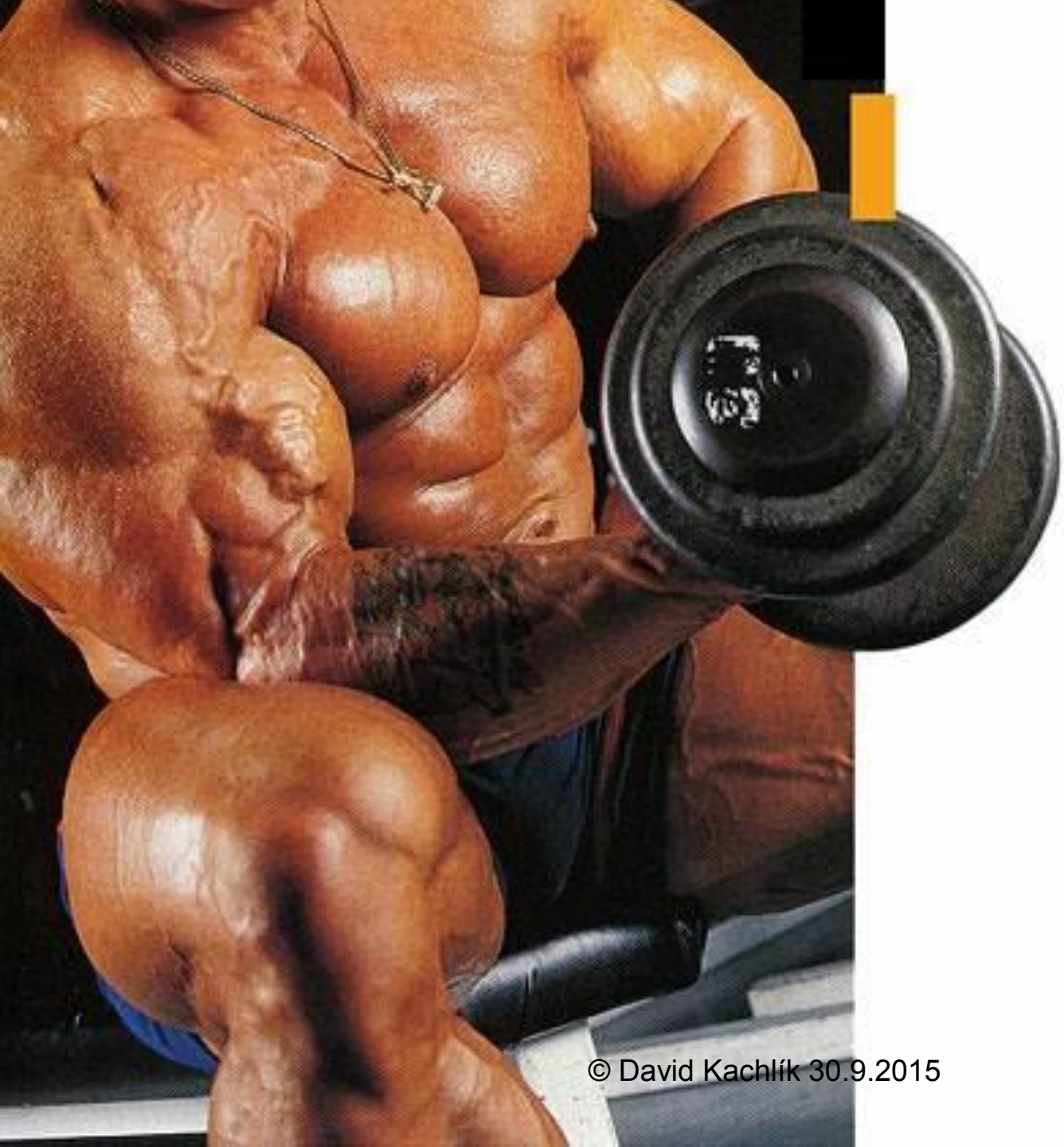

Muscles II.

Thorax & back

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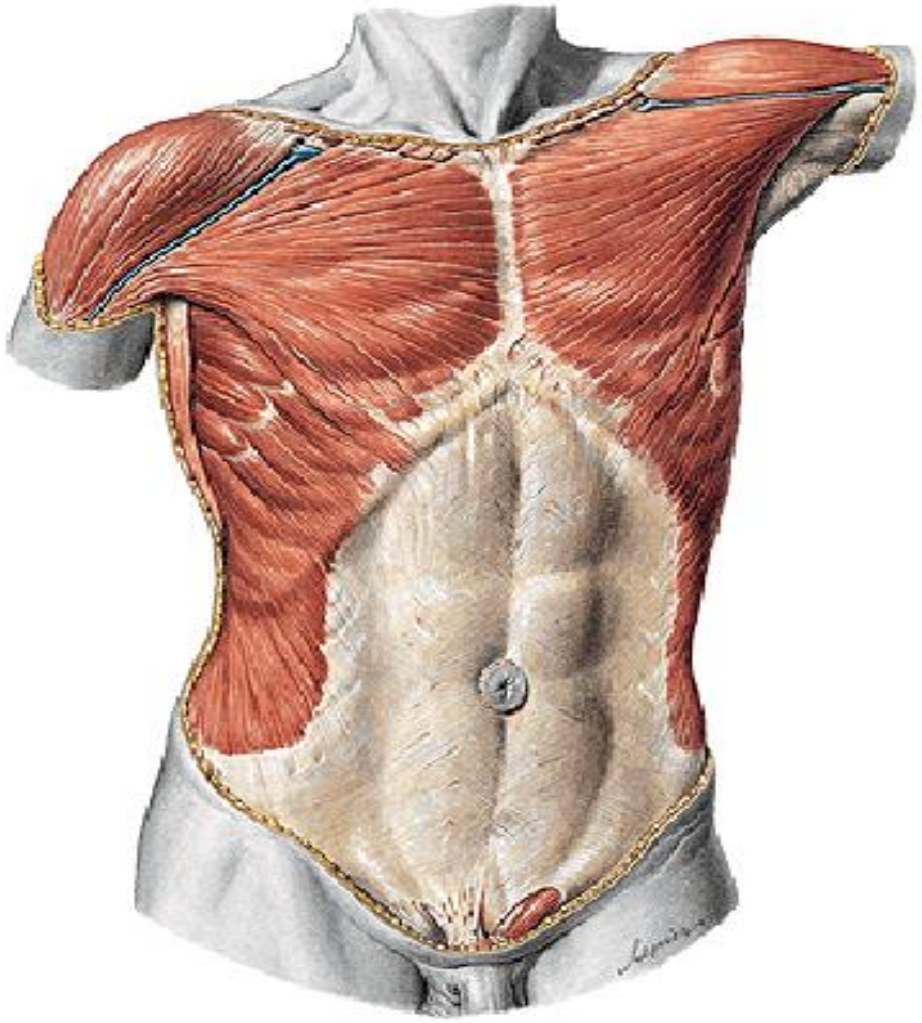
Muscles of thorax – *Musculi thoracis*

- thoracohumeral
  - m. pectoralis major
  - m. pectoralis minor
  - m. subclavius
  - m. serratus anterior
- proper thoracic
  - mm. intercostales (externi, interni, intimi)
  - mm. subcostales
  - mm. levatores costarum
  - m. transversus thoracis
- diaphragma



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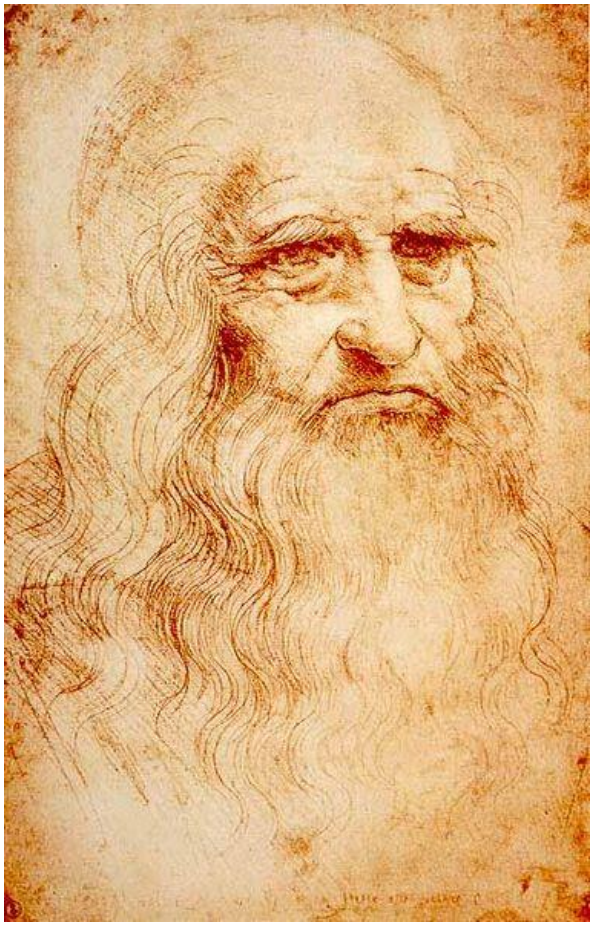
Leonardo



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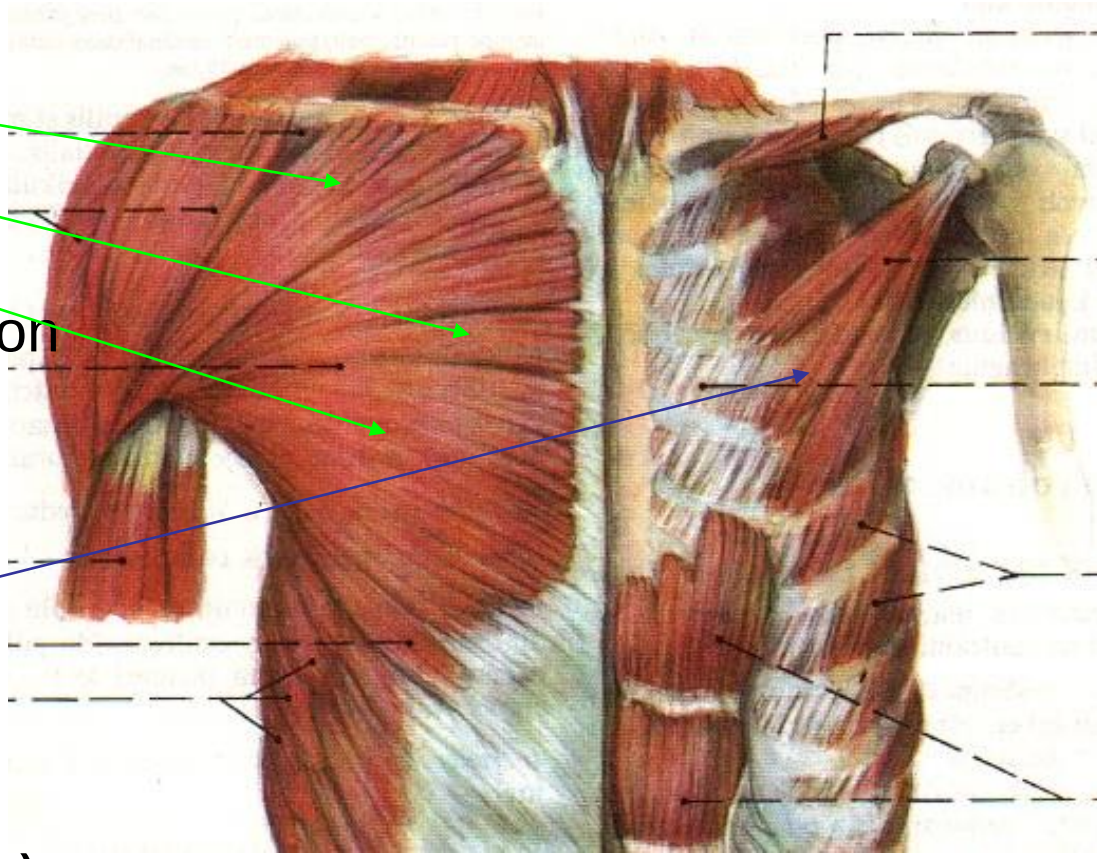
Thoracohumeral muscles

- **<u>m. pectoralis major</u>**
  - pars clavicularis
  - pars sternocostalis
  - pars abdominalis
  - Rotation of insertion tendon 180°



- **<u>m. pectoralis minor</u>**

fascia clavipectoralis

nn. pectorales (med.+lat.)

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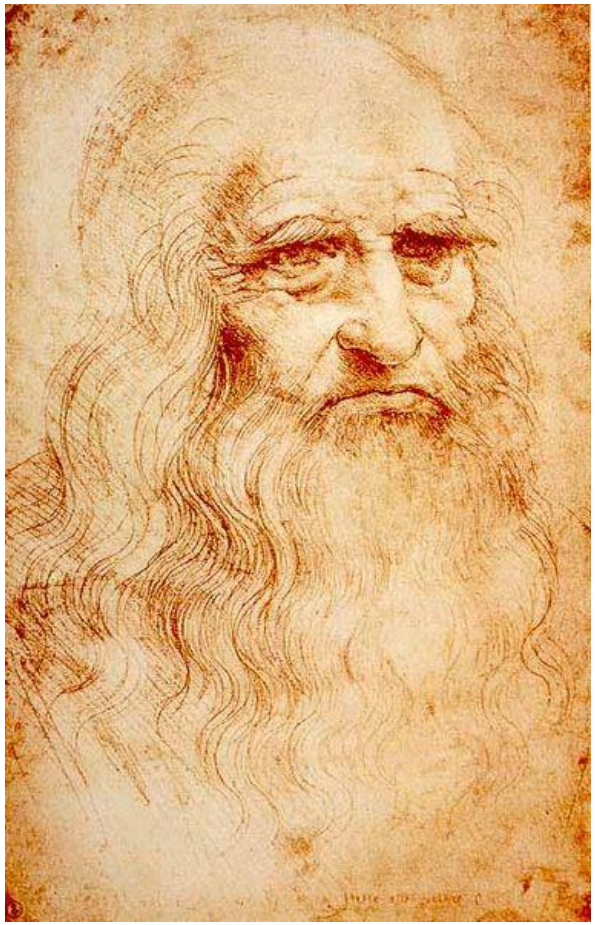
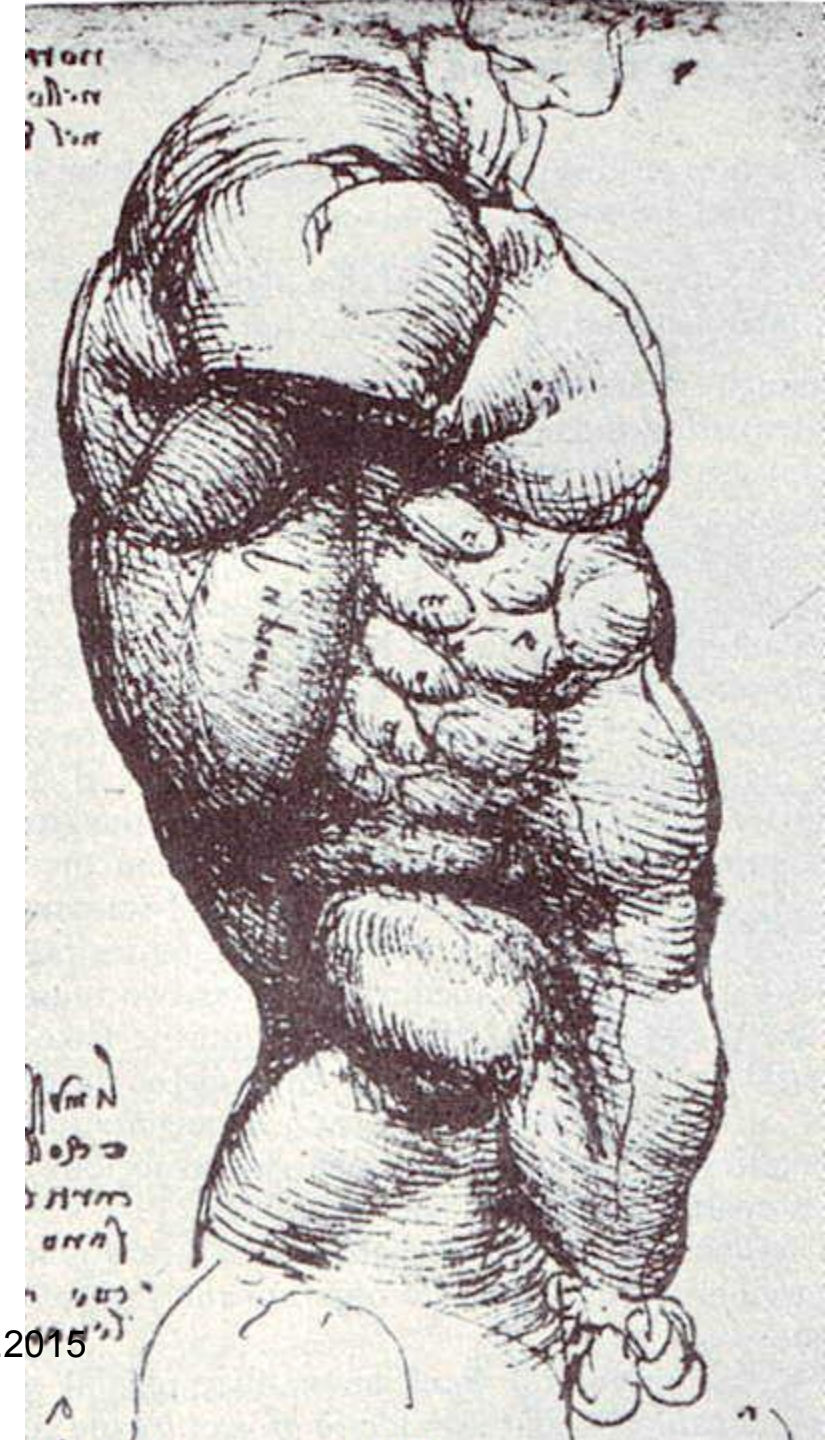
Leonardo





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Thoracohumeral muscles

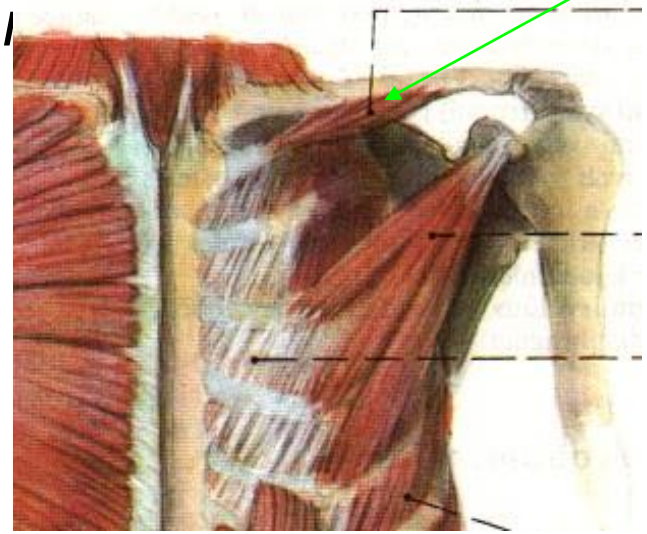
- **m. serratus anterior**

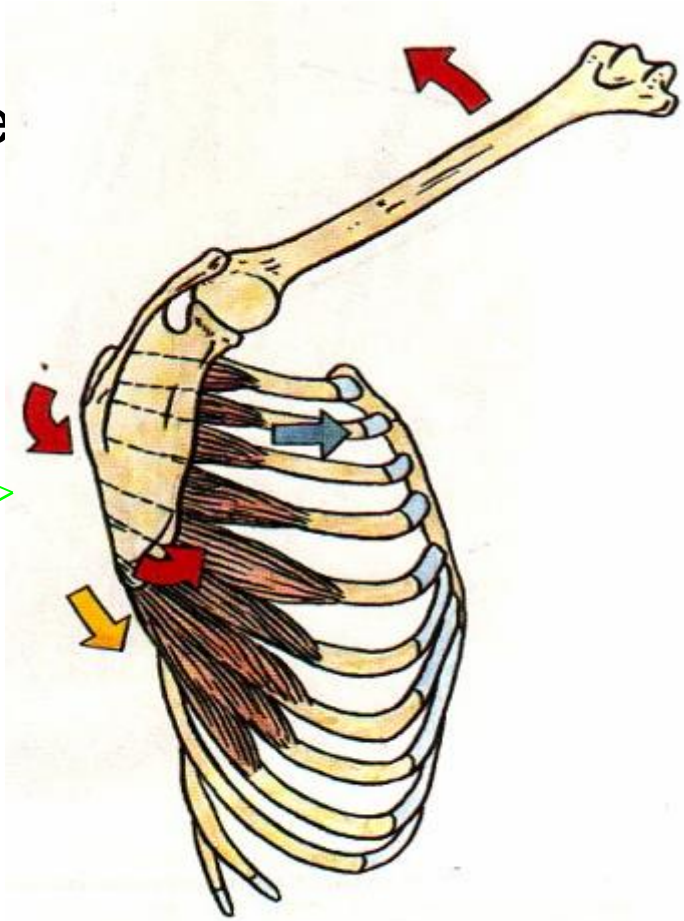
„thoracoscapular muscle

n. thoracicus longus

- **m. subclavius**

fascia clavipectoralis





351. MUSCULUS SERRATUS ANTERIOR – schéma funkci svalu

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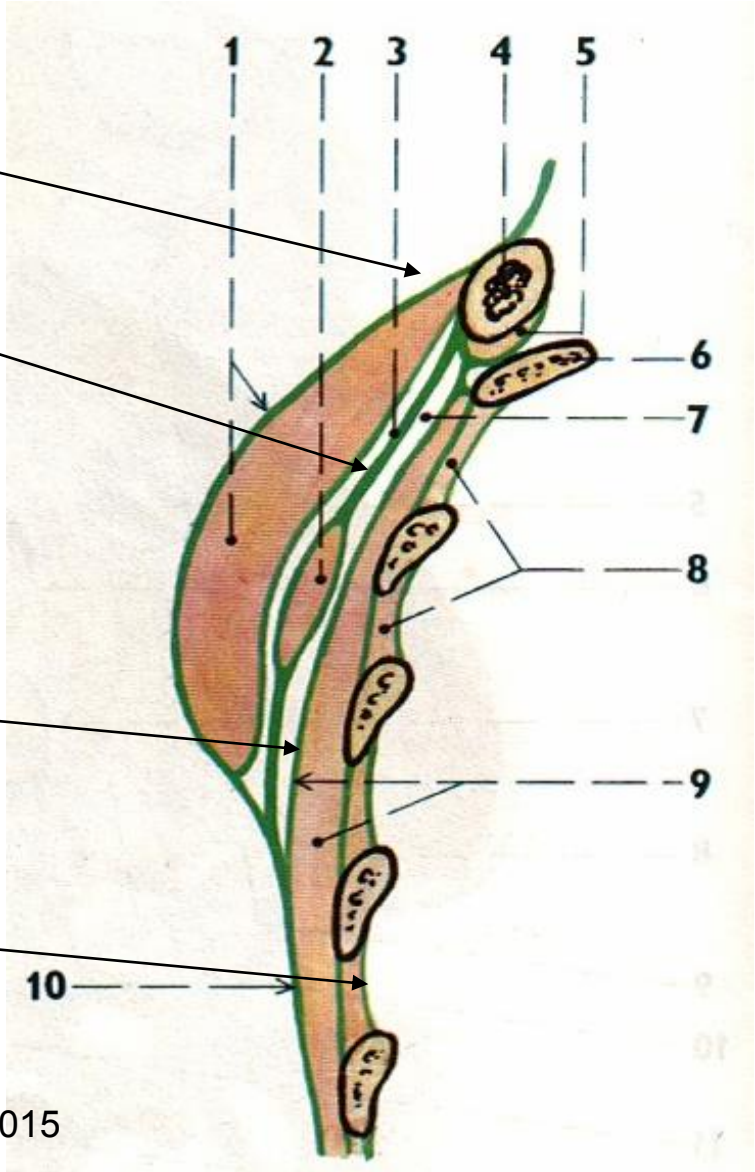
Thoracic fasciae

- fascia pectoralis
  - covering m. pectoralis major
- fascia clavipectoralis
  - covering m. subclavius and m. pectoralis minor
  - fossa ovalis infraclavicularis *Mohrenheimi* (for v. cephalica)
- fascia thoracica
  - superficial fascia of all intercostal spaces
- fascia endothoracica (f. thoracis parietalis)
  - lining the thoracic cavity



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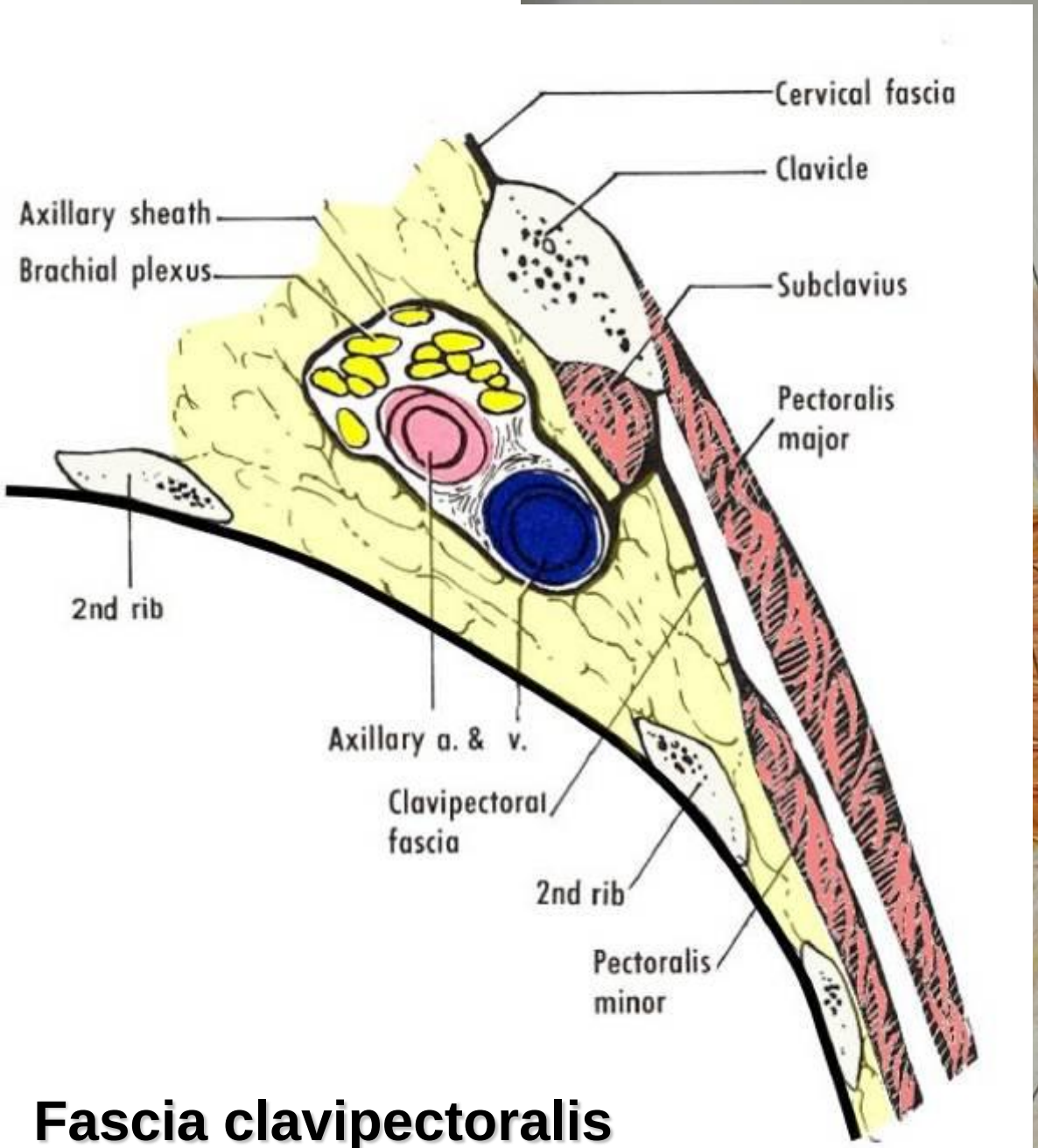

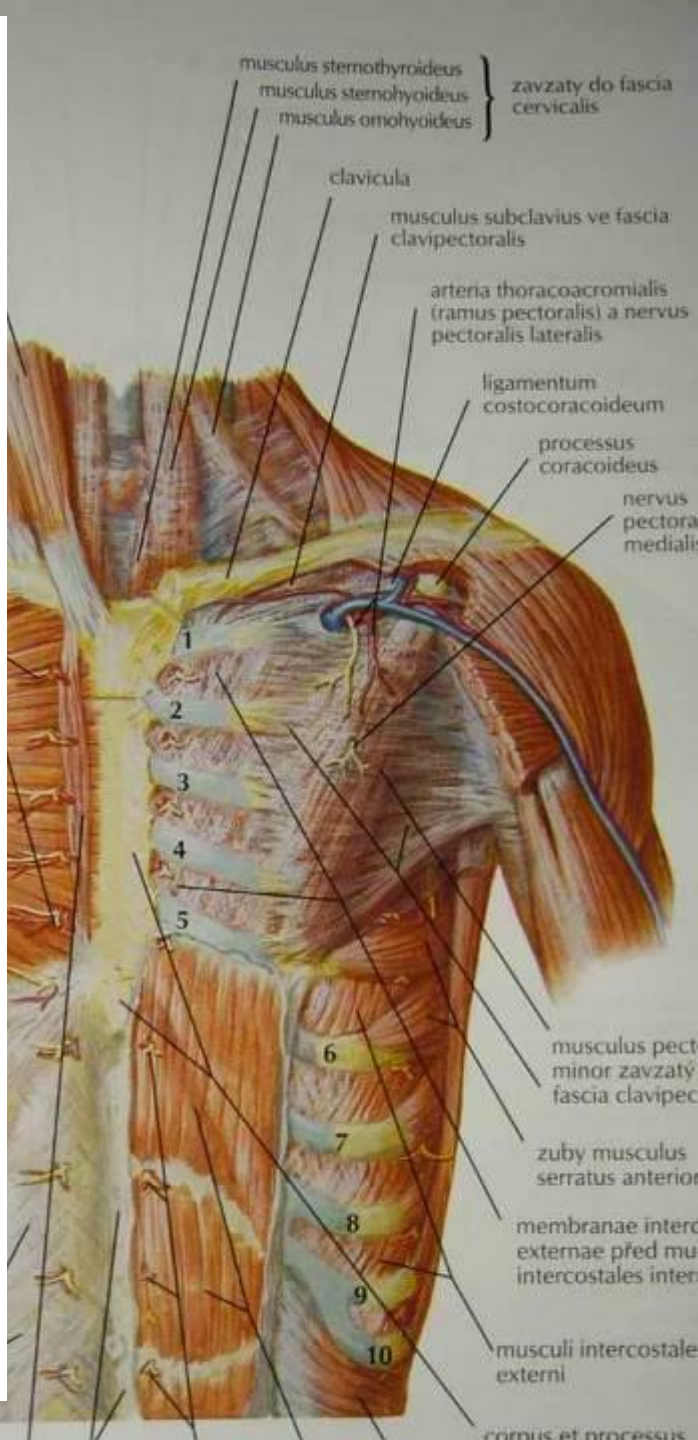

Fascia clavipectoralis

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Developmental defects

Polland syndrom

- absence of m. pectoralis major
- length reduction of fingers or syndactylia (obviously a defect of induction)
- 3x more in ♂

