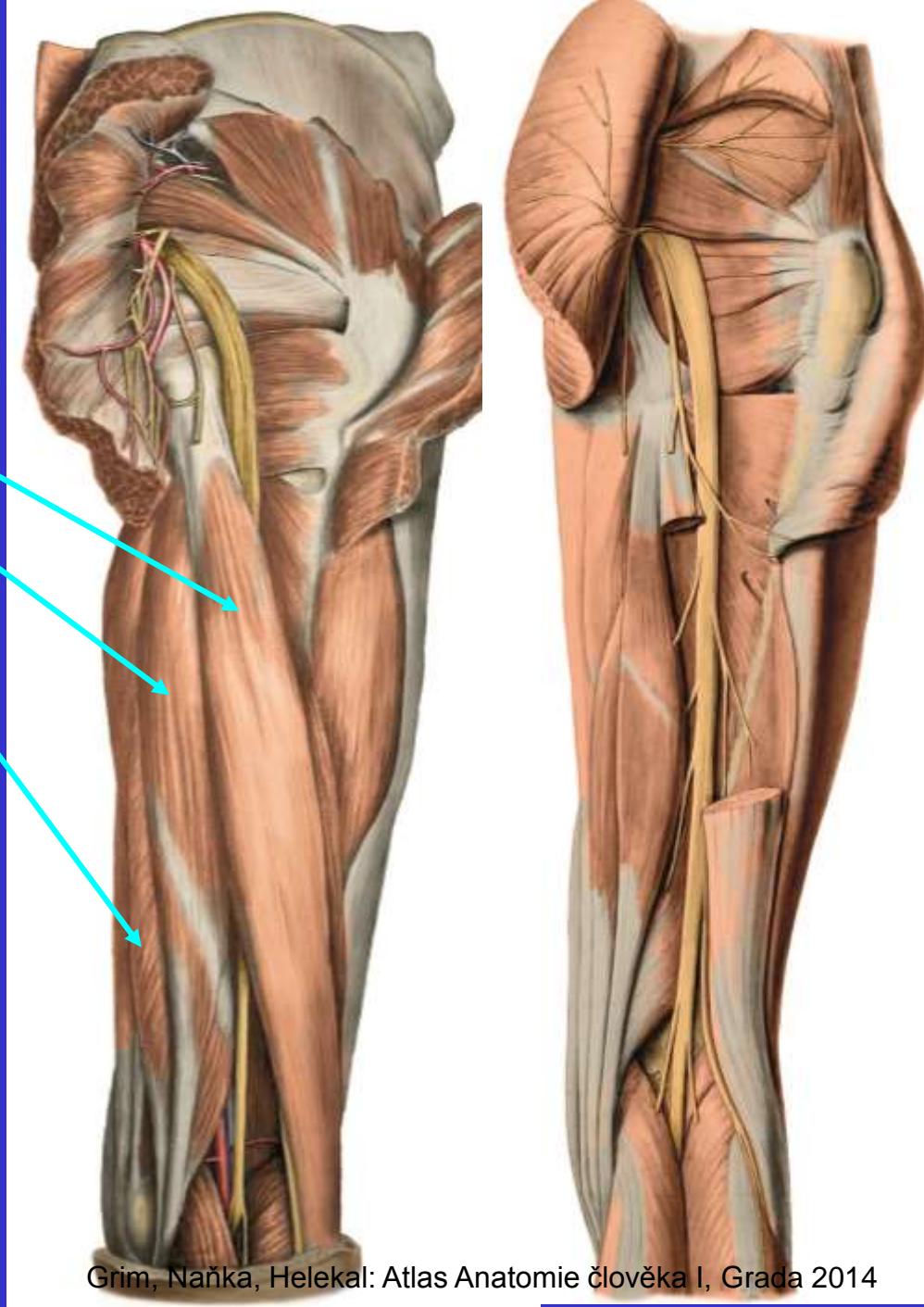
n. ischiadicus

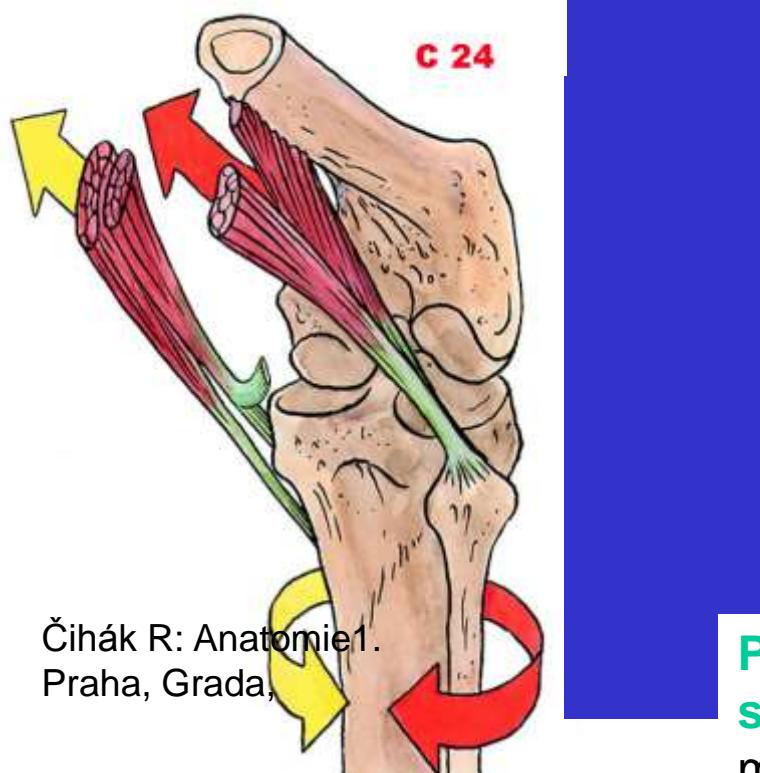
Pes anserinus superficialis

m. sartorius
m. gracilis
m. semitendinosus

Pes anserinus profundus

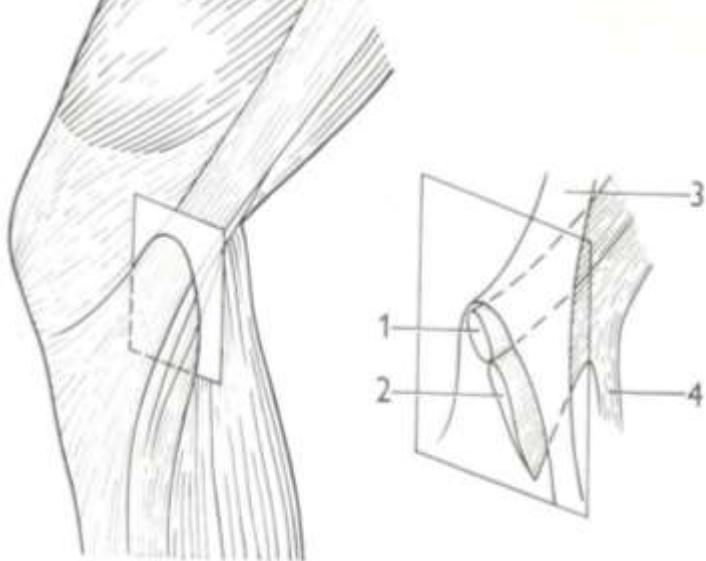
úpon. m. semimembranosus
Lig. popliteum obliquum





Čihák R: Anatomie 1.
Praha, Grada,

Čech O., Sosna A., Bartoňíček J.:
Poranění vazivového aparátu kolenního kloubu



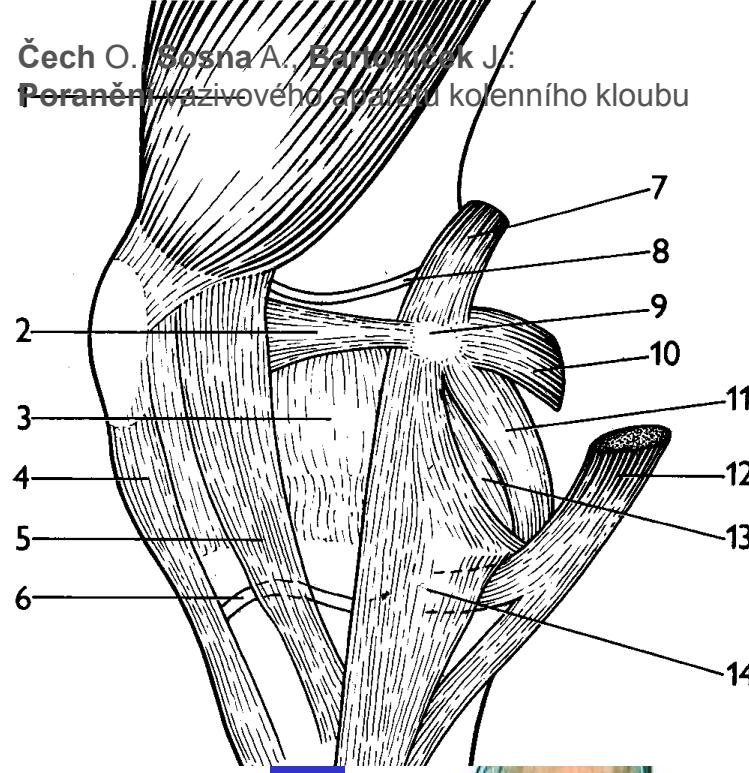
Pes anserinus superficialis

m. sartorius
m. gracilis
m. semitendinosus

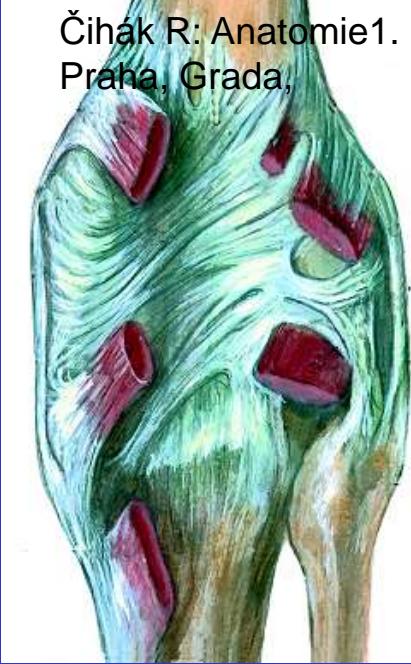
Pes anserinus profundus

úpon. m. semimembranosus
Lig. popliteum obliquum

Obr. 9. Uspořádání pes anserinus:
1 — šlacha m. gracilis, 2 — šlacha m. semitendinosus, 3 — šlacha m. sartorius, 4 — část šlachy m. semitendinosus vyzafoující do běrcové fascie.



Čihák R: Anatomie 1.
Praha, Grada,



Svaly kyčle a jejich funkční rozdělení

Flexory Fem

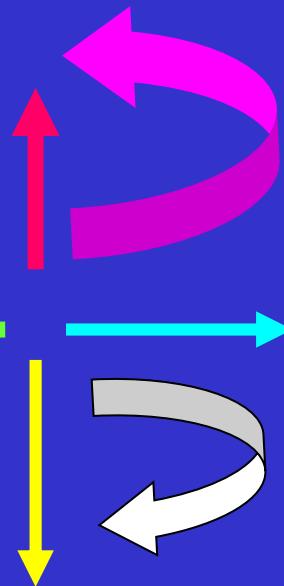
IP, Sar, RF, TFL

Vnitřní rotace

GMi, Me, TFL, GS+I
Gr, AdM, Pect F,O,I

Adduktory Ob+Is

AdL, AdBr,
AdM, Gr, Pect



Abduktory GS+I

TFL, Glutei

Zevní rotace

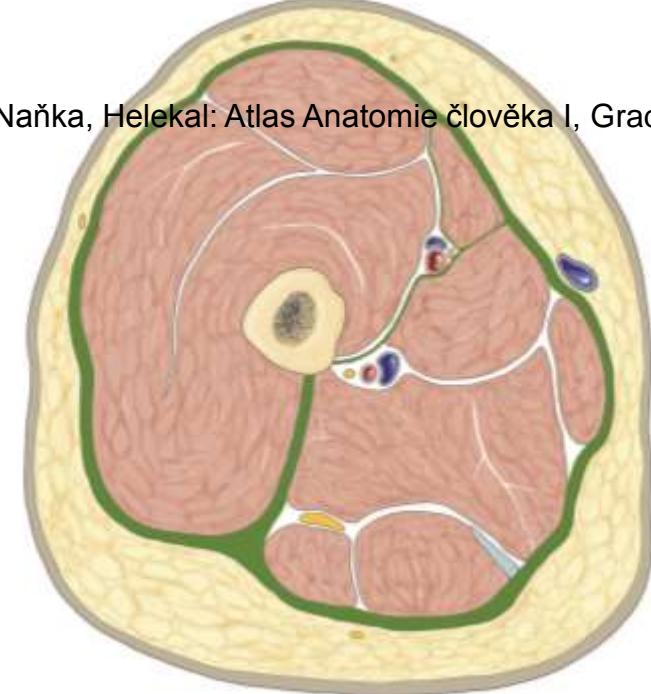
Pir, ObIn, ObEx,
GeSup, Geln, Qt Fe
+Glu PISac, GS

Extensor

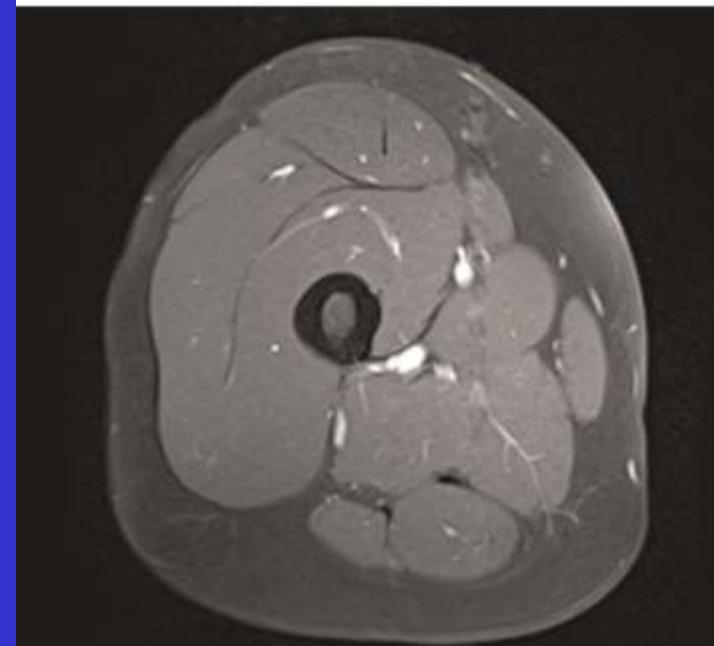
Glu Max
Hamstringy
GI+I

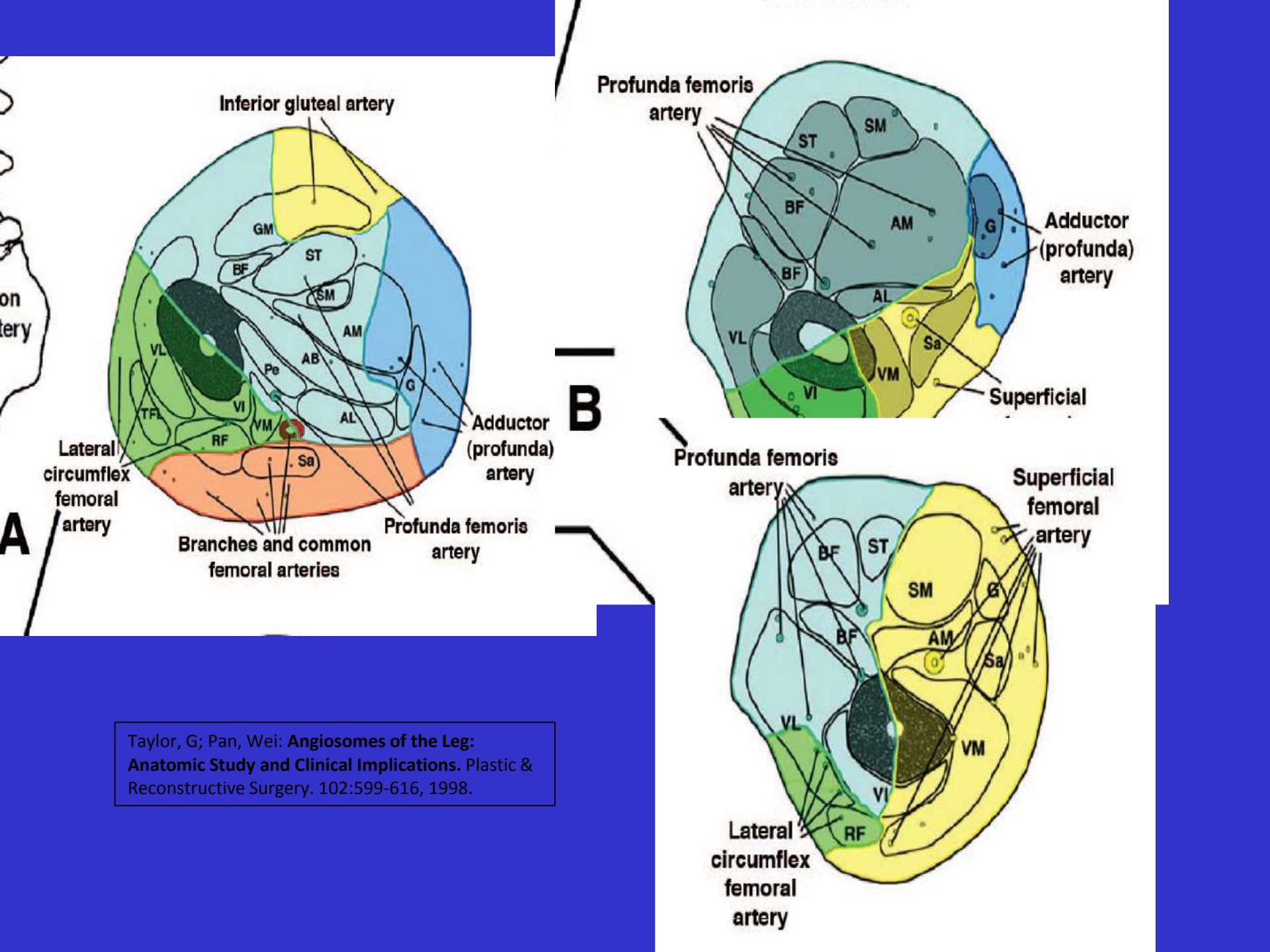
**Fascia lata,
tractus iliotibialis,
septum femorale
intermusculare
laterale;
septum mediale—
jen splývající
fascie**

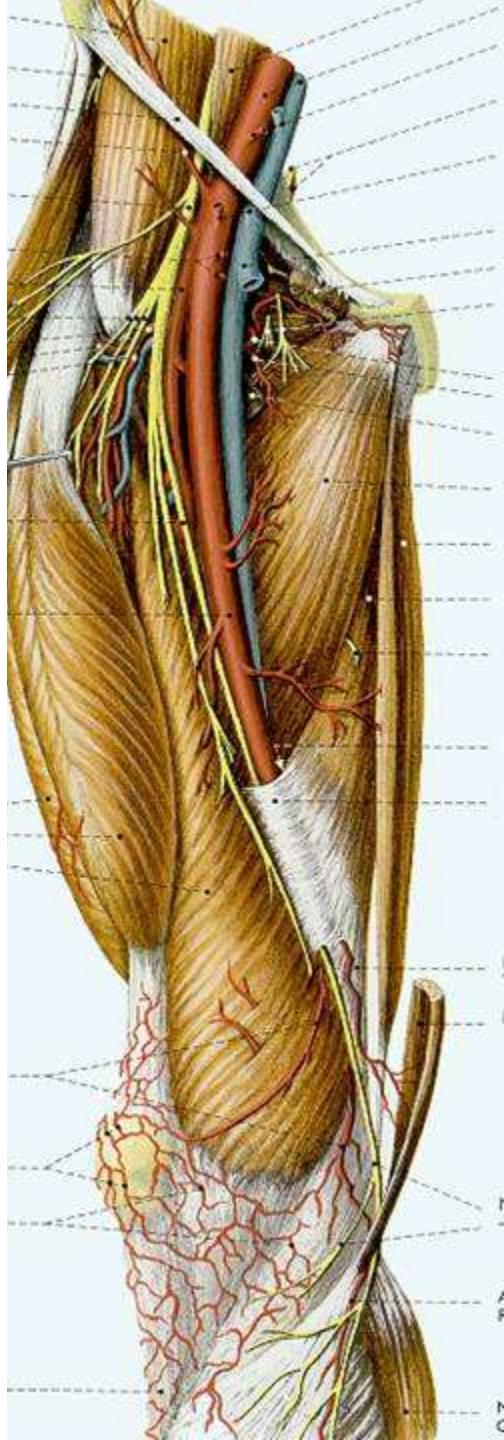
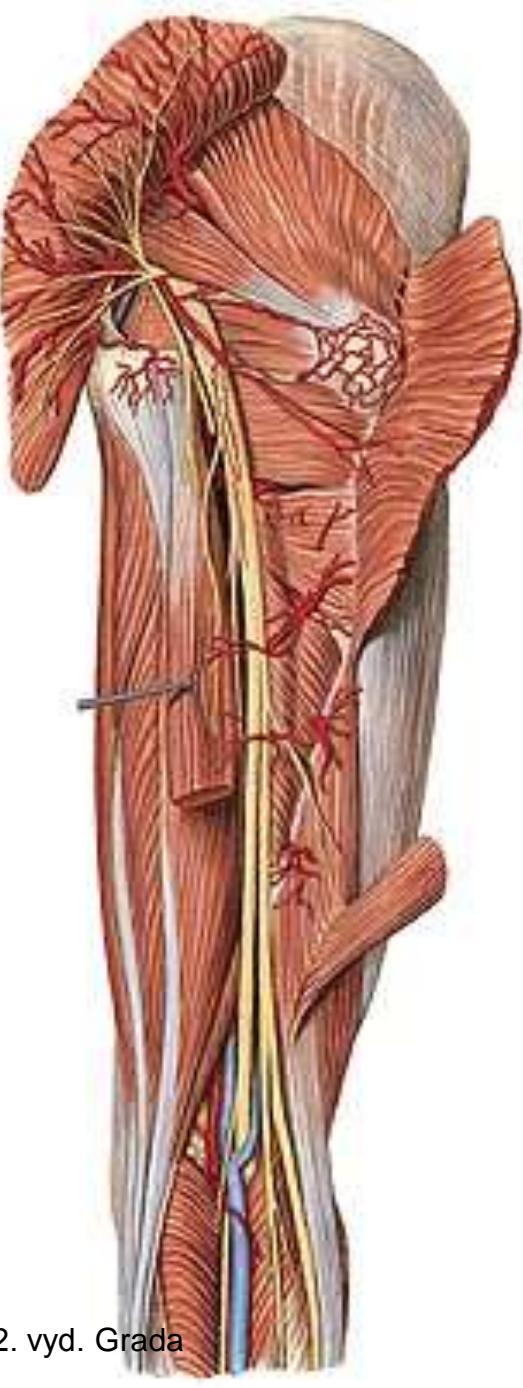
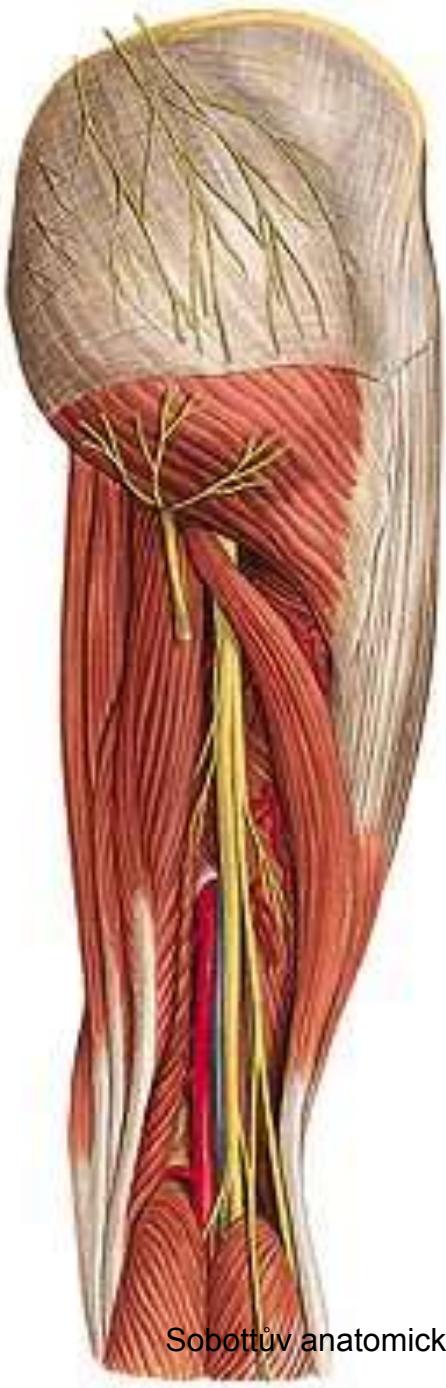
Grim, Nařka, Helekal: Atlas Anatomie člověka I, Grada 2014



