EMG Practicum 1: Electrode location and placement

Objectives

Learning to

- Find the correct muscles
- Find the correct electrode location on the muscle
- Prepare the skin
- Place the electrodes correctly

How?

- In groups of 3 to 4 persons. One person is the subject, the others perform the electrode placement
- Follow the guidelines on the next pages for 11 muscles
- To find anatomical landmarks/ muscles use an atlas of anatomy or other resources
- If you are finished with one subject, do the same for another subject

Action list

In groups:

- Put the subject in a good position to be able to find the correct muscle
- The electrode location is described as a point on a line between 2 anatomical landmarks
    - Locate the position of the anatomical landmarks and mark these positions
    - Locate the position of electrode placement and mark this position
        - Somewhere on the line between the 2 landmarks
        - According to the guidelines mentioned on the next pages
- Shave the skin if necessary
- Clean the skin with alcohol

All:

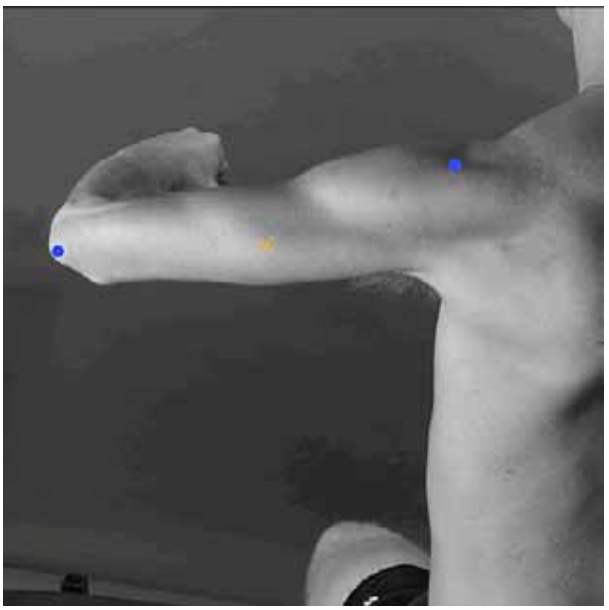
- Discussing the procedure
- Check some of the signals

1.Biceps Bracchi

Anatomy	
Subdivision	Short and Long head
Function	Elbow flexion
Placement	
Start position	Flexed elbow at a right angle, dorsal side of forearm in a horizontal downward position
Location	Line *medial acromion – fossa cubi*t, at 1/3 from *fossa cubit* (elbow pit)
Orientation	Parallel to line *acromion – fossa cubit*
Test	Flex the elbow, while applying pressure to the forearm in the direction of extentsion

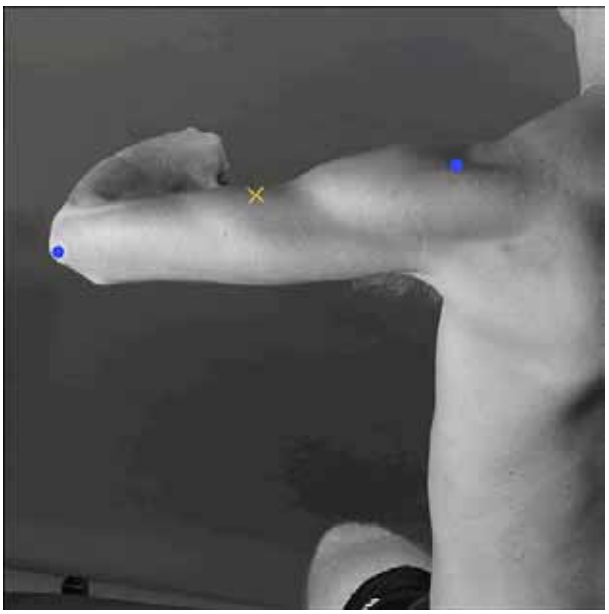
2.Triceps Bracchi (long head)