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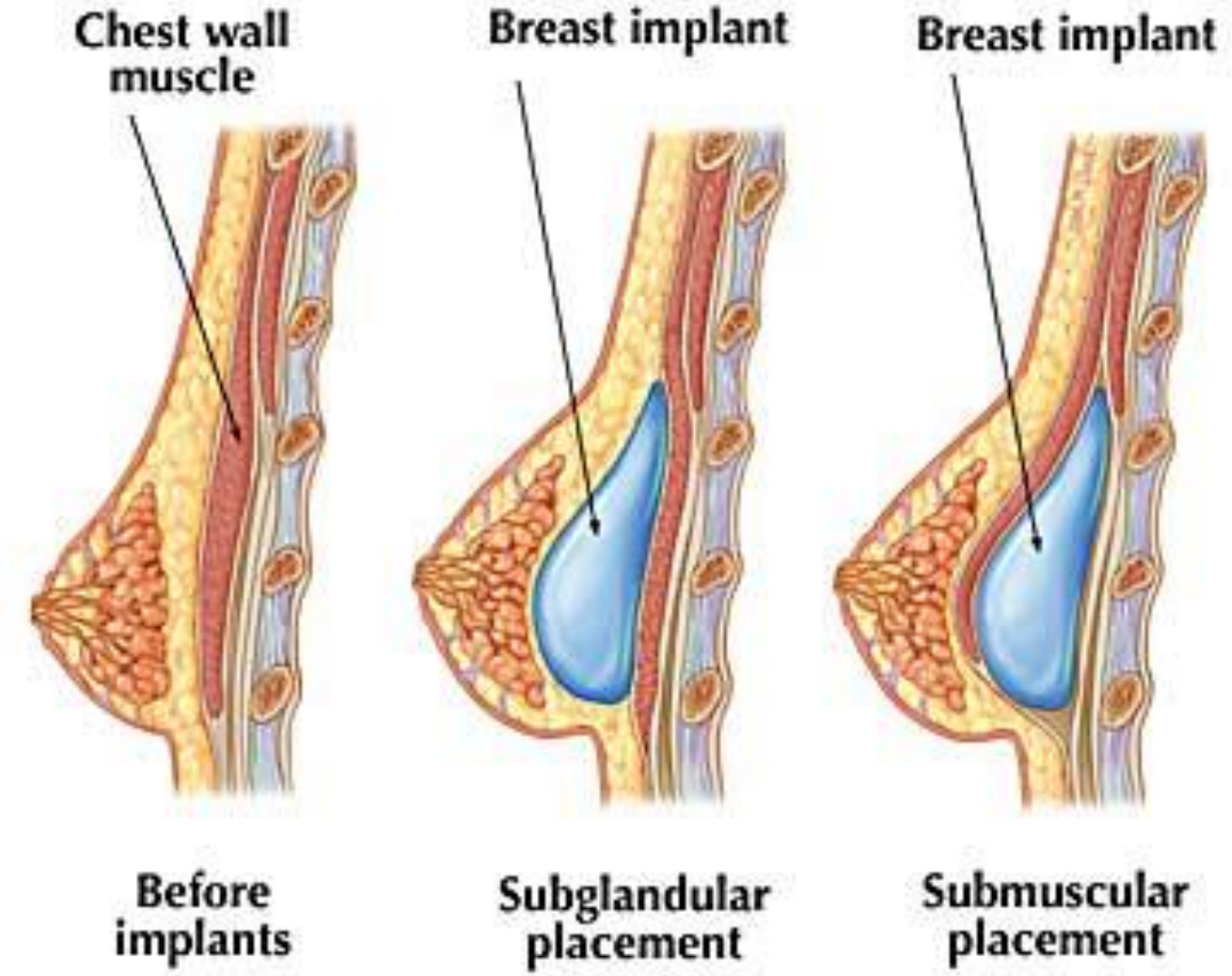
Breast implants



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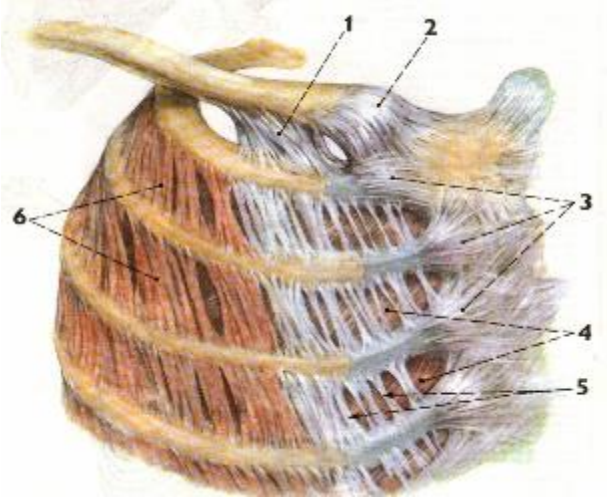
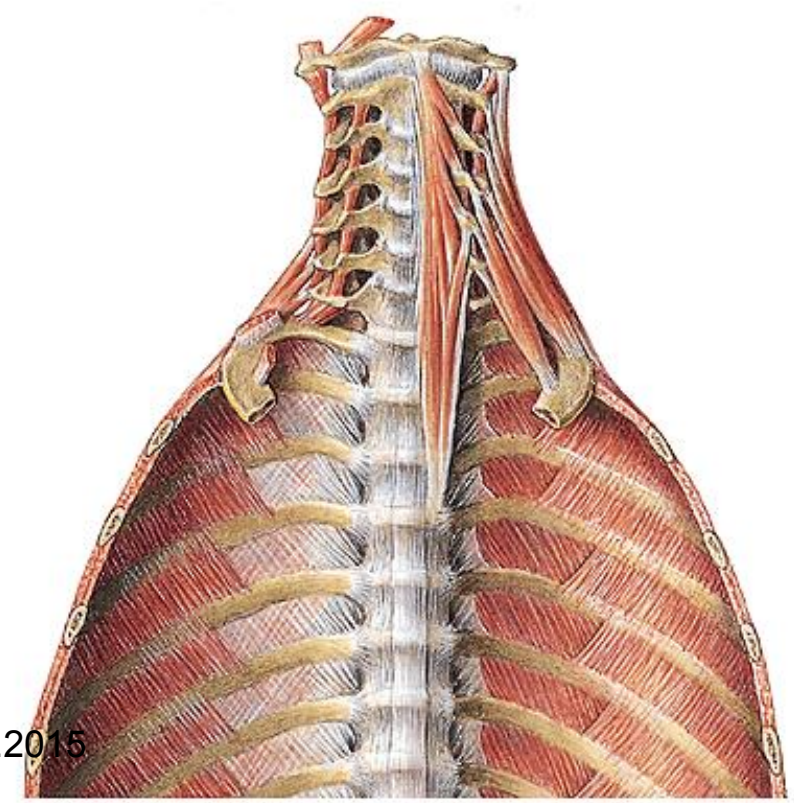
Proper thoracic muscles



- **mm. intercostales externi**
  - from tuberculum costae to cartilago costalis
  - then **membrana intercostalis externa** as far as sternum

inspiration

- **mm. intercostales interni**
  - from sternum to angulus costae
  - then **membrana intercostalis interna** as far as vertebral column
- **mm. intercostales intimi**
  - similar to interni, weaker
  - insertion internally to sulcus costae



expiration

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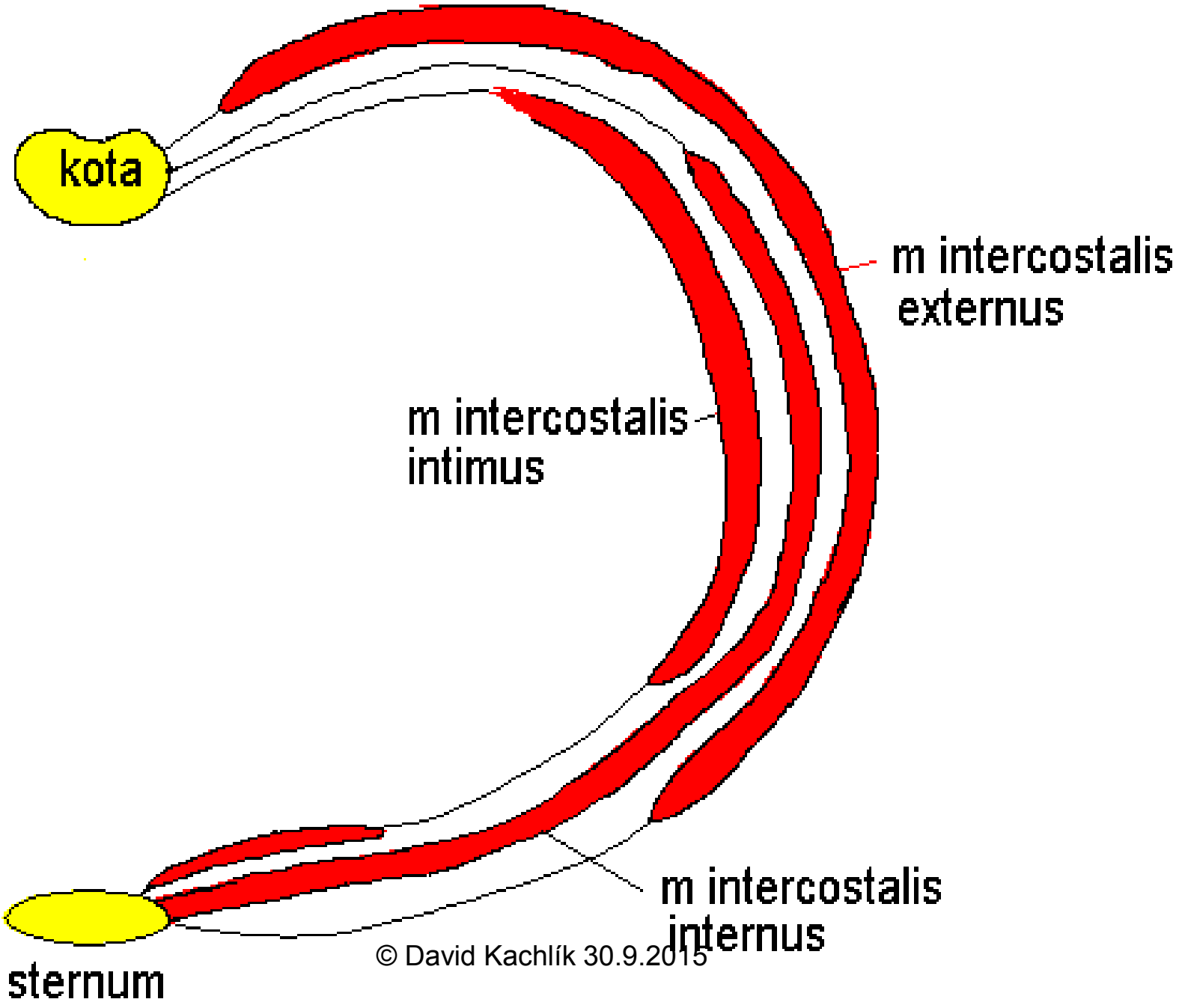

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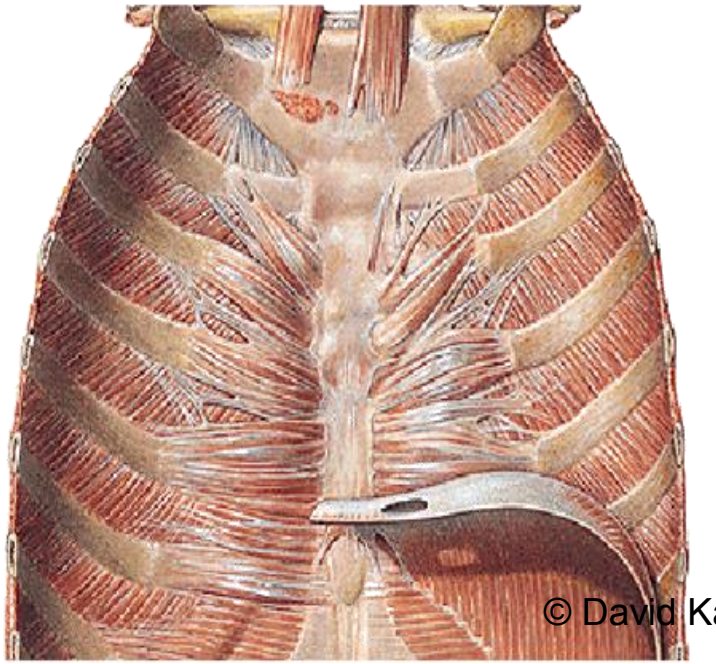
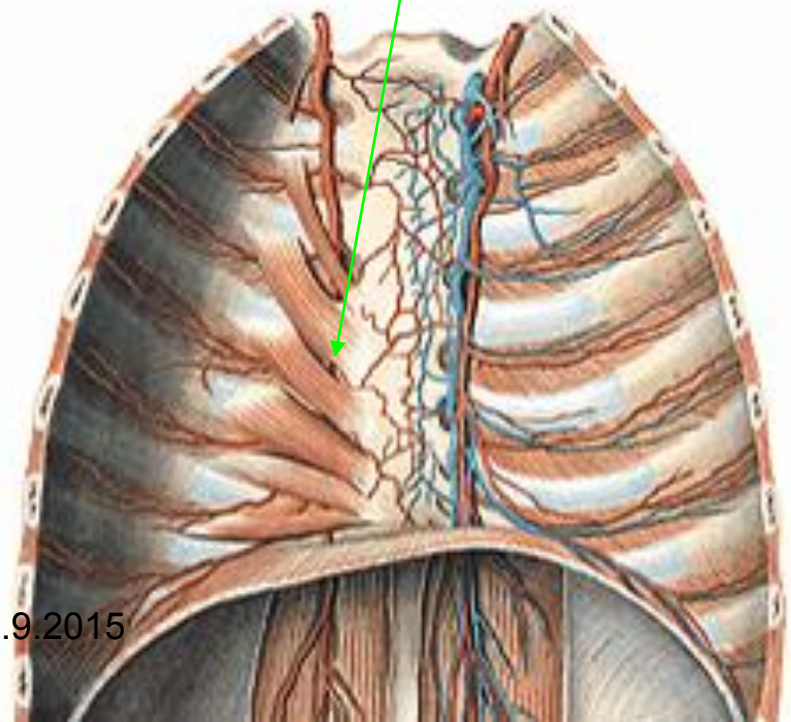
Proper thoracic muscles

- **m. transversus thoracis**
  - internal side of sternum
  - *expiration*
  - *inervation: nn. intercostales 1-6*





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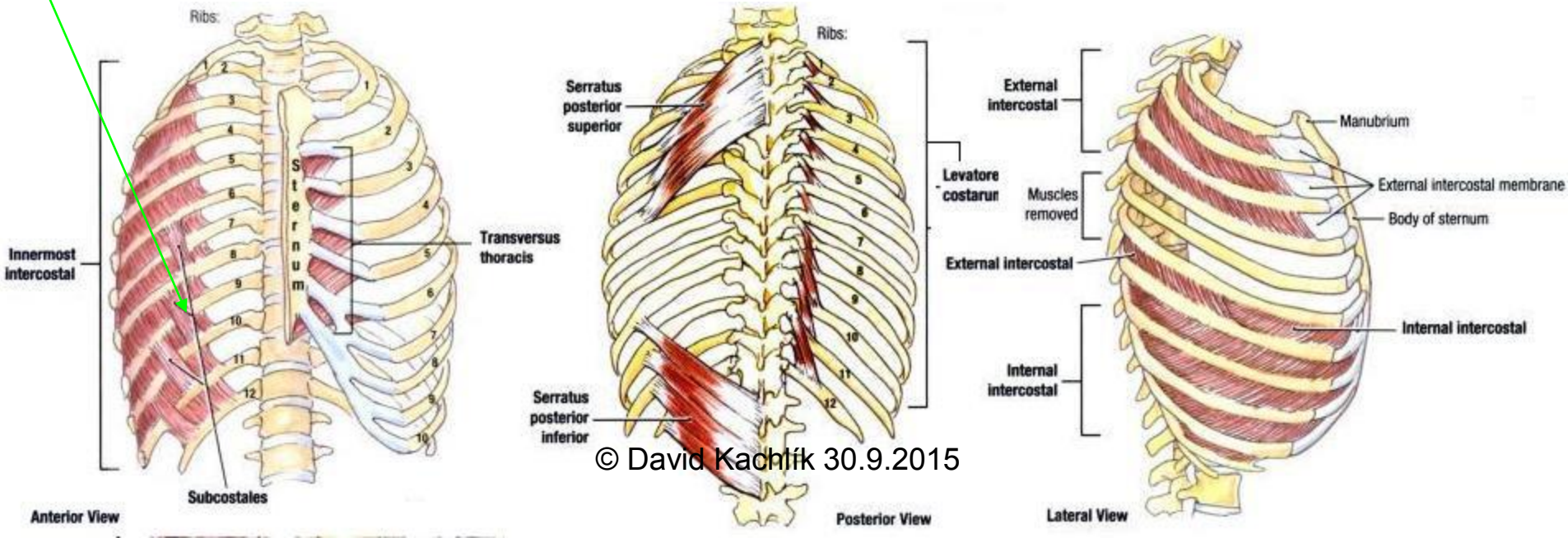
Proper thoracic muscles

- **mm. subcostales**
  - frequently rudimental
  - at anguli costarum
  - deep to mm. intercostales intimi
  - *inervation: nn. intercostales*



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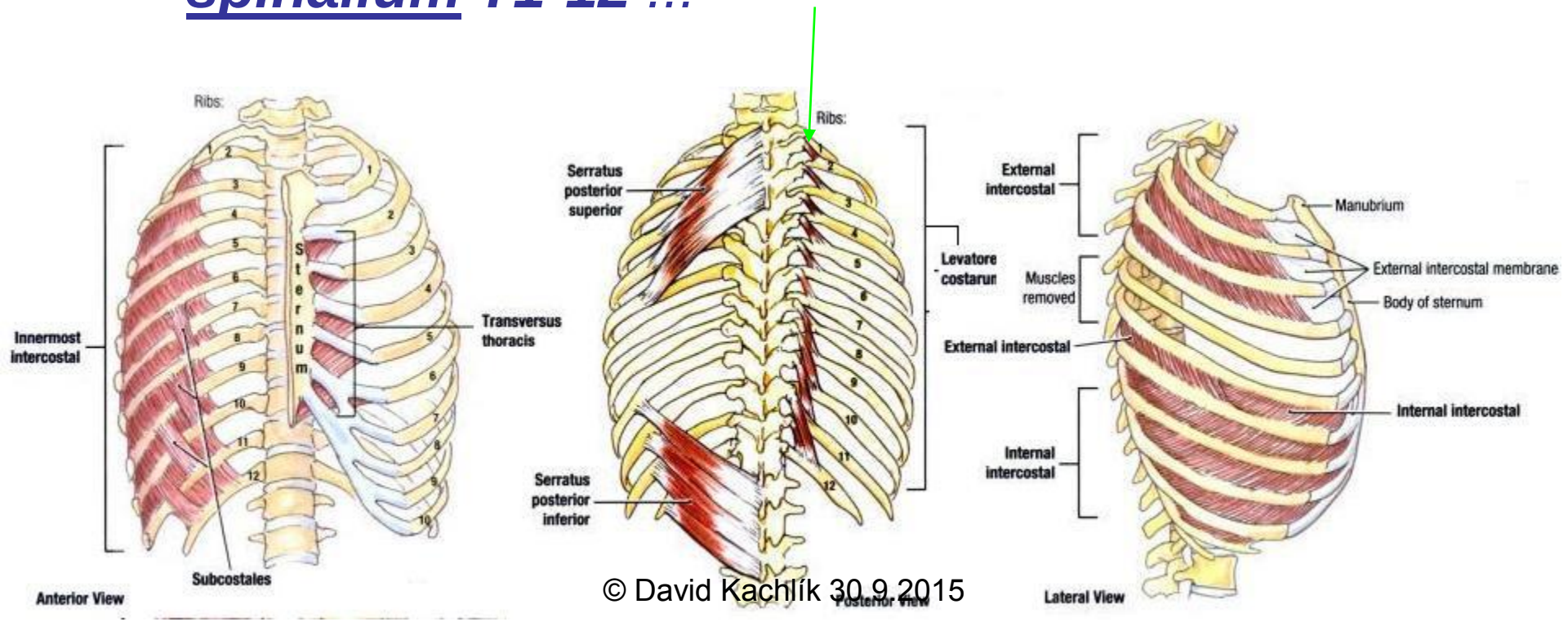
Proper thoracic muscles

- **<u>mm. levatores costarum</u> longi et breve**
  - breves 12 x longi 4 (*kaudal*)
  - *inervation: rr. dorsales <u>ramorum **posteriorum nn. spinalium**</u> **T1-12** !!!*



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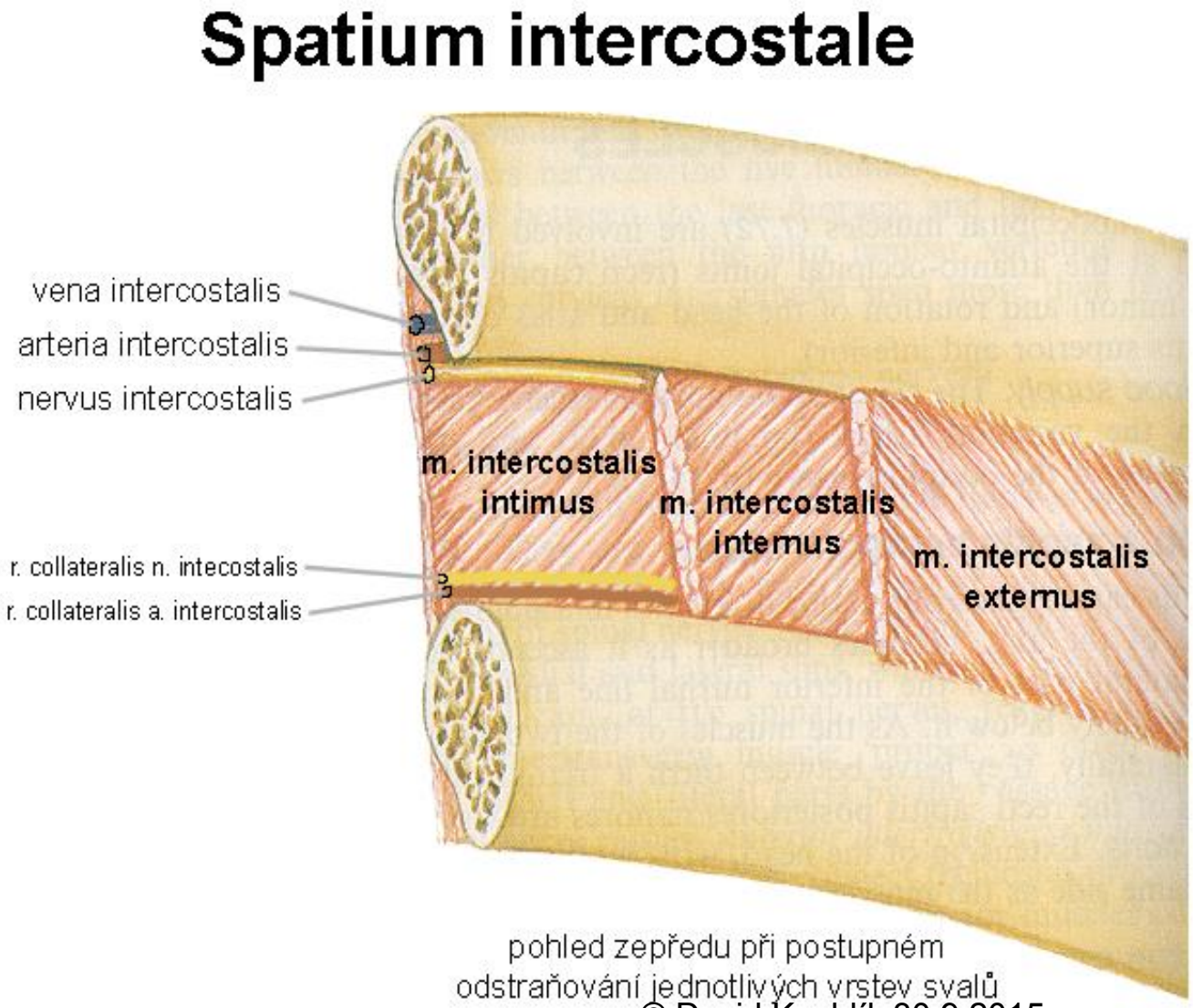
Intercostal space



pohled zepředu při postupném odstraňování jednotlivých vrstev svalů

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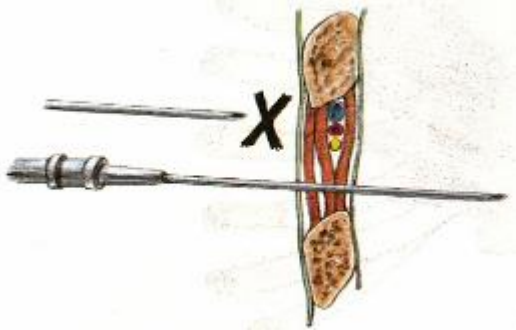
Punction

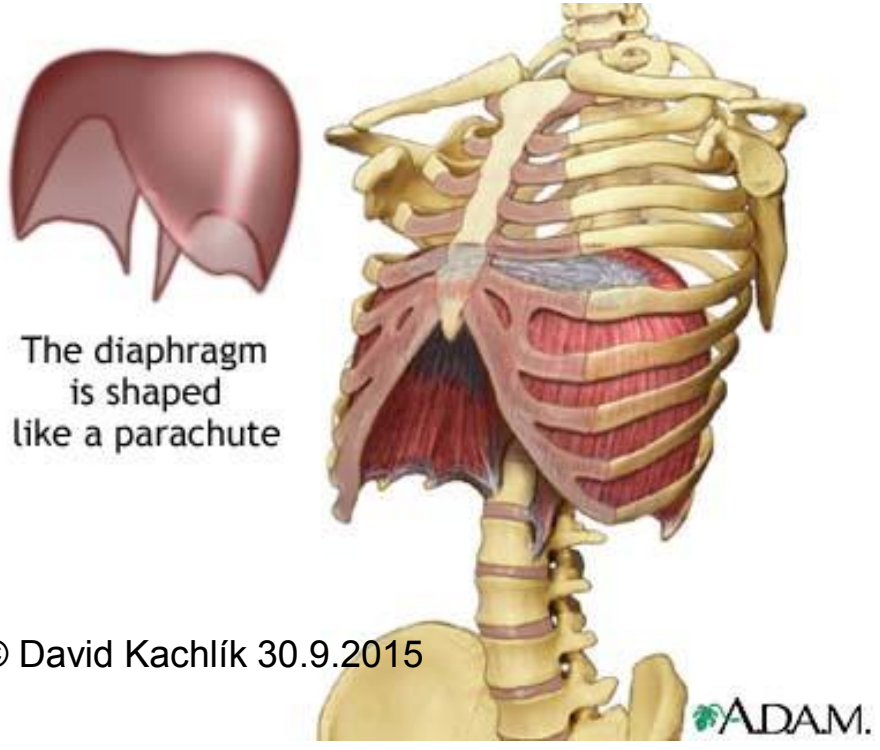
at superior margin of rib

= at inferior margin of intercostal space



Diaphragma (phren in Greek)

- mammalia, crocodiles
- 3-5 mm thick
- muscular-tendinous membrane
- separates thoracic and abdominal cavity
- main inspiration muscle: 60–80% of labor
- maintain stabilization of thoraco-lumbar transition of vertebral column



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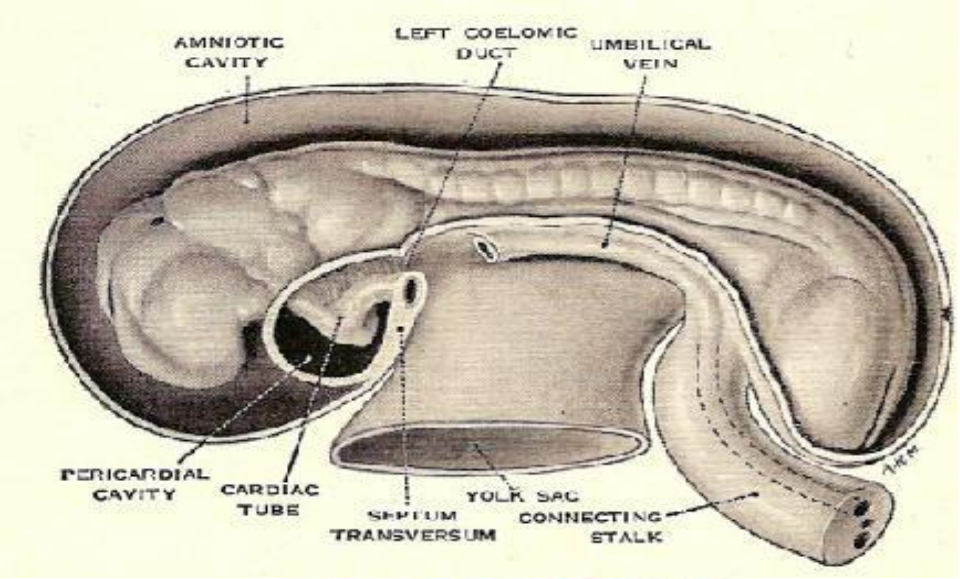
Diaphragma development



Week 5-12: 4 sources

- **septum transversum**

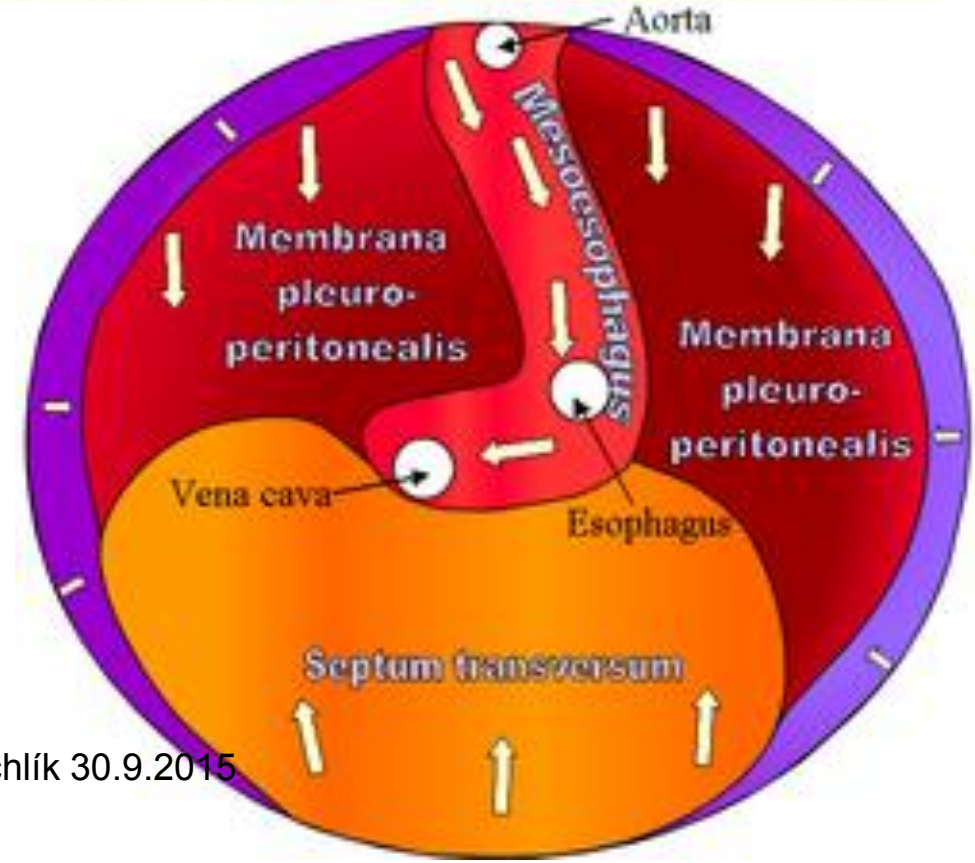
origin cranial to cardiogenic zone

- **pleuroperitoneal membrans** (= primitive diaphragm)