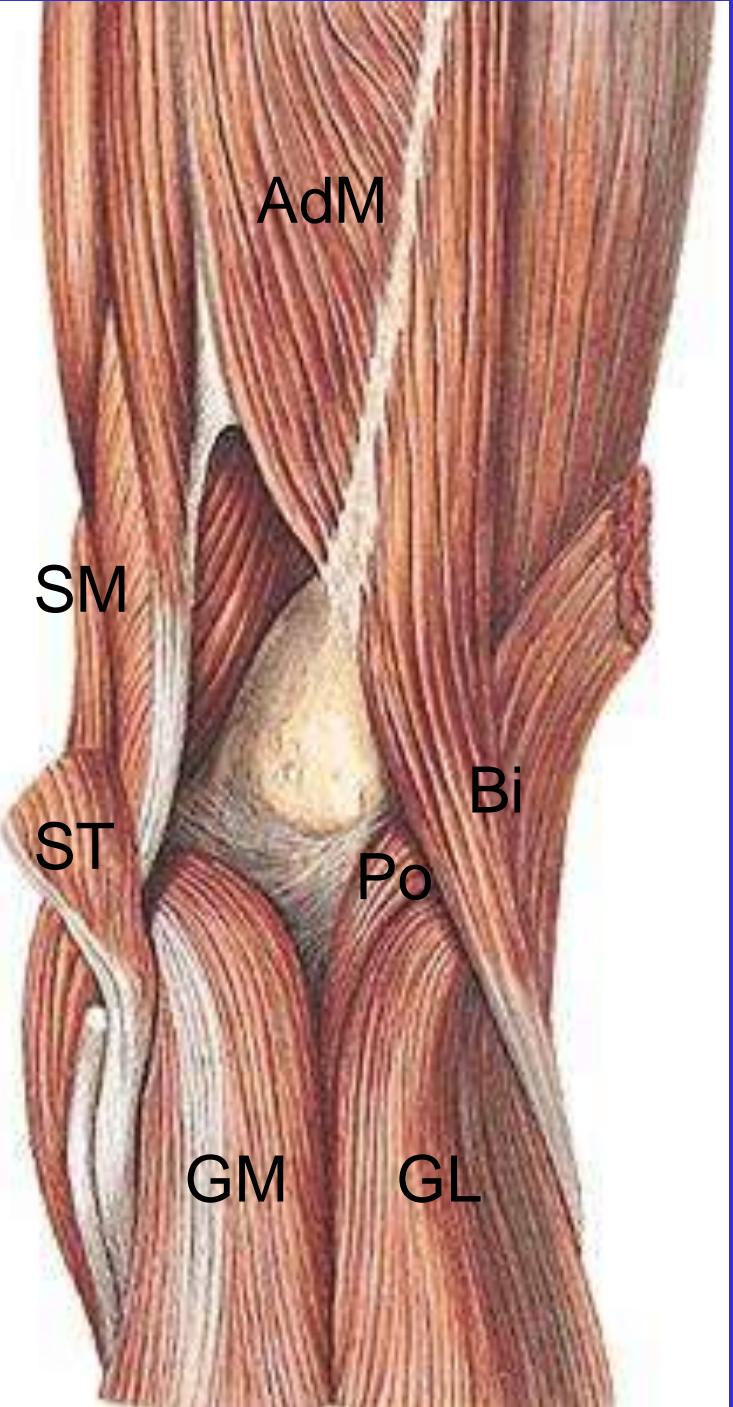
**Hiatus saphenus
*Trigonum
femorale*
Fossa iliopectinea
**Canalis
adductorius****





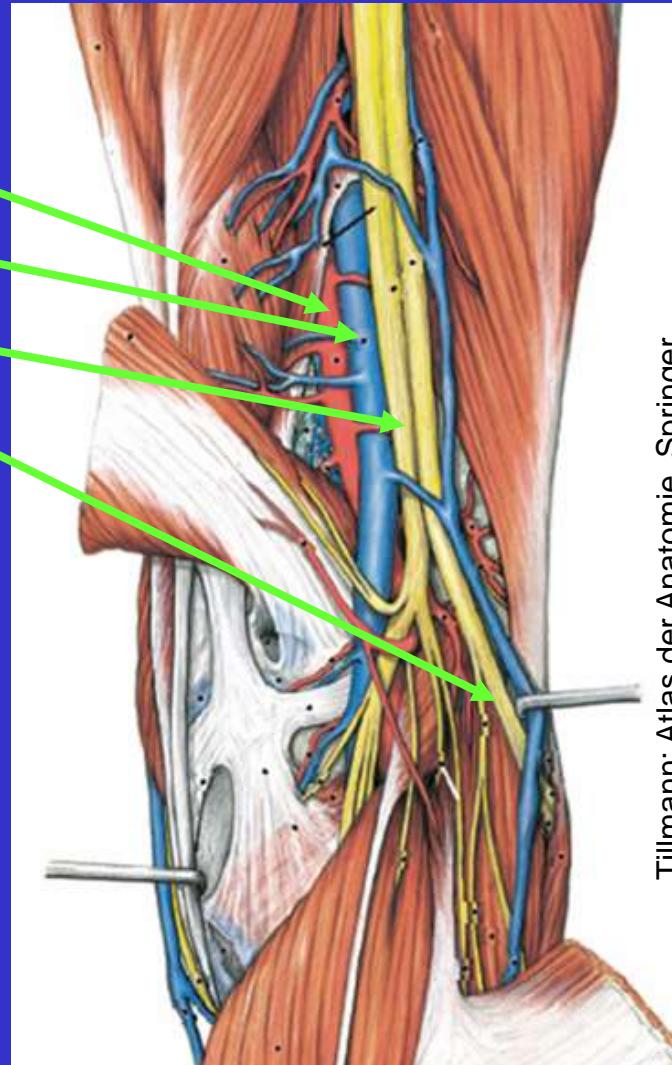


Sobottův anatomický atlas 2, překlad 22. vyd. Grada

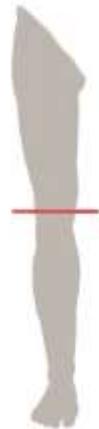
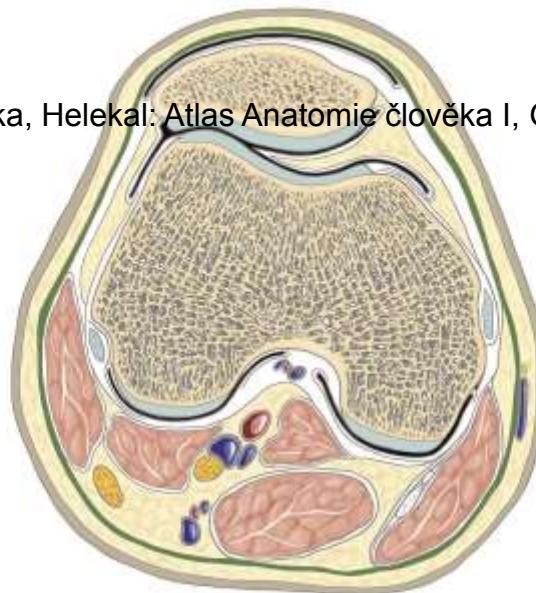


Fossa poplitea, hiatus adductorius
A+v. poplitea, n. tibialis,
n. peroneus comm.
m. popliteus

A. poplitea
V. poplitea
N. tibialis
**N. peroneus
communis**

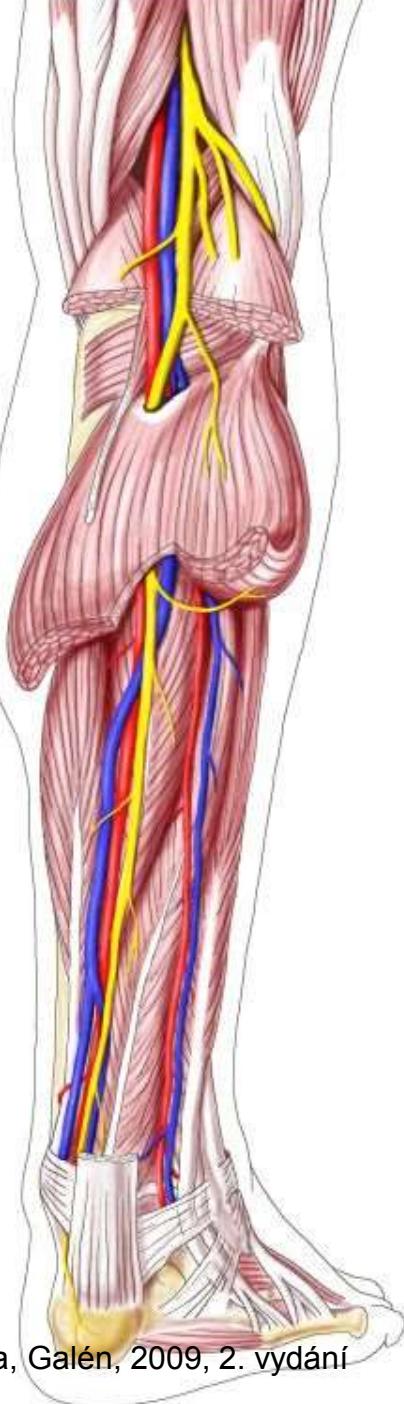


Grim, Nařka, Helekal: Atlas Anatomie člověka I, Grada 2014

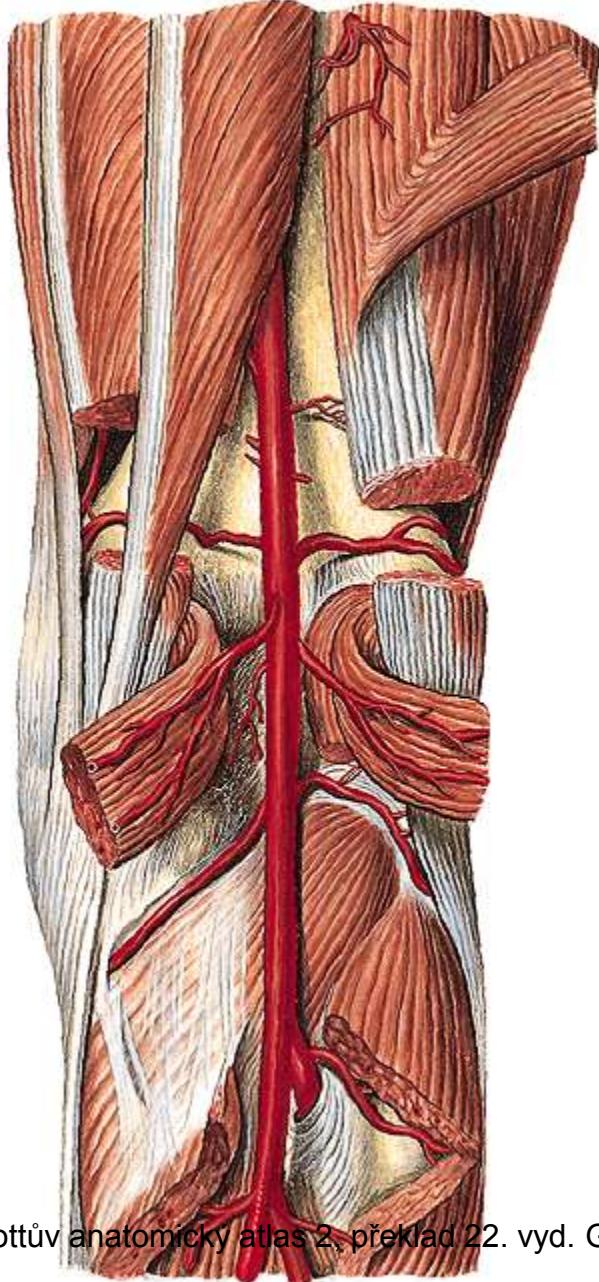




Nařka, Elišková. Přehled anatomie člověka, Galén, 2009, 2. vydání



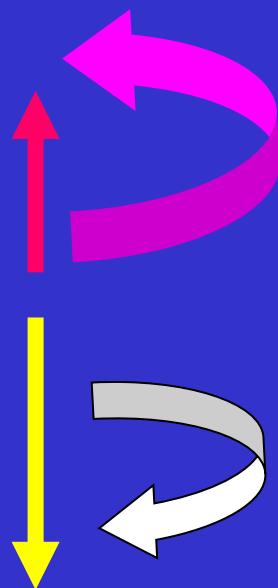
Sobottův anatomický atlas 2, překlad 22. vyd. Grada



Svaly kolene a jejich funkční rozdělení

Flexory Is

Bic, SemiTe, SemiMe, GM+L



Vnitřní rotace Is

SemiTe, SemiMe, Popliteus

Zevní rotace Is + GI

Bic, TFL

Extensor
Quadriceps Fe

Svaly bérce

Dorsální skupina povrchová vrstva

m. triceps surae

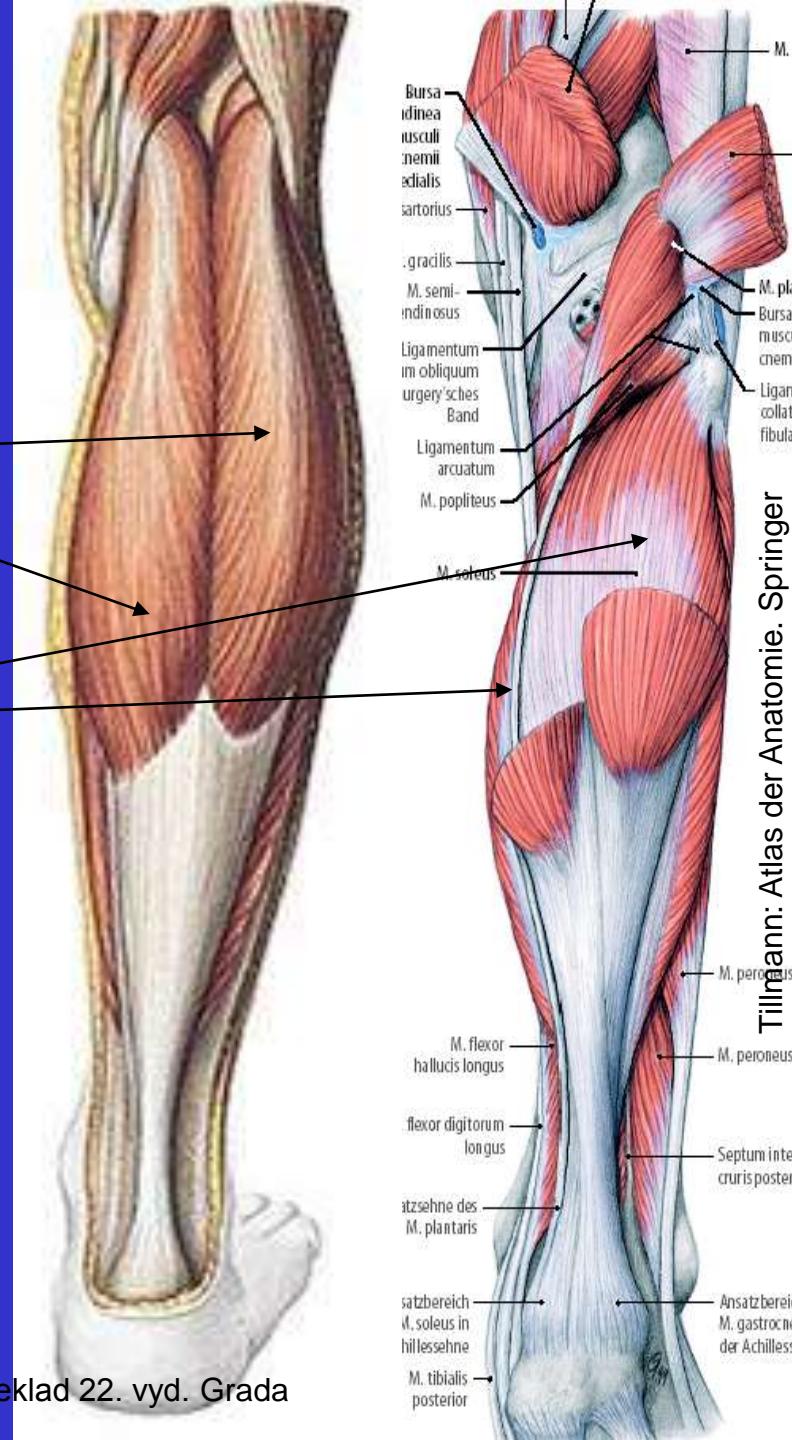
- m. gastrocnemius lat.
- m. gastrocnemius med.
- m. soleus