Anatomy	
Subdivision	Long head
Function	Elbow extention, adduction, shoulder extension
Placement	
Start position	Shoulder at 90° abduction with arm 90° flexed, palm of the hand pointing downward
Location	At 50% of line *posterior crista of acromion – olecranon*, 2 fingers medial to this line
Orientation	Parallel to line *posterior crista of acromion – olecranon*
Test	Extend the elbow while applying pressure to the forearm in the direction of flexion



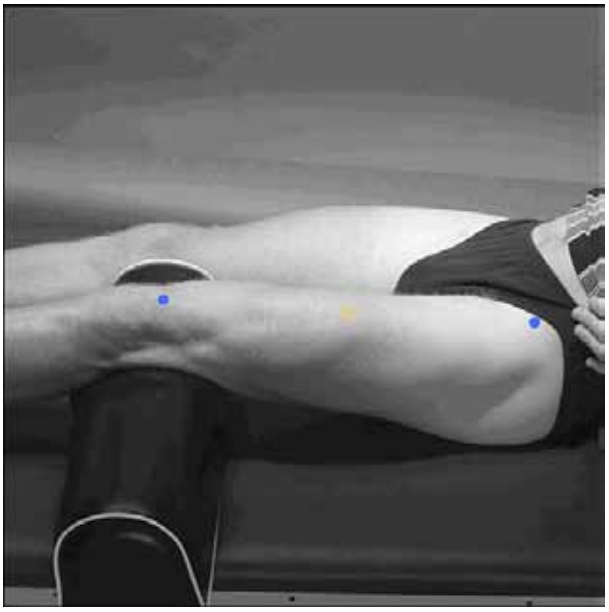
3.Triceps Bracchi (lateral head)

Anatomy	
Subdivision	Lateral head
Function	Elbow extension
Placement	
Start position	Shoulder at 90° abduction with arm 90° flexed, palm of the hand pointing downward
Location	At 50% of line *posterior crista of acromion – olecranon*, 2 finger lateral to this line
Orientation	Parallel to line *posterior crista of acromion – olecranon*
Test	Extend the elbow while applying pressure to the forearm in the direction of flexion



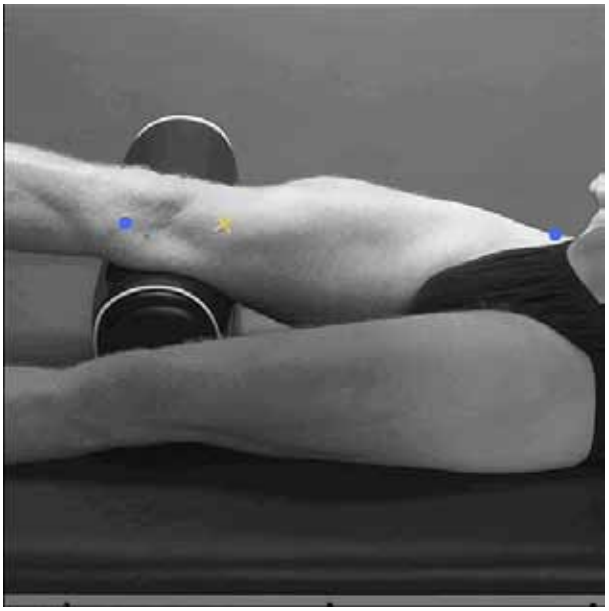
4.Rectus Femoris

Anatomy	
Subdivision	
Function	Extension of the knee joint and flexion of the hip joint
Placement	
Start position	Sitting on table, knees in slight flexion, upper body slightly bend backward
Location	At 50% of line *anterior spina iliaca superior -superior part of patella*
Orientation	Parallel to line *anterior spina iliaca superior -superior part of patella*
Test	Extend knee while pressing against the leg above the ankle in the direction of flexion



5.Vastus Medialis

Anatomy	
Subdivision	
Function	Extension of knee joint
Placement	
Start position	Sitting on table, knees in slight flexion, upper body slightly bend backward
Location	At 80% of line *anterior spina iliaca superior -anterior border of the medial ligament*
Orientation	Almost perpendicular to line *anterior spina iliaca superior – anterior border of the medial ligament*
Test	Extend knee while pressing against the leg above the ankle in the direction of flexion