1+2 fuses in <u>centrum tendineum</u>

- **mesoesophageum dorsale** → <u>crura diaphragmatis</u>

- ingrowth of **mesenchyme** from the dorsolateral body wall → future muscles of <u>dorsolateral</u> part



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Diaphragma – inervation, shape

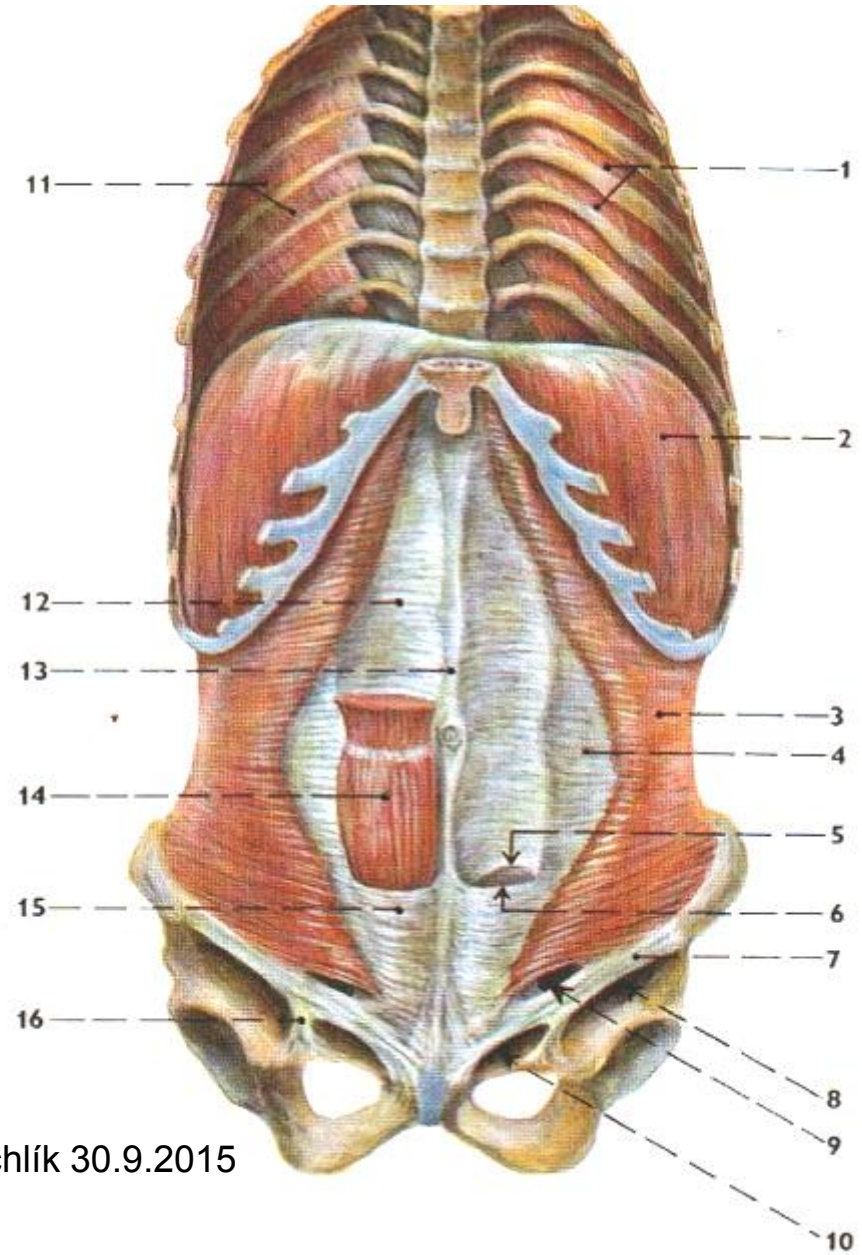
septum transversum

→ descensus → **n. phrenicus C3-5**

firstly: frontal plane postition

later: by growth of lungs and formation of pleural cavities (*recessus costodiaphragmatici*)

→ typical cupular shape



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Diaphragm vaults

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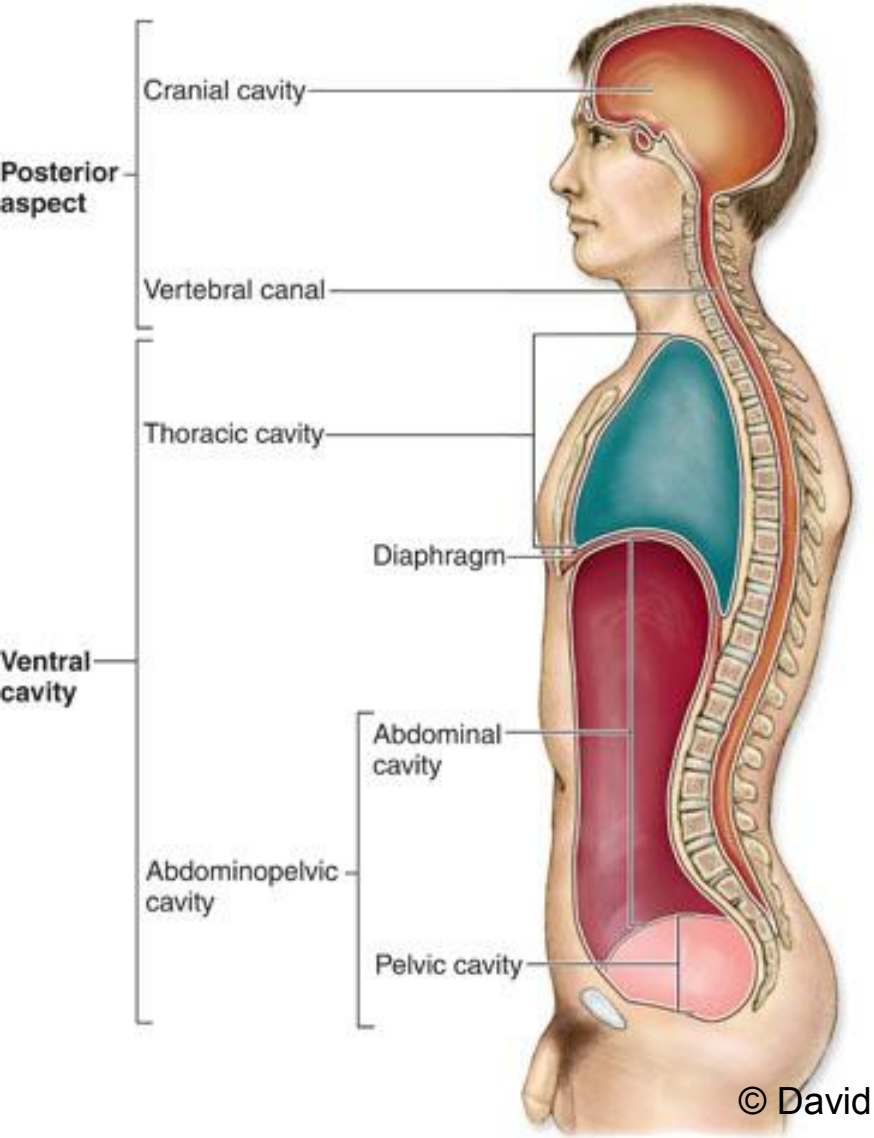
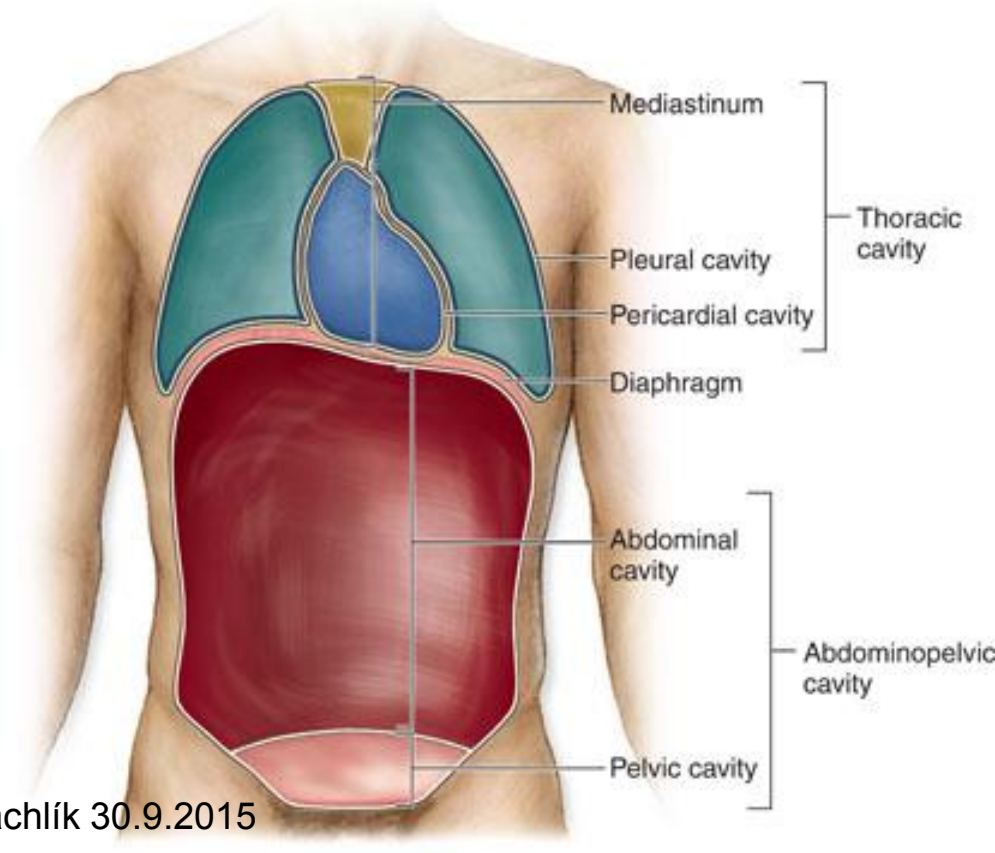


(a) Midsagittal view



(b) Coronal (frontal) view

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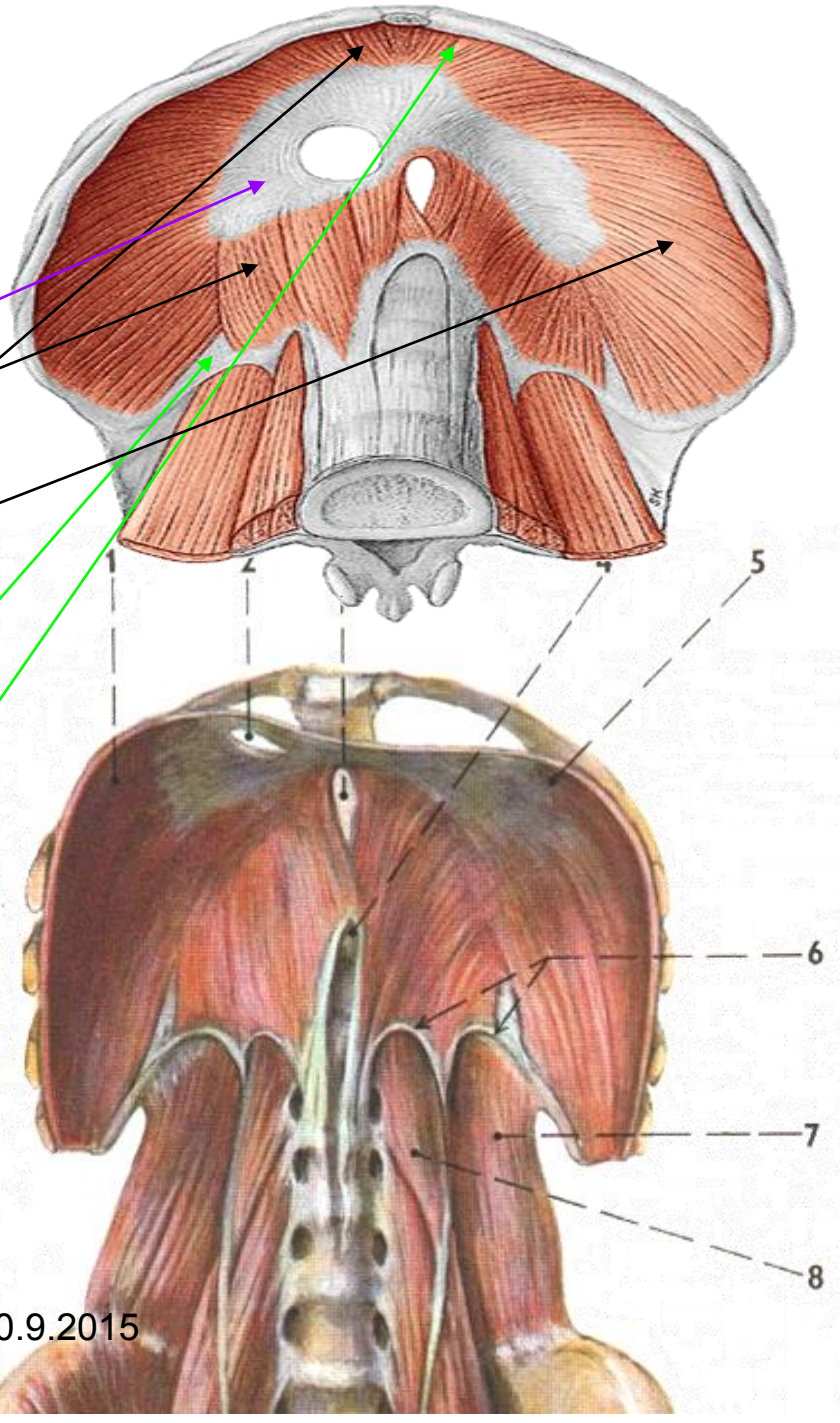
Diaphragma

- right and left diaphragmatic vault
  - 4th athd 5. intercostal space)
- centrum tendineum
- pars lumbalis
  - crus dextrum et sinistrum
- pars costalis
- pars sternalis
- trigonum lumbocostale Bochdaleki
- trigonum sternocostale Morgagni s. Larreyi
- ***main inspiration muscle***
- *active in exspiration, too*



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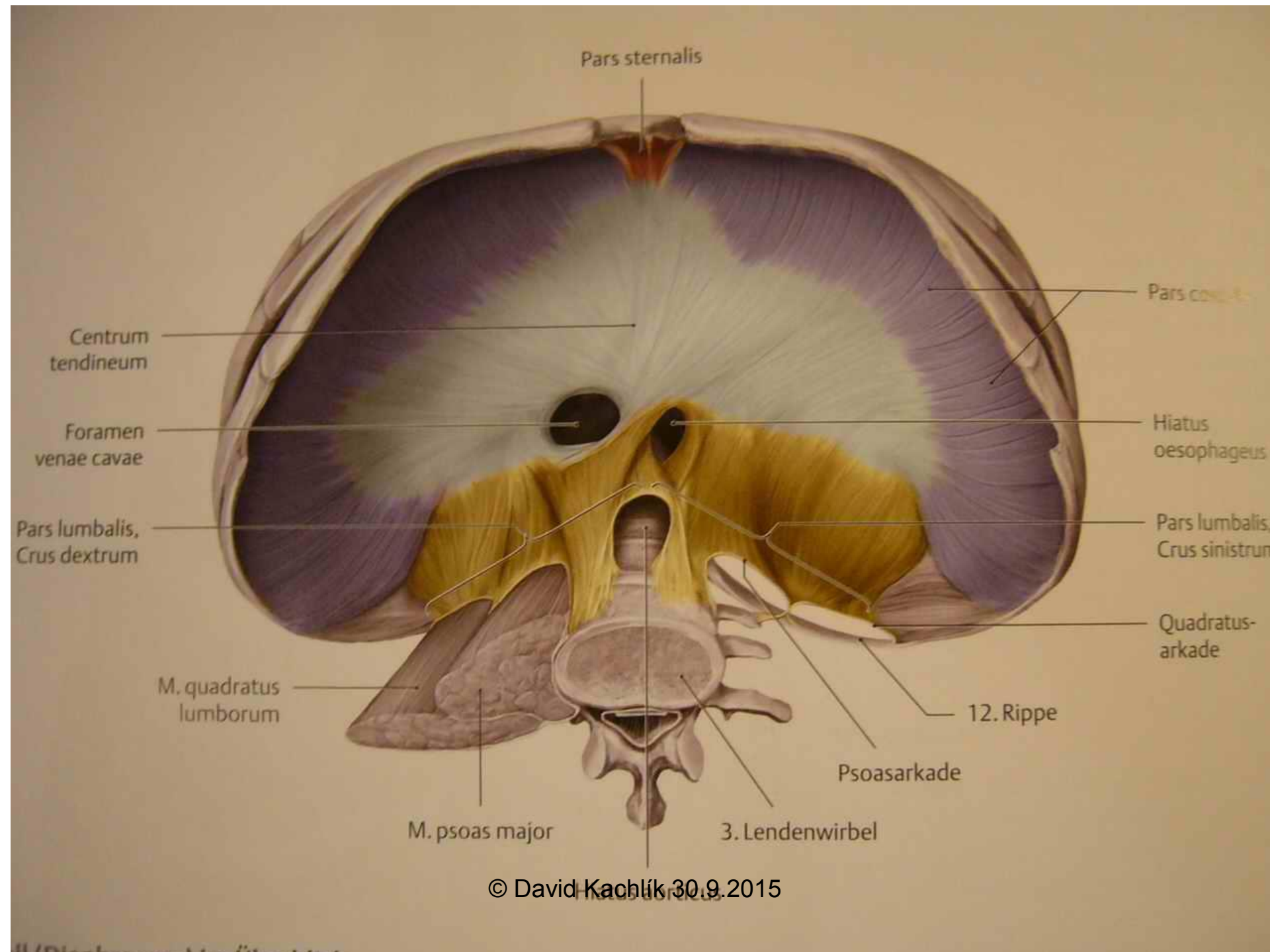

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Diaphragm – vaults

- **lig. arcuatum medianum** (aortic arcade) – unpaired

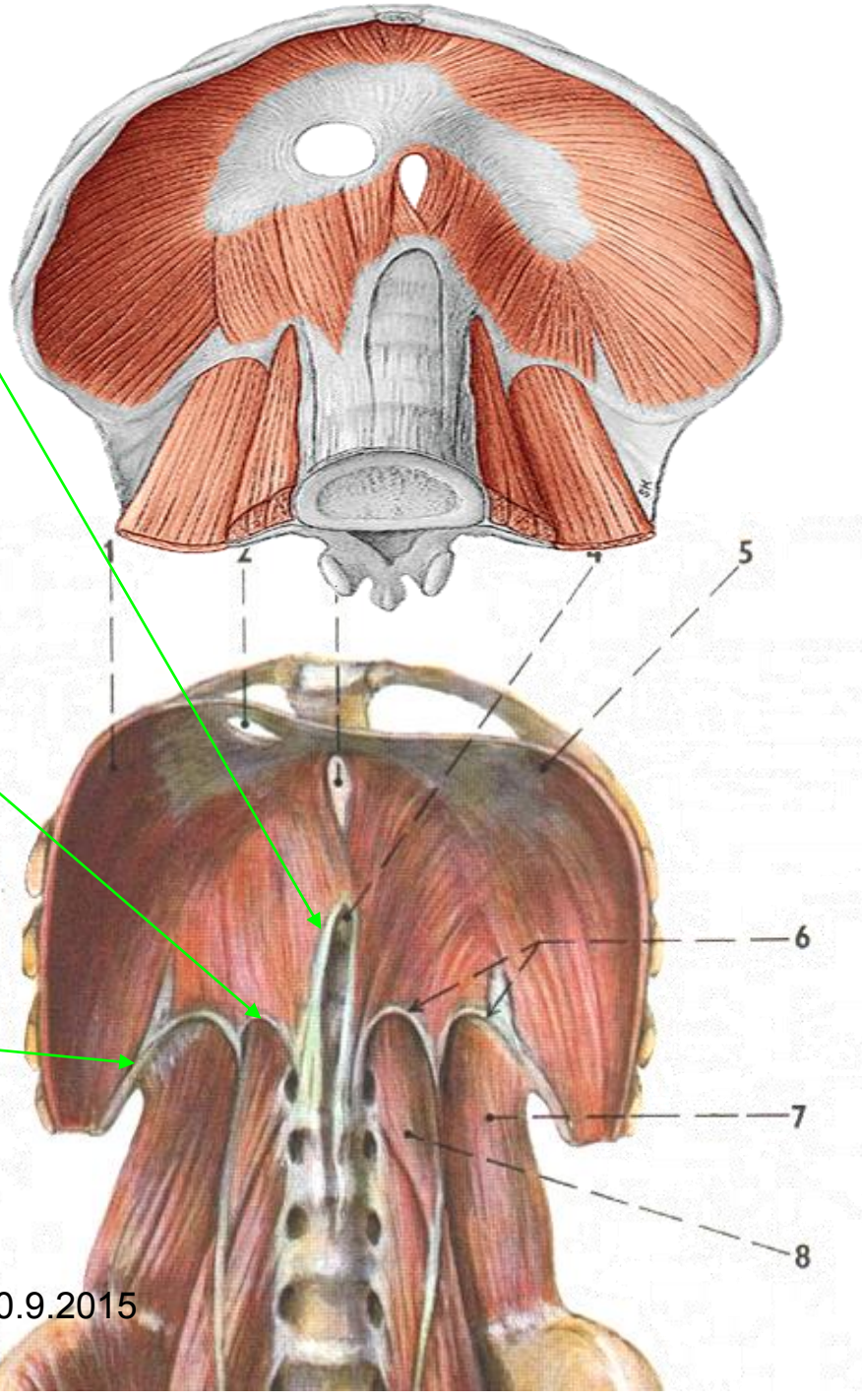
→ hiatus aorticus

- **lig. arcuatum mediale** (psoatic arcade) – paired

for m. psoas major

- **lig. arcuatum laterale** (quadratic arcade) – paired

for m. quadratus lumborum



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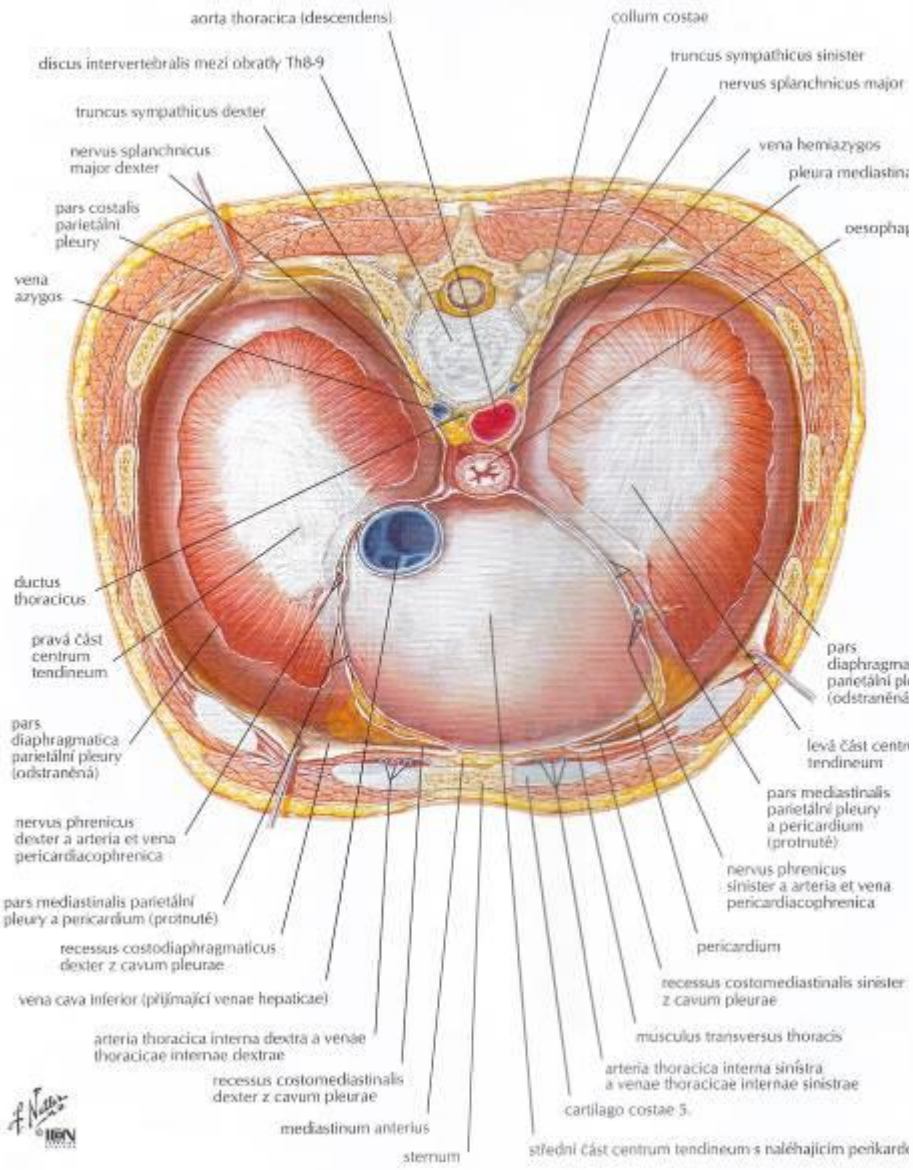
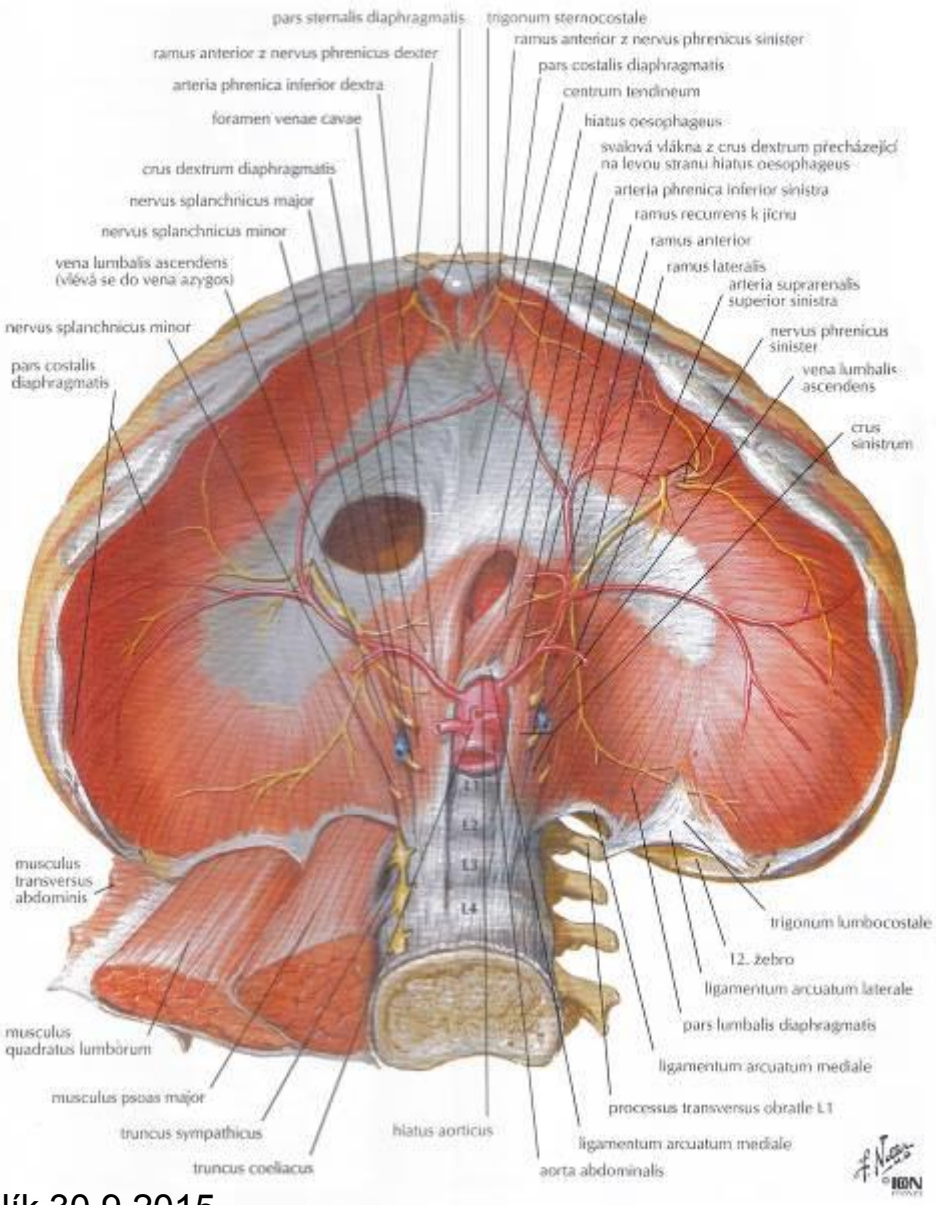
DIAPHRAGMA - *facies thoracica*



DIAPHRAGMA - *paries abdominalis*



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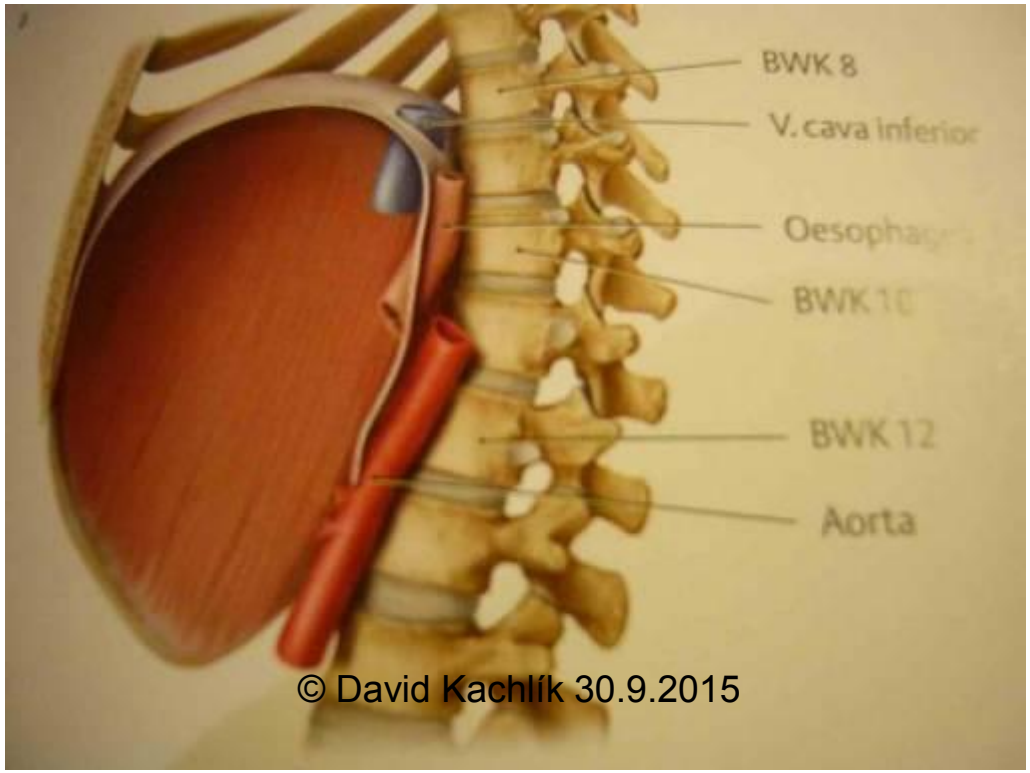
Level of diaphragmatic openings