m. plantaris

hluboká vrstva

- m. tibialis posterior
- m. flexor digitorum longus
- m. flexor hallucis longus

inervace n. tibialis



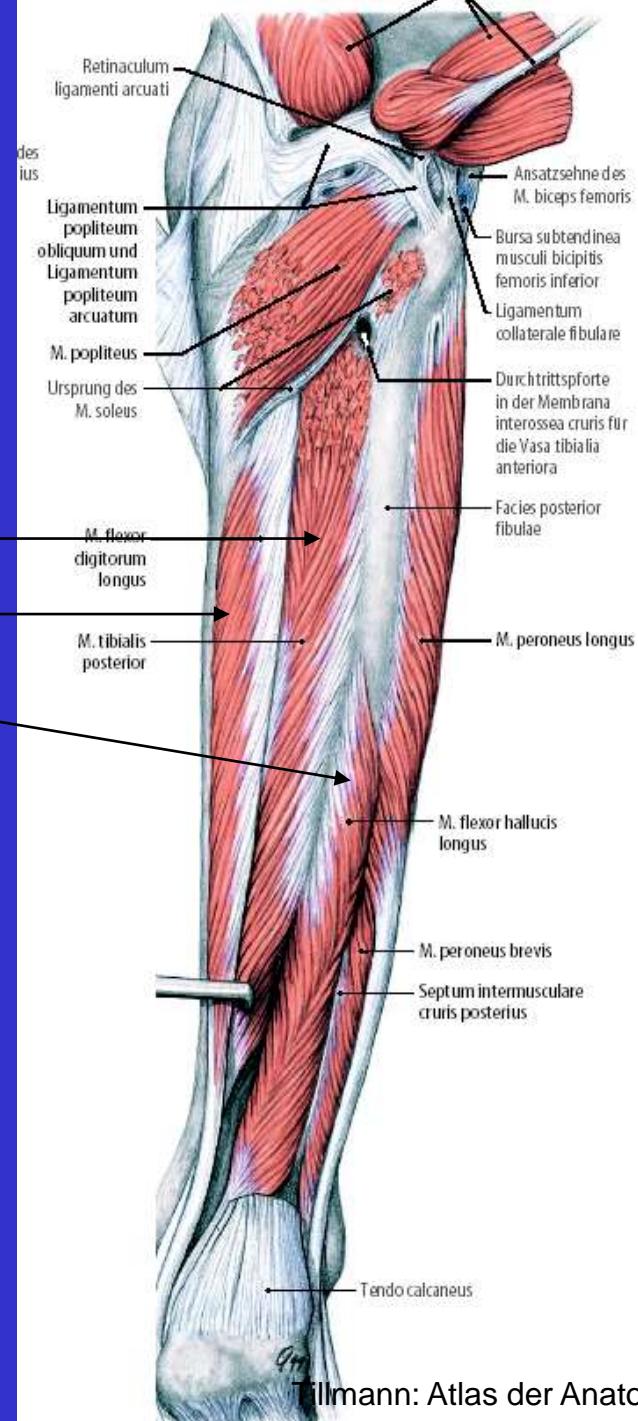
Dorsální skupina hluboká vrstva

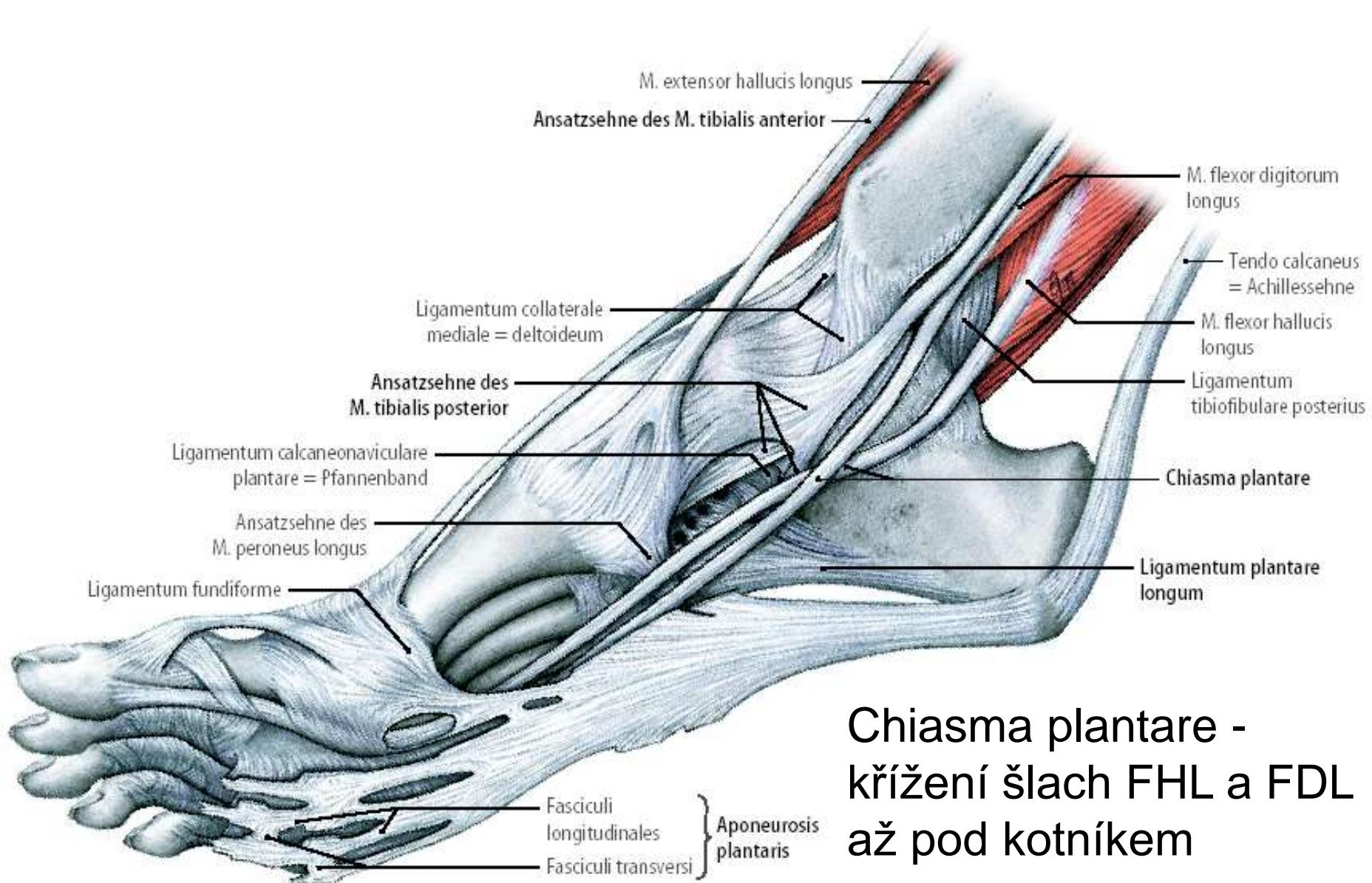
m. tibialis posterior

m. flexor digitorum longus

m. flexor hallucis longus

inervace n. tibialis



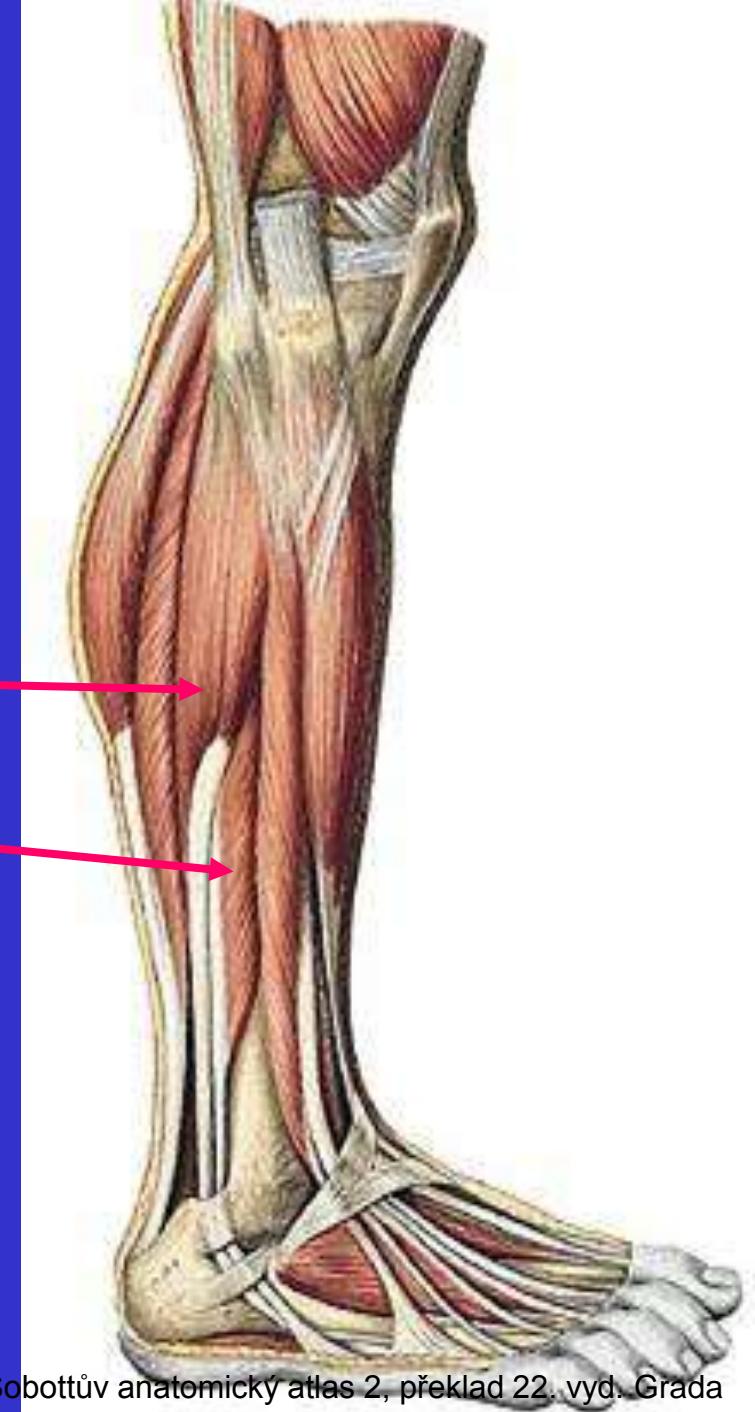


**Chiasma plantare -
křížení šlach FHL a FDL
až pod kotníkem**

Svaly bérce laterální skupina (n. peroneus superficialis)

m. peroneus longus
et brevis

CAVE - m. peroneus tertius-
přídatná šlacha z m. EDL k
tuber ositas MTT. V.





Ventrální skupina n. peroneus profundus

m. tibialis anterior

m. extensor hallucis longus

m. extensor digitorum longus

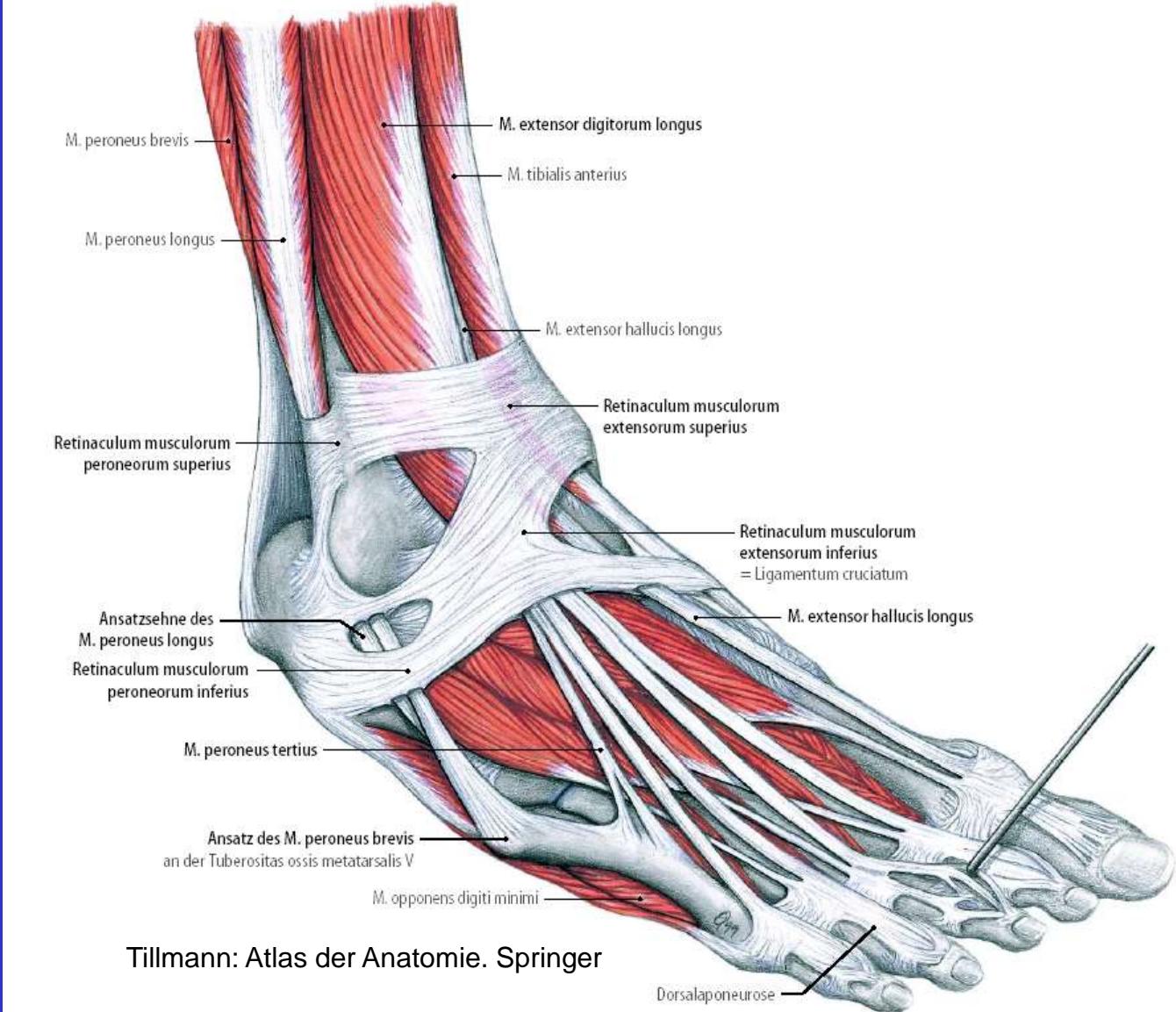
**retinaculum
mm.
extensorum
sup. et inf.**

vaginae
tendinum
tarsales ant.

a. tibialis ant.
n. tibialis
n. peroneus
prof.

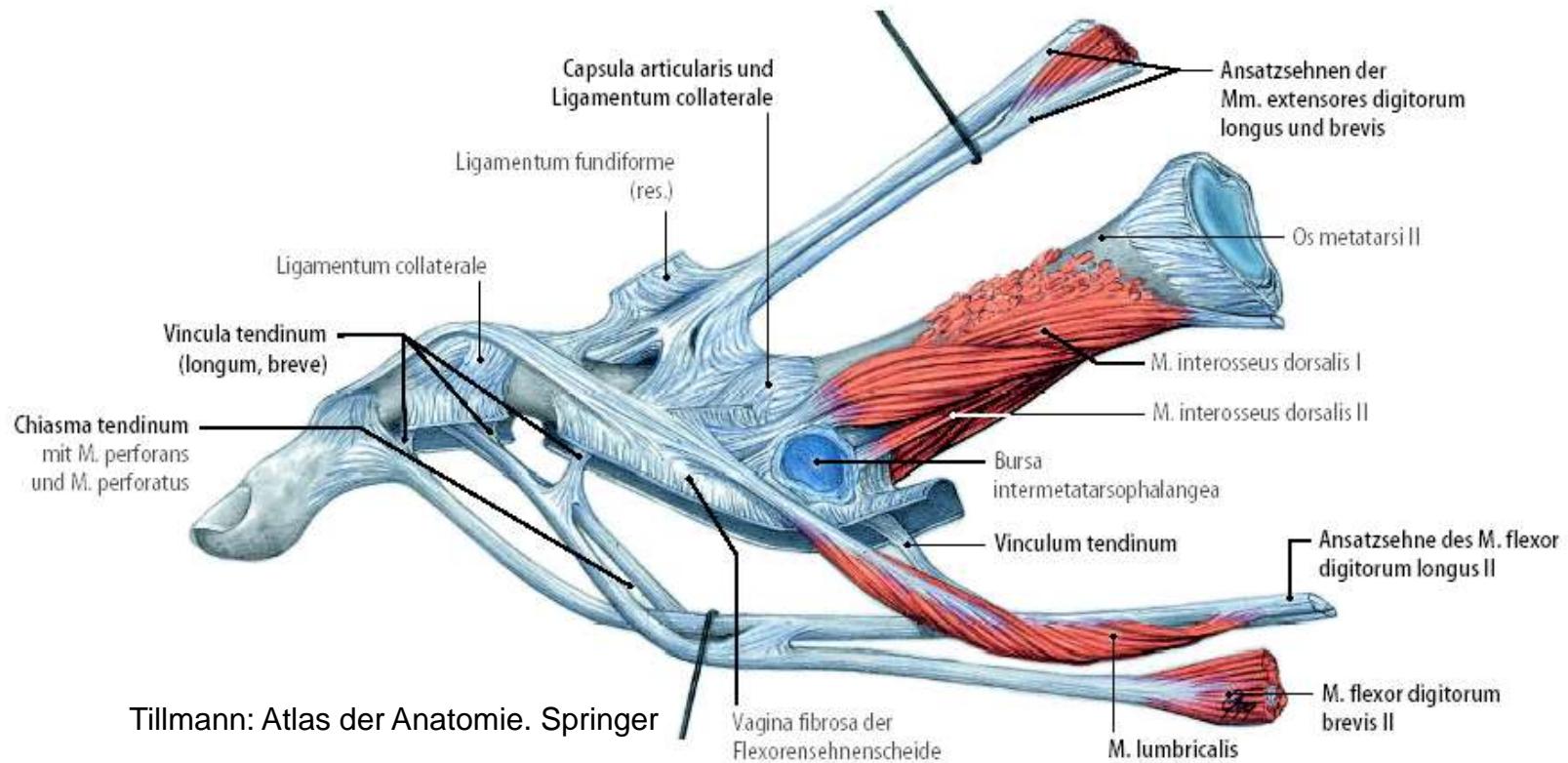
Sobottův anatomický atlas 2, překlad 22. vyd. Grada





Tillmann: Atlas der Anatomie. Springer

retinaculum mm. peroneorum superius et inferius



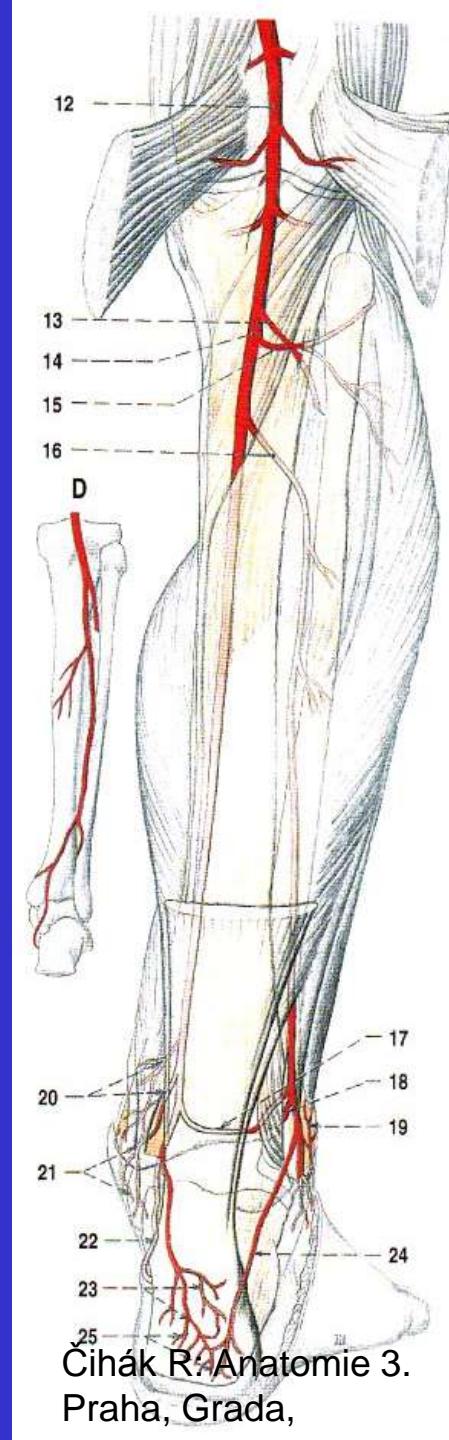
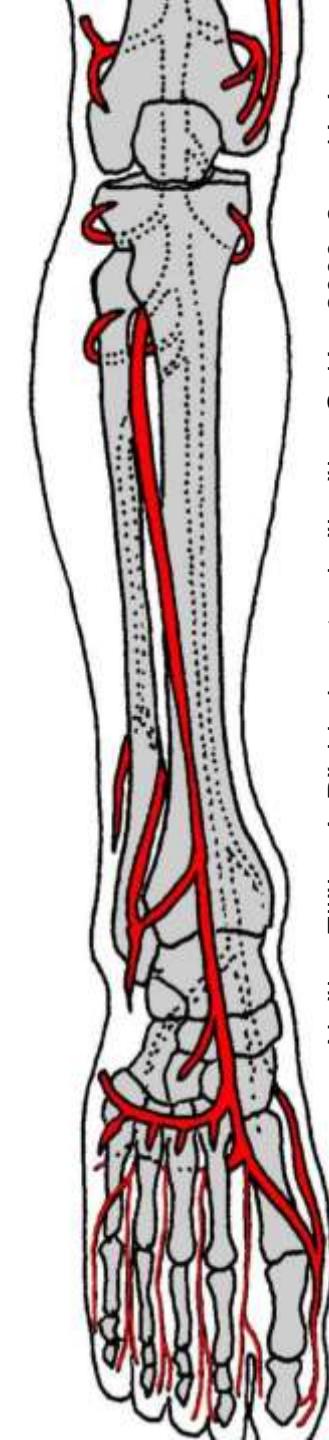
Tillmann: Atlas der Anatomie. Springer

A. poplitea

- a. genus sup. m. + l.
- a. genus media
- a. genus inf. m. + l.

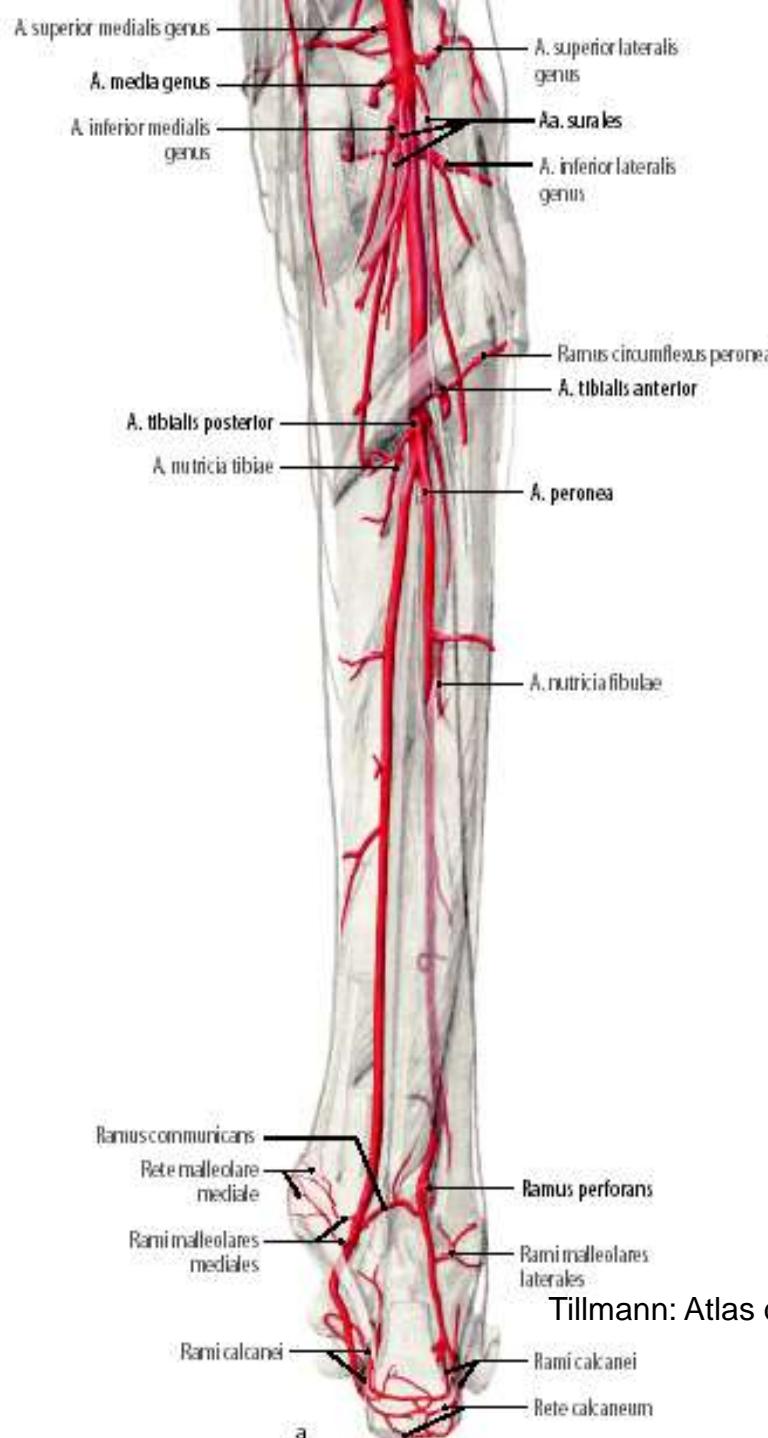
- a. tibialis posterior
 - a. peronea
 - a. plantaris med.
 - a. plantaris lat.