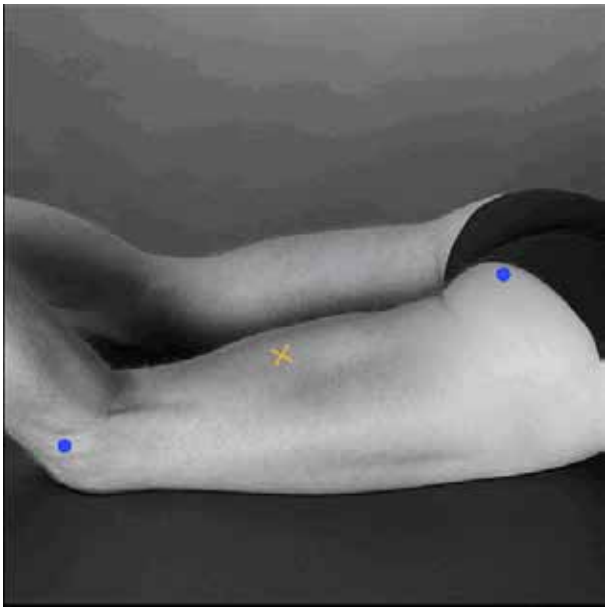


6.Vastus Lateralis

Anatomy	
Subdivision	
Function	Extension of knee joint
Placement	
Start position	Sitting on table, knees in slight flexion, upper body slightly bend backward
Location	At 2/3 of line *anterior spina iliaca superior – lateral side of patella*
Orientation	In the direction of muscle fiber
Test	Extend knee while pressing against the leg above the ankle in the direction of flexion

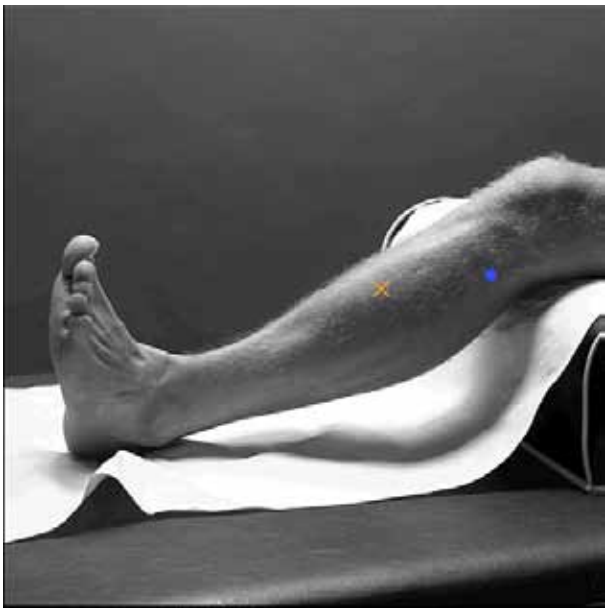
7.Biceps Femoris

Anatomy	
Subdivision	Long head (LH) and short head
Function	Flexion and lateral rotation of knee joint. LH also extends lateral rotation of hip joint
Placement	
Start position	Lying on belly, thigh down on table, knees flexed, thigh in slight lateral rotation, leg in slight lateral rotation with respect to the thigh
Location	At 50% of line *ischial tuberosity – lateral epicondyle of the tibia*
Orientation	Parallel to line *ischial tuberosity – lateral epicondyle of the tibia*
Test	Press against the leg proximal to the ankle in the direction of knee extension



8.Tibialis Anterior

Anatomy	
Subdivision	
Function	Dorsiflexion of ankle joint, inversion of foot
Placement	
Start position	Supine or sitting
Location	At 1/3 of line *tip of fibula – tip of medial malleolus*
Orientation	Parallel to line *tip of fibula – tip of medial malleolus*
Test	Support leg just above ankle joint with ankle joint in dorsiflexion and the foot in inversion without extension of big toe. Apply pressure against medial side, dorsal surface of foot in direction of plantar flexion of ankle joint and eversion of foot.