- foramen venae cavae T8
- hiatus oesophageus T10
- hiatus aorticus T12



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Structures passing via diaphragm

pars lumbalis (crus sin. et dx.)	truncus sympathicus, nn. splanchnici, (*sometimes* v. azygos et hemiazygos)
hiatus aorticus (*between* crura diaphragmatis, *border with* lig. arcuatum medianum)	aorta thoracica/abdominalis, ductus thoracicus (*sometimes* v. azygos et hemiazygos)
hiatus oesophageus (*within* crura diaphragmatis)	oesophagus, truncus vagalis ant.et post. (+ rr. gastrici), rr. oesophageales a. et v. gastricae sin.
foramen venae cavae (*within* centrum tendineum)	v. cava inf., rr. phrenicoabdominales n. phrenici dx.
trigonum strenocostale	nothing *ventrally to m. transversus thoracis*: vasa thoracica interna → vasa epigastrica superiora
trionum lumbocostale	nothing

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Diaphragmatic herniae

- hiatus oesophageus
  - **<u>sliding hiatus (hiatal) hernia</u>**

  false hernia (without peritoneal cover) – contains abdominal part of oesophagus, stomach, intestine
  - **<u>para-oesophageal hiatus (hiatal) hernia</u>**

  true hernia – sac appears between the wall of hiatus oesophageus and oesophageus
- trigonum lumbocostale (rarely)
  - **inborn** – failure of diaphragm parts fusion
  - acquired
- trigonum sternocostale (rarely)

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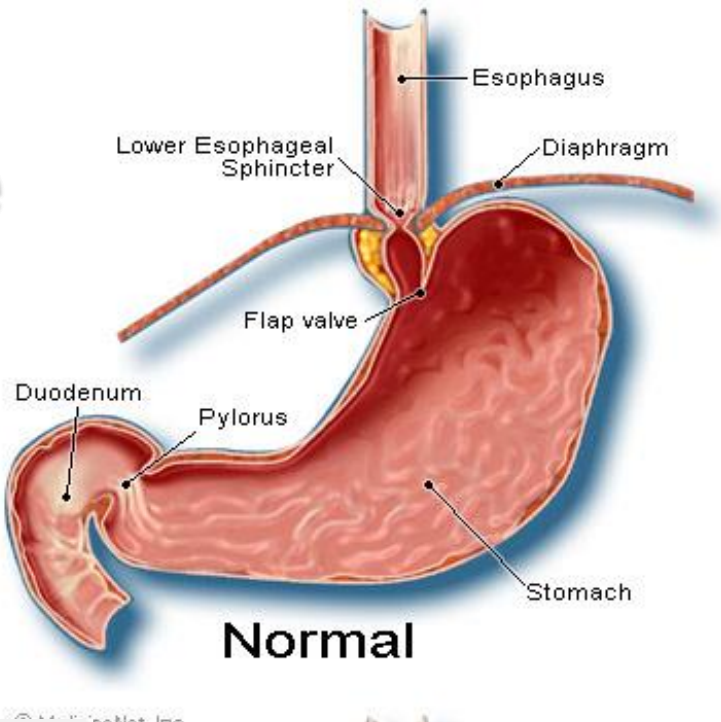
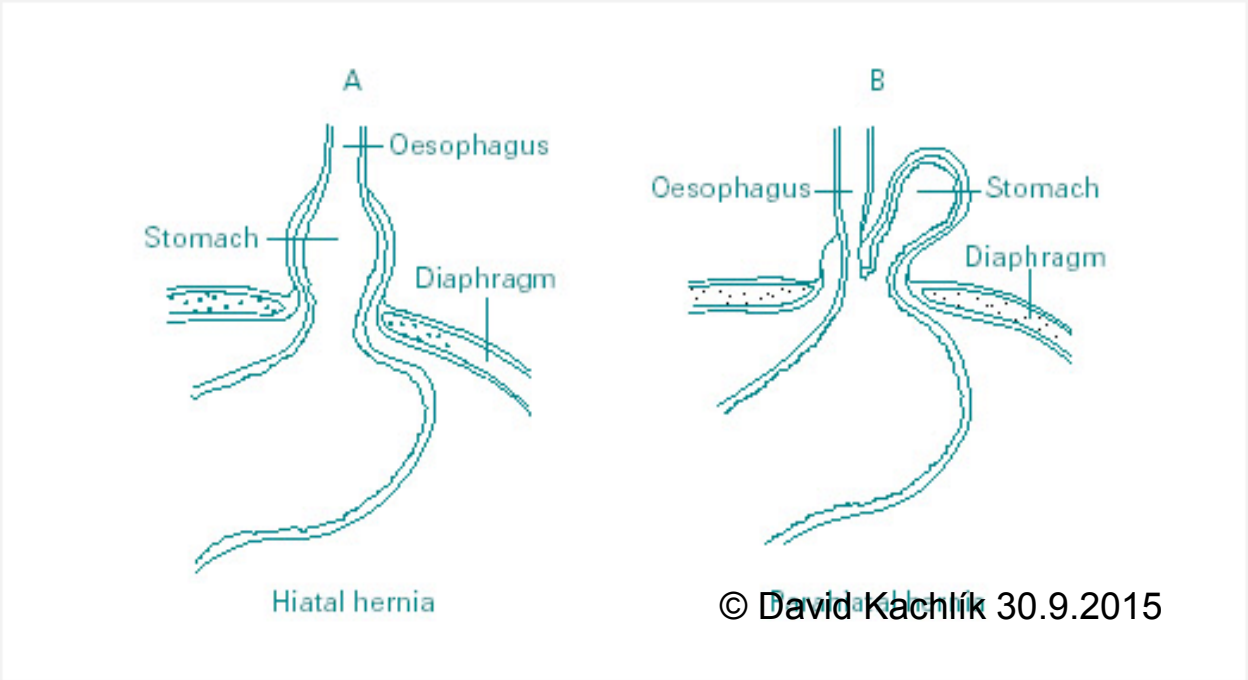
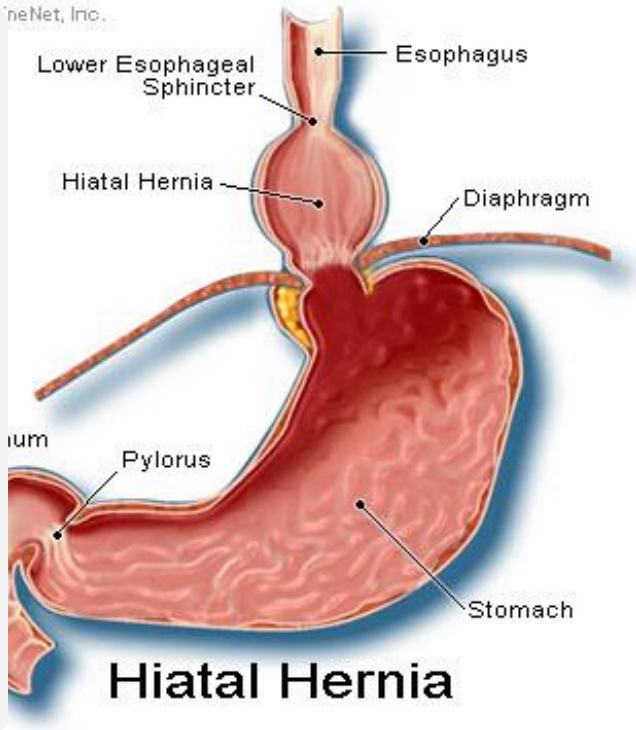
Diaphragmatic herniae

- sliding hiatus hernia
- para-oesophageal hiatus hernia







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Diaphragmatic herniae

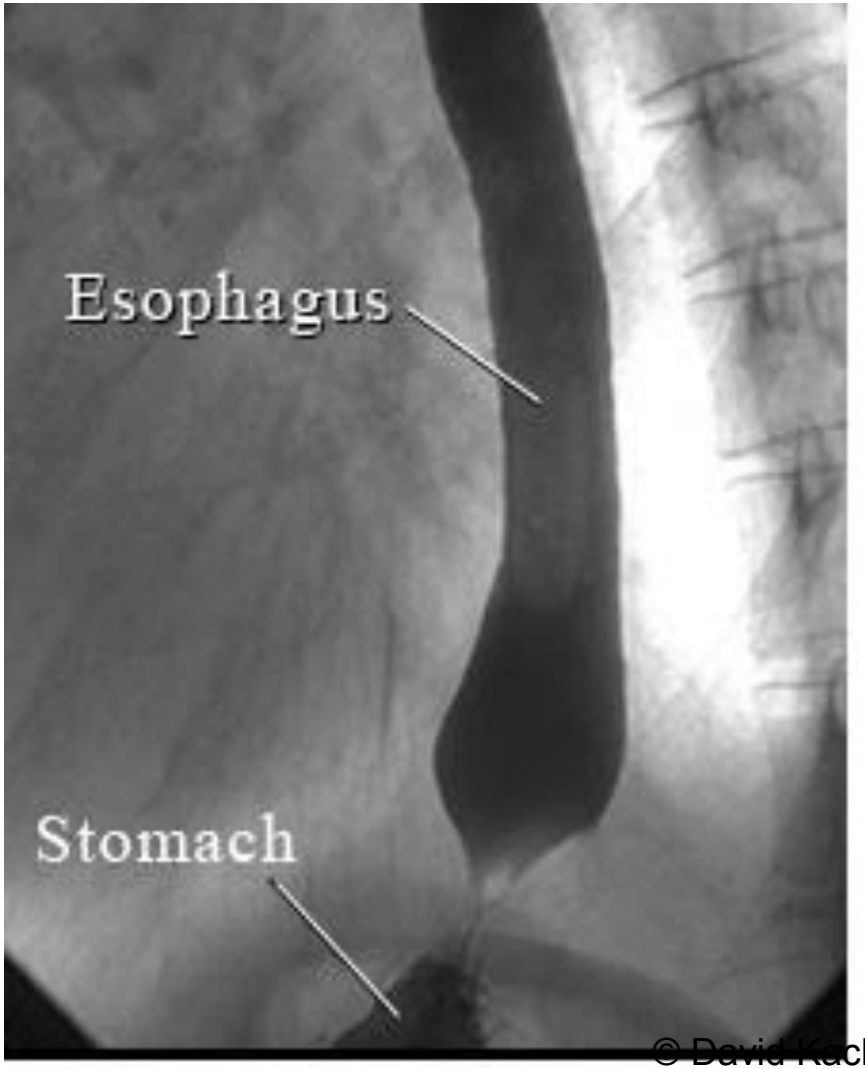

Figure 1

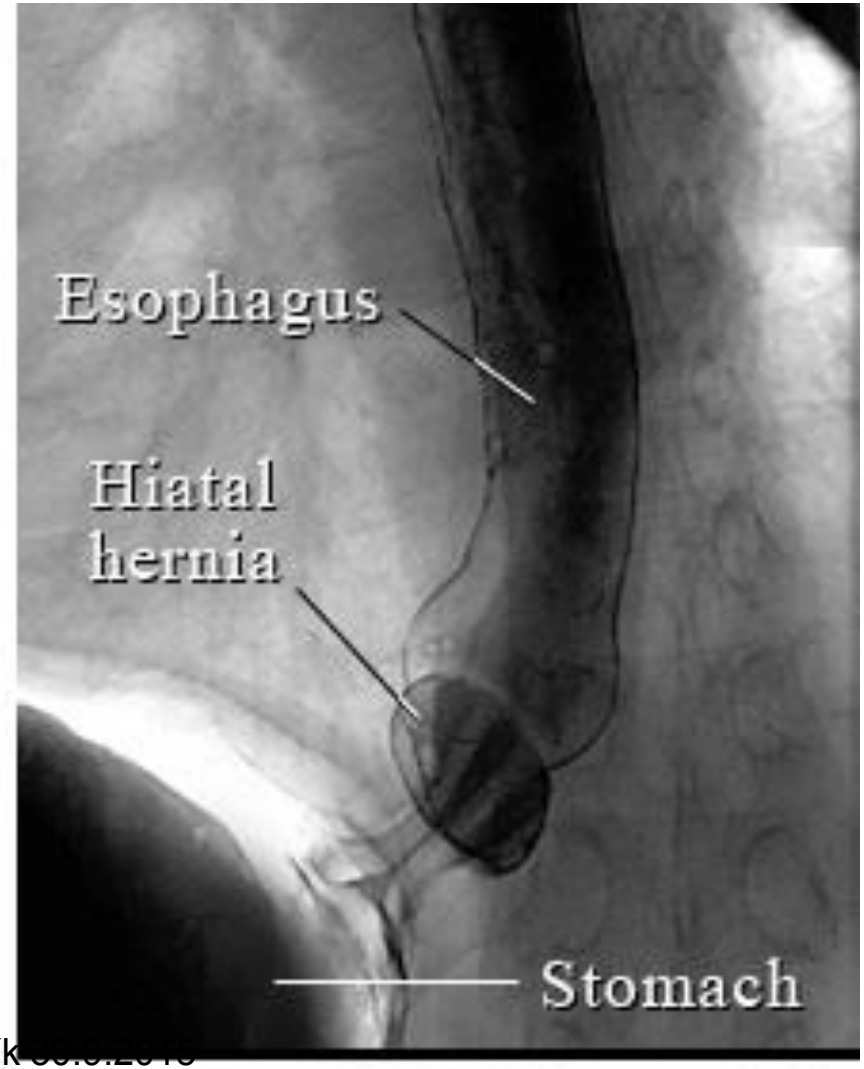

Figure 2

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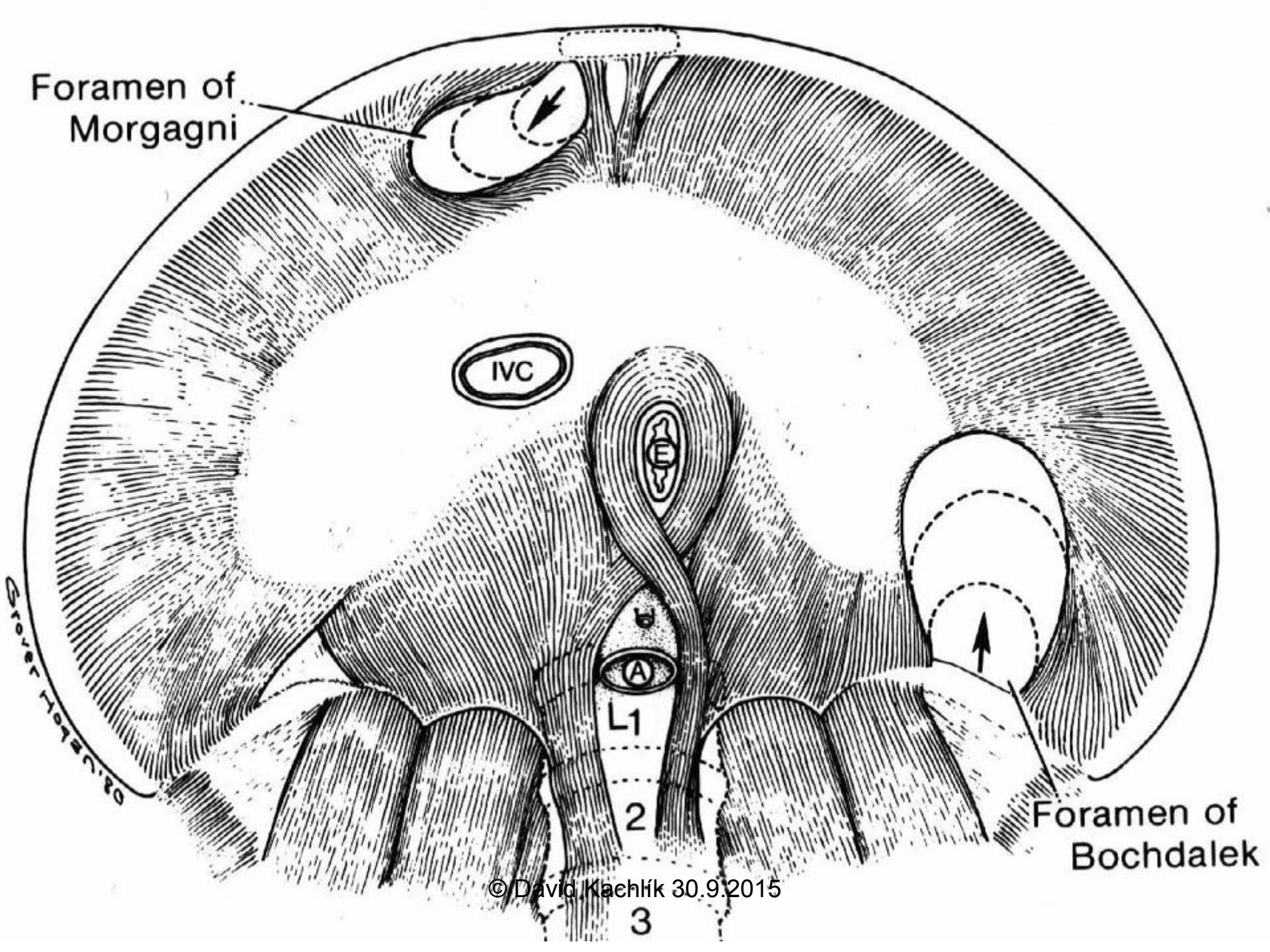

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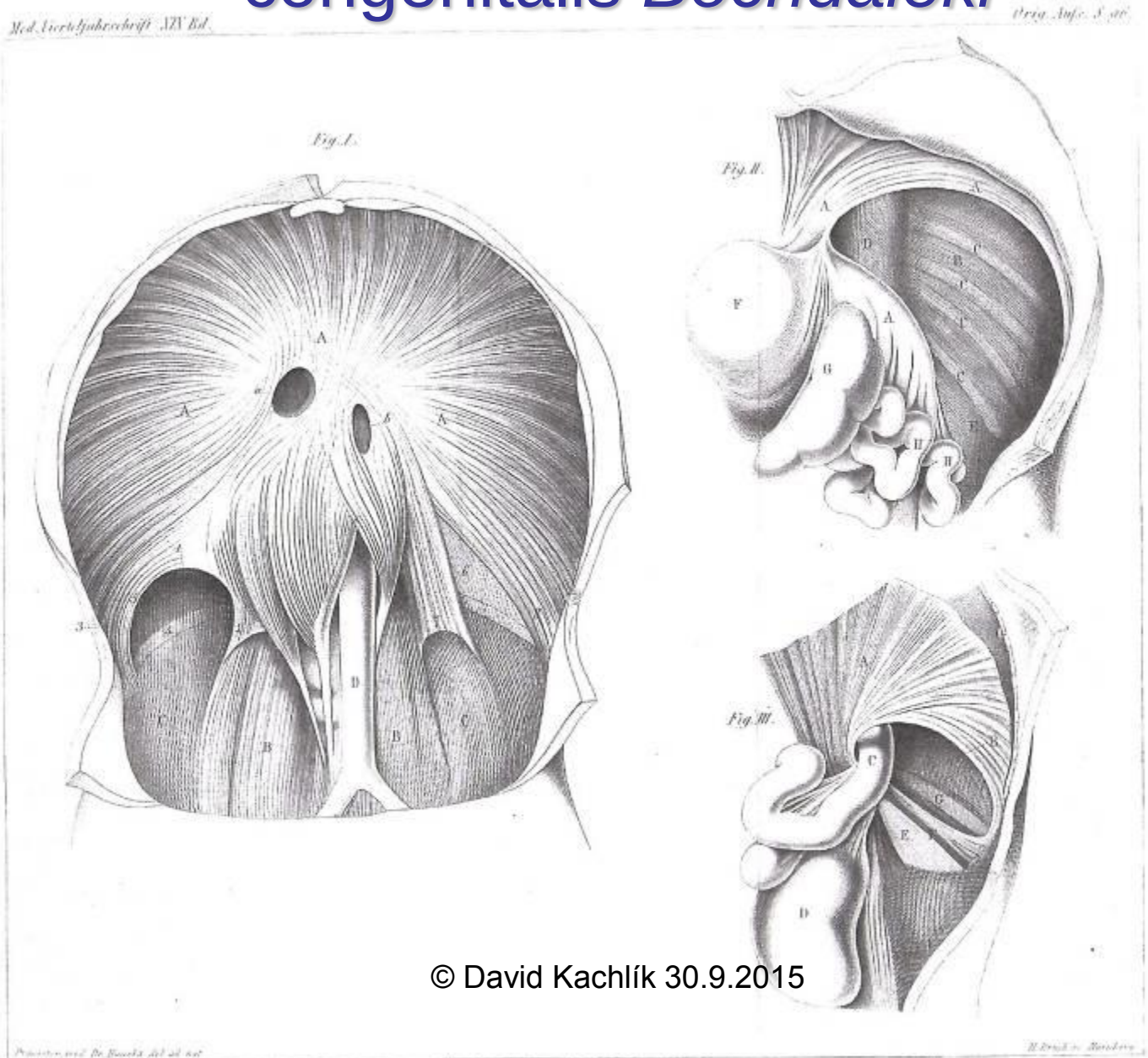
Hernia diaphragmatica posterolateralis congenitalis *Bochdaleki*



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Vincenz Alexander Bochdalek

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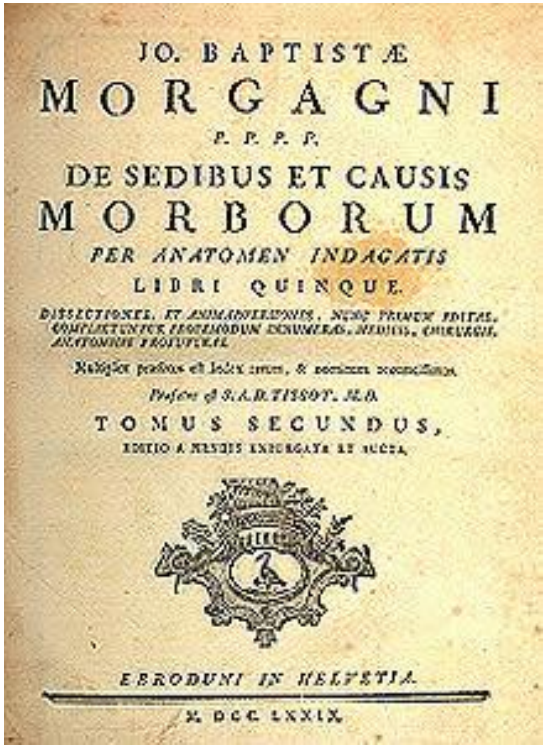
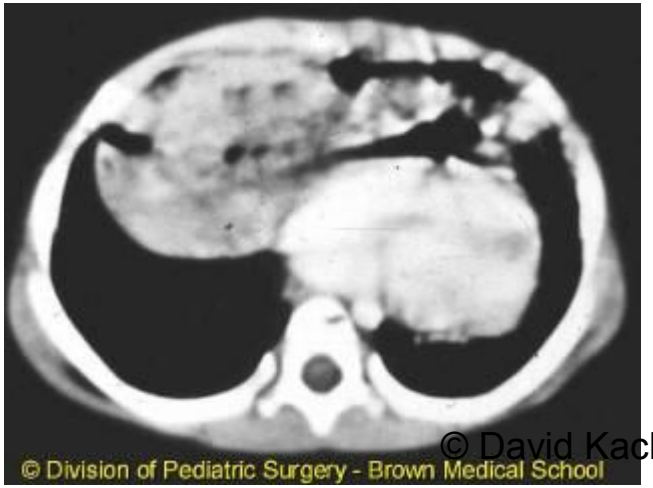
1801 Skripov – † 1883 Litoměřice

Giovanni Battista Morgagni

- 1682 –1771
- Italy
- founder of pathology


JO. BAPTISTÆ
MORGAGNI
P. P. P. P.
DE SEDIBUS ET CAUSIS
MORBORUM
PER ANATOMEN INDAGATIS
LIBRI QUINQUE.
TOMUS SECUNDUS,
EBRODUNI IN HELVETIA.
M. DCC. LXXIX.



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Break – 5 minutes

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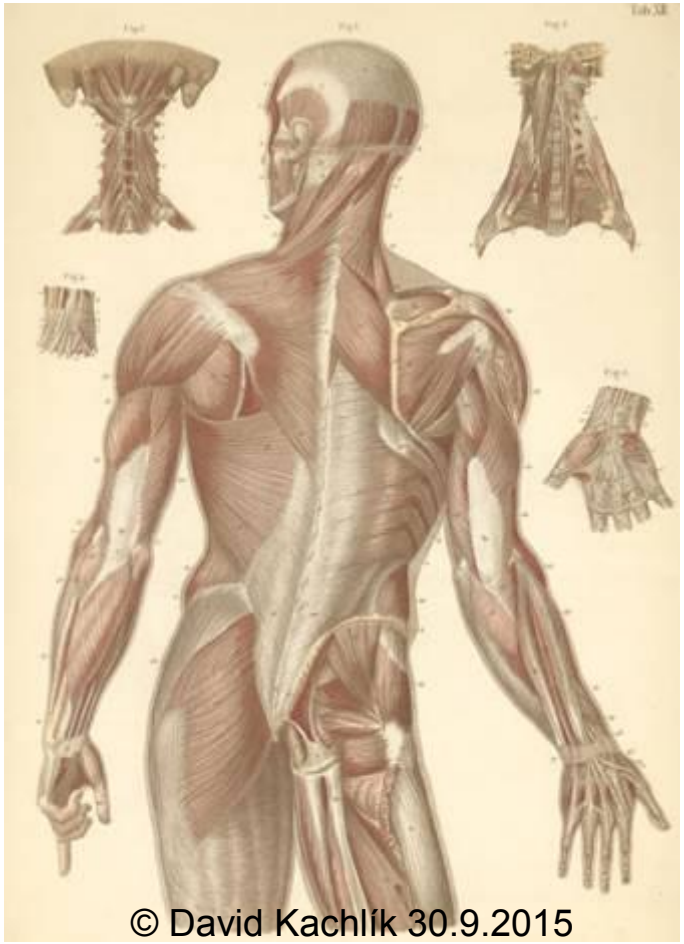
Muscles of back
Musculi dorsi



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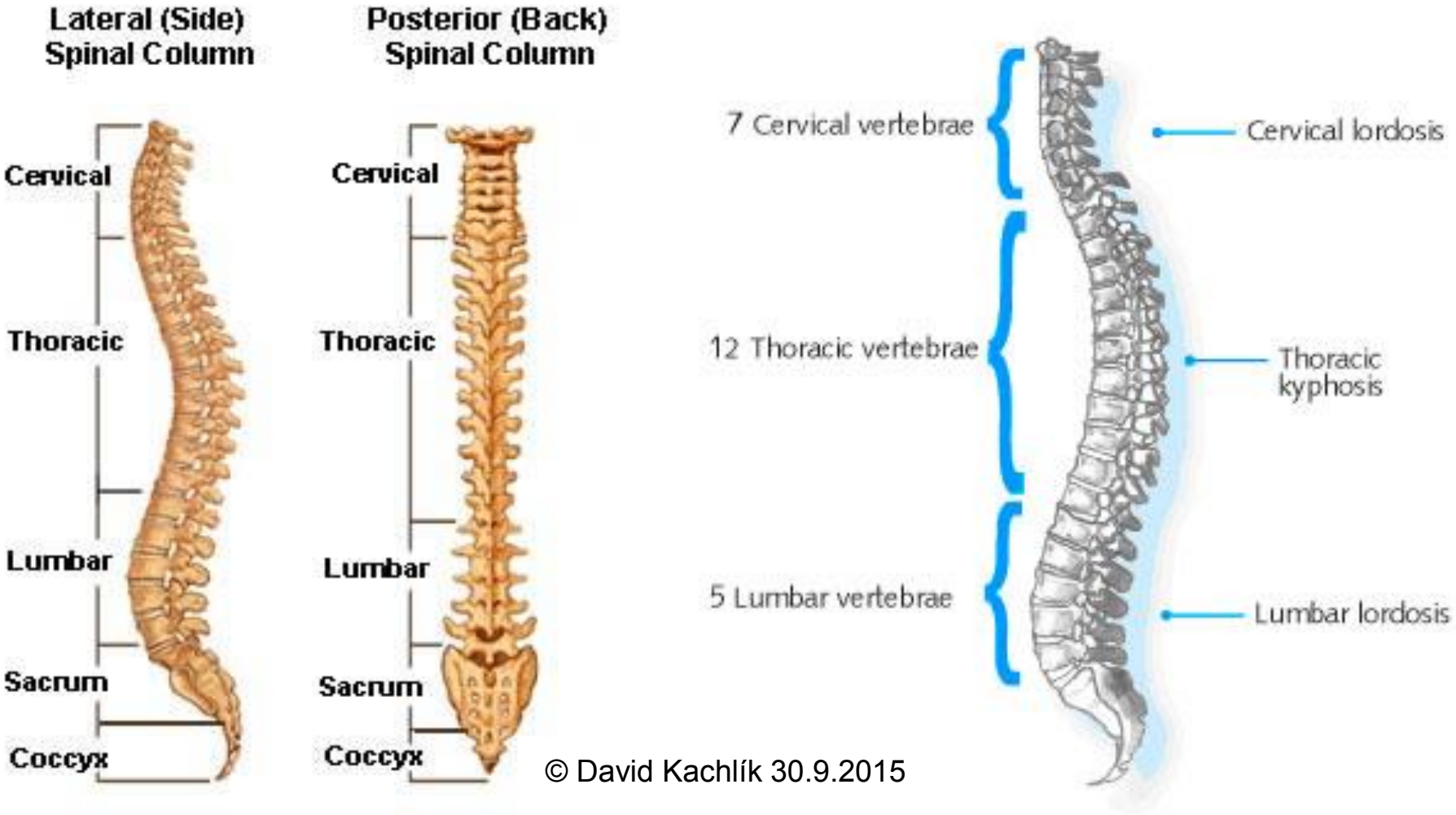
Vertebral column
Columna vertebralis