- a. tibialis anterior
 - a. malleolaris ant. med.
 - a. malleolaris ant. lat.

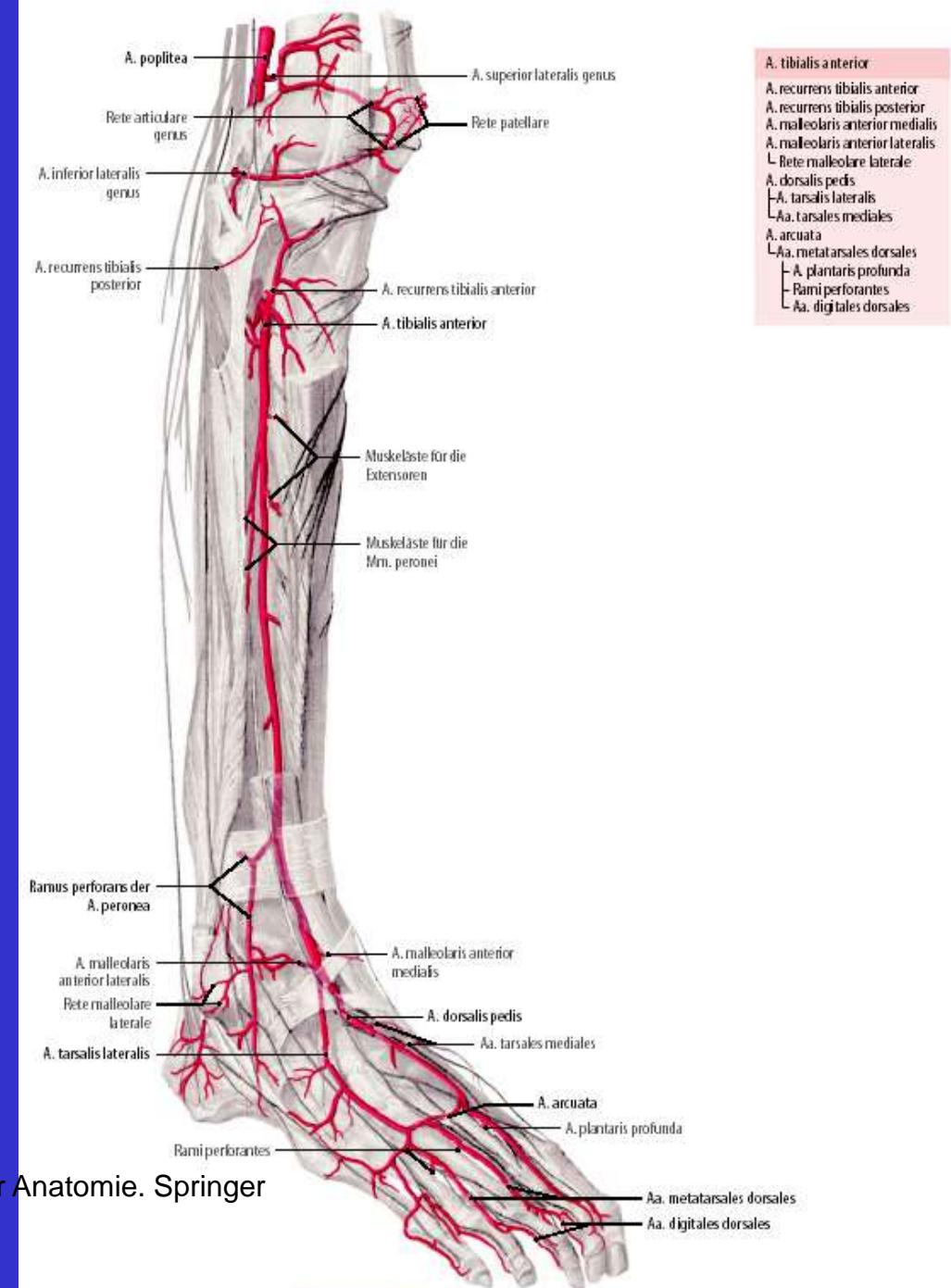


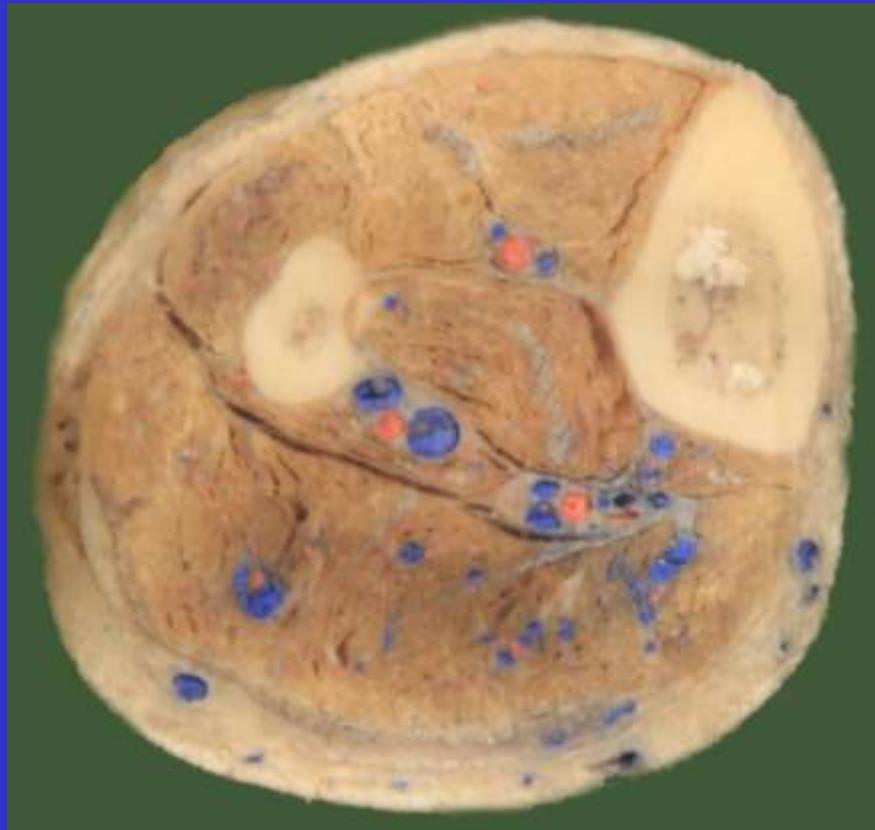
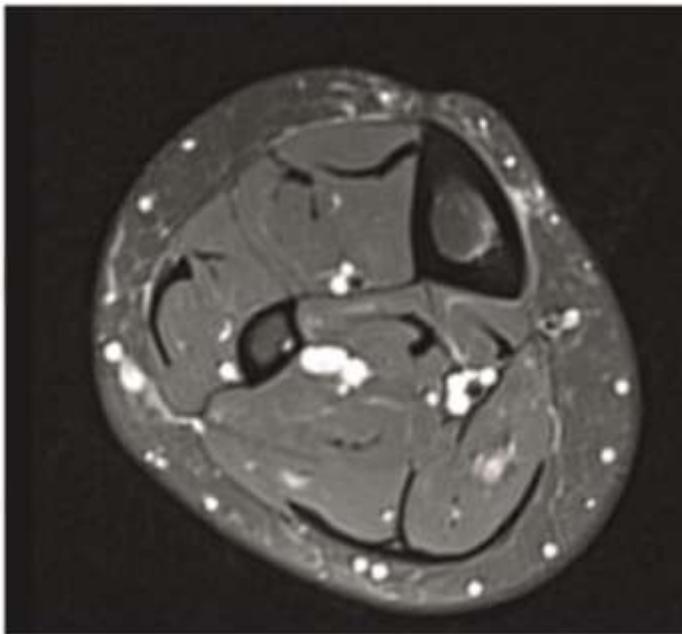
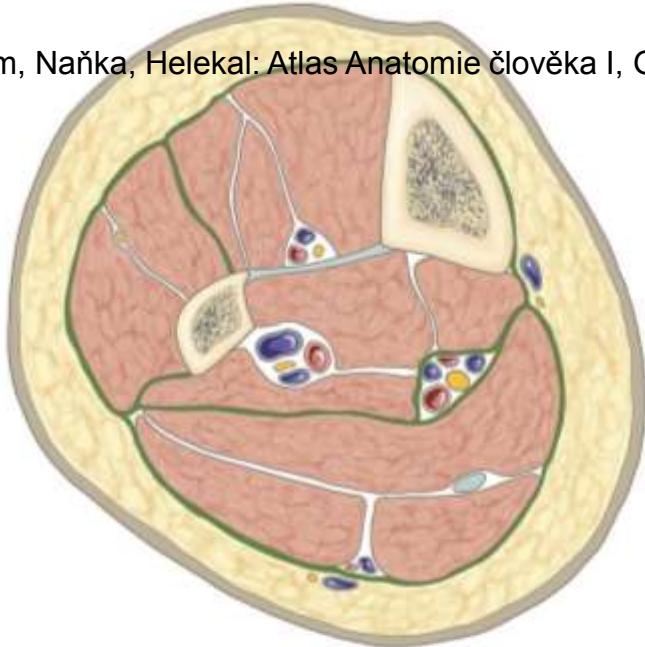
Nařka, Elišková. Přehled anatomicie člověka, Galén, 2009, 2. vydání

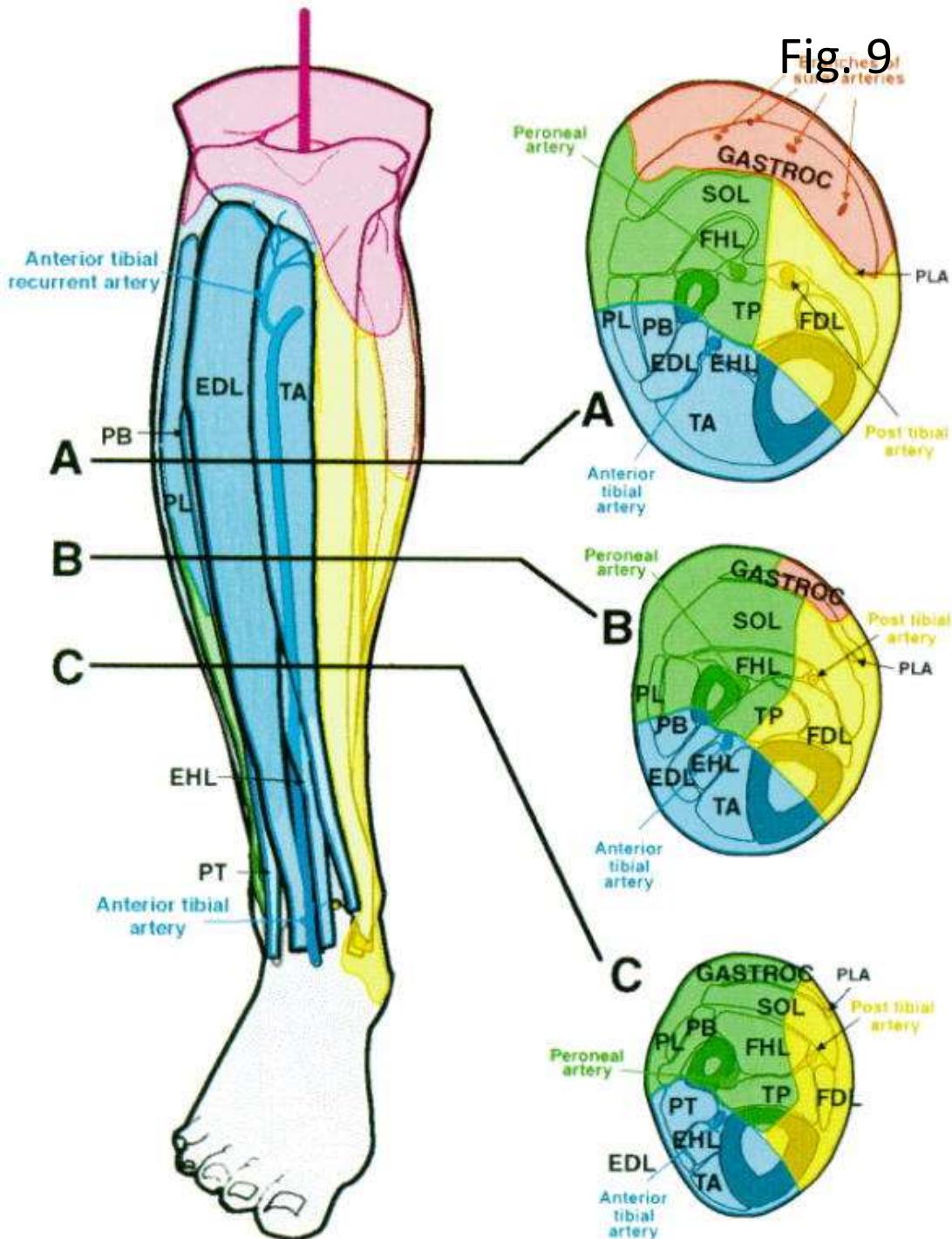
Čihák R. Anatomie 3.
Praha, Grada,



Tillmann: Atlas der Anatomie. Springer







Angiosomes of the Leg: Anatomic Study and Clinical Implications.

Taylor, G; Pan, Wei

Plastic & Reconstructive Surgery. 102(3):599-616, September 1998.

Fig. 9 . Anterior view of the leg with cross-sections at three levels, viewed distally. They show the angiosomes of the anterior tibial (blue), posterior tibial (yellow), peroneal (green), and sural (orange) angiosomes. Note that, in each case, the angiosome territories extend from the skin to the bone and their borders, defined by anastomotic vessels, and meet usually within tissues, especially the muscles, rather than between them. EDL, extensor digitorum longus; EHL, extensor hallucis longus; FDL, flexor digitorum longus; FHL, flexor hallucis longus; GASTROC, gastrocnemius; PB, peroneus brevis; PL, peroneus longus; PLA, plantaris; PT, peroneus tertius; SOL, soleus; TA, tibialis anterior; TP, tibialis posterior.

Pohyby hlezna

Plantární Flexe *Ti, PeProf*

Tri, FHL, PLo, TP, FDL, PBr



Dorsální flexe *PeSup,*
TA, EDL, EHL, PTe

Pohyby v dolním kloubu zánártním

Plantární Flexe *Ti, PeSup*

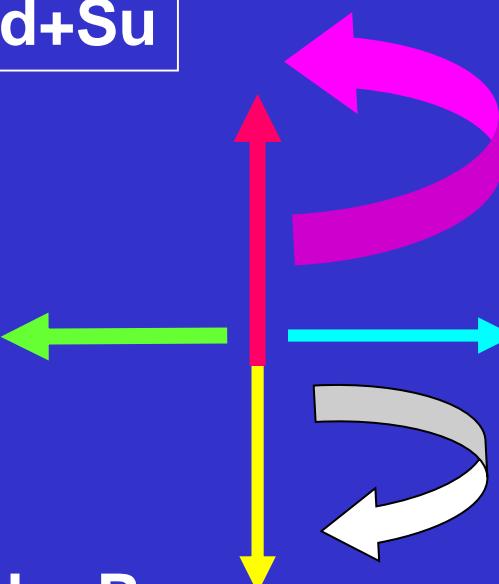
Tri, FHL, PLo, TP, FDL, FiBre

Inverse – PFle+Add+Su

Addukce *Ti*
TP, FHL,

Everse – DoFle + Abd + Pro

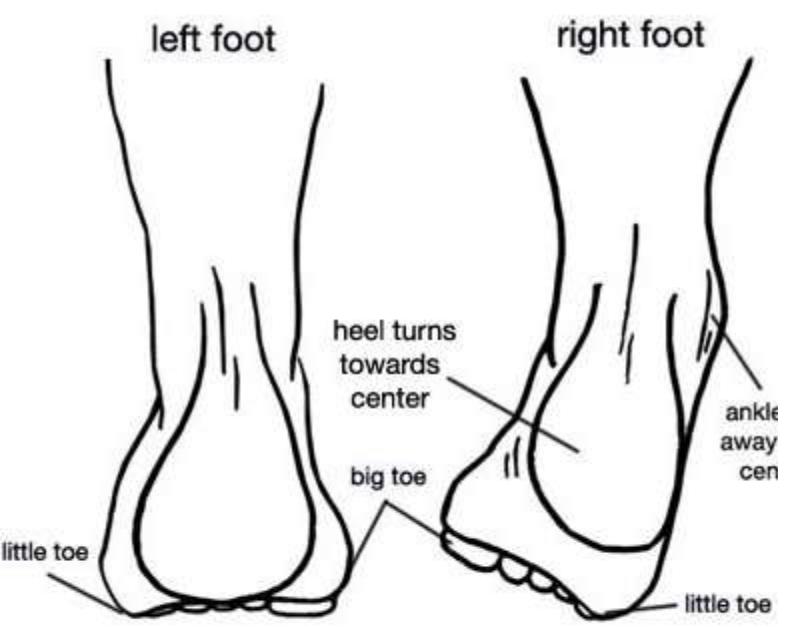
Dorsální flexe *PePro,
TA, EDL, EHL*



Supinace
TP, FDL, FHL *Ti*

Abdukce *PeSup*
FiBre, FiLo

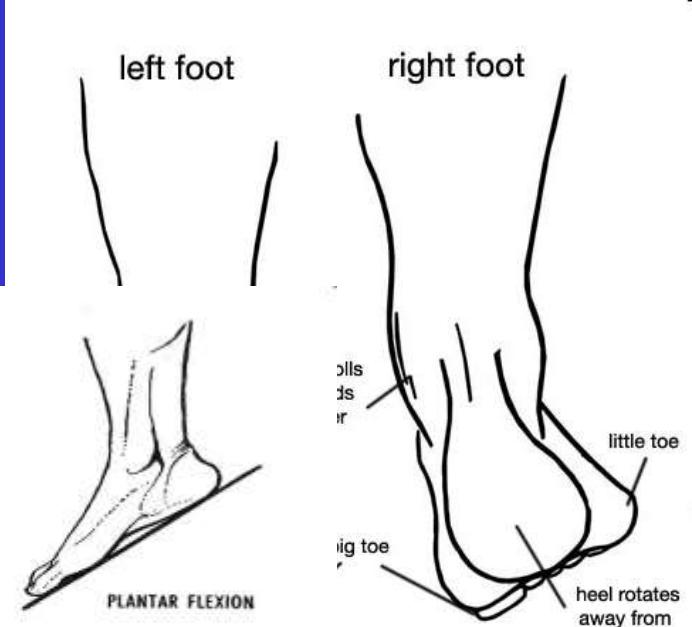
Pronace
FiLo, FiBre
+EDL, EHL
PePro+Sup



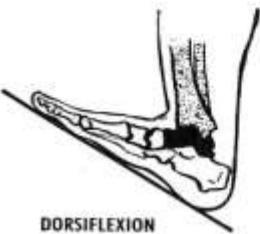
supination



DORSIFLEXION



pronation



DORSIFLEXION



PLANTAR FLEXION



EVERSION



INVERSION



Svaly nohy

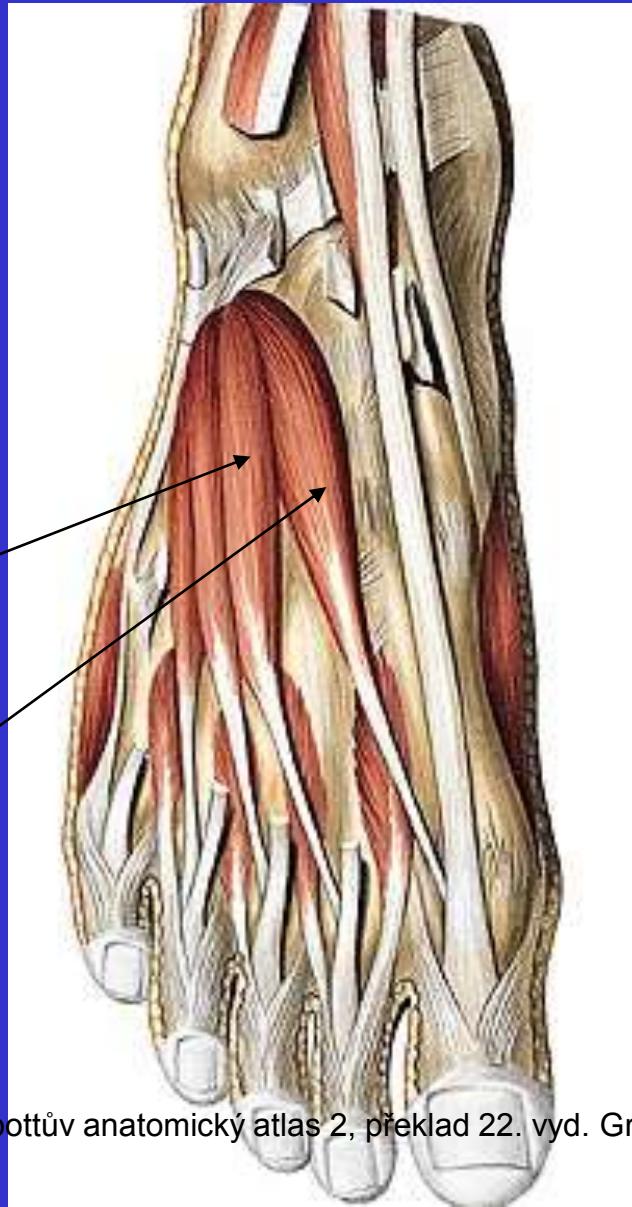
Dorsální skupina

inervace

n. peroneus prof.