9.Soleus

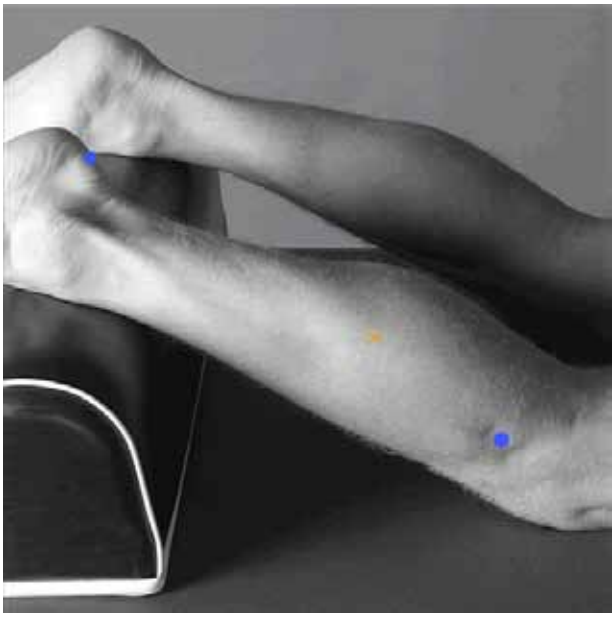
Anatomy	
Subdivision	
Function	Plantar flexion of ankle joint
Placement	
Start position	Sitting with knee approx. 90° flexed and heel/foot on the floor
Location	At 2/3 of line *medial condylis of femur – medial malleolus*
Orientation	Parallel to line *medial condylis – medial malleolus*
Test	Put hand on the knee and push knee down while asking subject to lift heel from floor