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Development

- *epaxial muscules = autochthonous*

  → **deep dorsal muscules**

- *myoseptum horizontale* – fish

  → **lamina media fasciae thoracolumbalis**

- *hypaxial muscules = heterochthonous*

  → all other muscles:

  limbs, head, neck, thorax, abdomen + 3 superficial layer dorsal muscules

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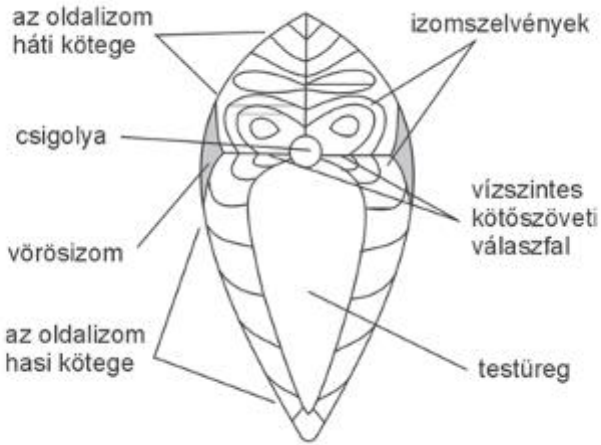
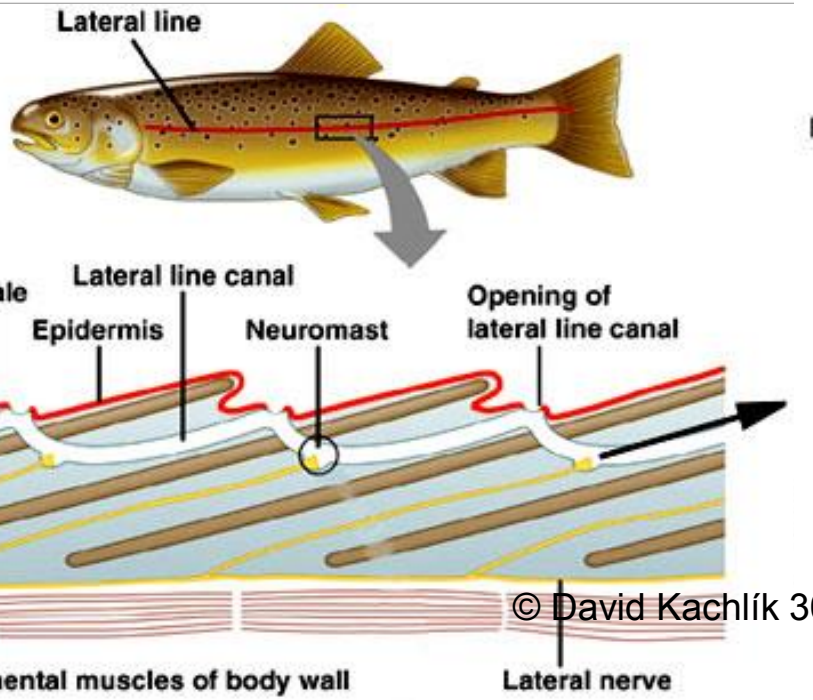
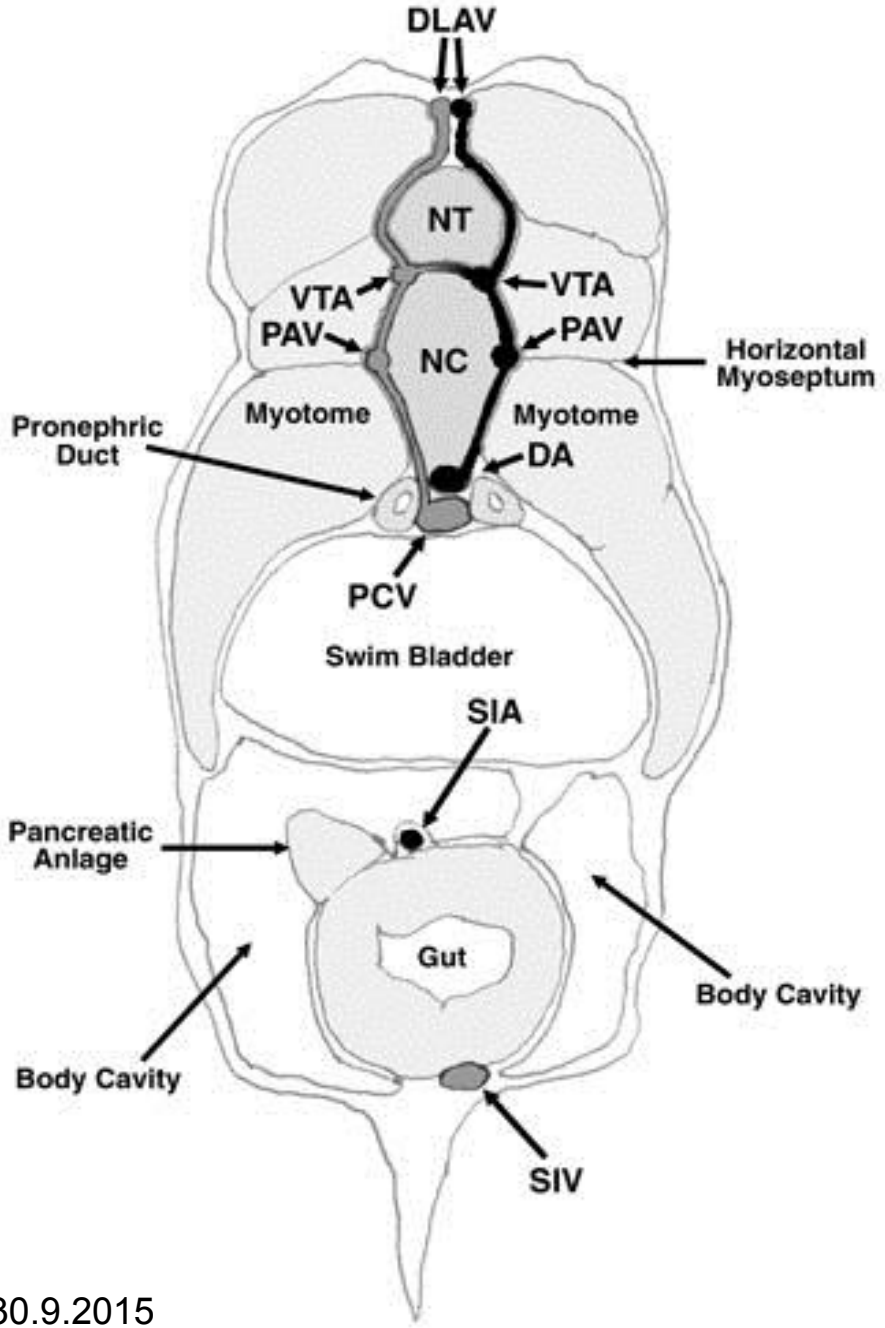
Development







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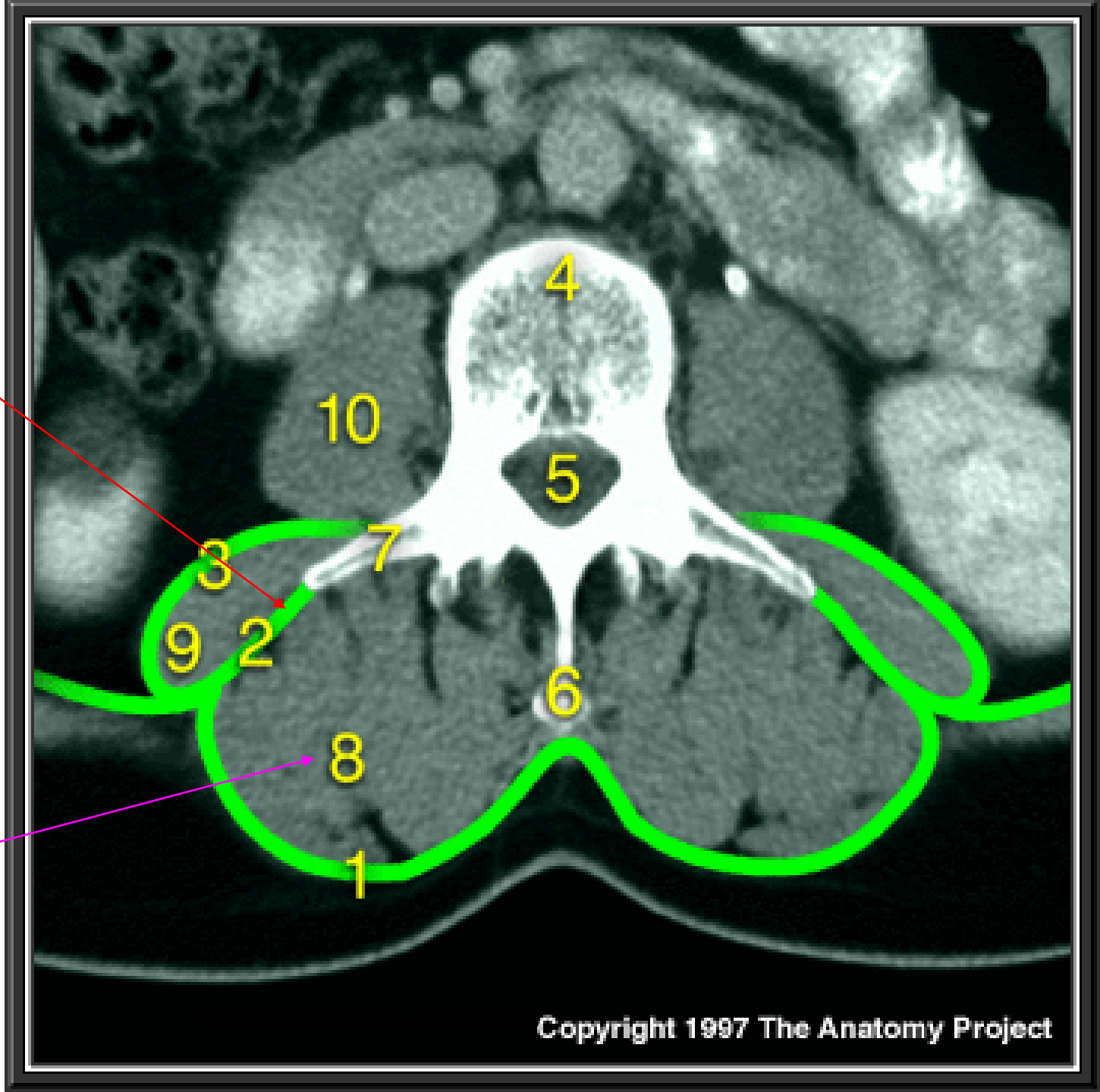
CT

lamina media fasciae thoraco-lumbalis

epaxial muscles



Muscles of back (*Musculi dorsi*)

4 layers:

- superficial (first)

= spinohumeral muscles

- second layer

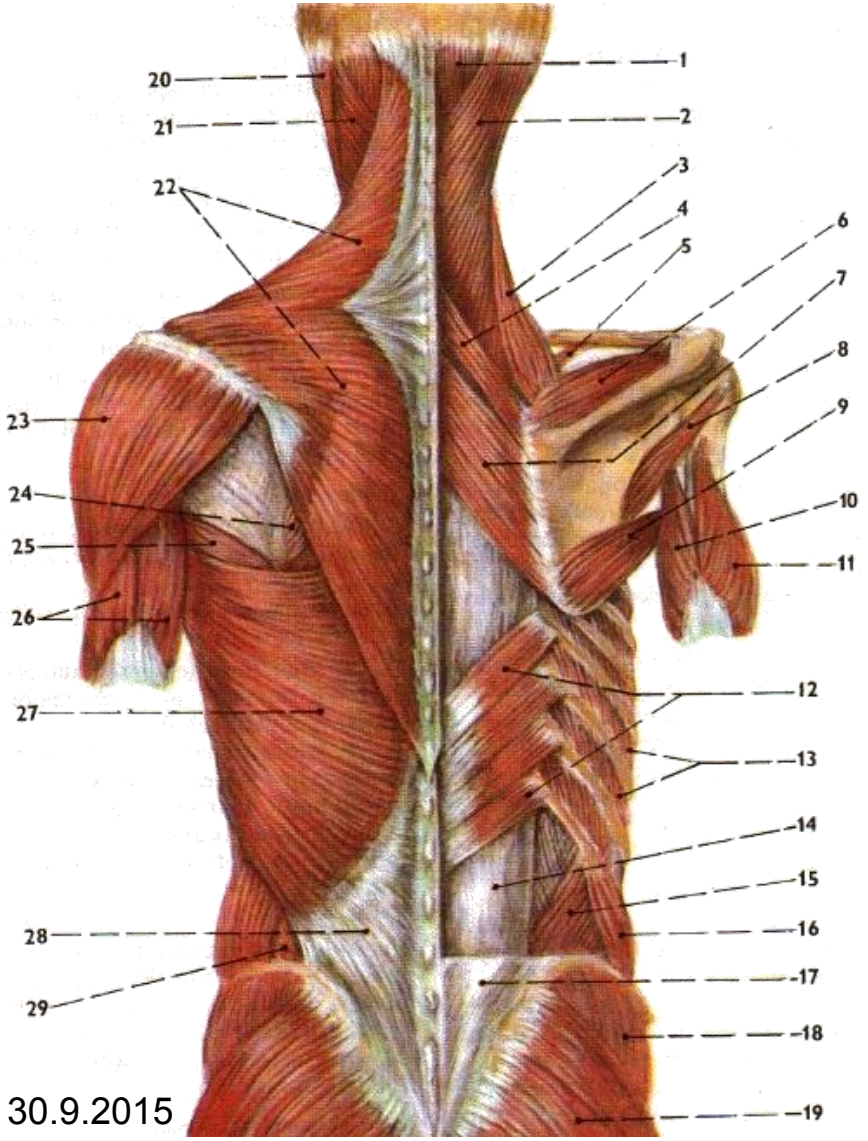
= spinoscapular muscles

- third layer

= spinocostal muscles

- fourth layer

= deep (proper) dorsal muscles = epaxial muscles



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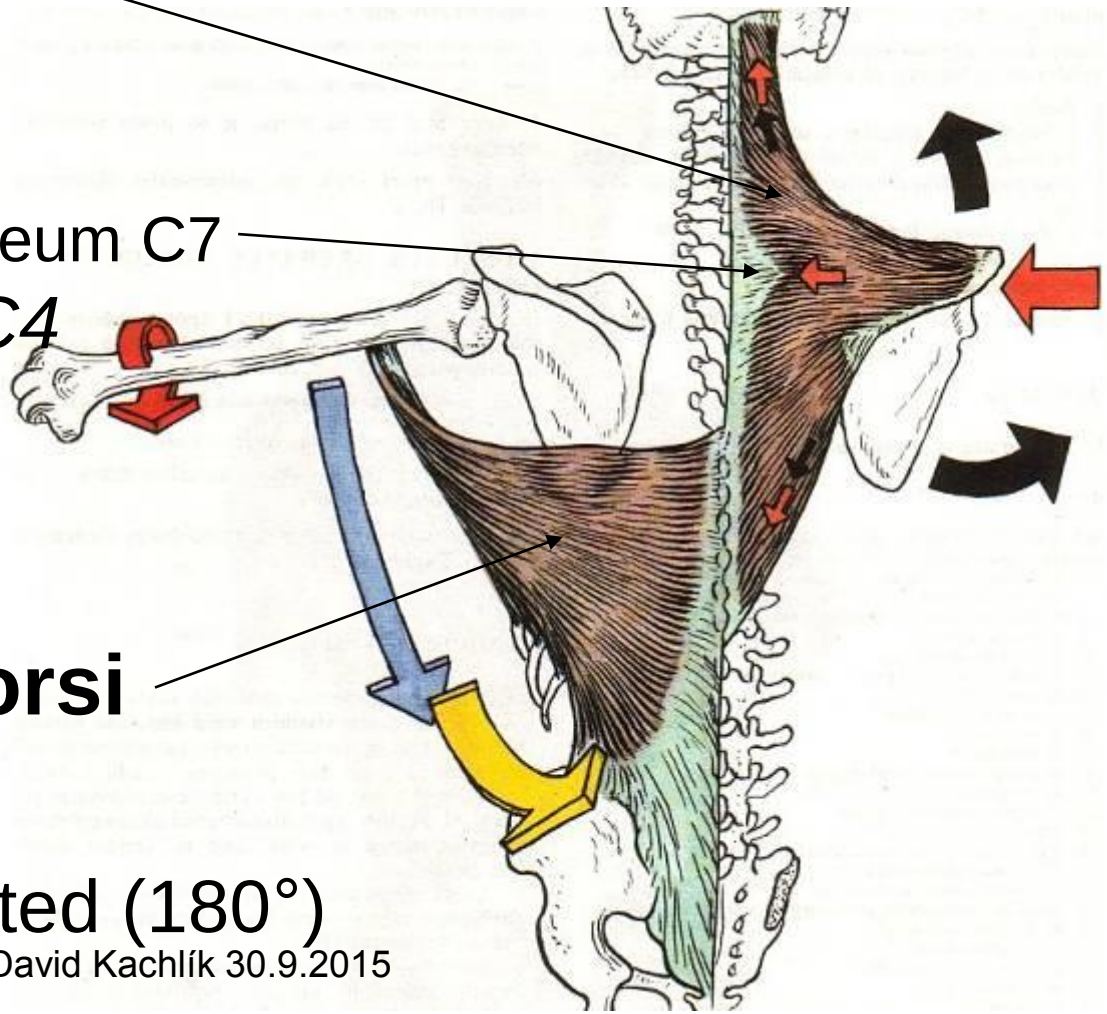
Superficial (first) layer

- **m. trapezius**
  - pars descendens
  - pars transversa
  - pars ascendens
  - speculum rhomboideum C7

n. accessorius + C3-C4



- **m. latissimus dorsi**

n. thoracodorsalis

insertion tendon inverted (180°)

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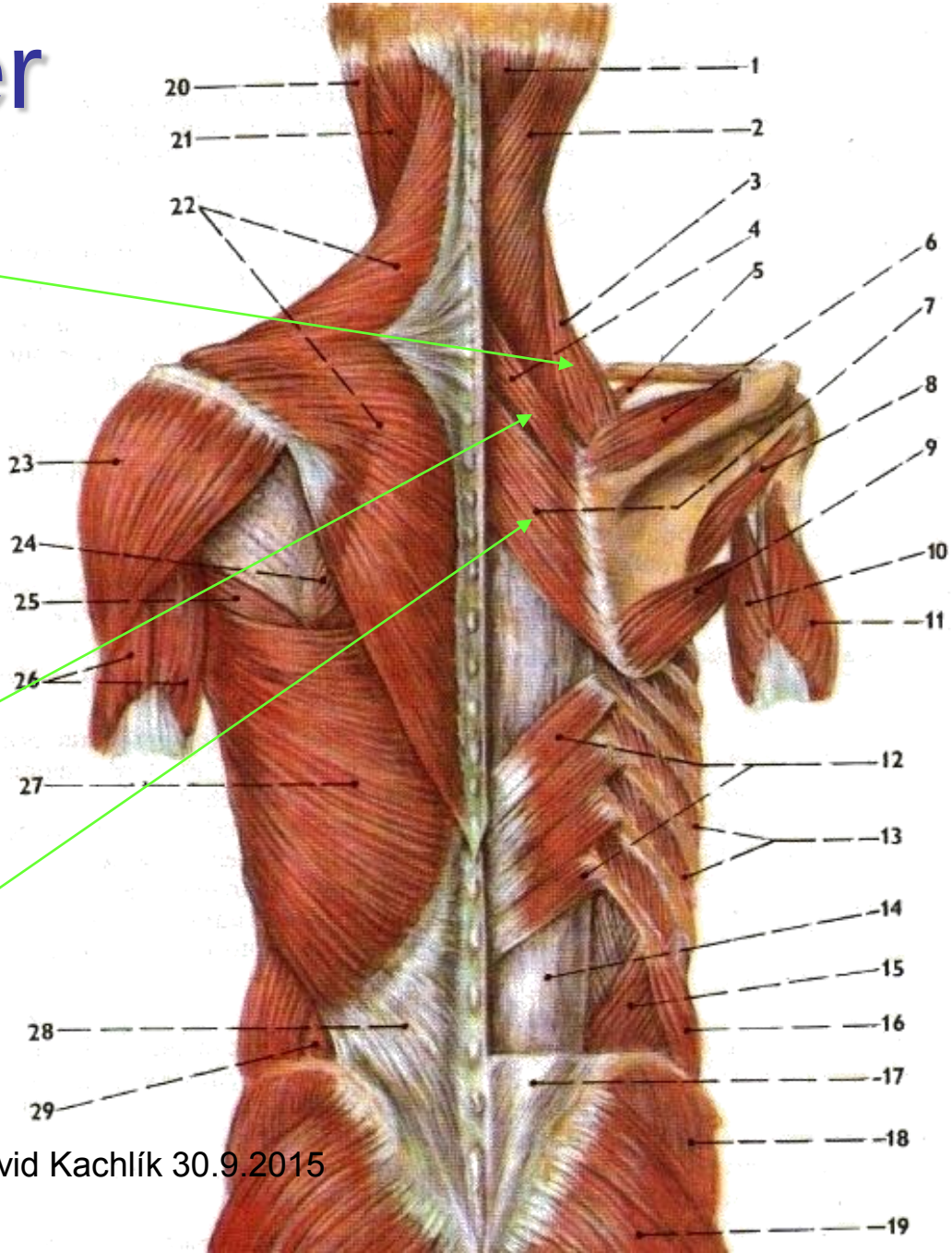
Second layer

- **m. levator scapulae**

C3,4 + n. dorsalis scapulae (C5)

- **m. rhomboideus minor**
- **m. rhomboideus major**

n. dorsalis scapulae



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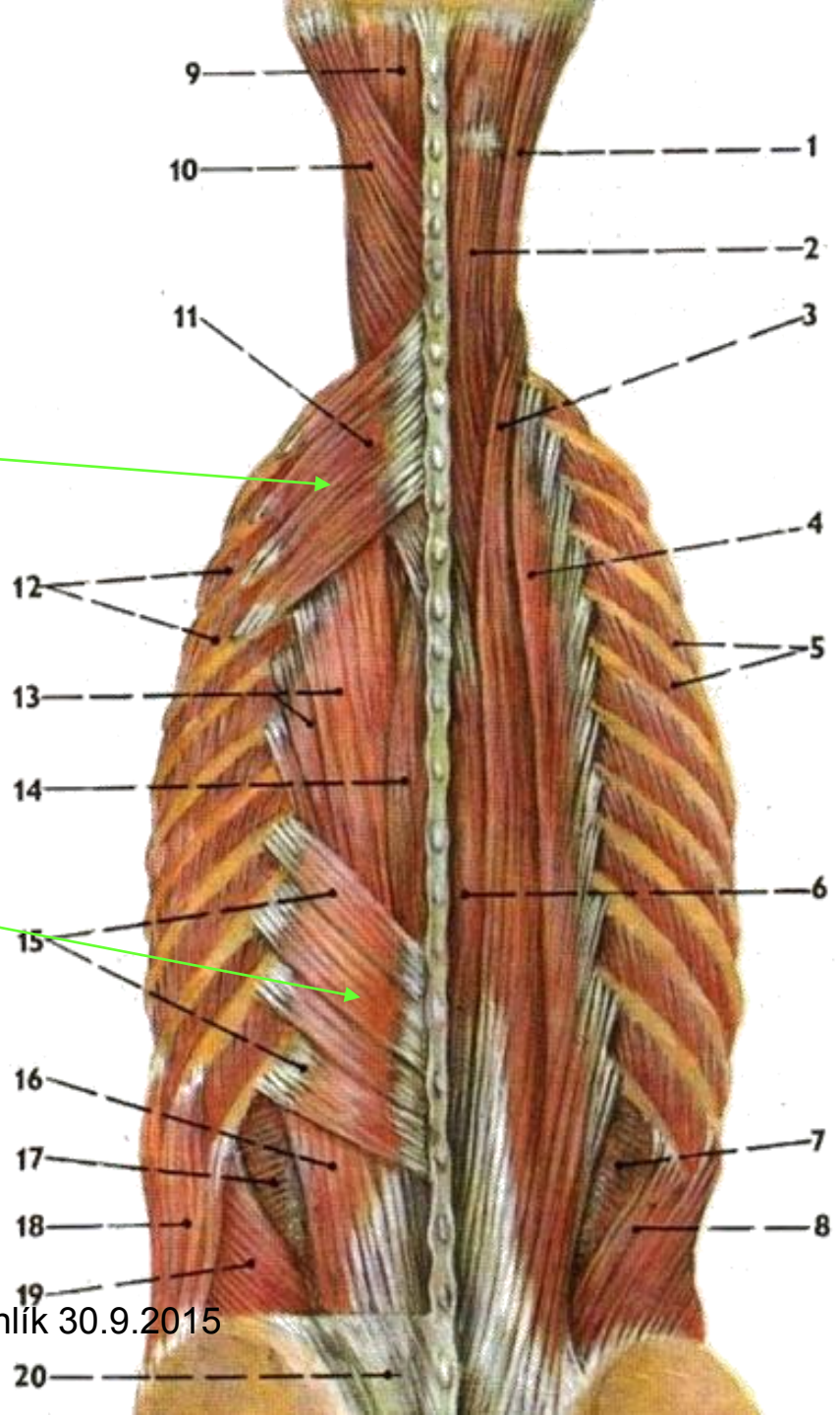
Third layer

- **m. serratus posterior superior**

nn. intercostales 2-5

- **m. serratus posterior inferior**

nn. intercostales 9-11 + n. subcostalis



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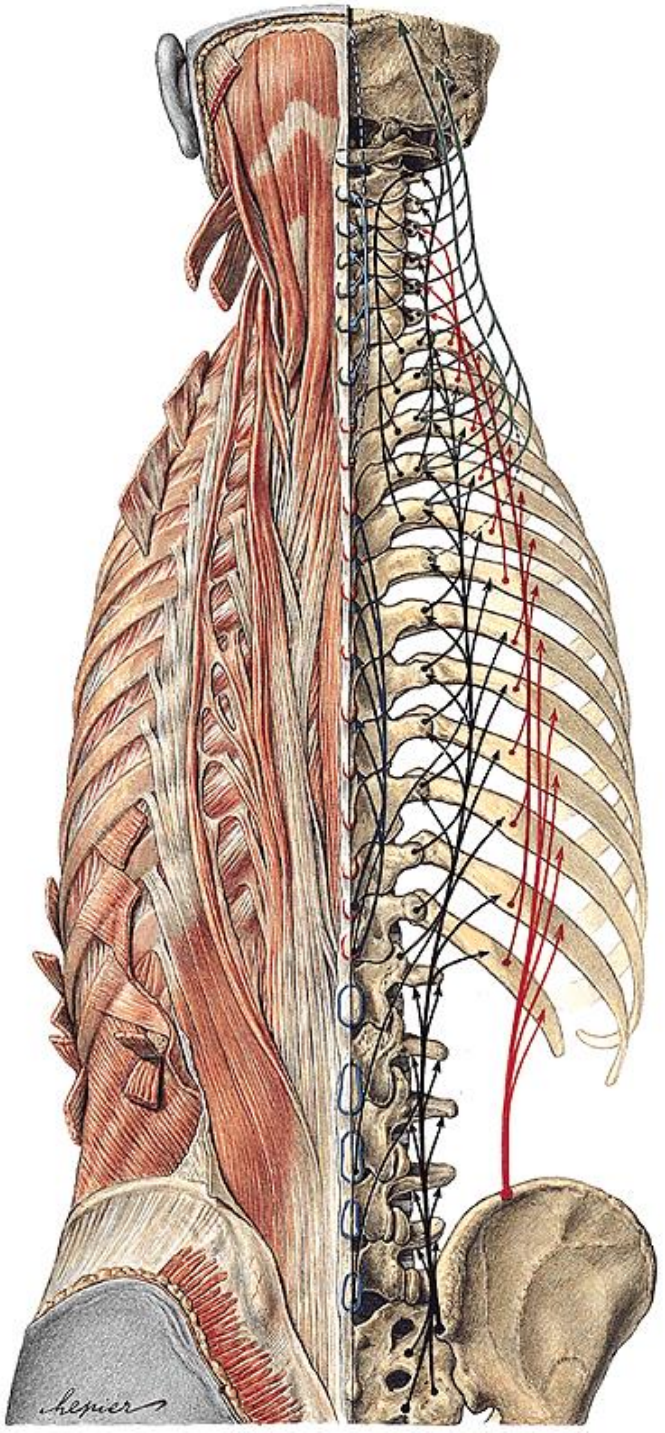
Deep (fourth) layer

- „proper muscles of back“
- epaxial muscles → derivates of somites → segmental organization + inervation
- inervation:

rami posteriores nervorum spinalium



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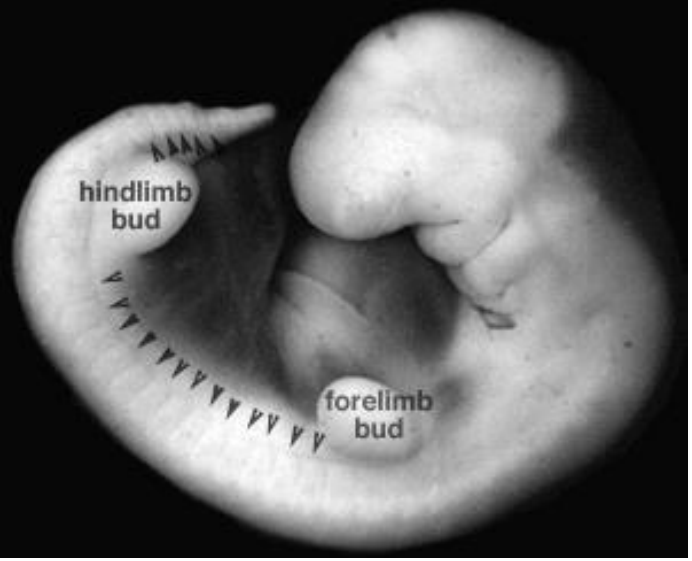
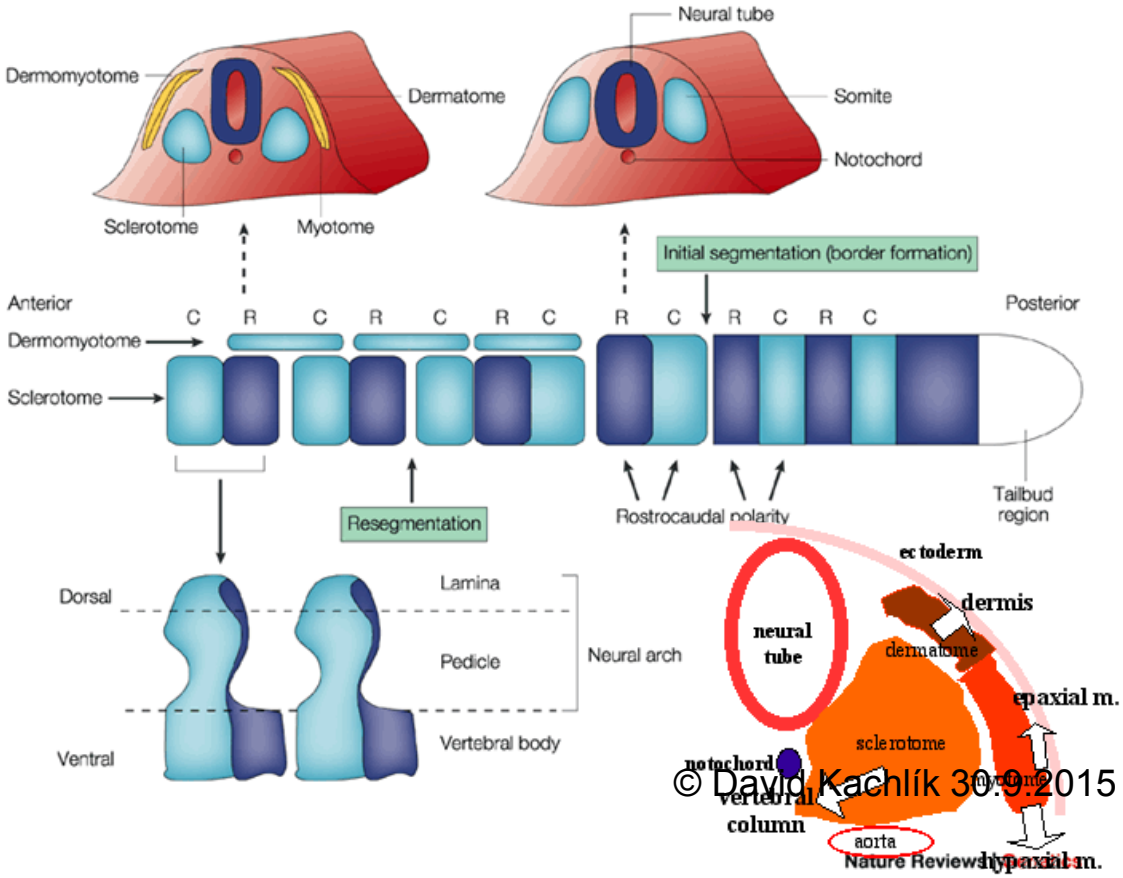
Somites