m. extensor digitorum
brevis (II-IV)

m. extensor hallucis
brevis



Svaly nohy

Planta

Svaly palce

m. abductor hallucis, m. flexor hallucis brevis,

m. adductor hallucis

Střední prostor

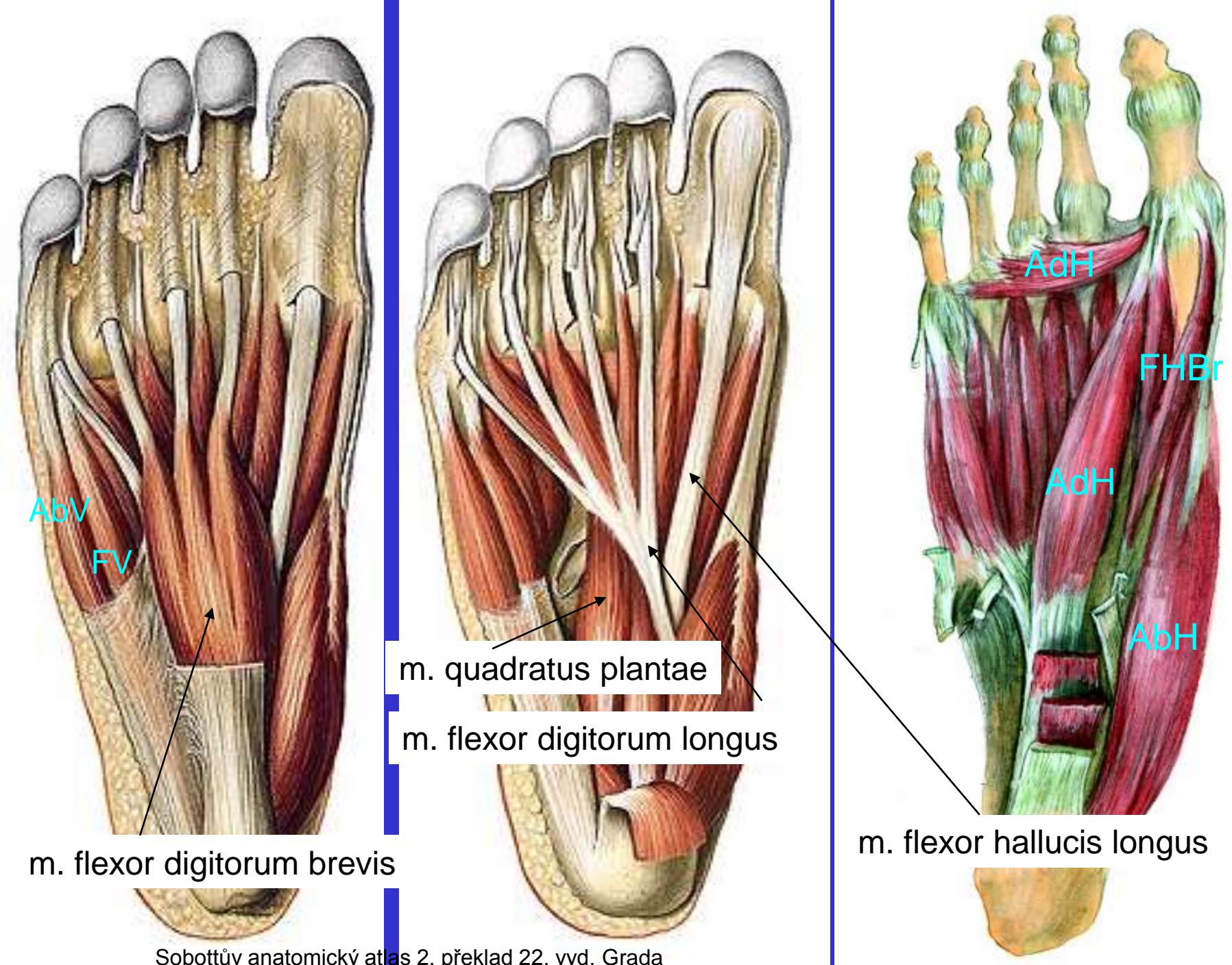
m. flexor digitorum brevis, m. quadratus
plantae, mm. lumbricales

m. interossei plantares et dorsales

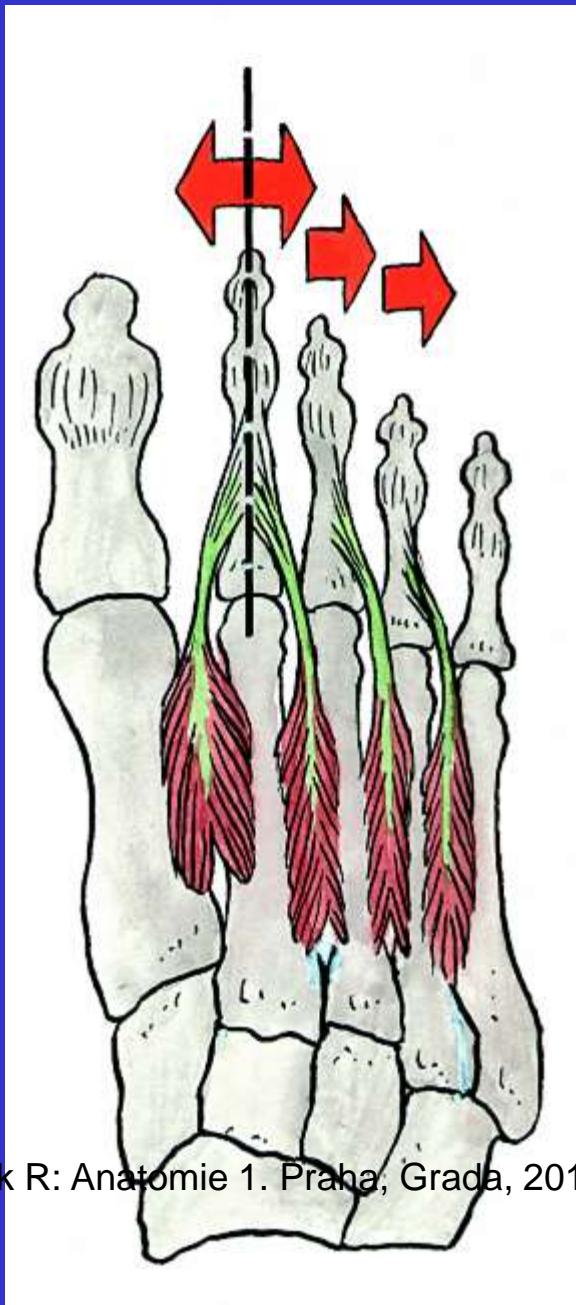
Svaly malíku

m. flexor digiti minimi brevis,

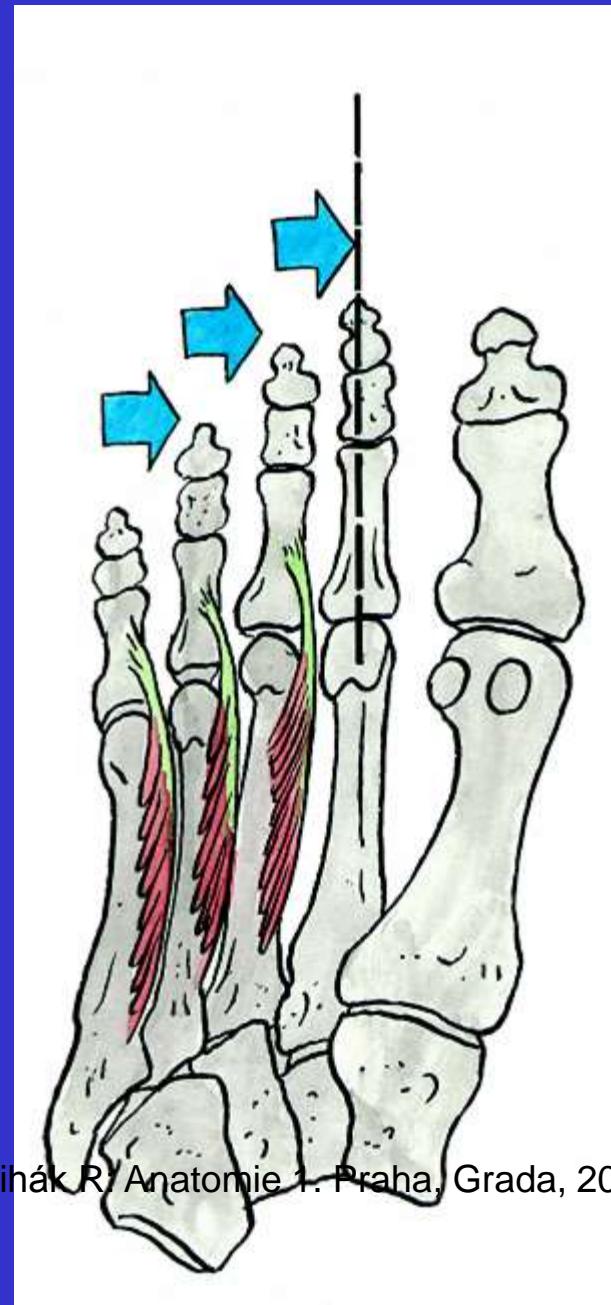
m. abductor digiti minimi , (m. opponens d. V.)



Mm. interosseis dorsales et plantares (n. plantaris lat)



Čihák R: Anatomie 1. Praha, Grada, 2011

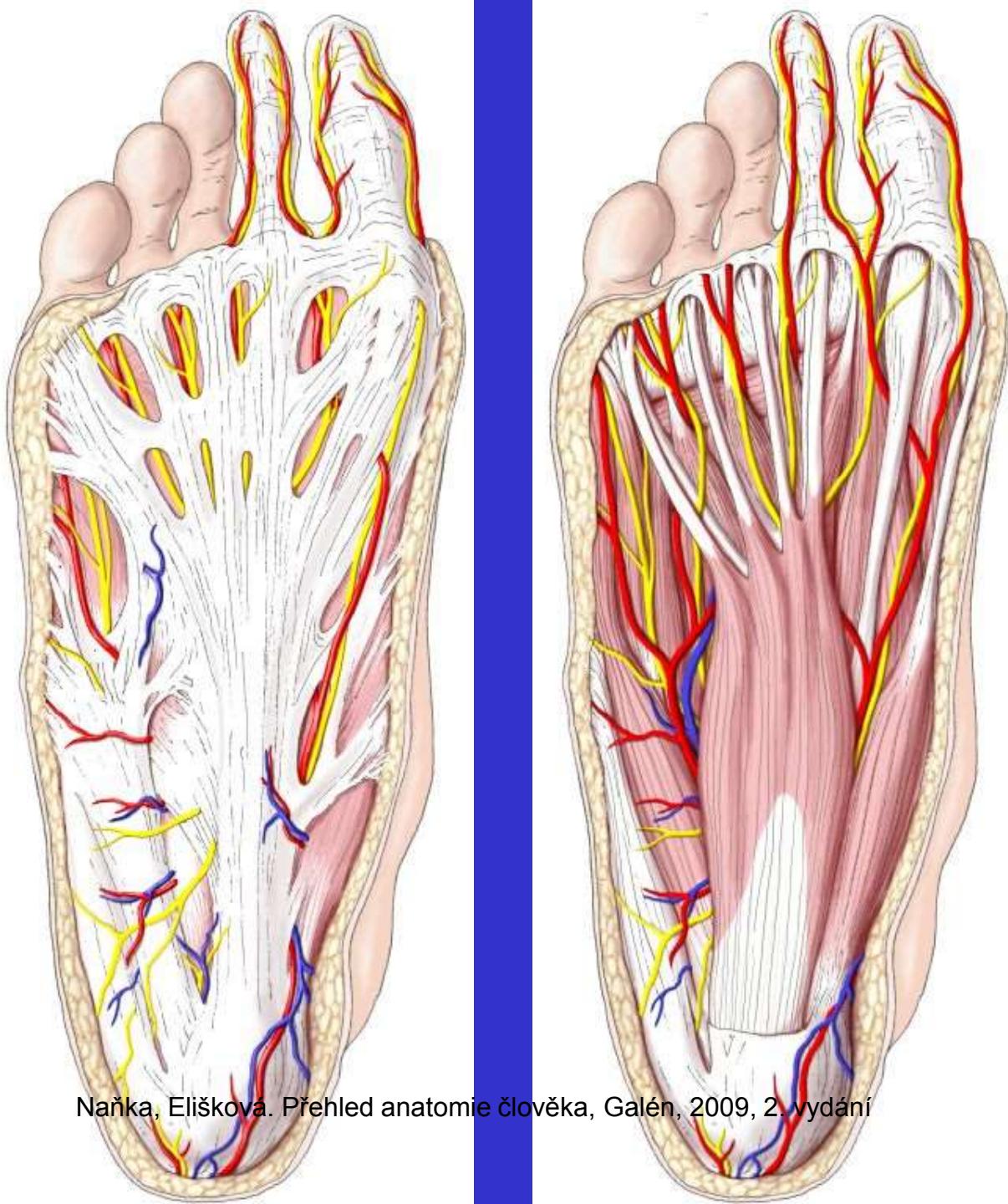


Čihák R: Anatomie 1. Praha, Grada, 2011

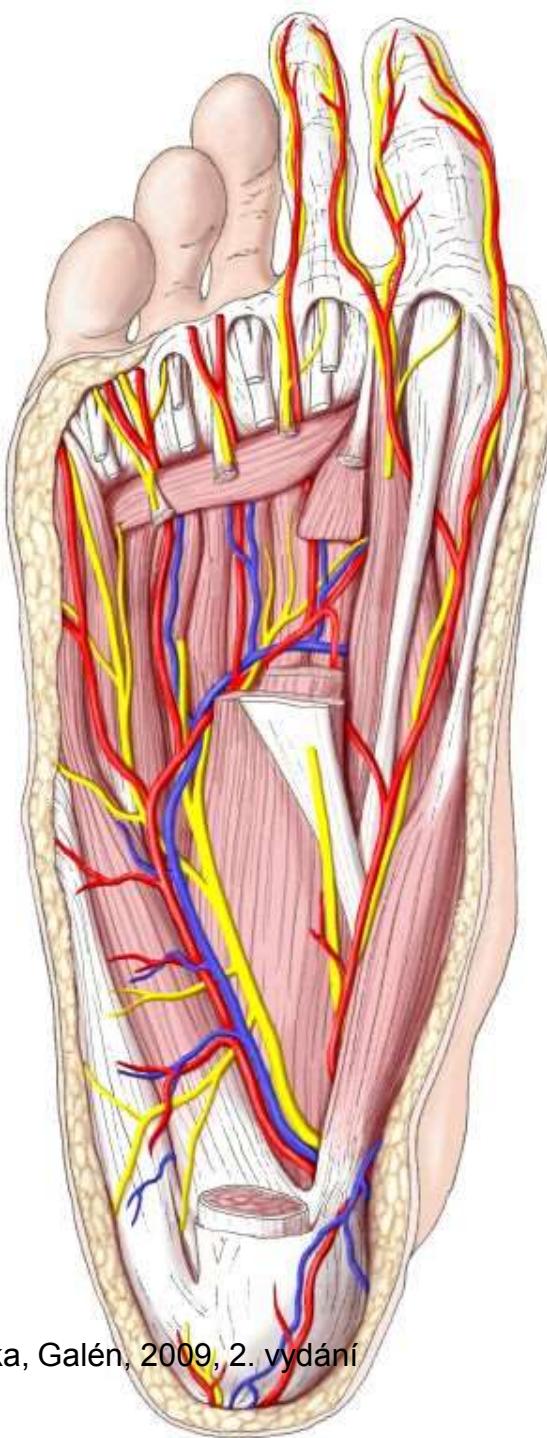
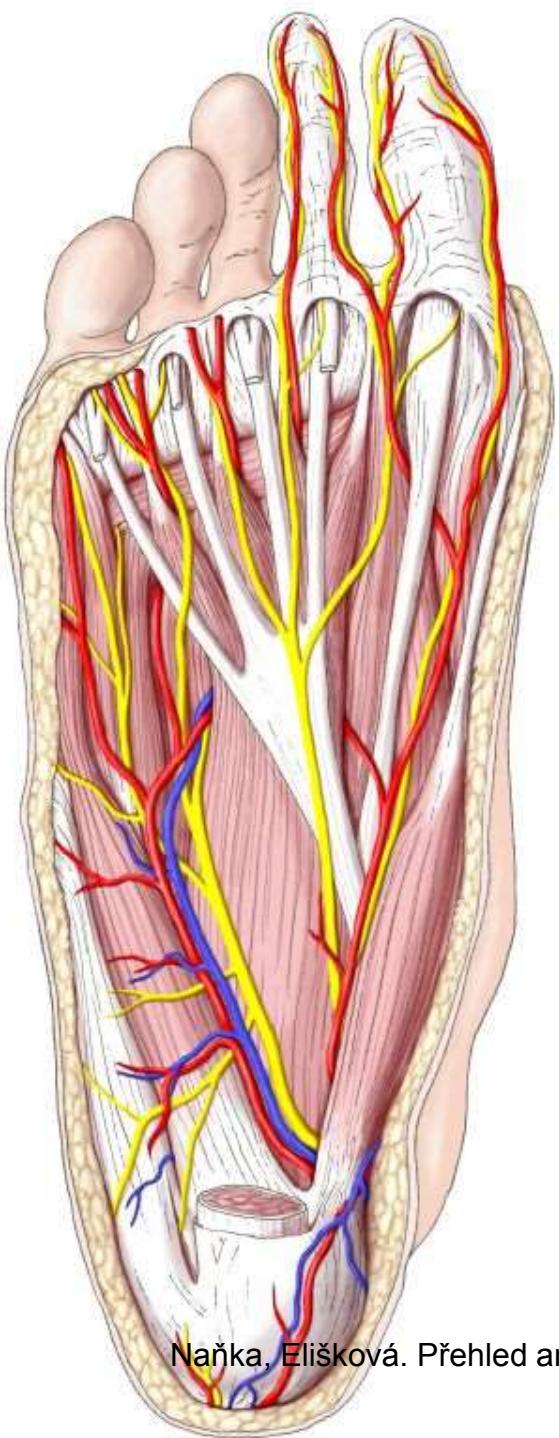
Topografie planta pedis

4 ostefasciální prostory

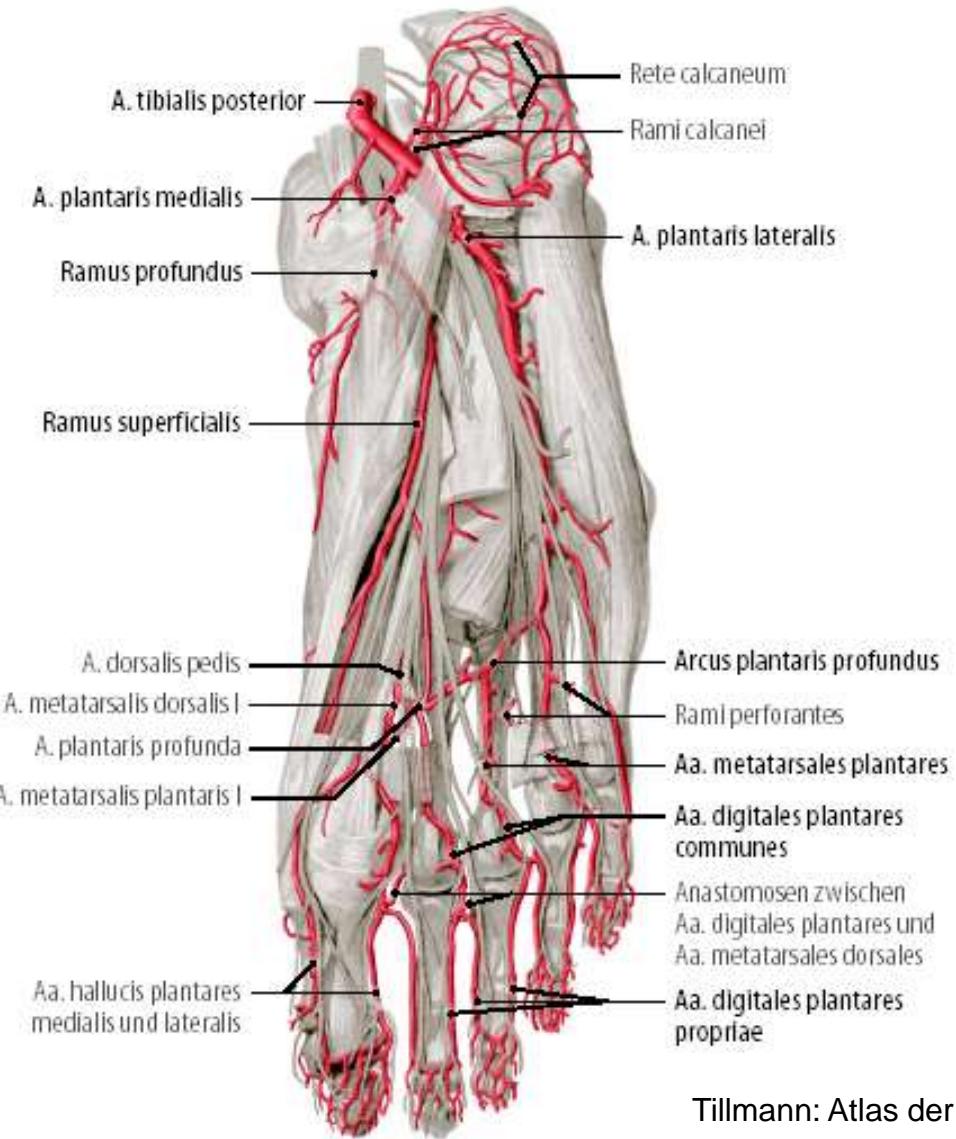
palcový,
střední,
malíkový,
Interosseální