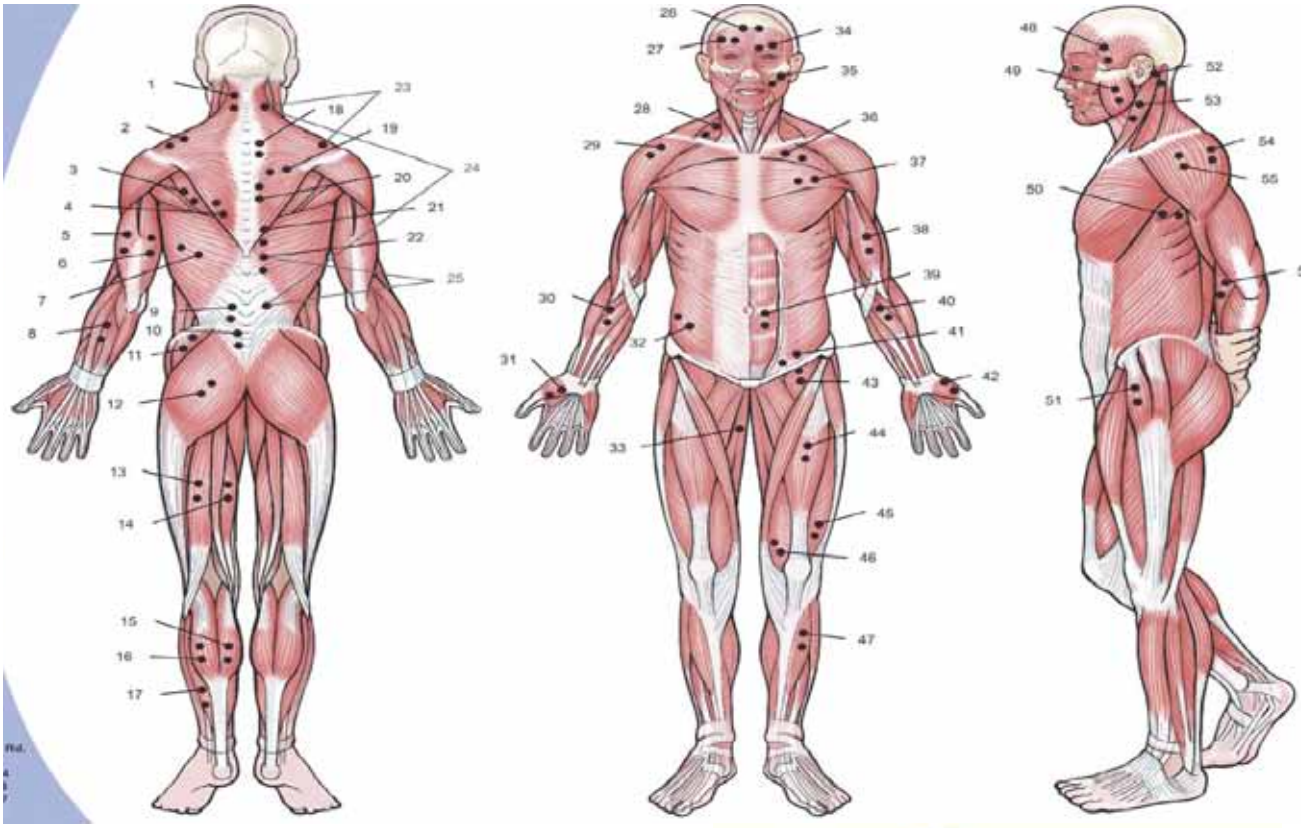
10.Gastrocnemius Medialis

Anatomy	
Subdivision	Medialis
Function	Flexion of ankle joint, flexion knee joint
Placement	
Start position	Lying on belly, knee extended, foot projecting over end of table
Location	At most prominent bulge of muscle
Orientation	Parallel to the lower leg
Test	Plantar flexion of foot with emphasis on pulling heel upward more than pushing forefoot down. Apply pressure against the forefoot as well as calcaneus

11.Gastrocnemius Lateralis

Anatomy	
Subdivision	Lateralis
Function	Flexion of ankle joint, flexion of knee joint
Placement	
Start position	Lying on belly, knee extended, foot projecting over end of table
Location	At 1/3 *of line head of fibula – heel*
Orientation	Parallel to line *head of fibula – heel*
Test	Plantar flexion of foot with emphasis on pulling heel upward more than pushing forefoot down. Apply pressure against the forefoot as well as calcaneus