- 42-44



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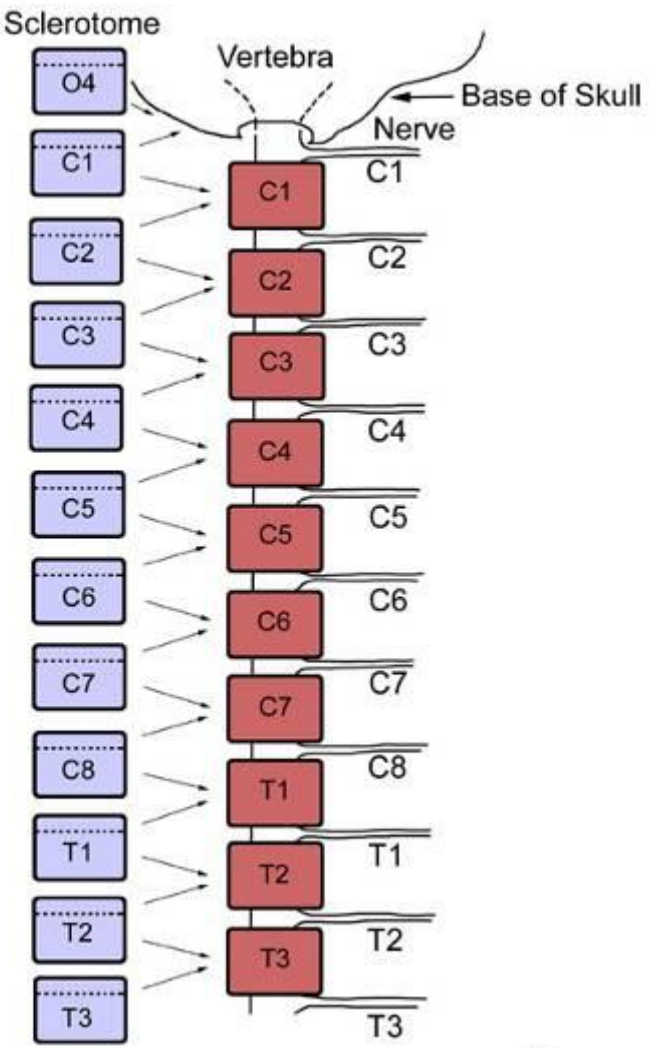
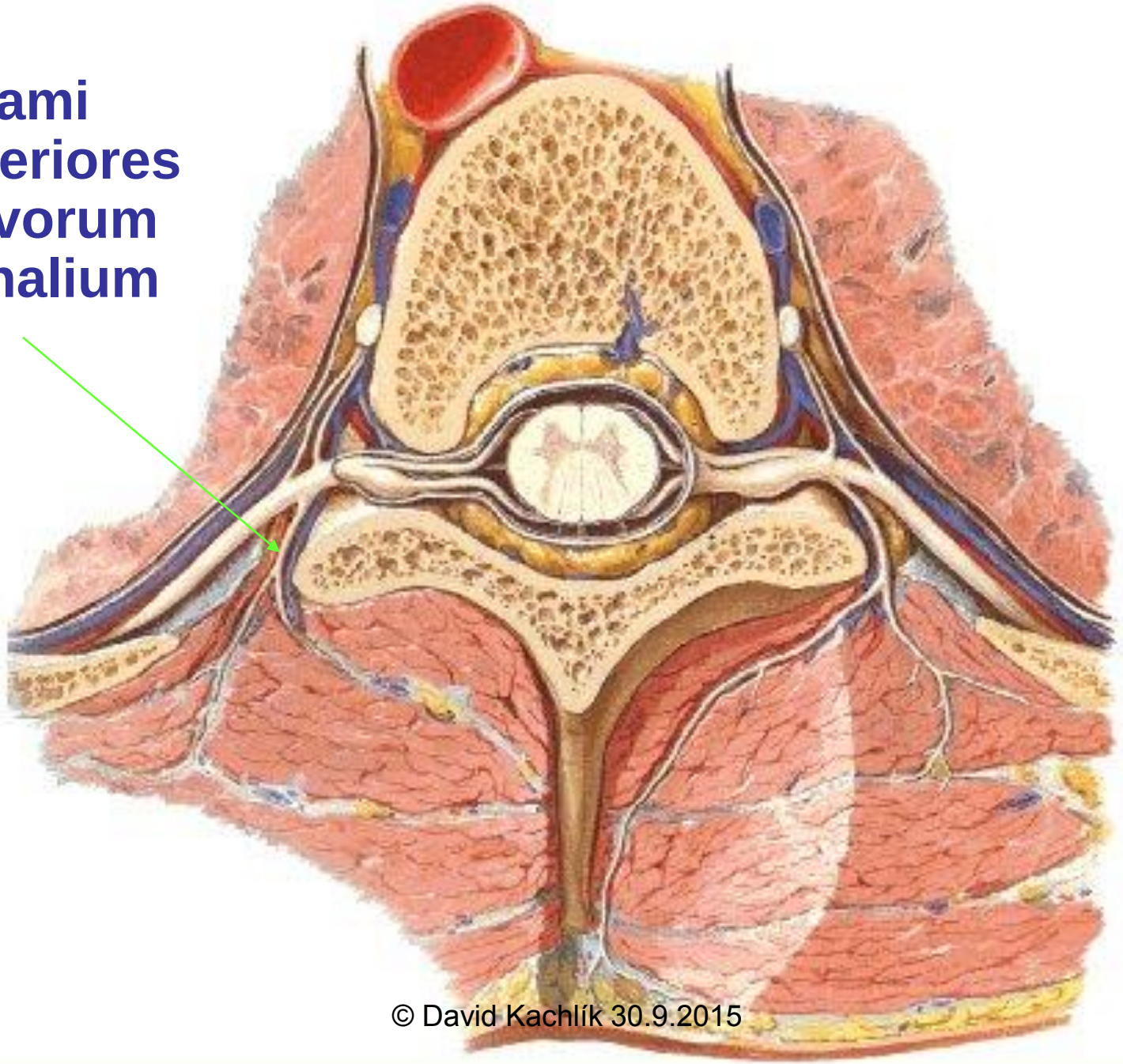


rami posteriores nervorum spinalium



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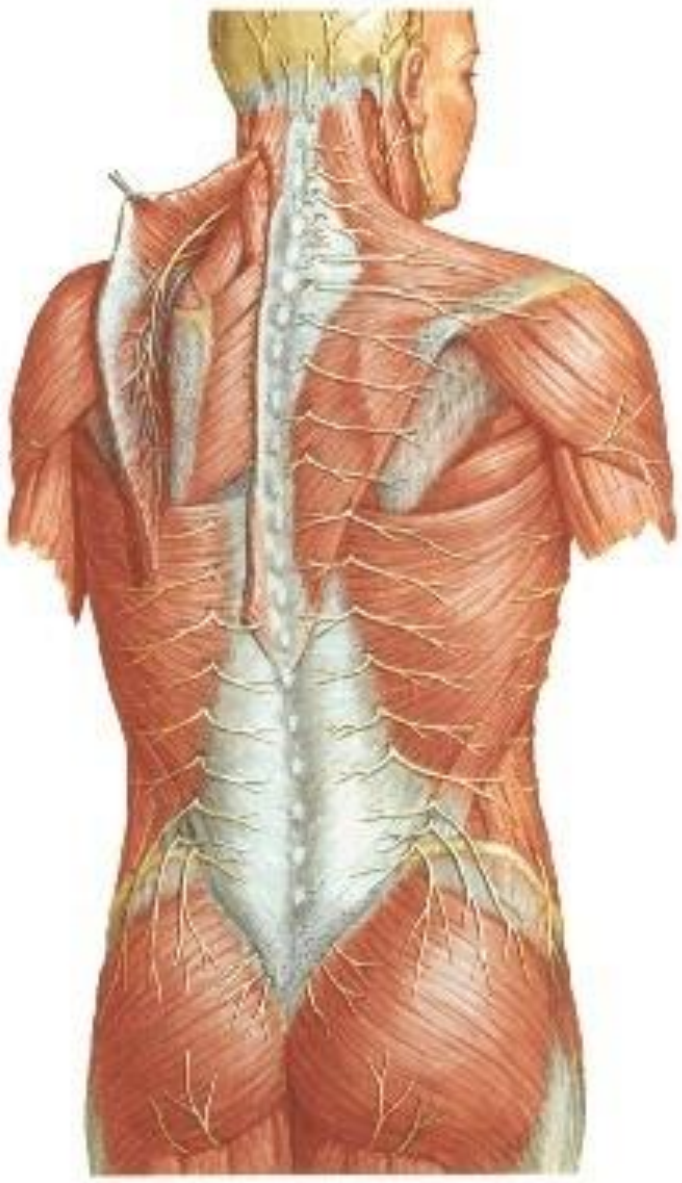
Rami posteriores nervorum spinalium

- segmental arrangement
- no plexuses
- mixed nerves
  - motor – deep muscles of back
  - sensory – skin medially to vertebral column



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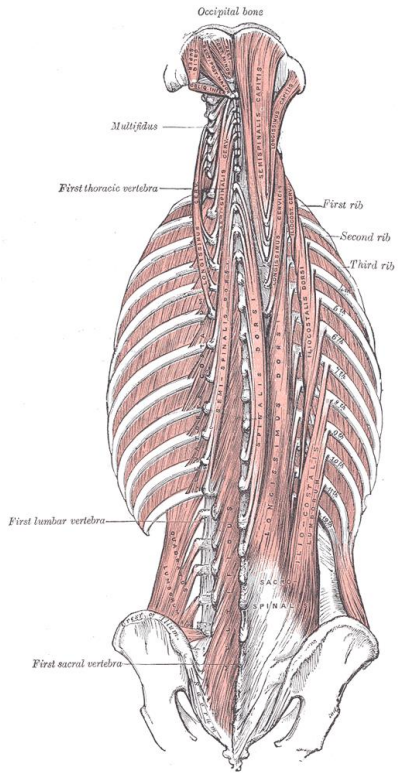
Deep (fourth) layer
Musculi dorsi proprii

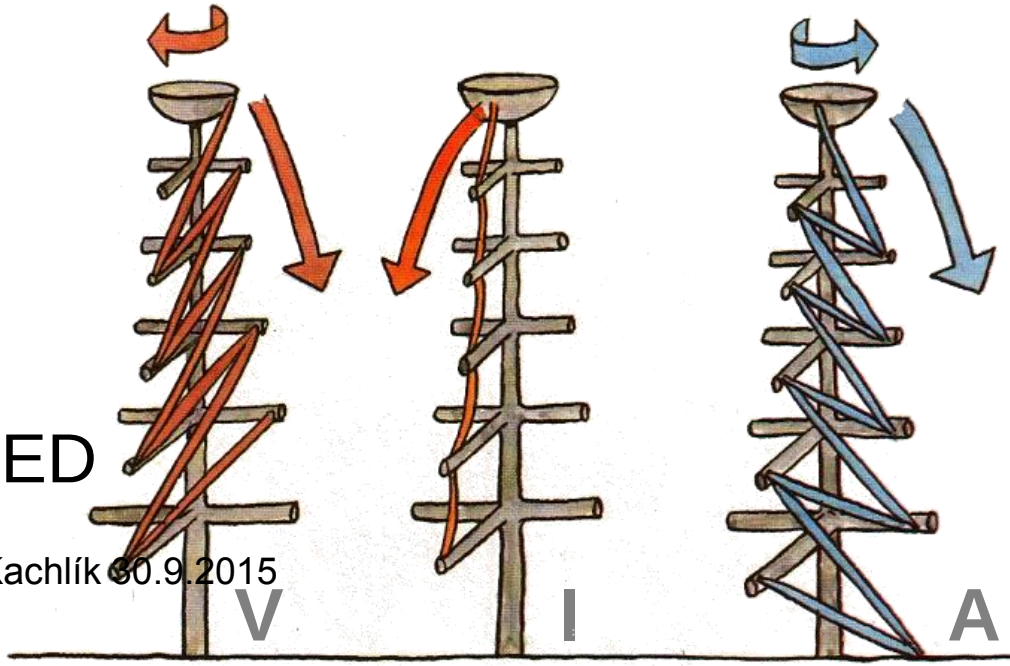


- 3 systema due direct fibres:
  - spinotransversal (form „V“)
  - spinospinal (form „I“)
  - transversospinal (form „A“)

- short dorsal mm
  - mm. interspinales
  - mm. intertransversarii

- **deep neck muscules**

- ANATOMICAL DEFINATED MUSCULES



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M. ERECTOR SPINAE

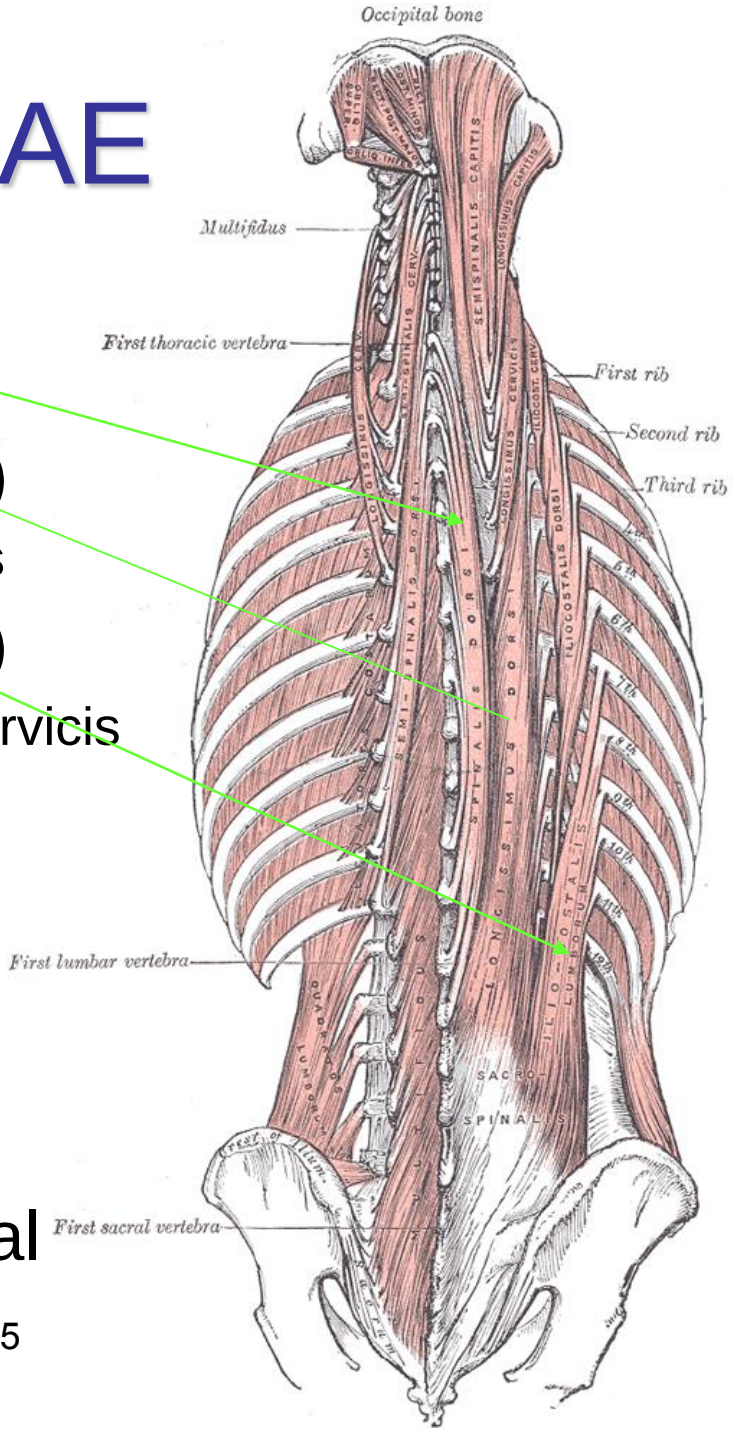
- **M. SPINALIS** (shape „I“)
  - thoracis, cervicis, capitis
- **M. LONGISSIMUS** (shape „V“)
  - thoracis (pars lumbalis), cervicis, capitis
- **M. ILIOCOSTALIS** (shape „V“)
  - lumborum (pars lumbalis, thoracica), cervicis

function:

bilateral – erection (extension) of vertebral column

– retroflexion of head

unilateral – lateroflexion and ipsilateral rotation of vertebral column



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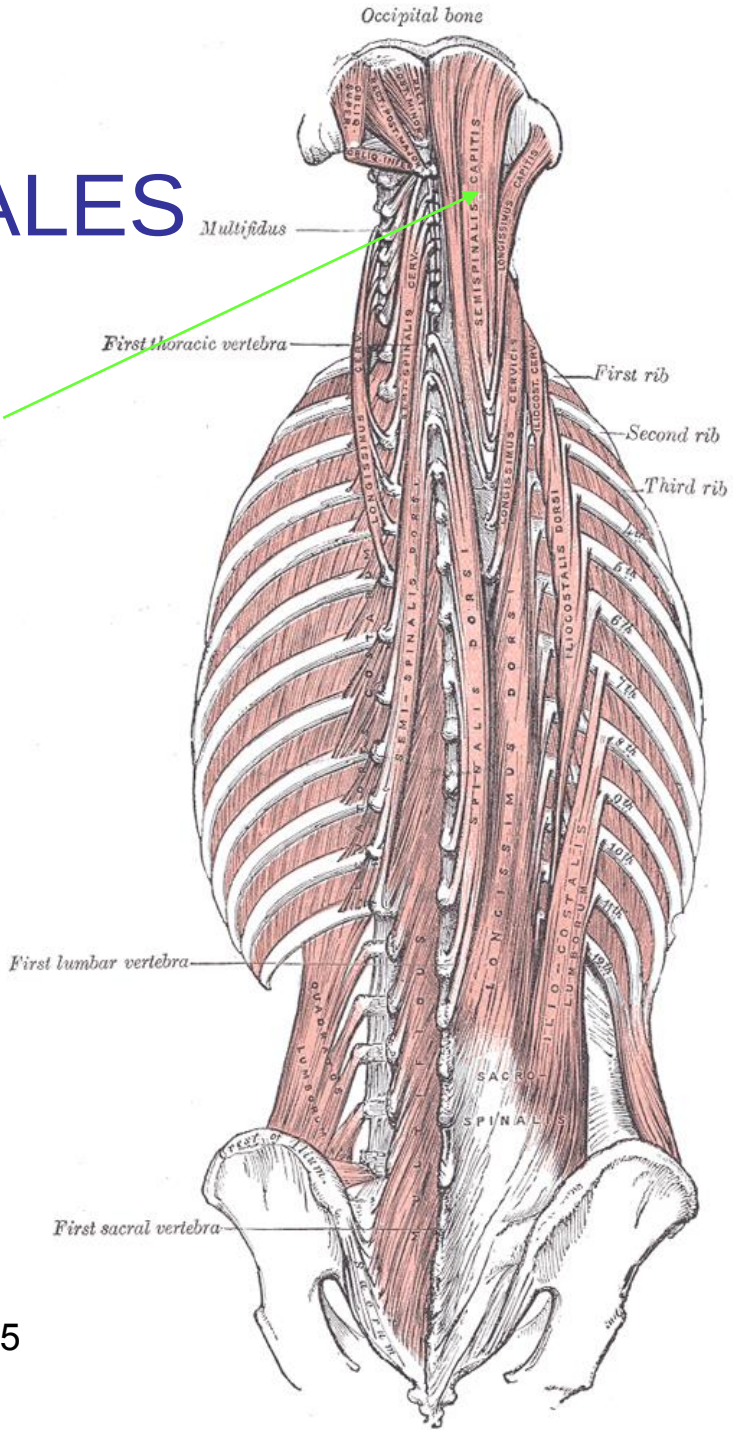
MM. SPINOSTRANSVERSALES

- **M. SPLENIUS** (shape „V“)
  - **cervicis, capitis**

function: retroflexion, rotation



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MM. TRANSVERSOSPINALES

- **M. SEMISPINALIS**

  (shape „A“)

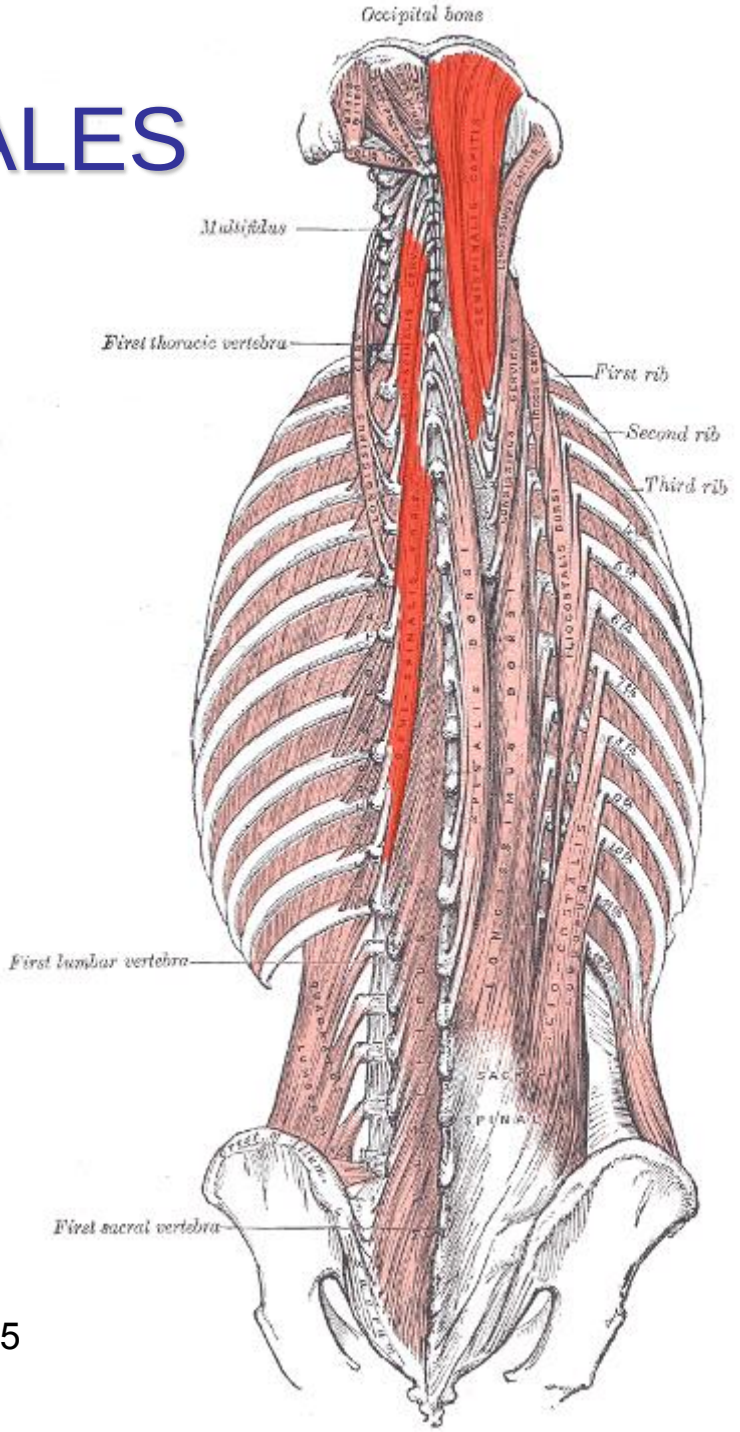
  – thoracis, cervicis, capitis

function:

bilateral – erection (extension) of vertebral column

– retroflexion of head

unilateral – lateroflexion of vertebral column and head and contralateral rotation



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MM. TRANSVERSOSPINALES 2.

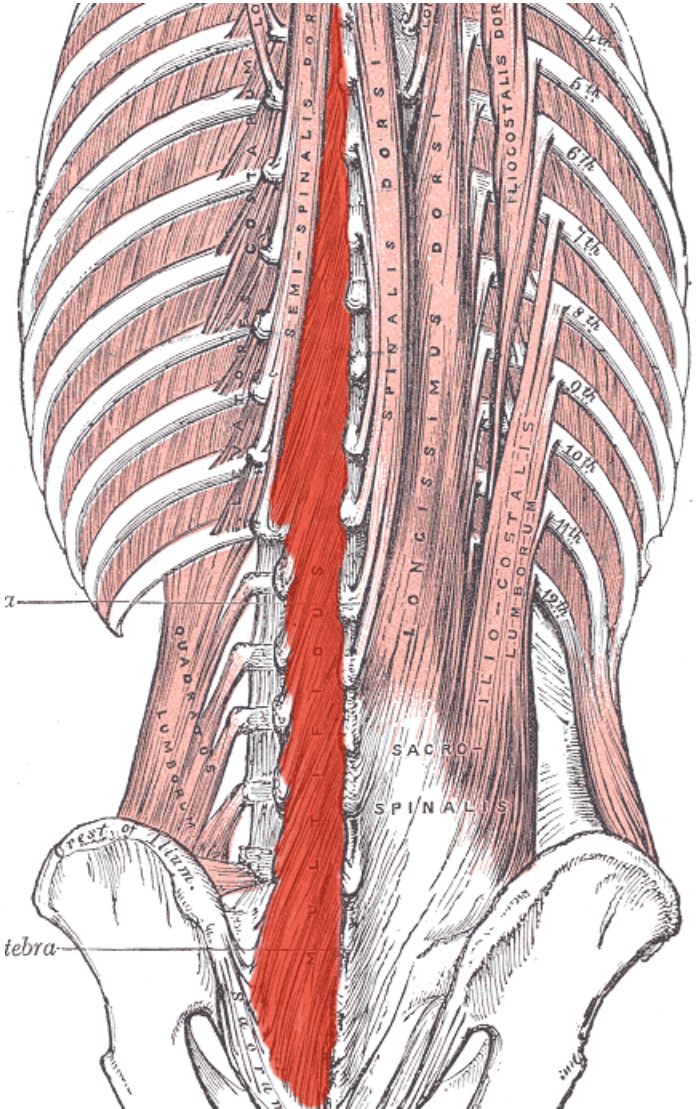
- **MM. MULTIFIDI**
  (shape „A“)
  - lumborum, thoracis, cervicis

function:

bilateral – erection (extension) of vertebral column

– retroflexion of head

unilateral – lateroflexion of vertebral column and head and contralateral rotation



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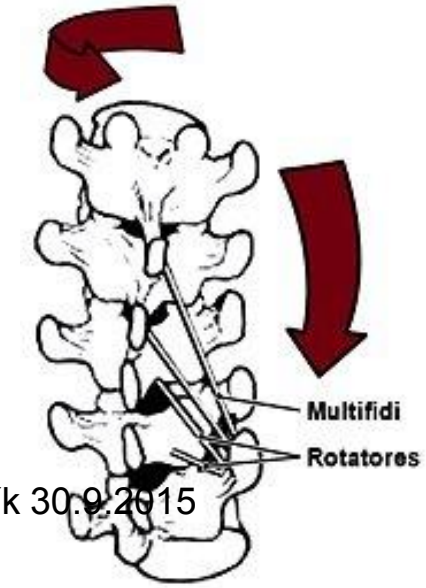
MM. TRANSVERSOSPINALES

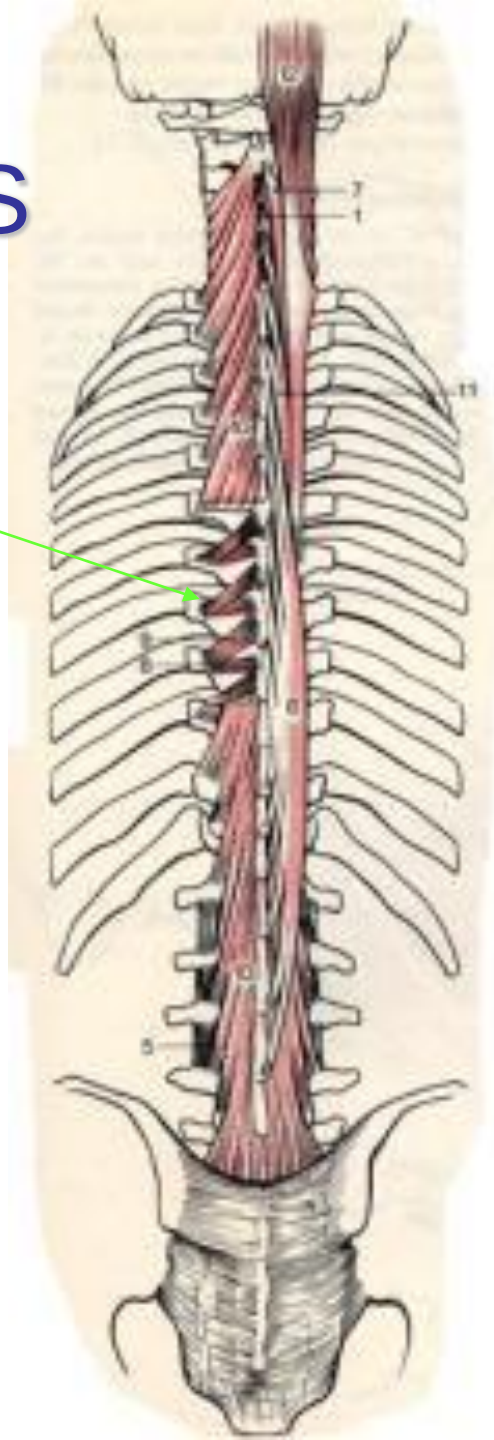
- **MM. ROTATORES**
  - **LONGI**
  - **BREVES**

(form „A“)

- lumborum, thoracis, cervicis

•*<u>function</u>:*
•bilateral – erection (extension)of vertebral column
• – retroflexion of head
•unilateral – lateroflexion of vertebral column and head and contralateral rotation