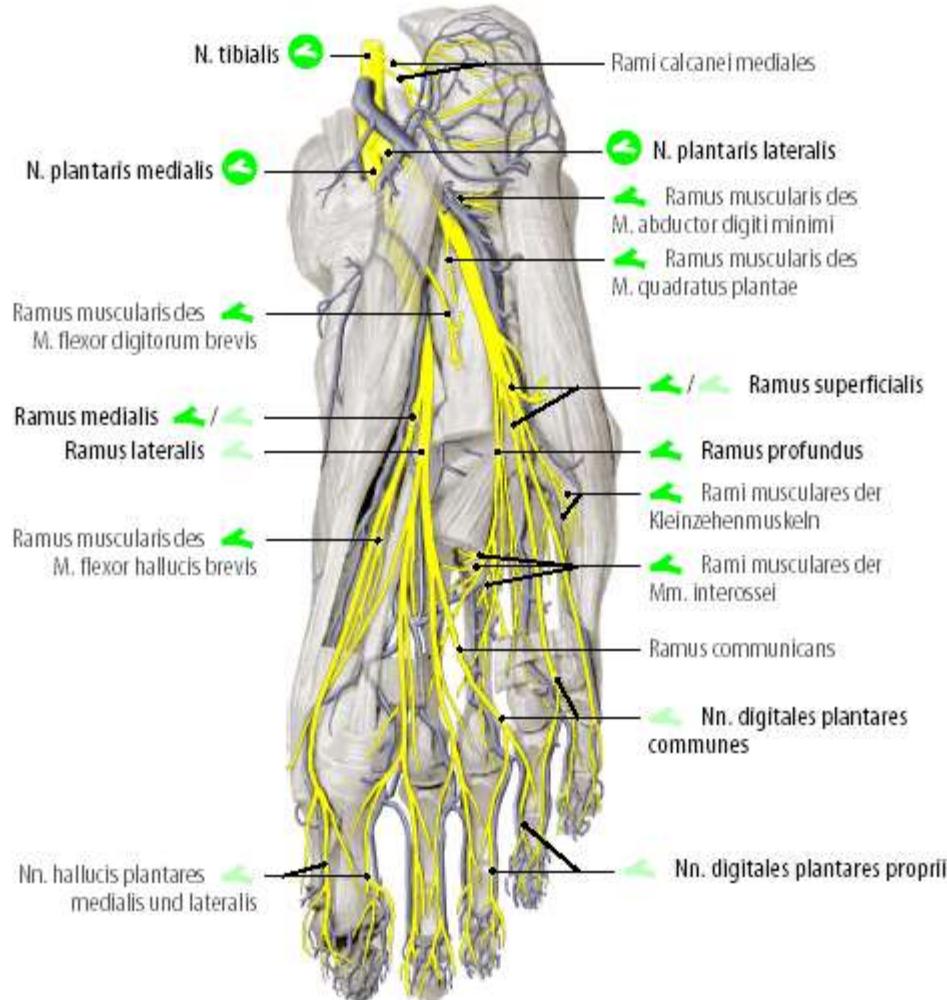
Naňka, Elišková. Přehled anatomie člověka, Galén, 2009, 2. vydání



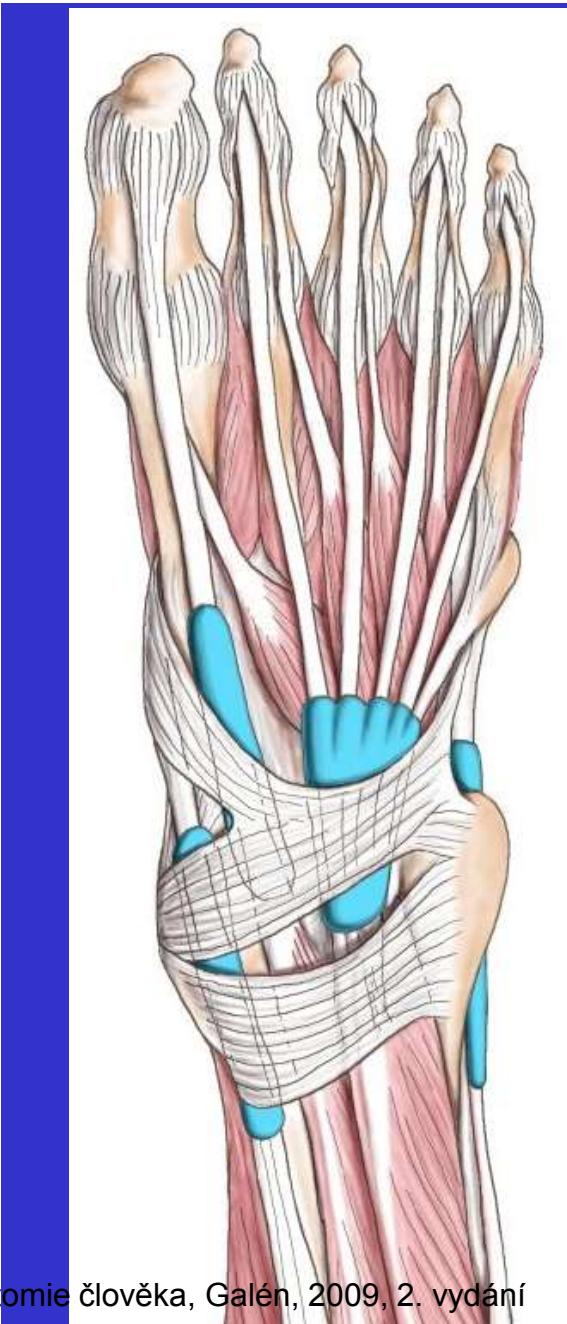
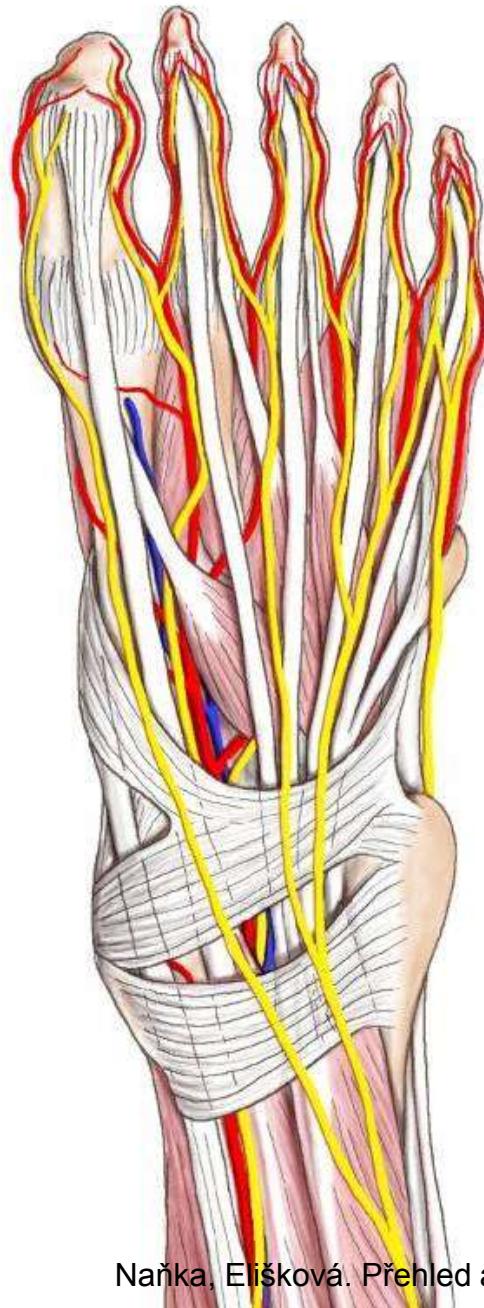
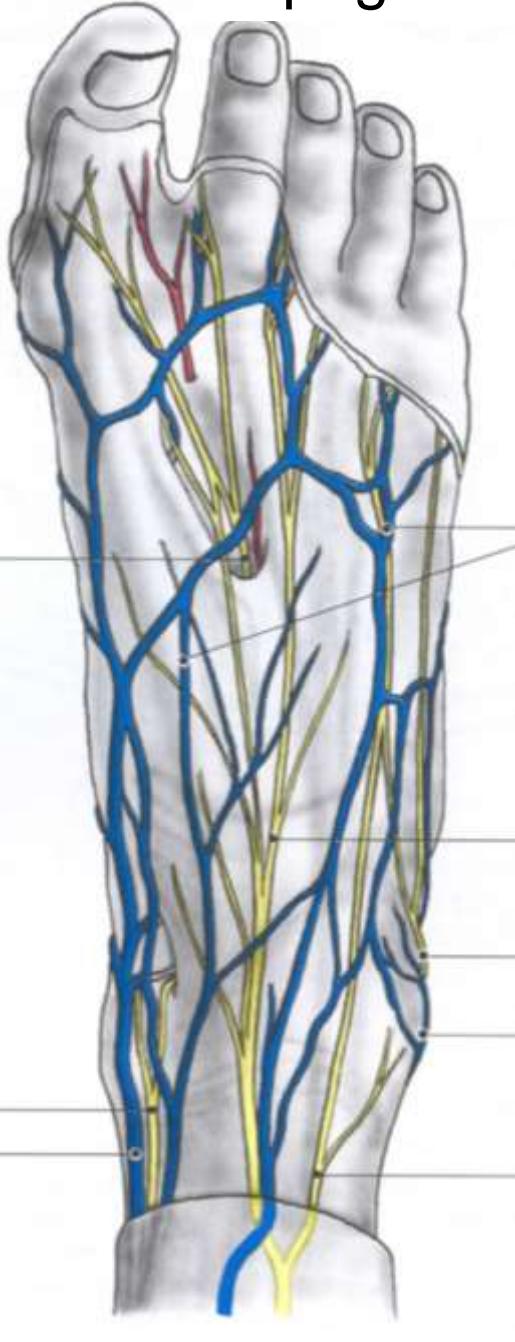
Nařka, Elišková. Přehled anatomie člověka, Galén, 2009, 2. vydání



Tillmann: Atlas der Anatomie. Springer

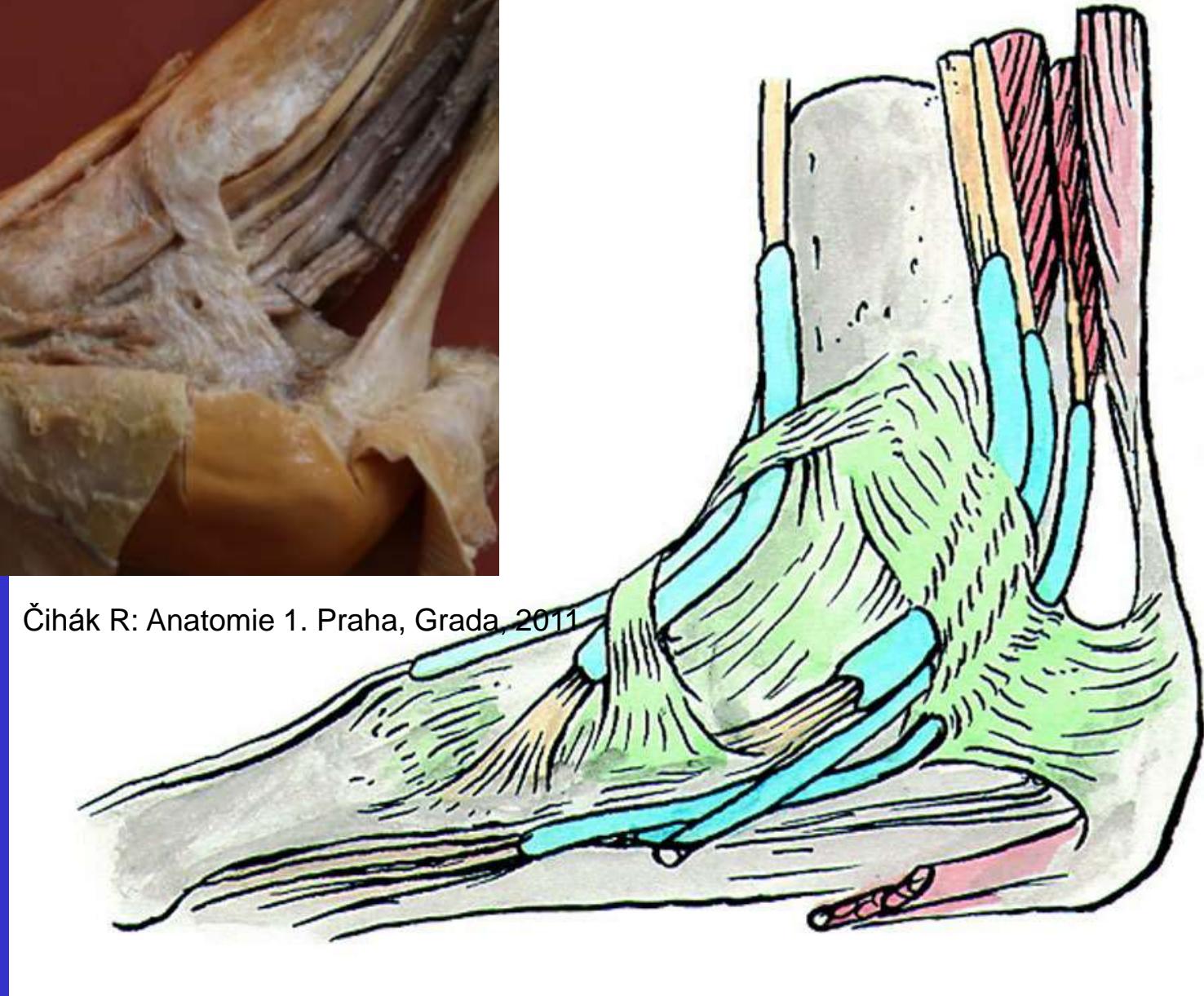


Topografie dorsum pedis – 1 ostefasciální prostor

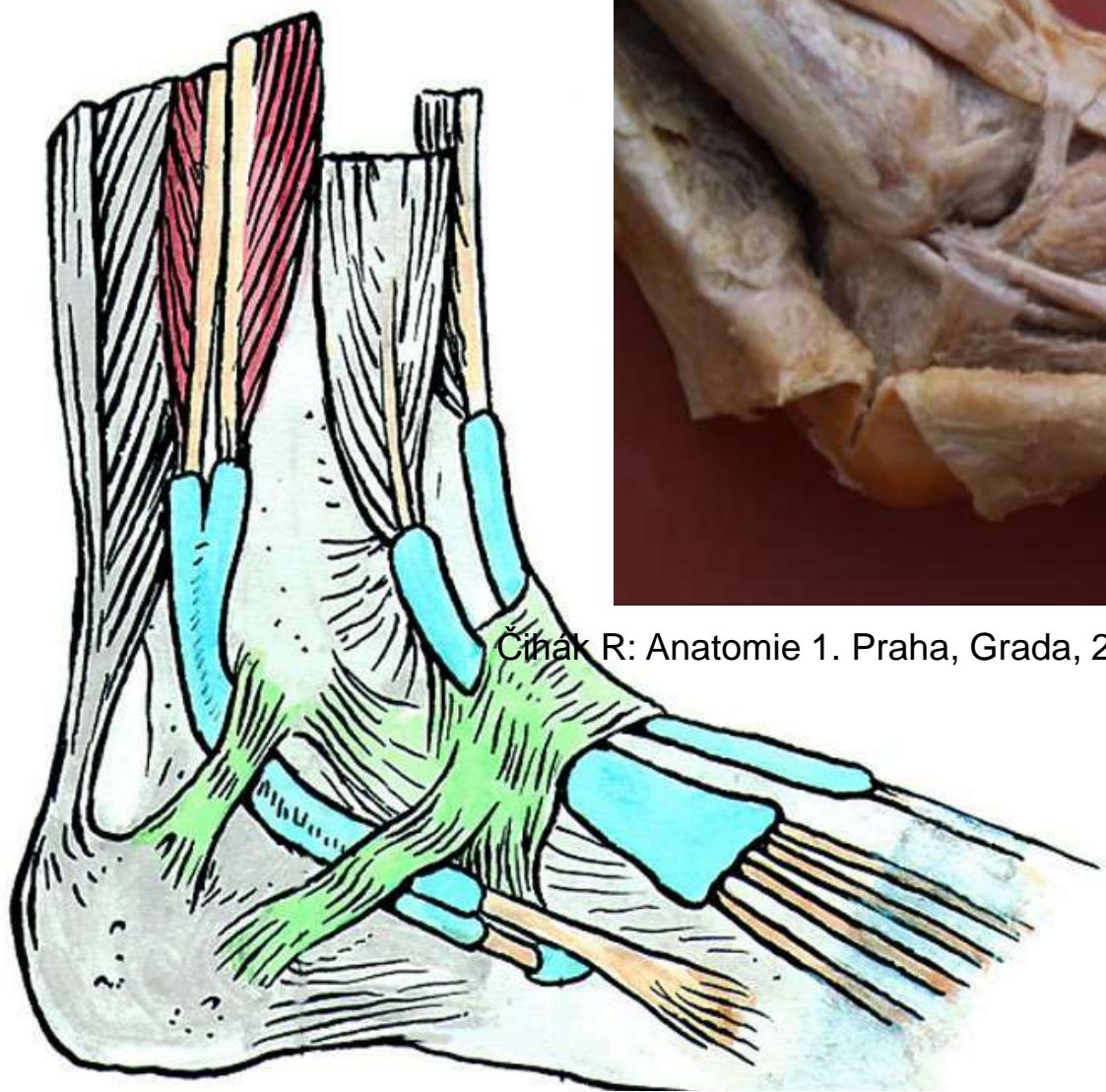




Čihák R: Anatomie 1. Praha, Grada, 2011



retinaculum mm. flexorum (lig. laciniatum)



Čihák R: Anatomie 1. Praha, Grada, 2011

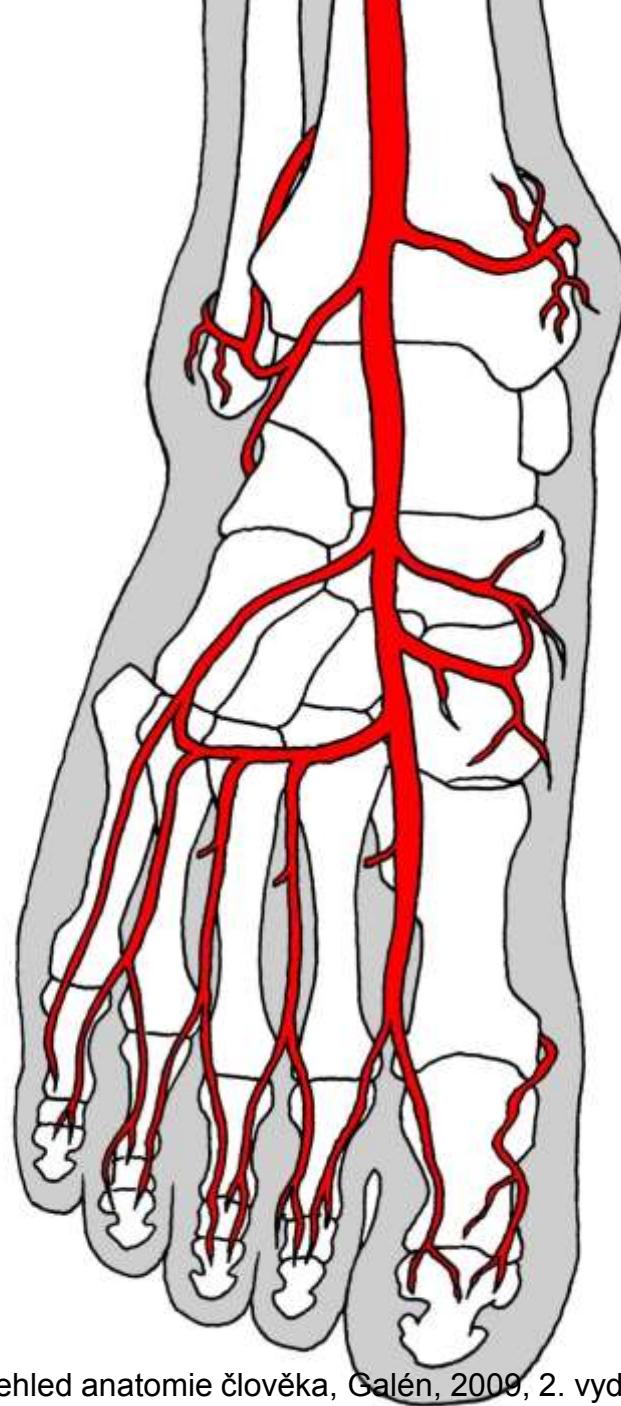
Retinaculum mm. extensorum sup. et inf
Retinaculum mm. peronaerorum sup. et inf.