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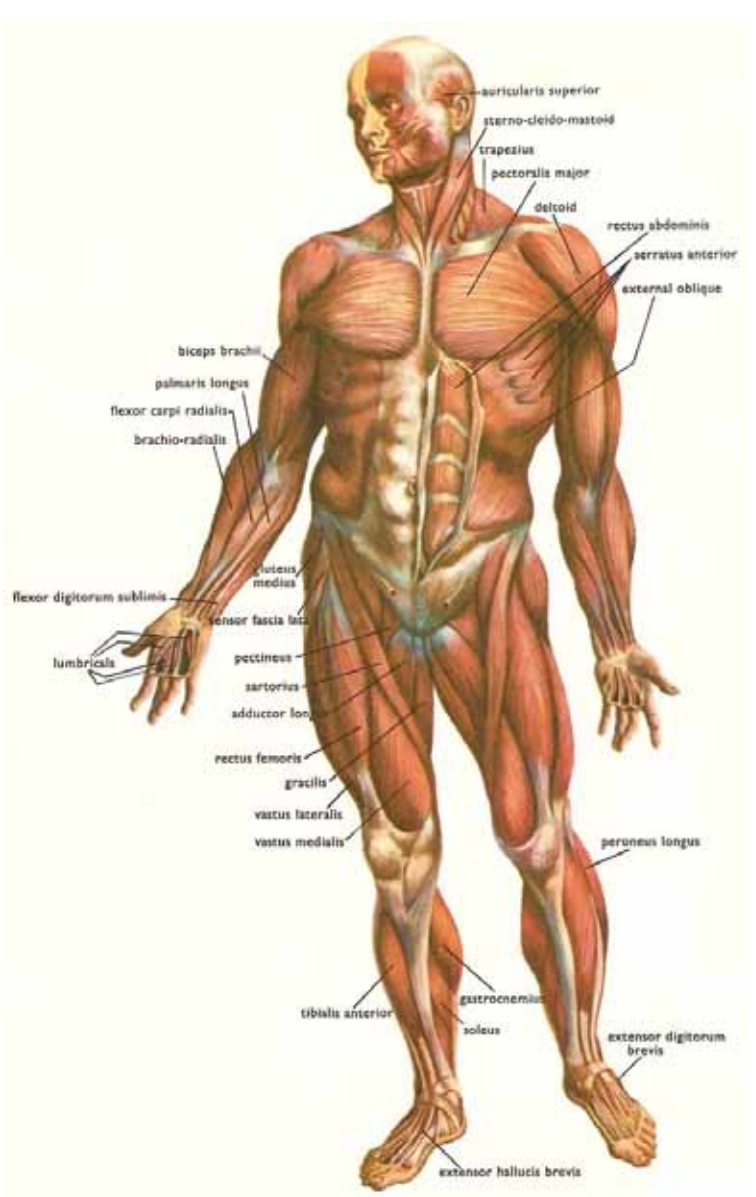
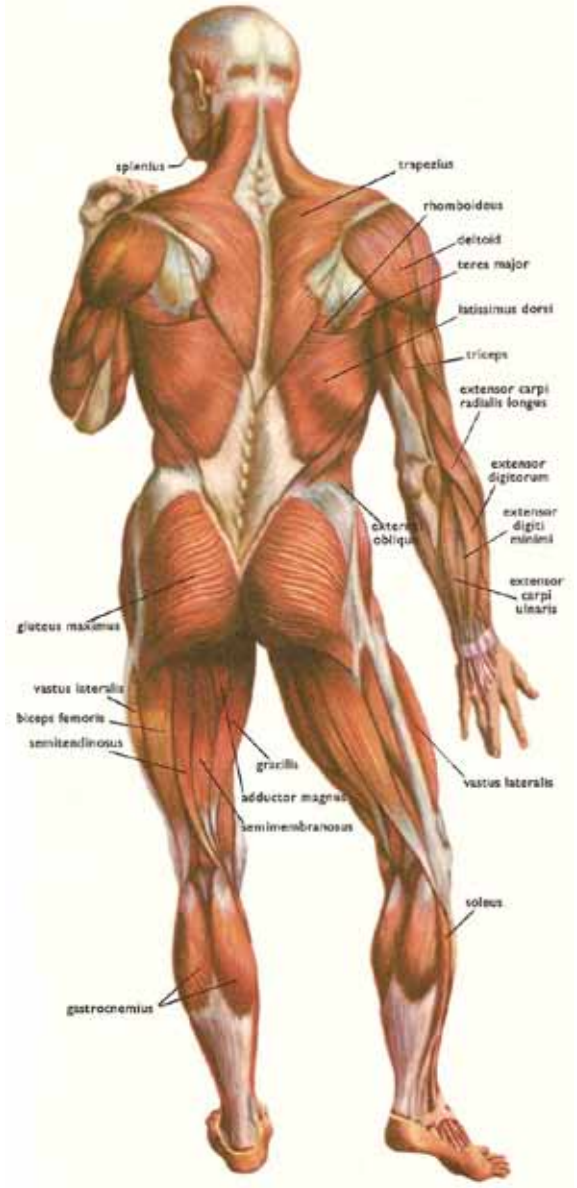

auricularis superior
sterno-cleido-mastoid
trapezius
pectoralis major
deltoid
rectus abdominis
serratus anterior
external oblique
biceps brachii
palmaris longus
flexor carpi radialis
brachio-radialis
flexor digitorum sublimis
gluteus medius
tensor fascia lata
lumbricals
pectineus
sartorius
adductor longus
rectus femoris
gracilis
vastus lateralis
vastus medialis
peroneus longus
tibialis anterior
gastrocnemius
soleus
extensor digitorum brevis
extensor hallucis brevis


splenius
trapezius
rhomboideus
deltoid
teres major
latissimus dorsi
triceps
extensor carpi radialis longus
extensor digitorum
extensor digiti minimi
extensor carpi ulnaris
external oblique
gluteus maximus
vastus lateralis
biceps femoris
semitendinosus
gracilis
adductor magnus
semimembranosus
soleus
gastrocnemius