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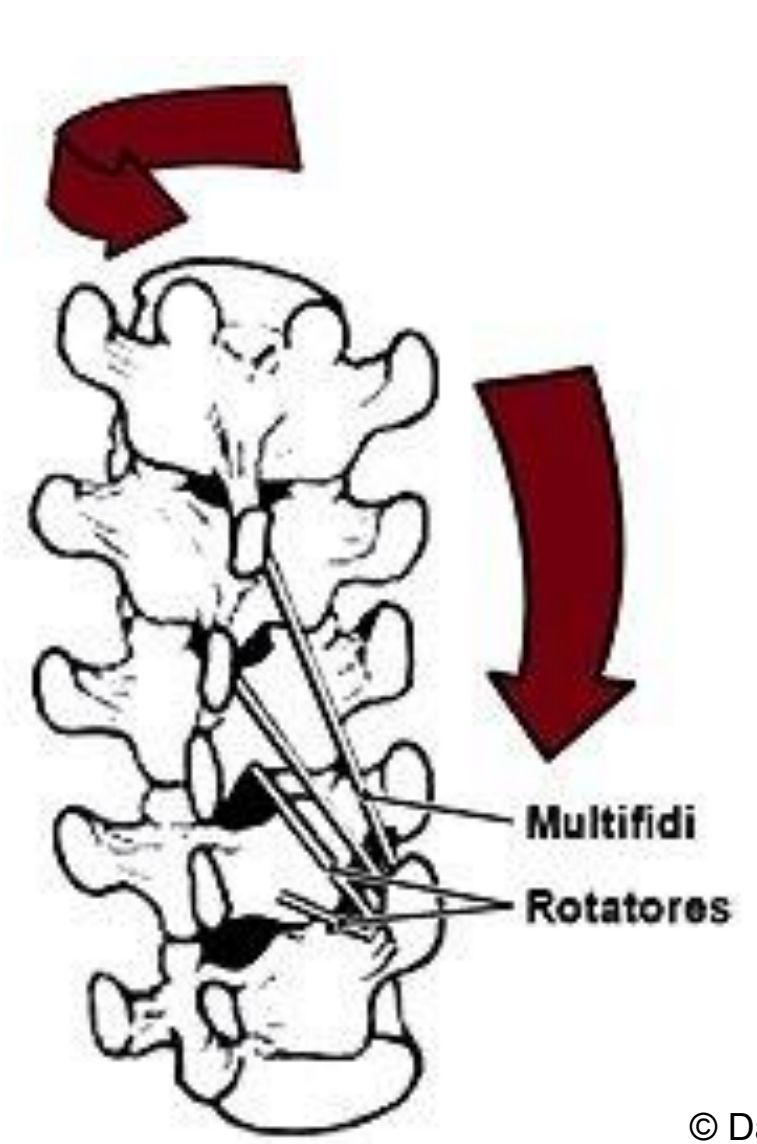
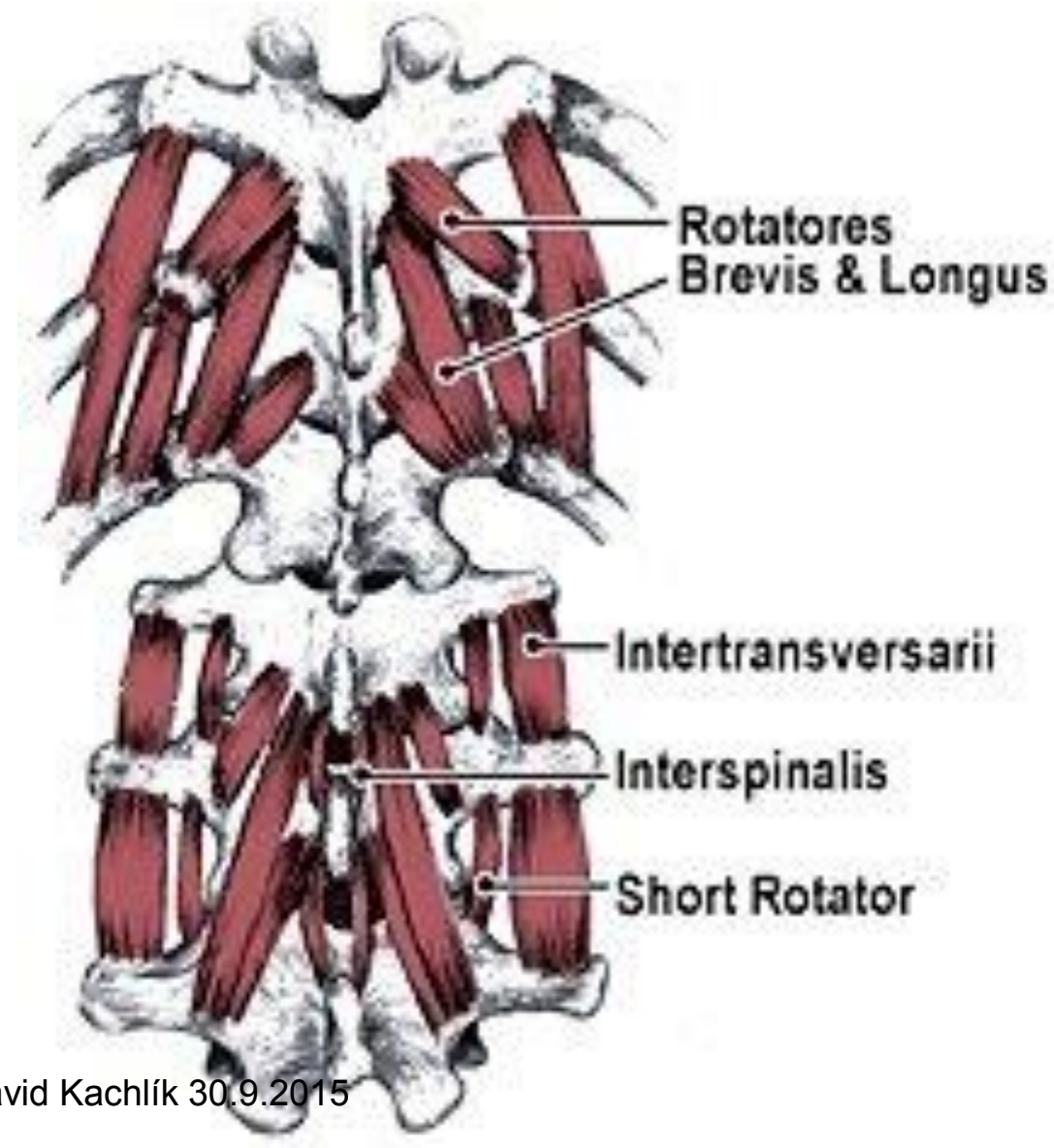
Deep and short muscles





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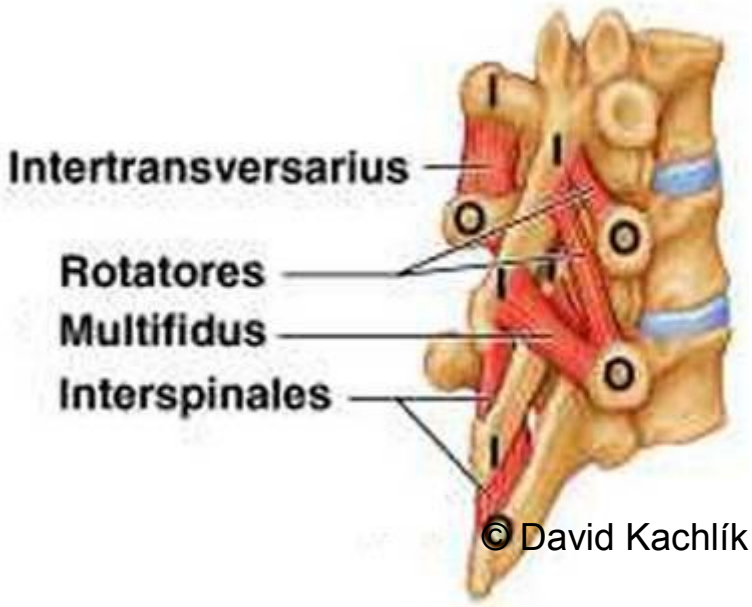
- **MM. INTERTRANSVERSARII**
- **MM. INTERSPINALES**

function:

small muscles contributing
to lateroflexion and retroflexion



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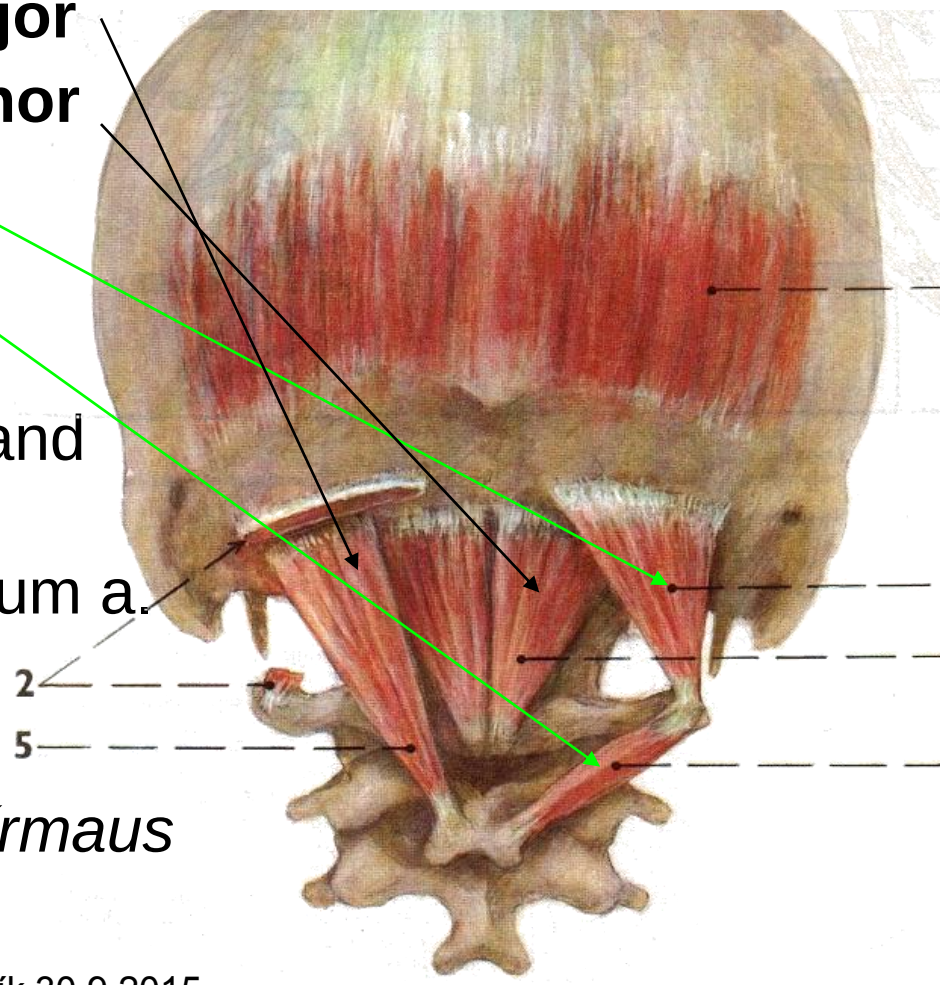
Suboccipital muscles

m. rectus capitis posterior major
m. rectus capitis posterior minor
m. obliquus capitis superior
m. obliquus capitis inferior



- balance movements of head and C1, C2
- trigonum suboccipitale (trigonum a. vertebralis)

- innervation: *n. suboccipitalis (rmaus posterior nervi spinalis C1)*

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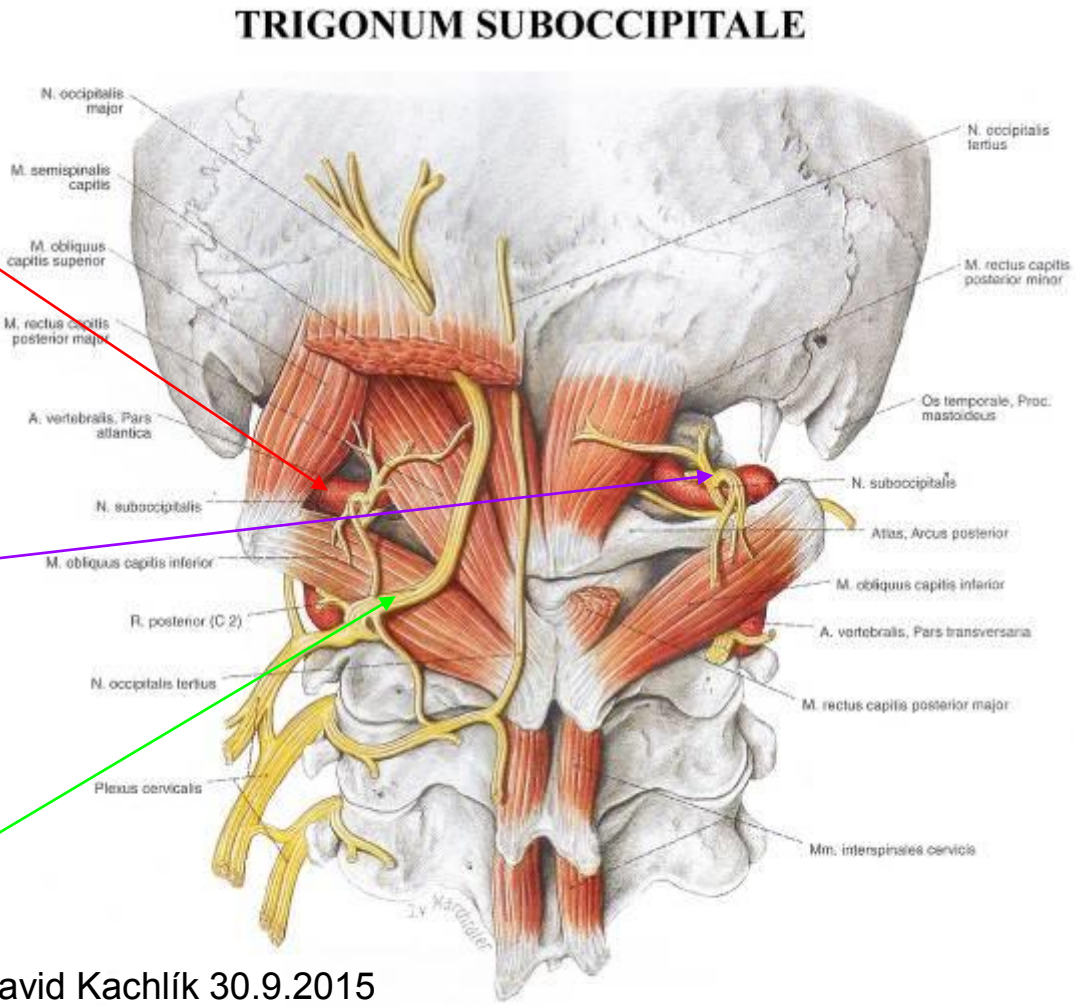
Trigonum suboccipitale

content:

- a. vertebralis (pars atlantica) - *running in depth*
- n. suboccipitalis - *emerging*
- n. occipitalis major – *passes superficially*



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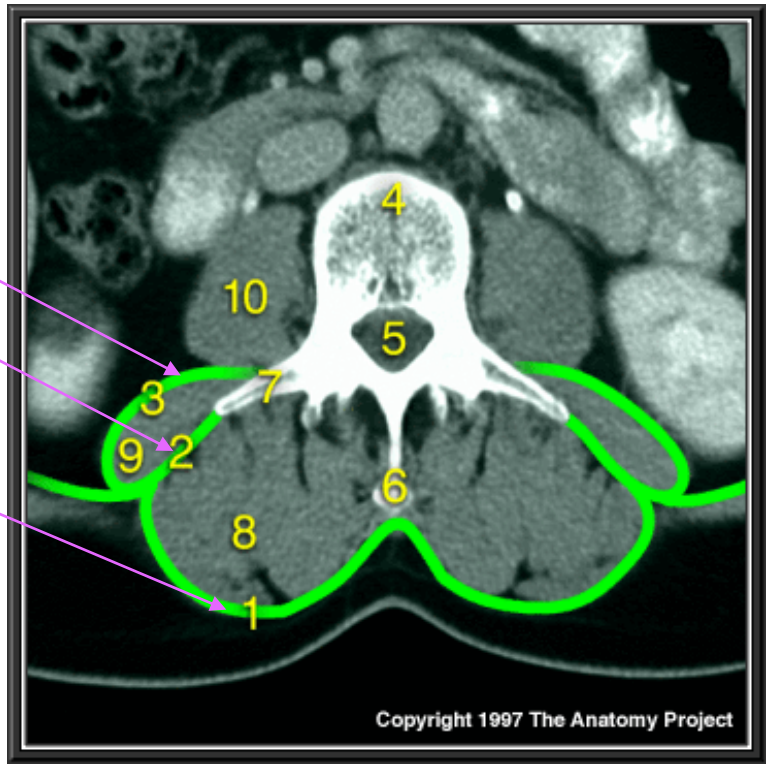
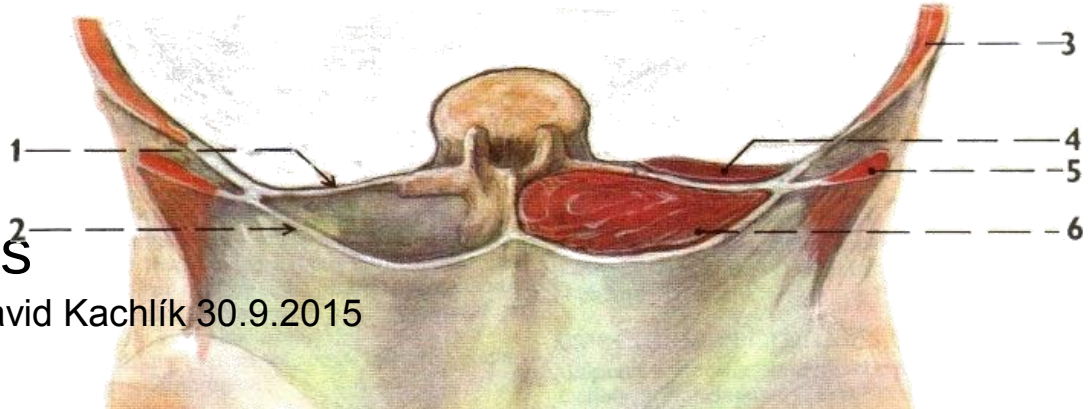
Fascia thoracolumbalis

- 3 layers
  - **lamina anterior**
  - **lamina media** = (original myoseptum horizontale in fish)
  - **lamina posterior**
- covers deep back muscles in lumbar region
- 3 laminae merge laterally
- origin site for 2 (out of 3) lateral abdominal muscles + m. latissimus dorsi





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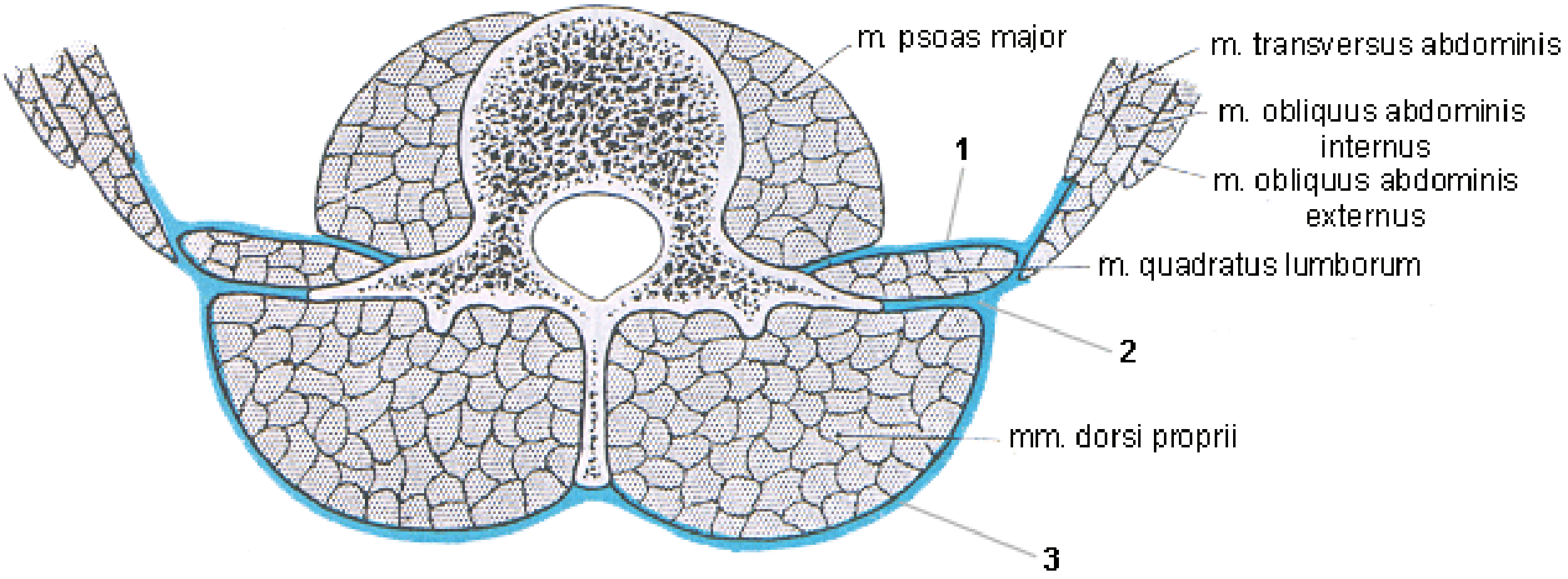
Fascia thoracolumbalis a její tři listy

1 - lamina anterior
2 - lamina media
3 - lamina posterior



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Michaelis rhomboid

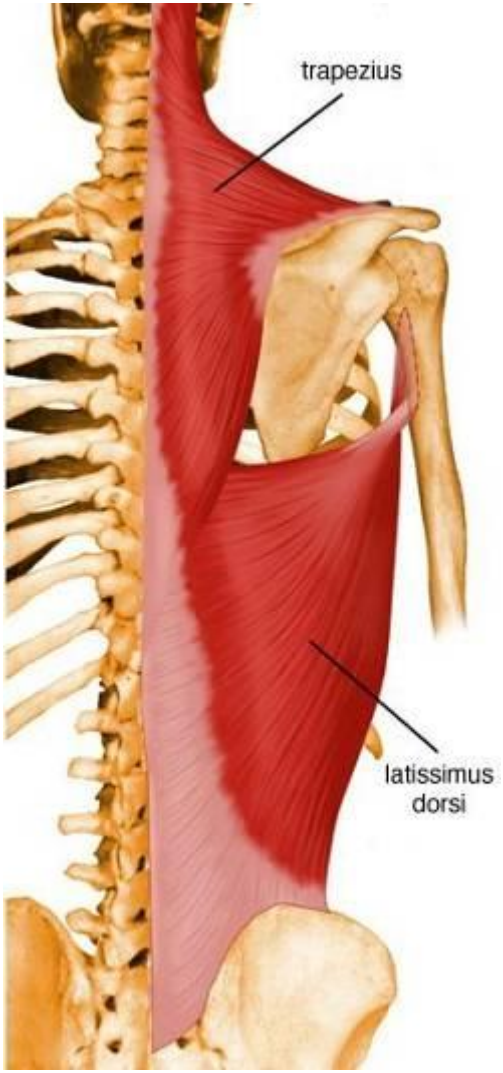
Rhombus; Rhomboid; Quadrilateral; Sacral quadrangle

- **Gustav Adolf Michaelis**

(1798-1848)

German obstetrician

- regular rhomboid shape marks correct pelvic proportions and same length of both limbs



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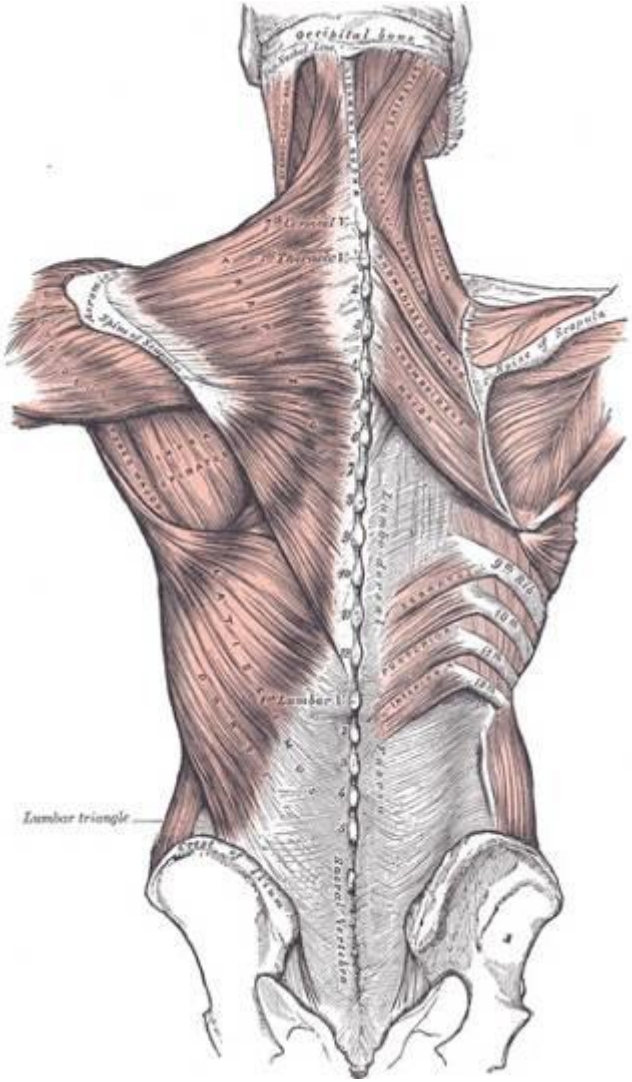
Michaelis rhomboid



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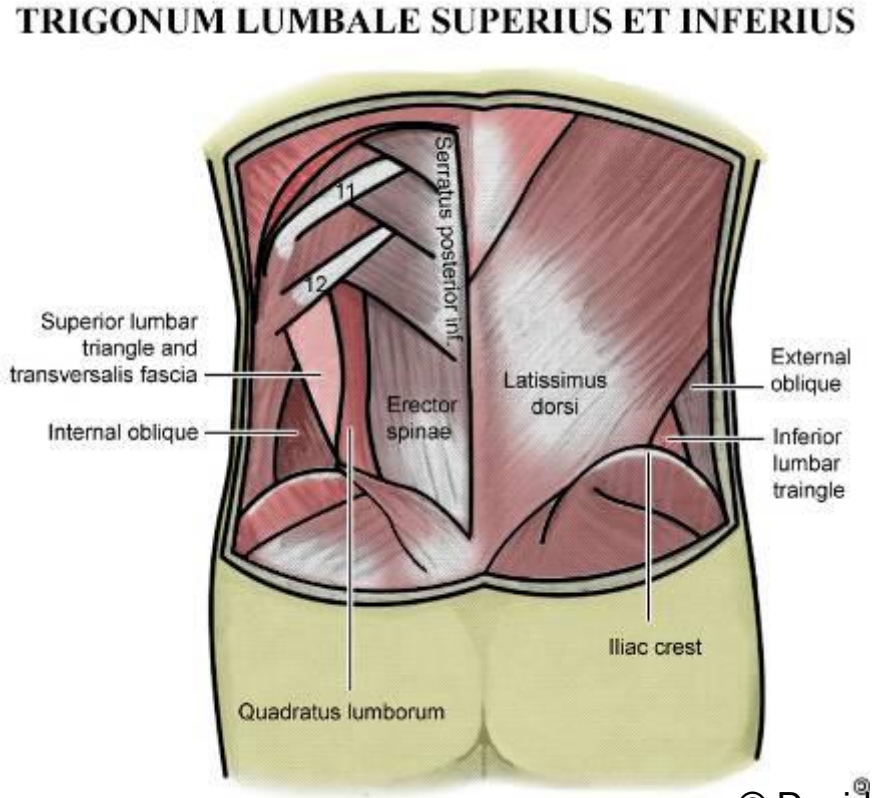
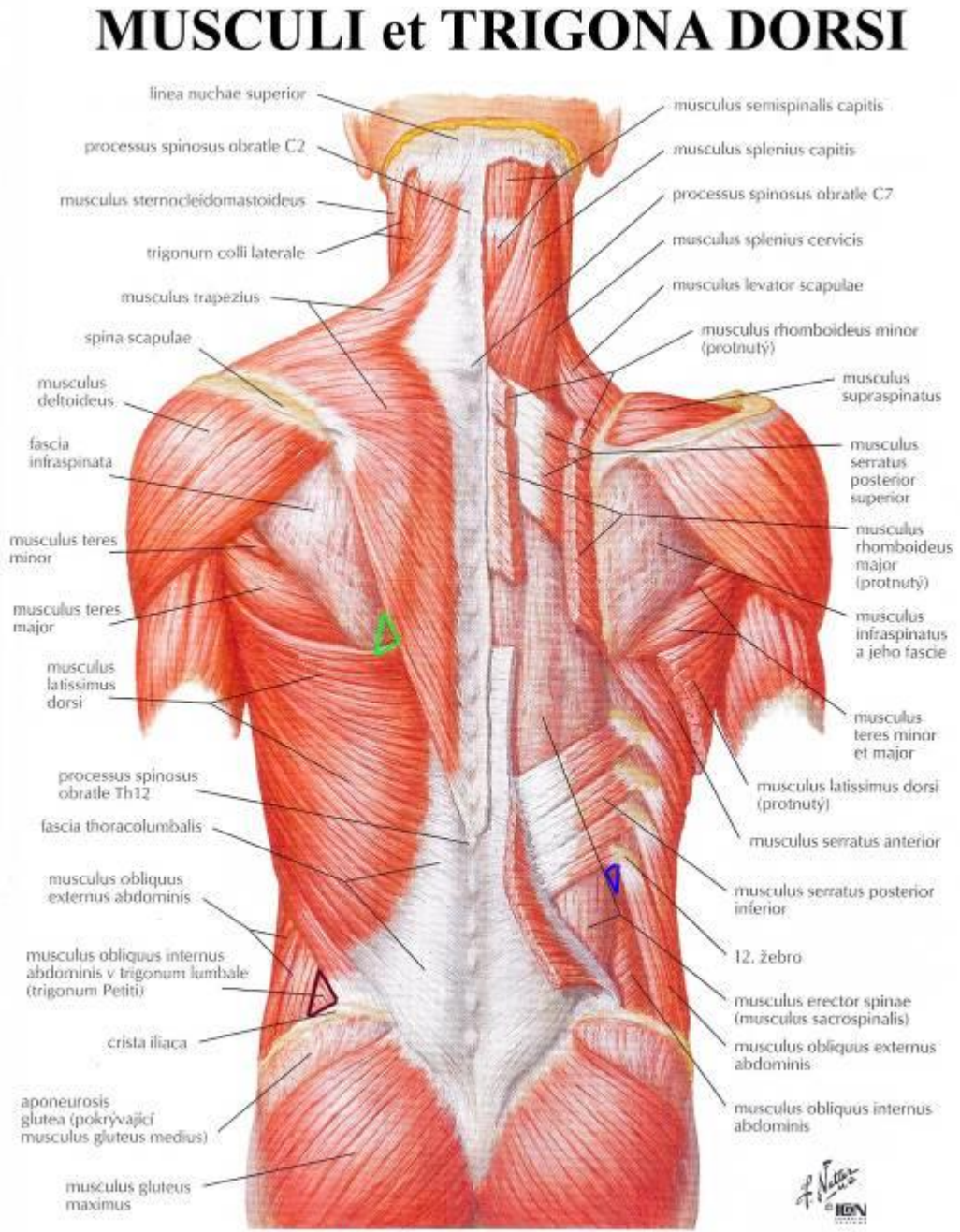
Topography





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Trigonum auscultationis

Trigonum lumbale superius (Lesshafti seu Gryfelti)

Trigonum lumbale (Petiti)