- a. tibialis anterior**
 - a. malleolaris ant. med.**
 - a. malleolaris ant. lat.**

- a. dorsalis pedis**
 - a. tarsalis lat.**
 - a. tarsales med.**

- a. arcuata**
 - aa. tarsales dorsales**
 - aa. digitales dorsales**

- a. plantaris profunda**



Faszienlogen (Fuß)

■ Oberflächliche Faszie des Fußes

Faszienlage der Extensoren (1)

zwischen

■ oberflächlichem und

■ tiefem Blatt der Fascia dorsalis pedis
M. extensor hallucis longus,
M. extensor hallucis brevis,
M. extensor digitorum longus,
M. extensor digitorum brevis,
M. tibialis anterior

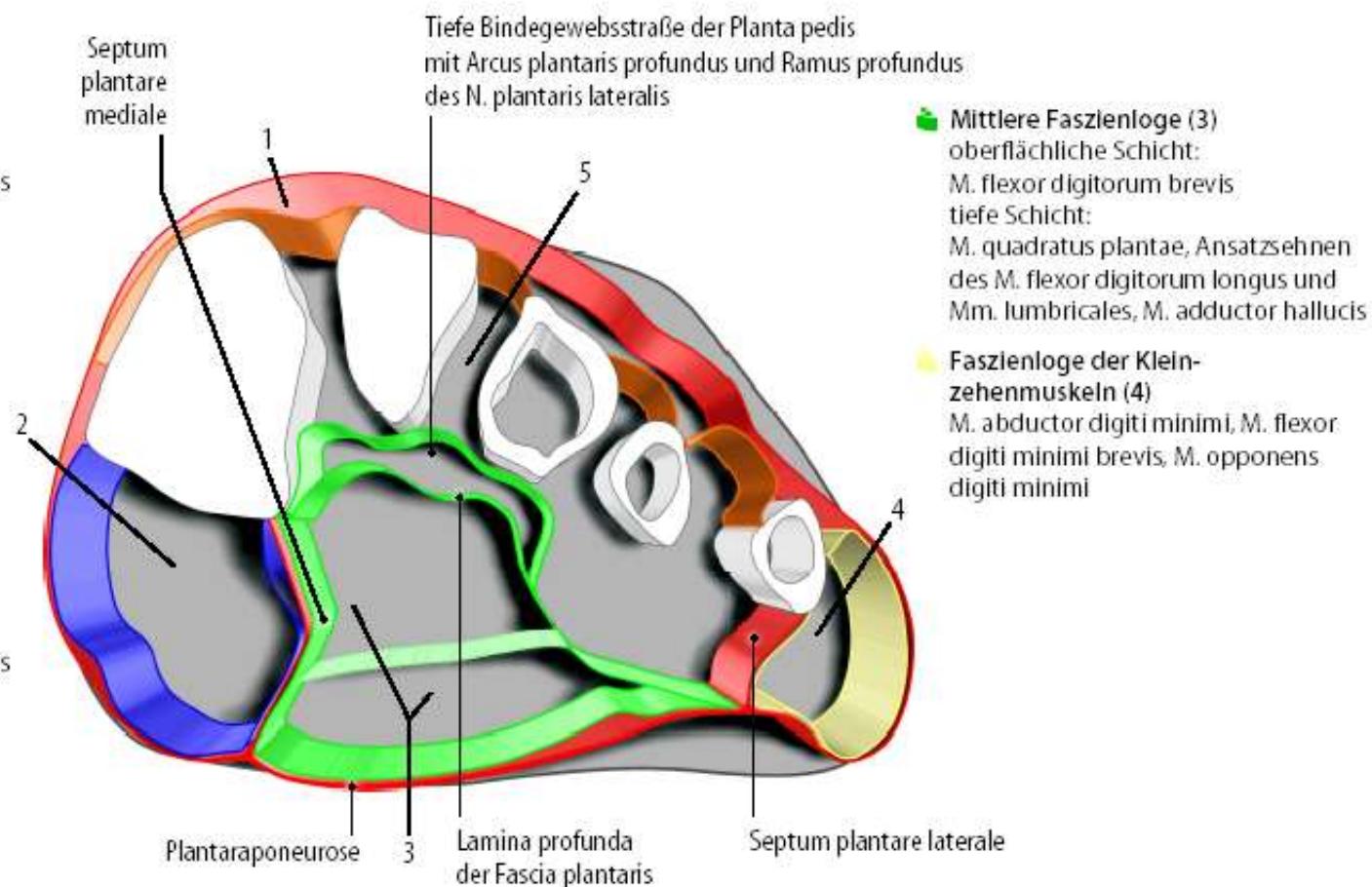
Faszienlage der Großzehenmuskeln (2)

M. abductor hallucis,
M. flexor hallucis brevis
Ansatzsehne des M. flexor
hallucis longus

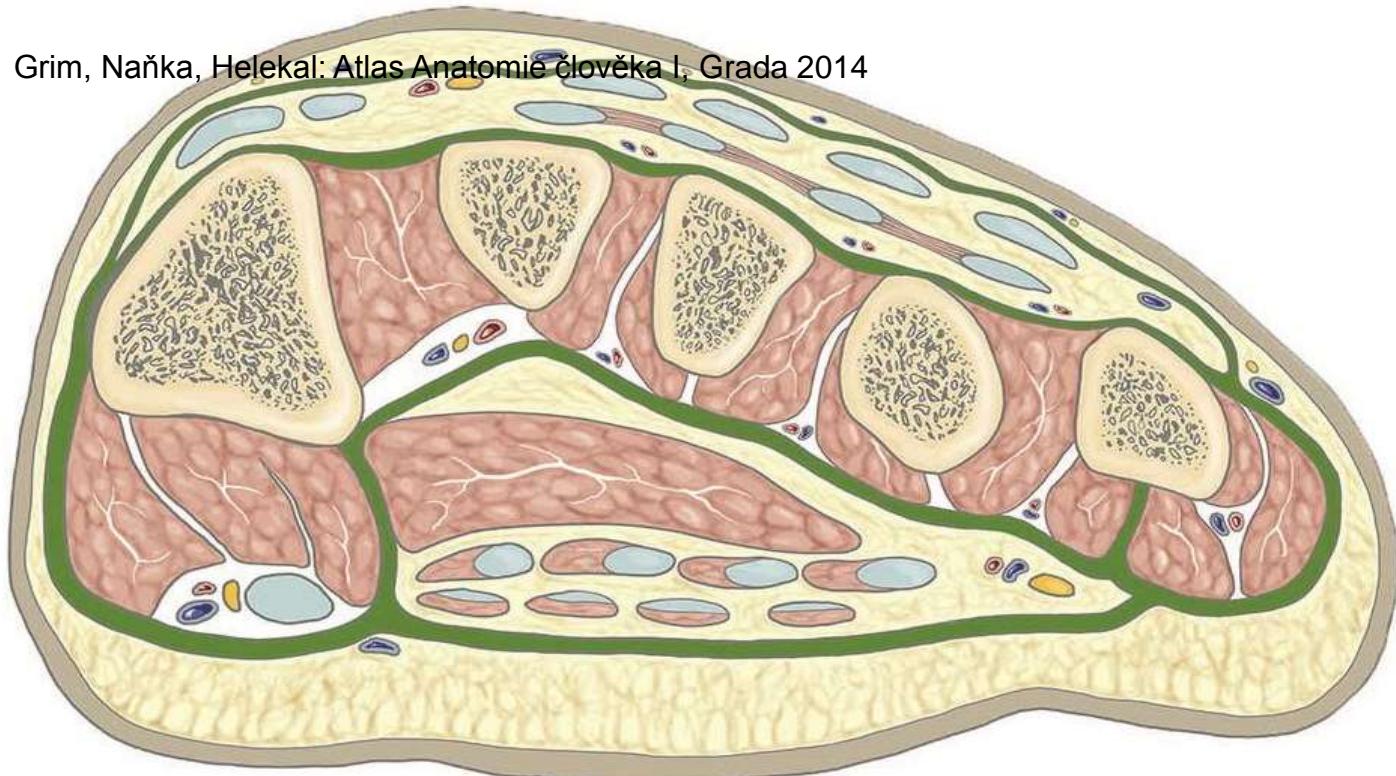
Tiefe Faszienlage (5)

zwischen

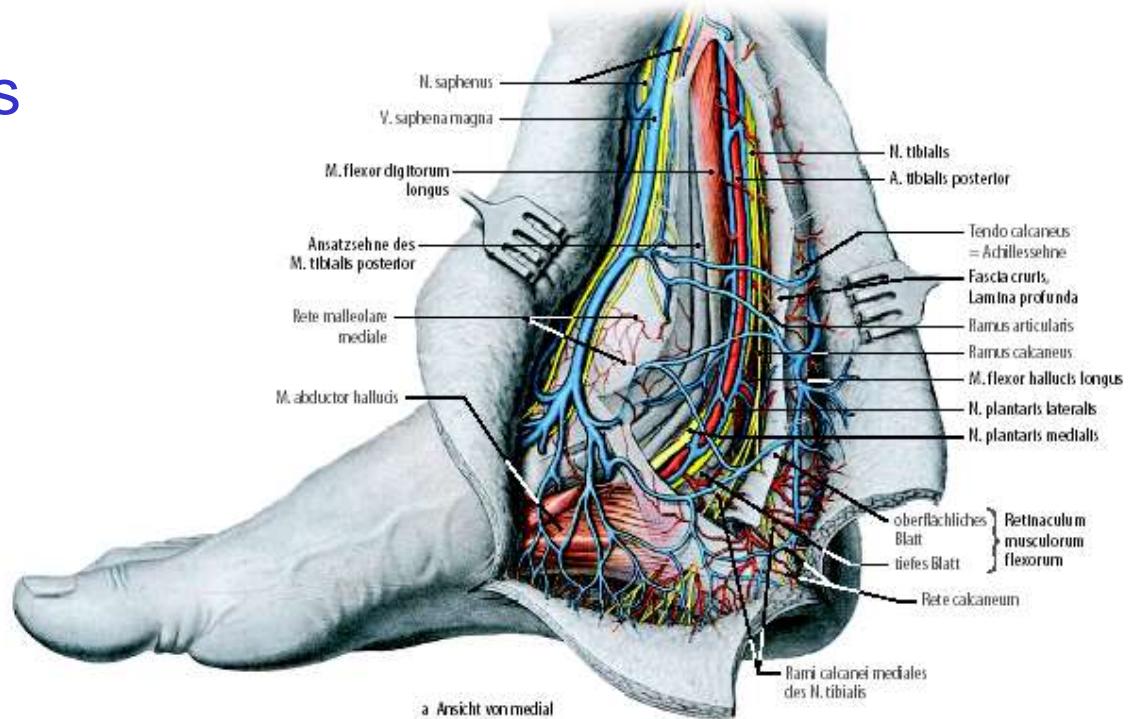
■ tiefem Blatt der Fascia dorsalis pedis
■ und der Fascia plantaris
Mm. interossei, Ansatzsehnen der
Mm. peroneus longus und
tibialis posterior



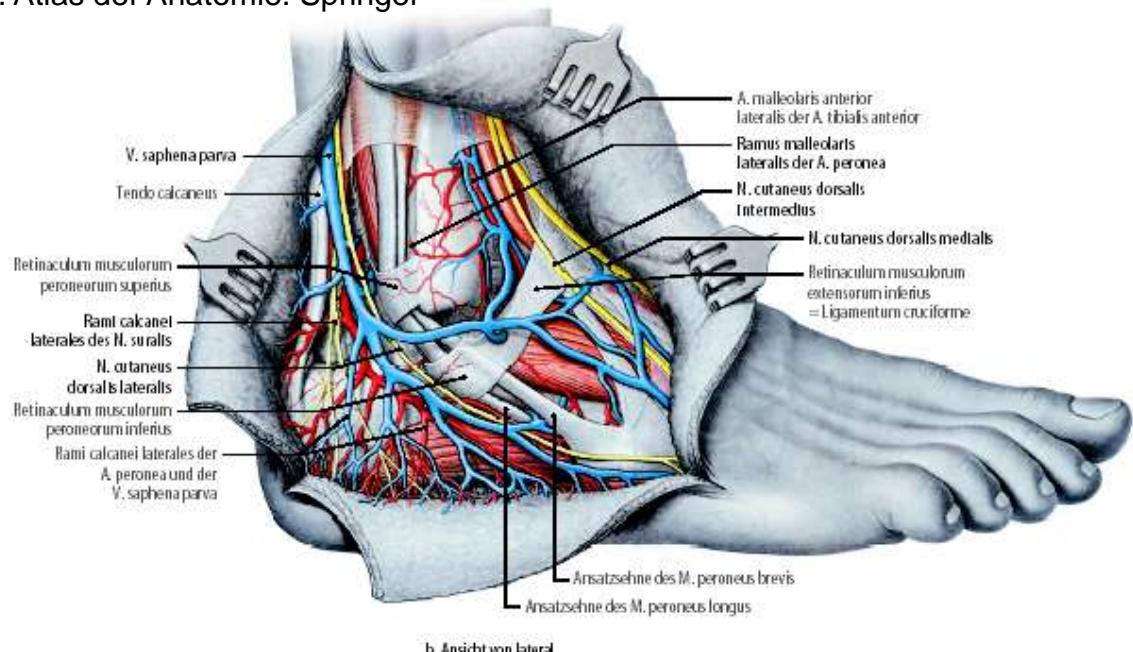
Grim, Naňka, Helekal: Atlas Anatomie člověka I, Grada 2014

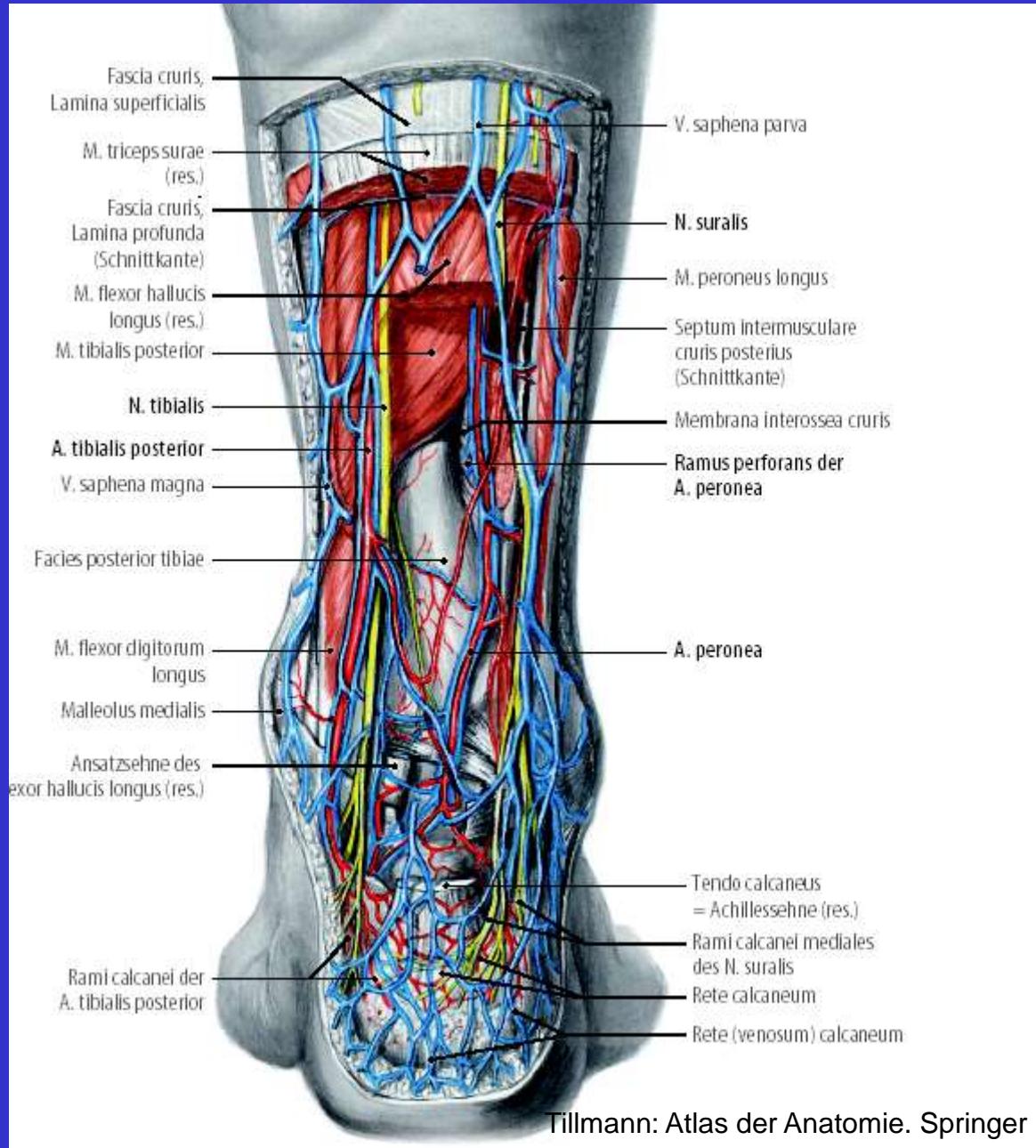


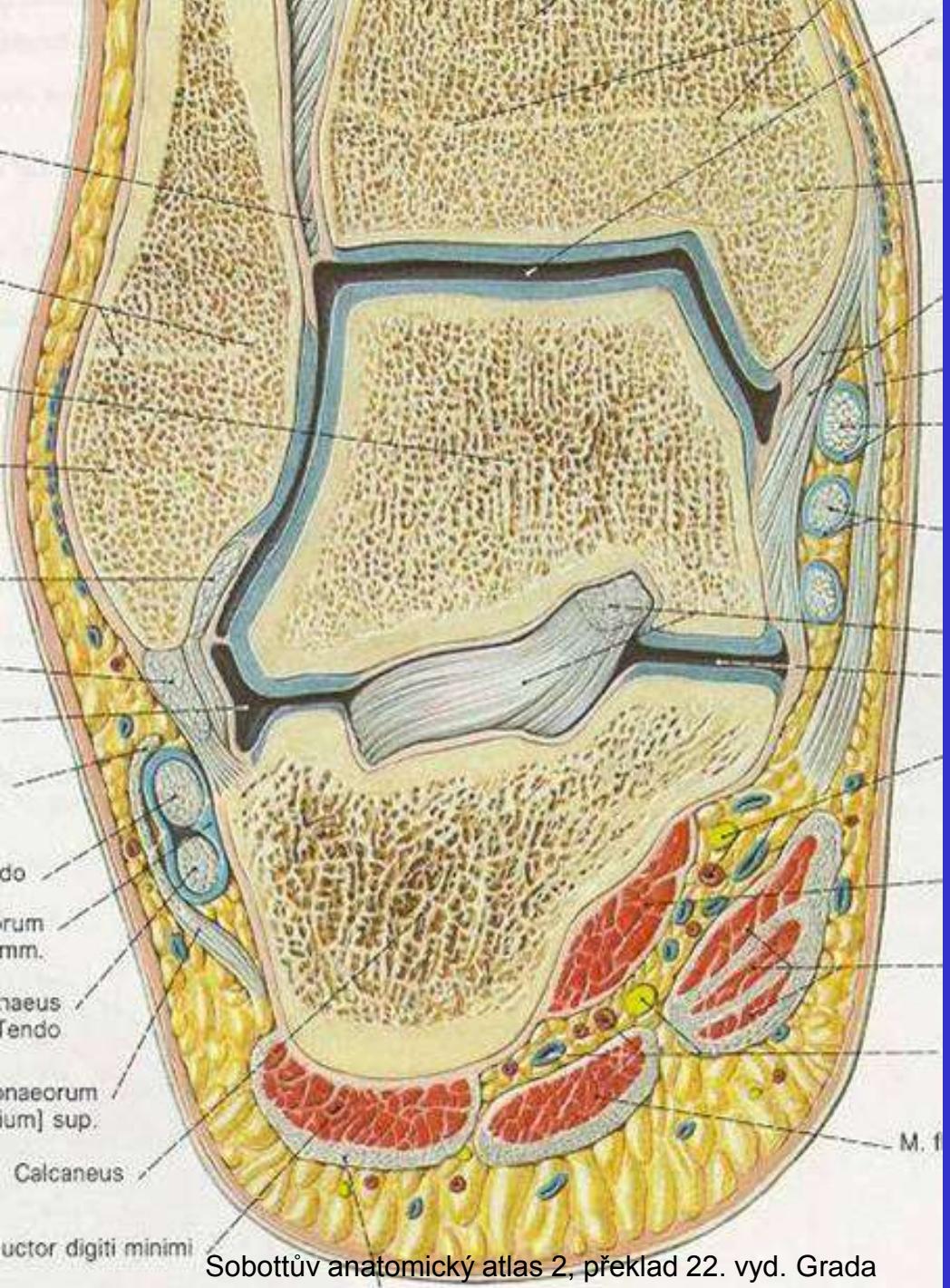
Reg. retromalleolaris medialis et lareralis



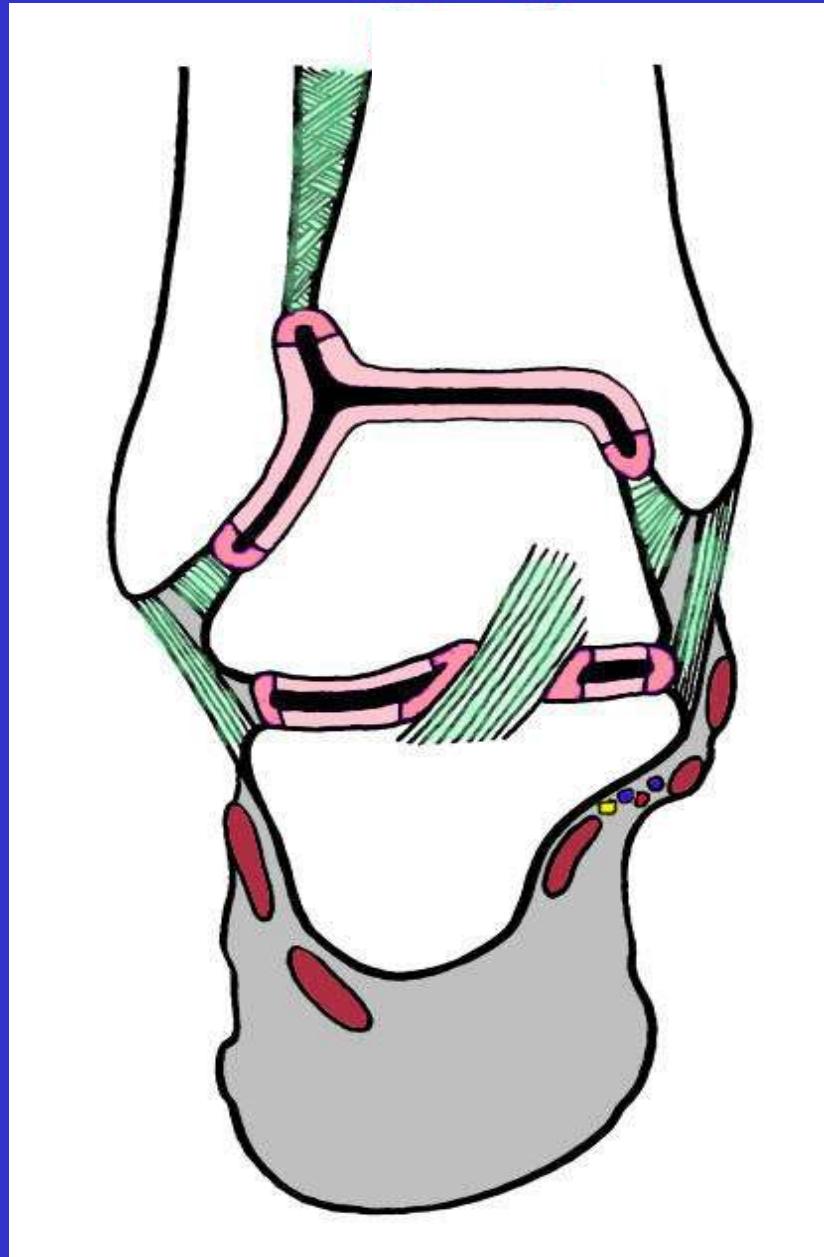
Tillmann: Atlas der Anatomie. Springer







Sobottův anatomický atlas 2, překlad 22. vyd. Grada



Klenba nožní

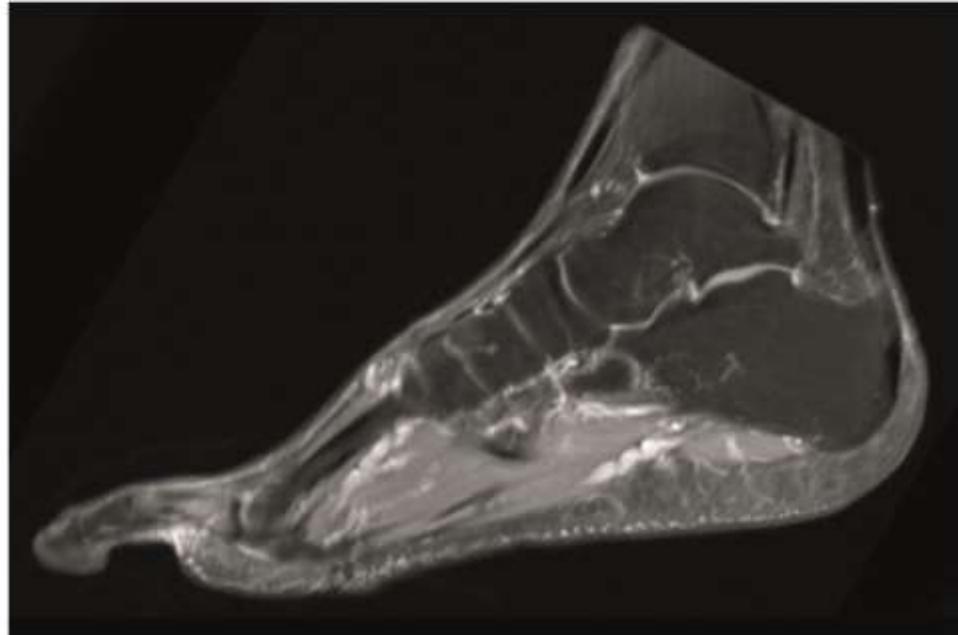
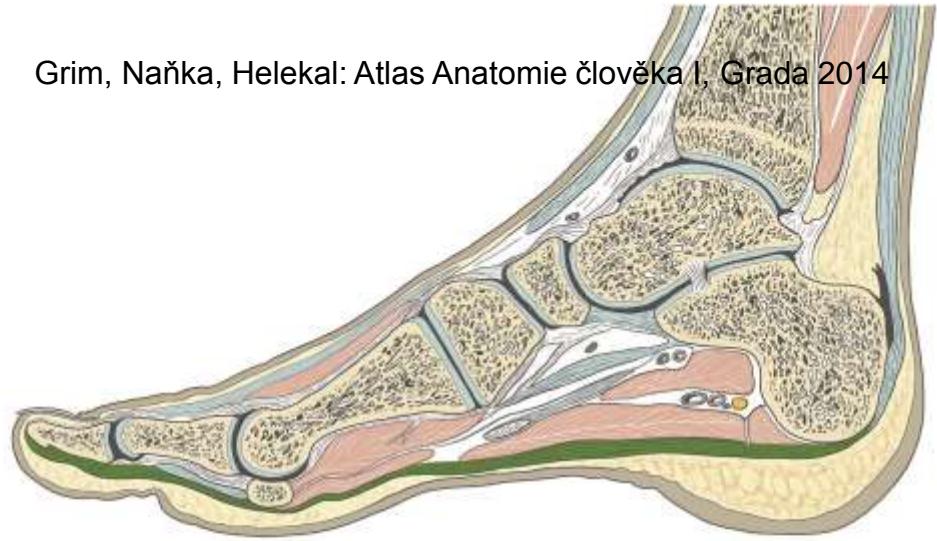
- brání utlačování

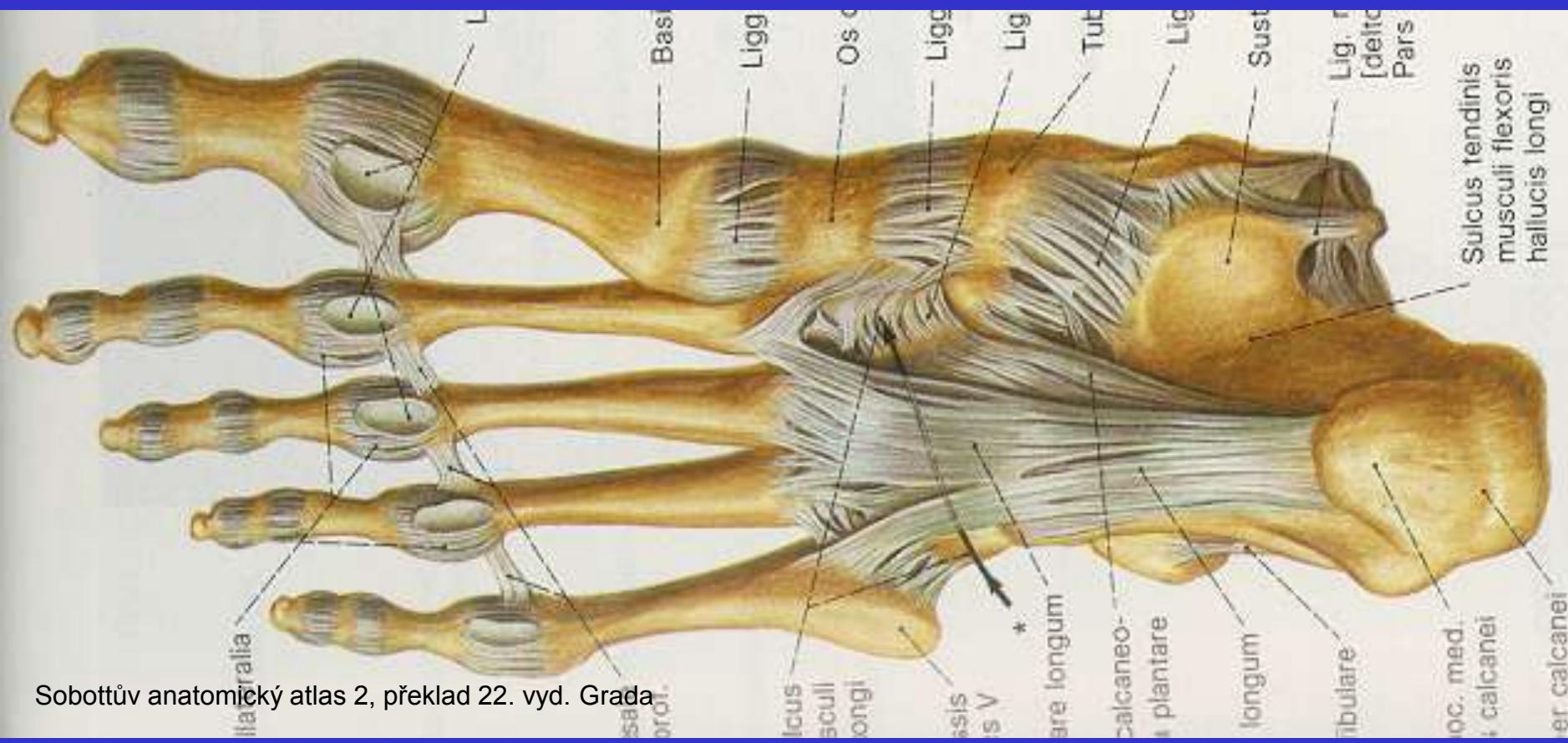
měkkých tkání v plantě,
umožňuje pružnost při
došlapování

příčná – dána sklenutím
ossa cuneiformia, drží ji
mezikostní vazy, m.
peroneus longus,
m.adductor hallucis

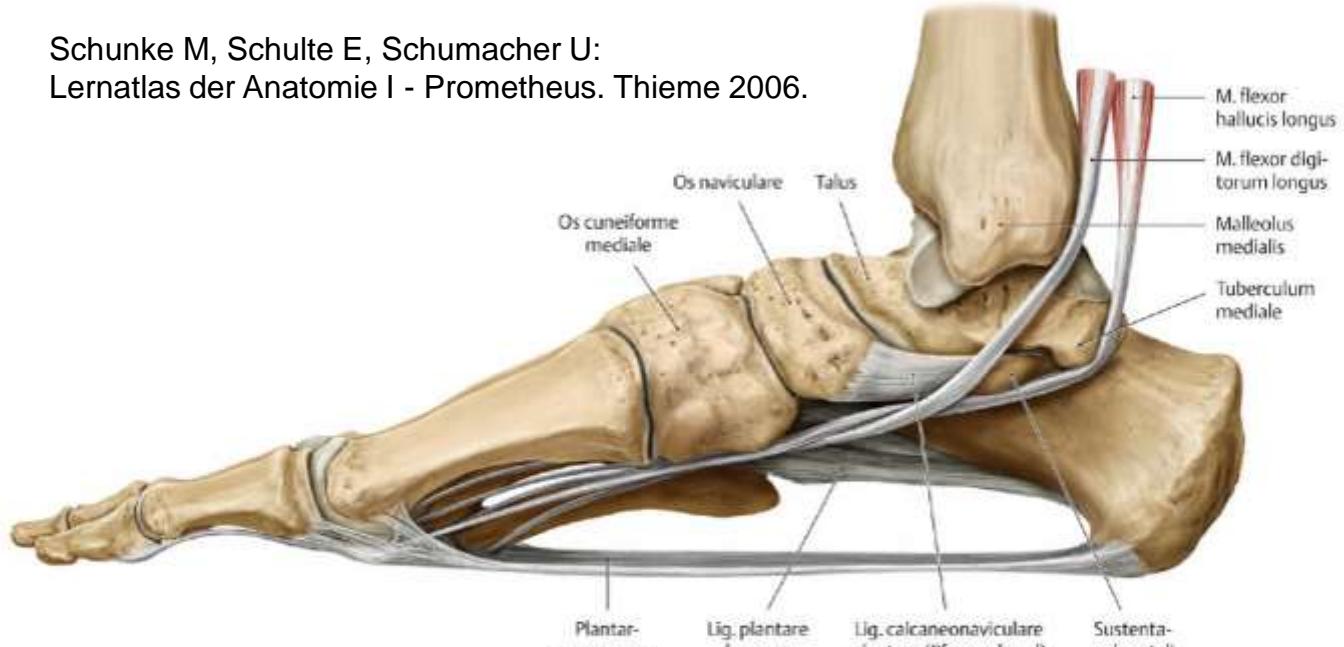
podélná – vrcholem talus,
aponeurosa, **lig. plantare**
longum,
m. tibialis ant. et post., **m.**
flexor hall. longus

Grim, Nařka, Helekal: Atlas Anatomie člověka I, Grada 2014





Schunke M, Schulte E, Schumacher U:
Lernatlas der Anatomie I - Prometheus. Thieme 2006.



B Passive Verspannungsstrukturen des Längsgewölbes

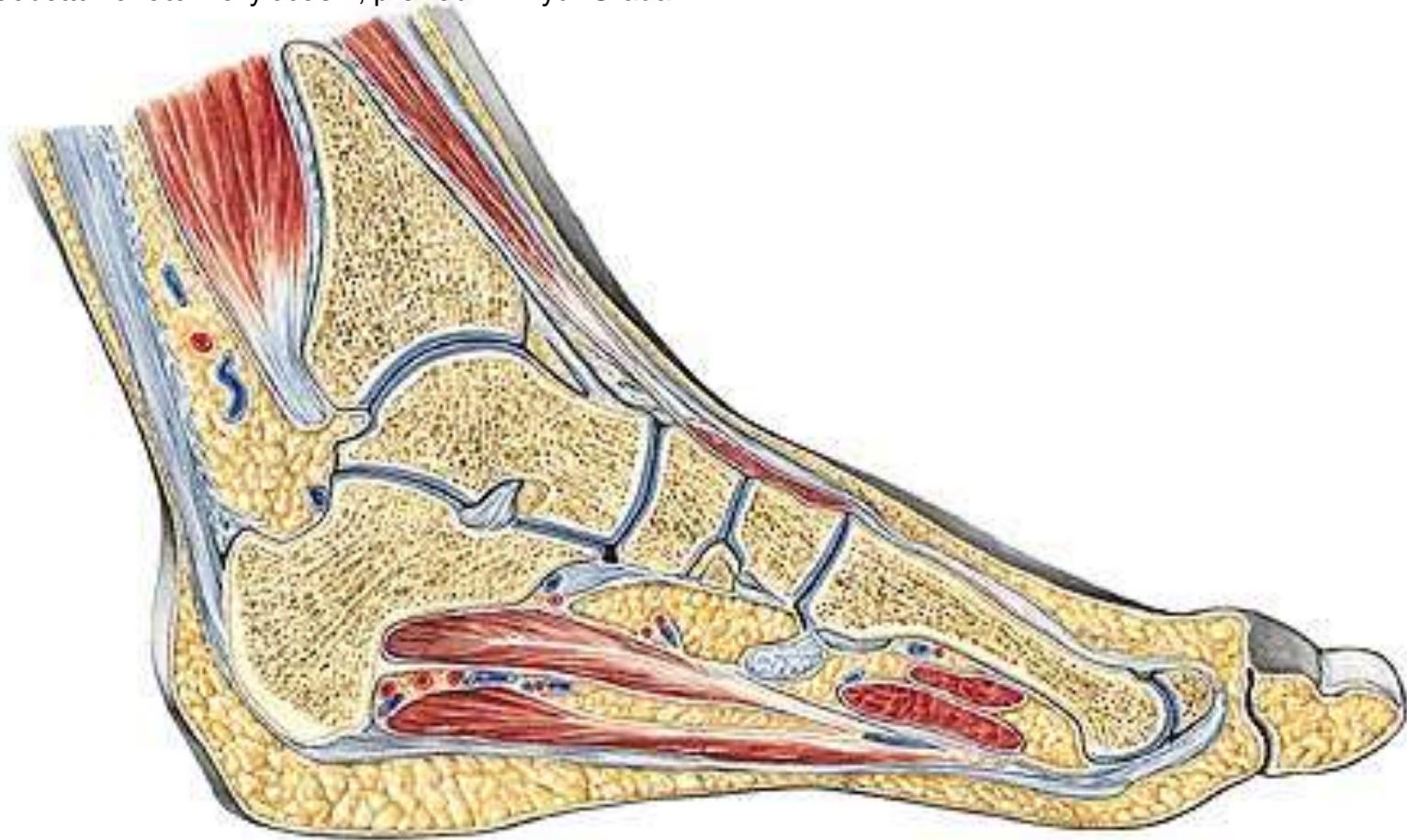
Rechtes Fußskelett, Ansicht von medial



PROMETHEUS Lernatlas der Anatomie - Allgemeine Anatomie und Bewegungssystem
M. Schünke, E. Schulte, U. Schumacher. Illustrator: K. Wesker
© Georg Thieme Verlag 2006 · Alle Rechte vorbehalten · www.thieme.de/prometheus

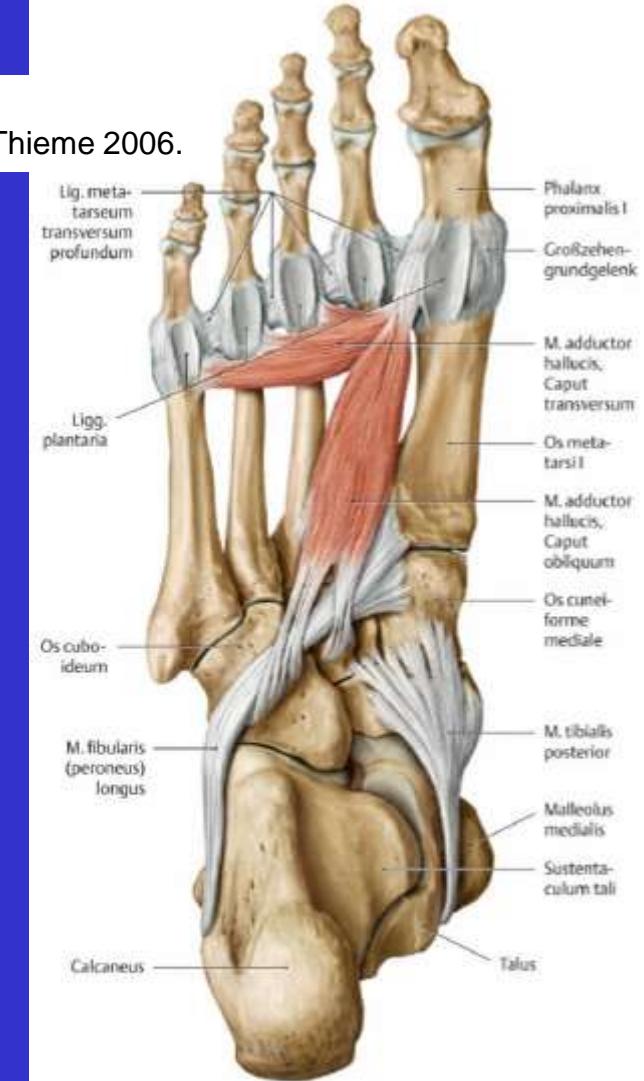
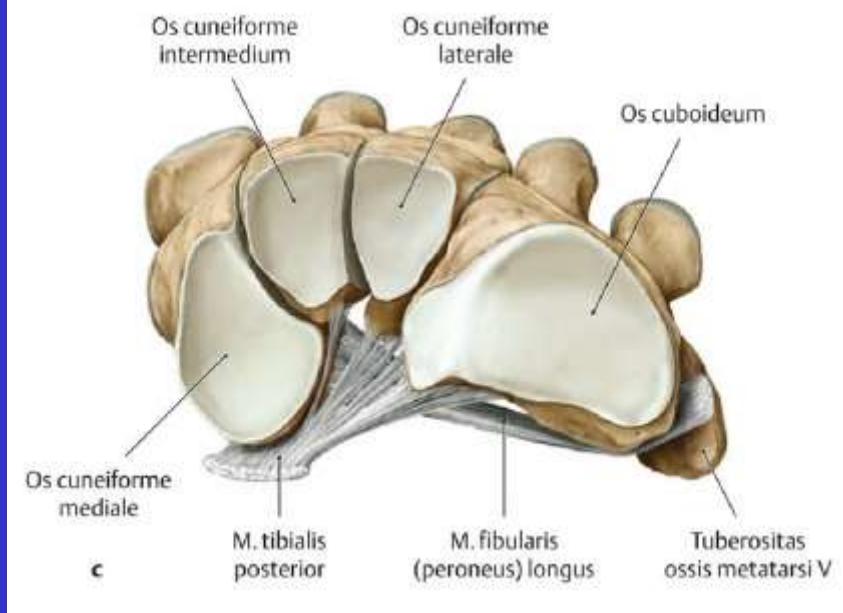
Podélná klenba

Sobottův anatomický atlas 2, překlad 22. vyd. Grada



Podélná klenba

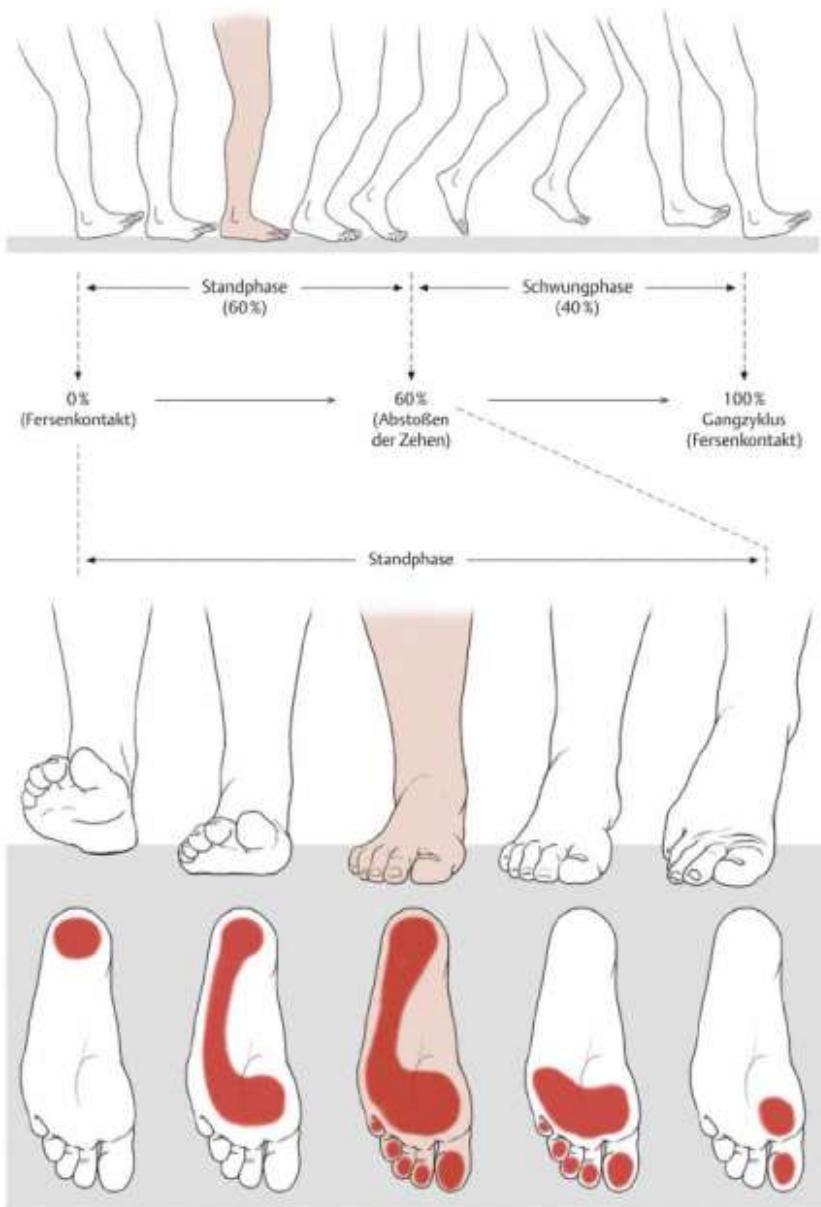
Schunke M, Schulte E, Schumacher U:
Lernatlas der Anatomie I - Prometheus. Thieme 2006.



Příčná klenba

D Aktive und passive Verspannungsstrukturen des Quergewölbes von plantar

Rechter Fuß.



Schunke M, Schulte E, Schumacher U:
Lernatlas der Anatomie I - Prometheus. Thieme 2006.



D Bewegungen der freien unteren Extremität während eines Gangzyklus



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