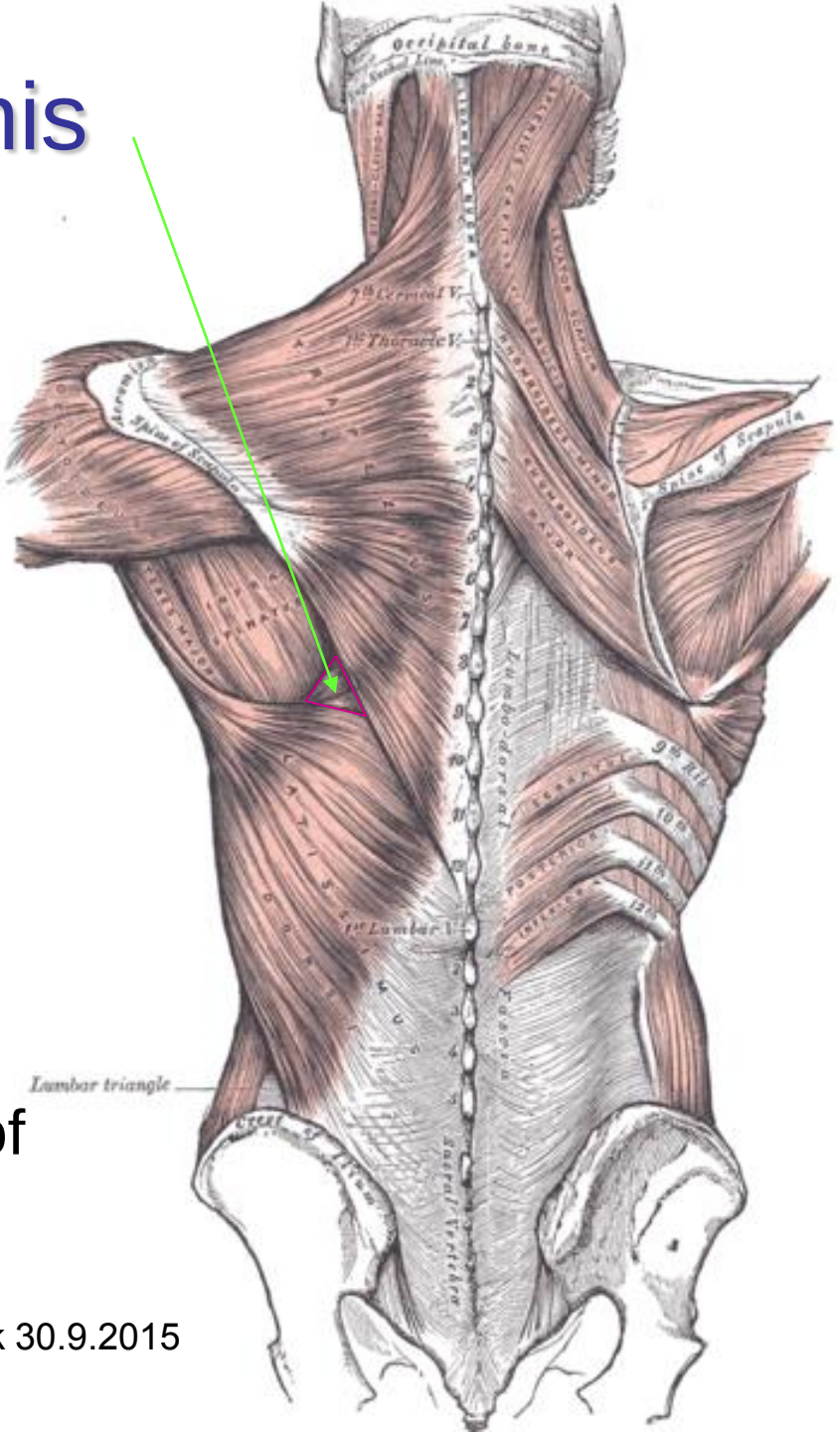
Trigonum auscultationis

- cranially: m. trapezius
- caudally: m. latissimus dorsi
- laterally: margo medialis scapulae
- floor: m. rhomboideus major (partially)

6th+7th rib (in protraction of scapulae = anteflexion of vertebral column + crossed hand on chest

- project of apex of inferior lobe of lungs

- possible point for auscultation



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Trigonum lumbale inferius *Petiti*

- caudally:

crista iliaca (cca 2-3 cm)

- medially:

m. latissimus dorsi

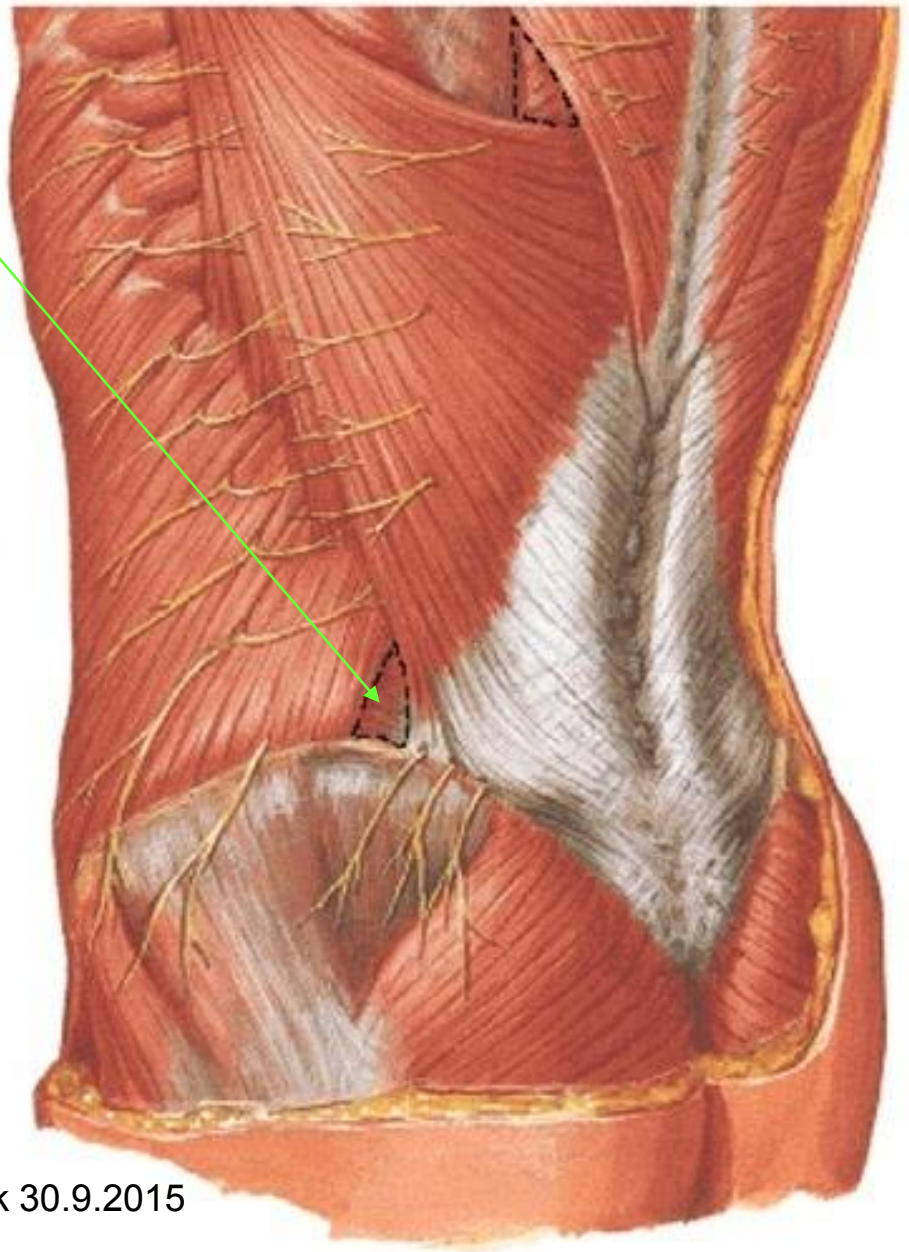
- laterally:

m. obliquus externus abd.

- floor:

m. obliquus internus abd.

inferior lumbal hernia



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Trigonum lumbale superius *Grynfeltti s. Lesshafti*

- cranially:

m. serratus post. inf. (*sometimes* costa XII.)

- medially:

m. iliocostalis lumborum

- laterally:

m. obliquus internus abd.

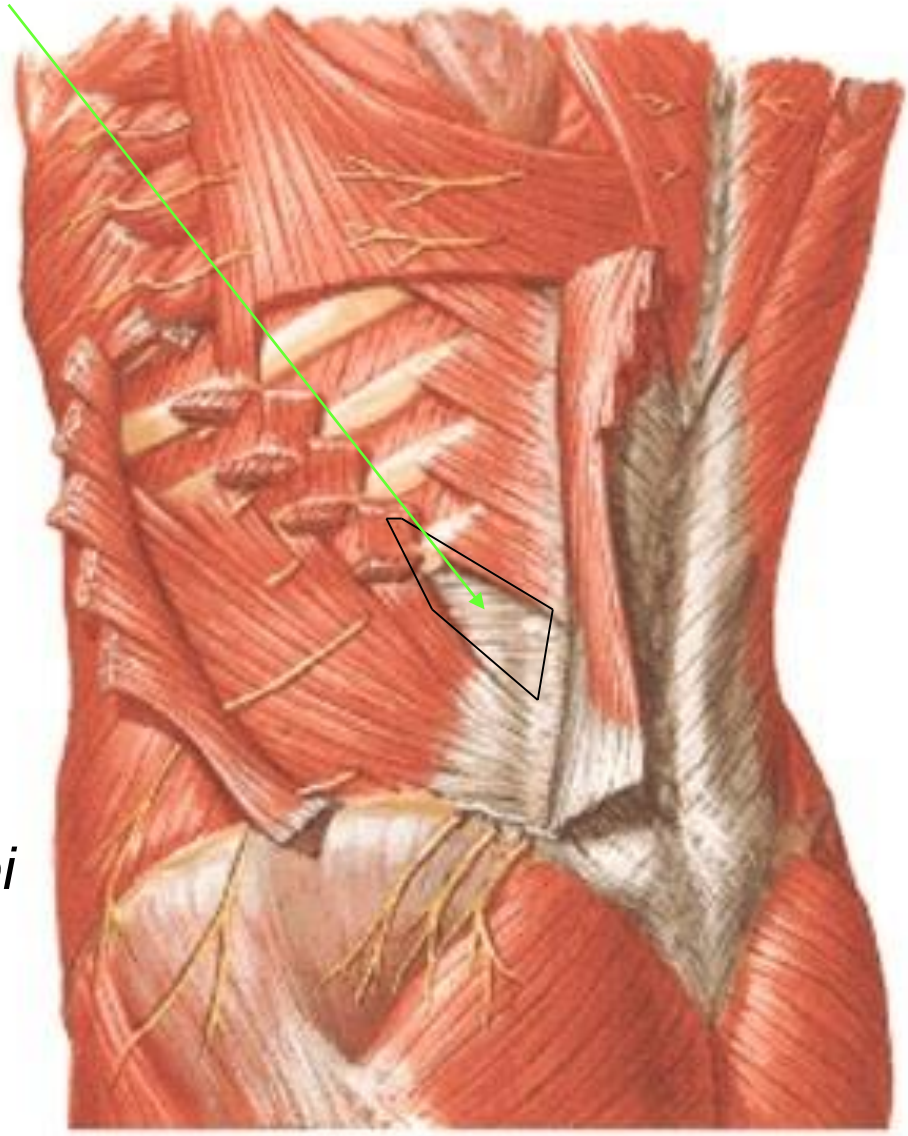
- floor:

aponeurosís m. transversi abd.

- ceiling:

m. latissimus dorsi

- resp. laterocranially: costa duodecima → tetragonum *Krausei*



- n. et vasa subcostalia emerge
- n. iliohypogastricus
- *superior lumbal hernia*

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Lumbal hernia
Bleichner hernia

- in lumbar region
- attention! danger of confusion with herniatio intervertebral disc
- **Petit hernia**
  - via Petit triangle (trigonum lumbale inferius) – 5%

Jean Louis Petit (1674–1750) – French surgeon

- **Grynfeltt hernia**
  - via Grynfeltt-Lesshaft triangle (trigonum lumbale superius) – **95 %**

Joseph Casimir Grynfeltt (1840–1913) – French physician

Pjotr Lesshaft – Russian physician

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Grynfeltt hernia

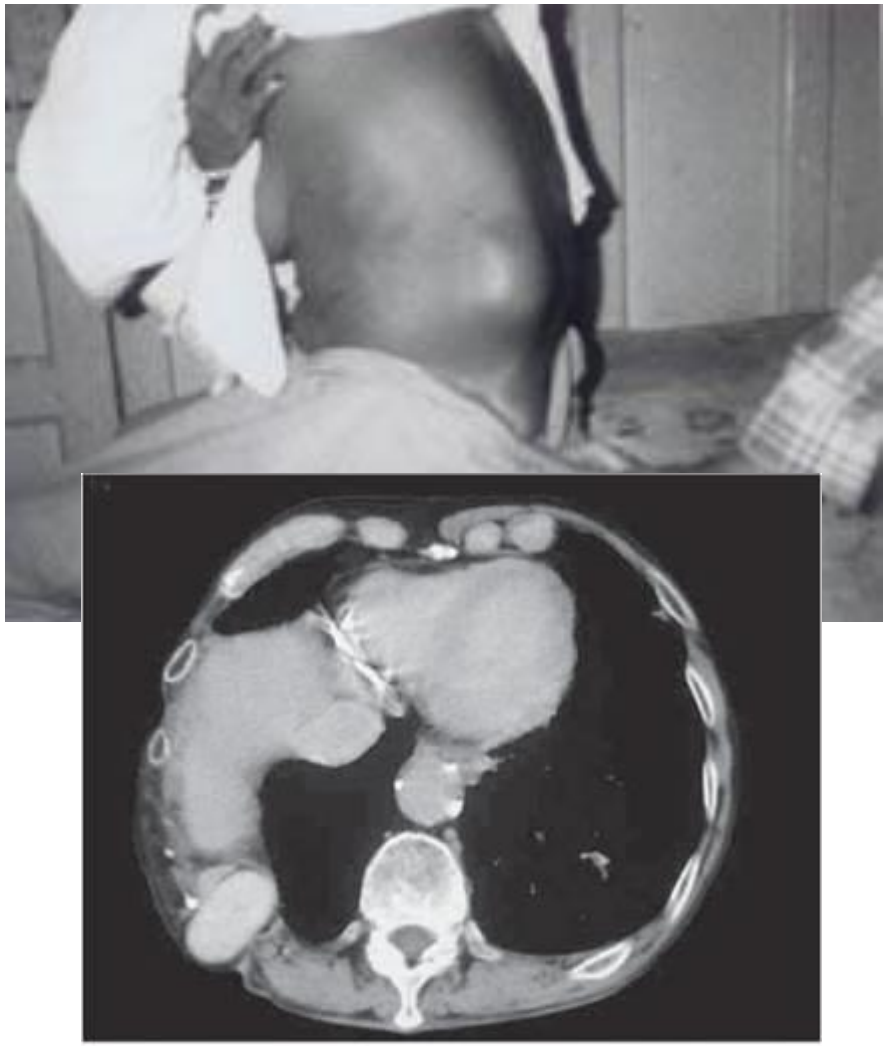

Figure 1. Computed tomography at the level of the thoracolumbar junction demonstrating herniated kidney, at right, through the superior lumbar triangle.

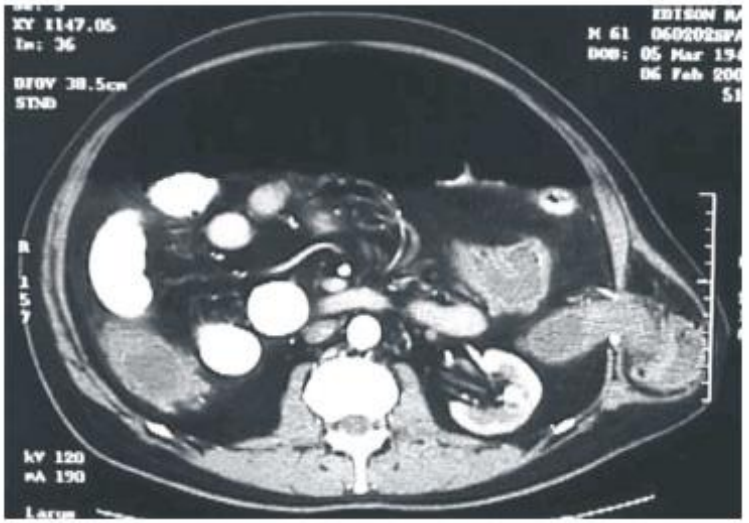

Figura 2 – *Tomografia computadorizada de abdome – pneumoperitônio e herniação do cólon sigmóide através do trígono lombar superior esquerdo.*

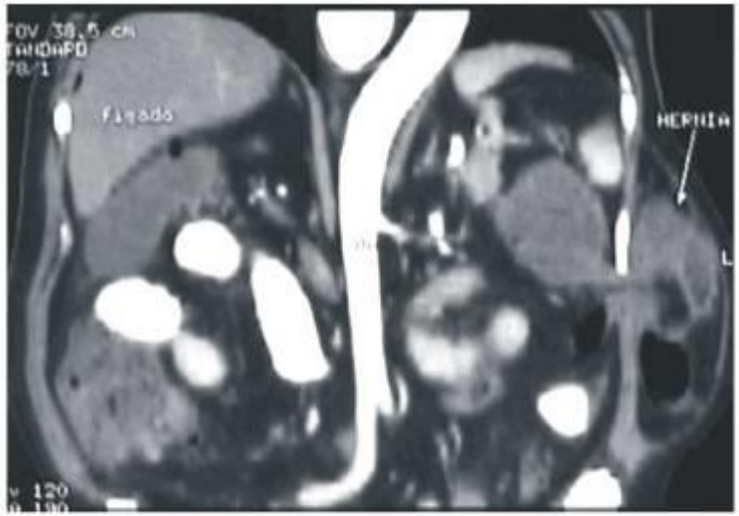

Figura 1 – *Tomografia computadorizada de abdome demonstrando hérnia lombar esquerda.*

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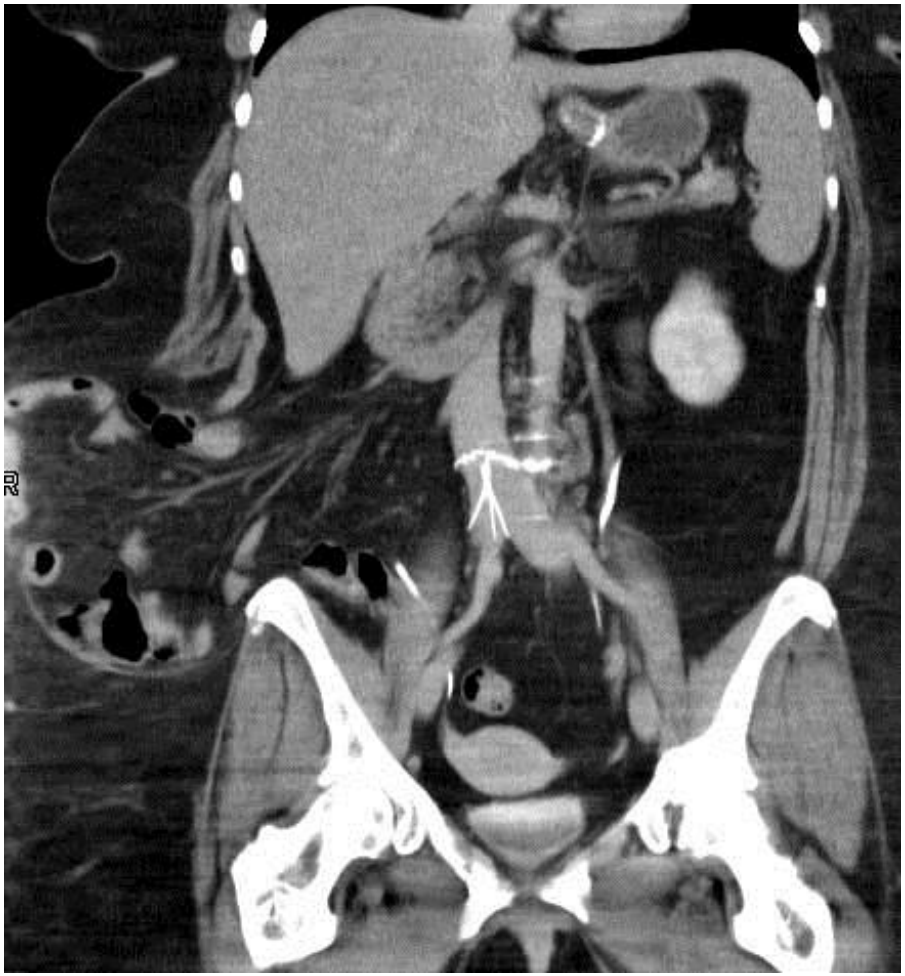
Petit hernia

Figura 1: Hérnia de Petit: tumor localizado na região lombar inferior direita.

Figure 1: Petit's hernia: tumor located in the right inferior lumbar triangle.



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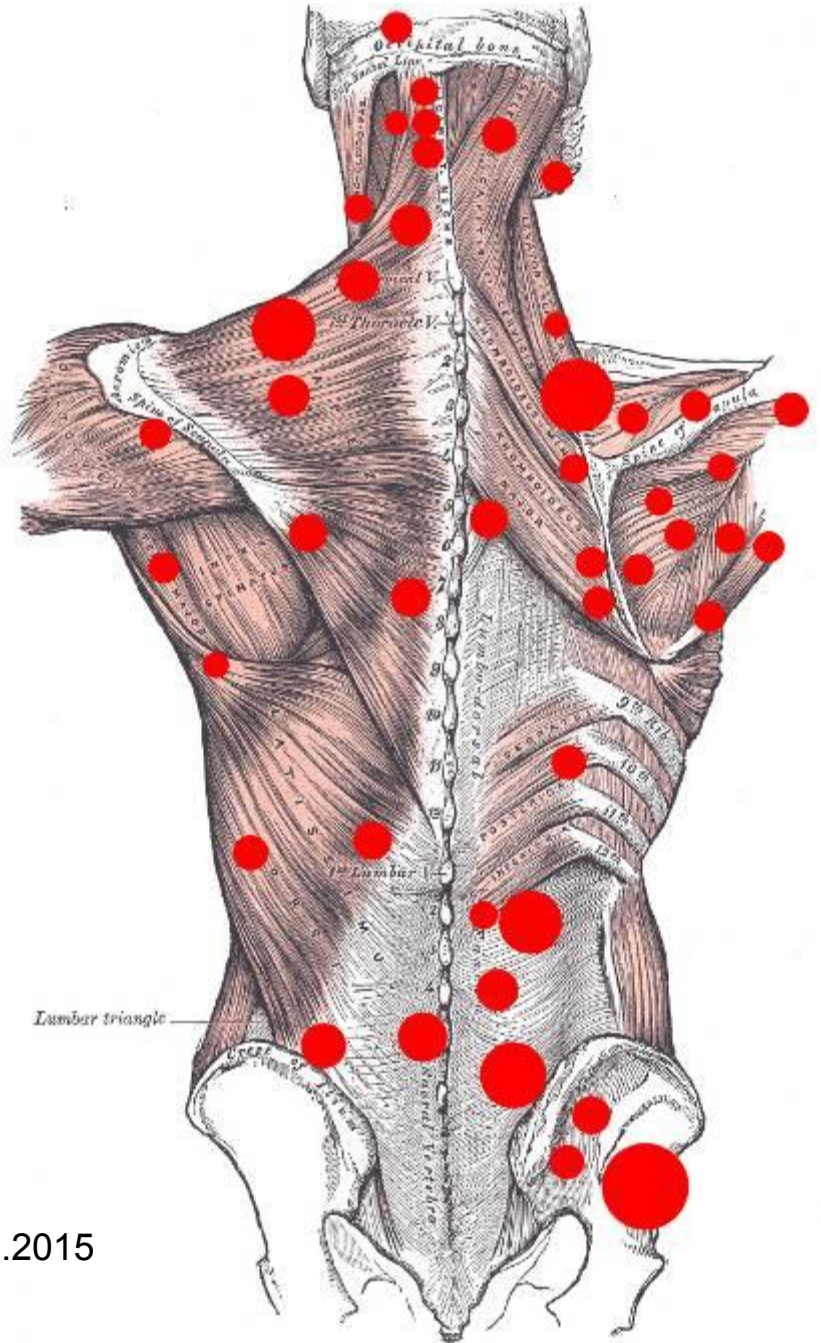
Clinical notes

- backache – vertebrogenic disorders
  - upper crossed syndrome
  - lower crossed syndrome

- „trigger points“ in muscle contractures
- lumbar herniae
- spondylosurgery



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Case report

♀, 32 years

- ½ year pyrosis (heartburn)
- last month gastro-oesophageal reflux
- last week vomiting after drnking alcohol

- normal blood tests
- normal size of liver

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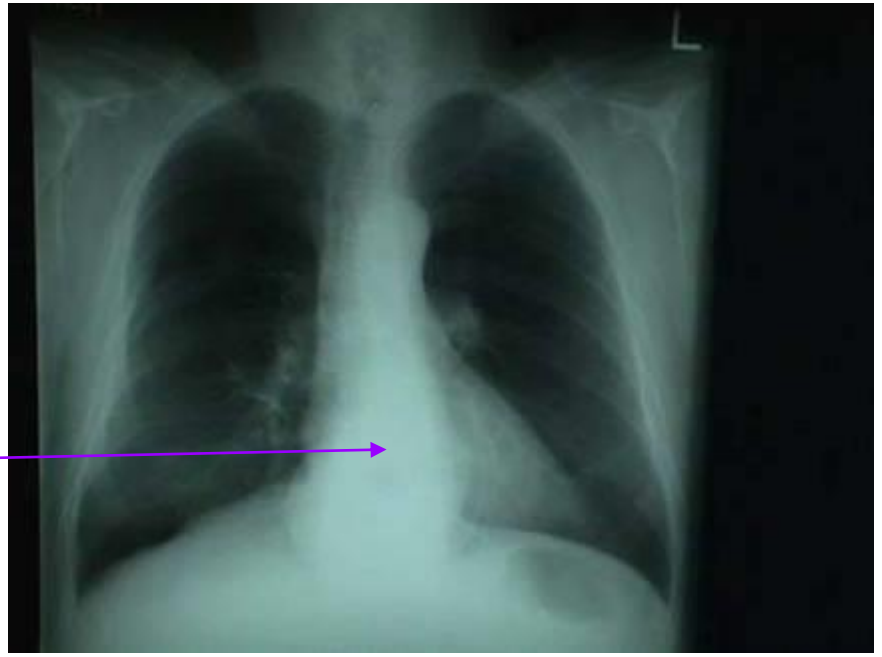
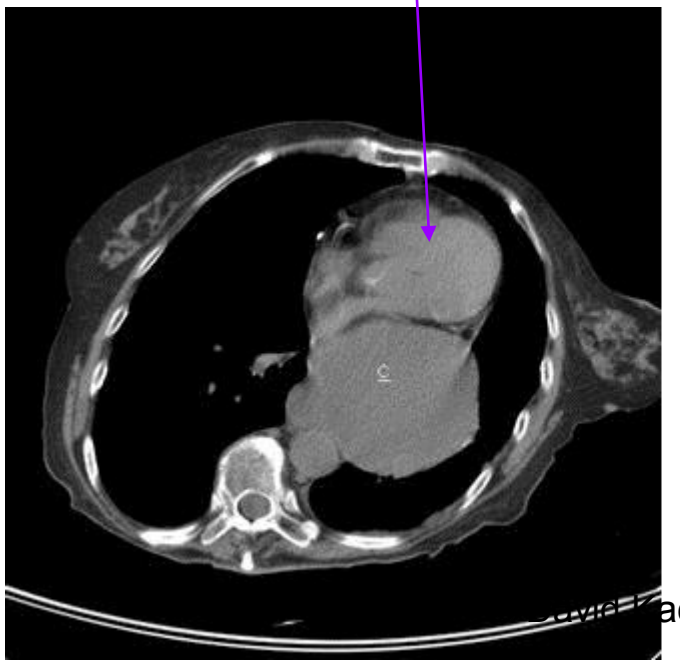
Case report

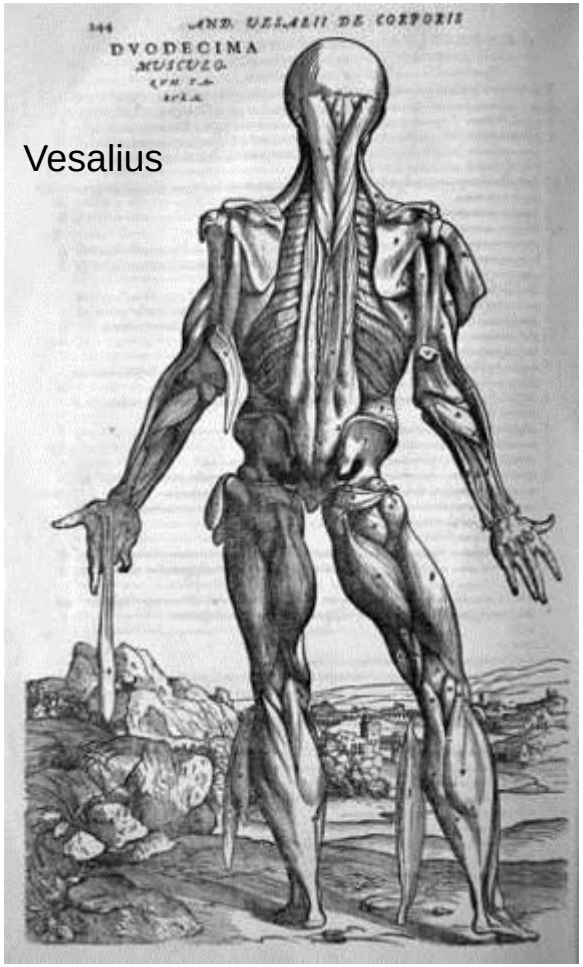
diagnosis:

hiatus hernia

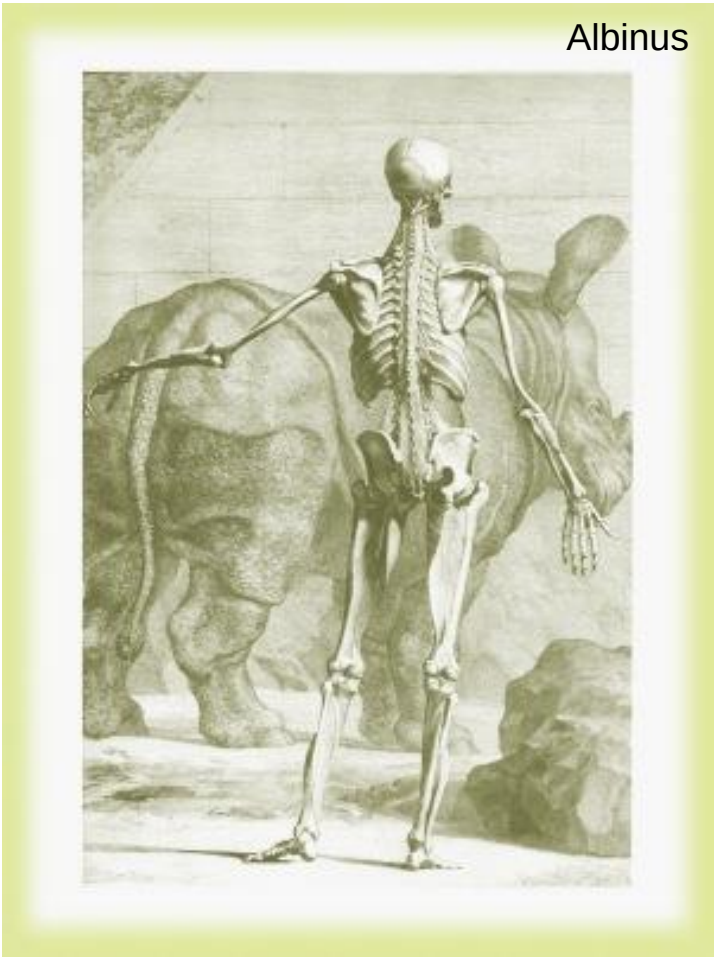




Thank you for your attention



Vesalius



Albinus

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