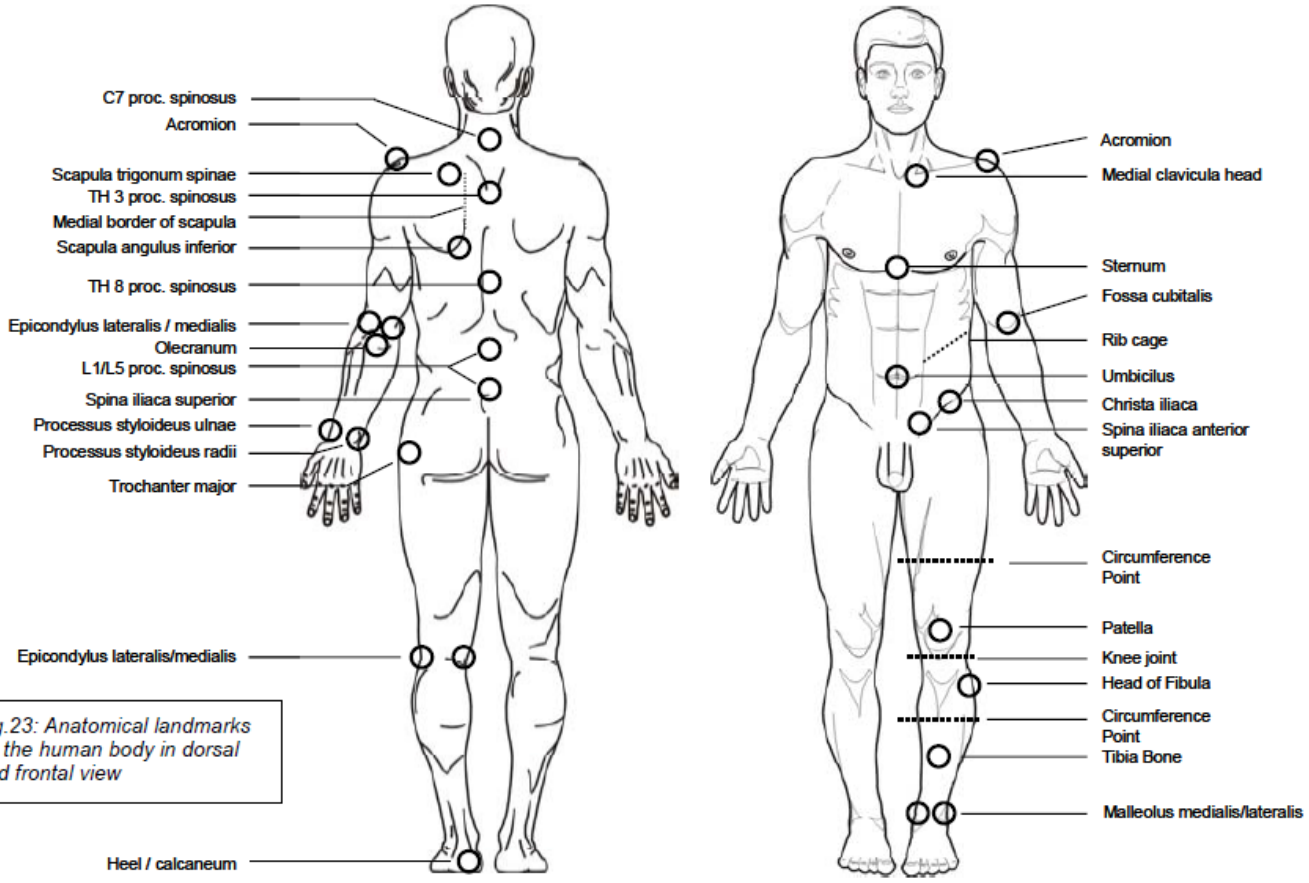
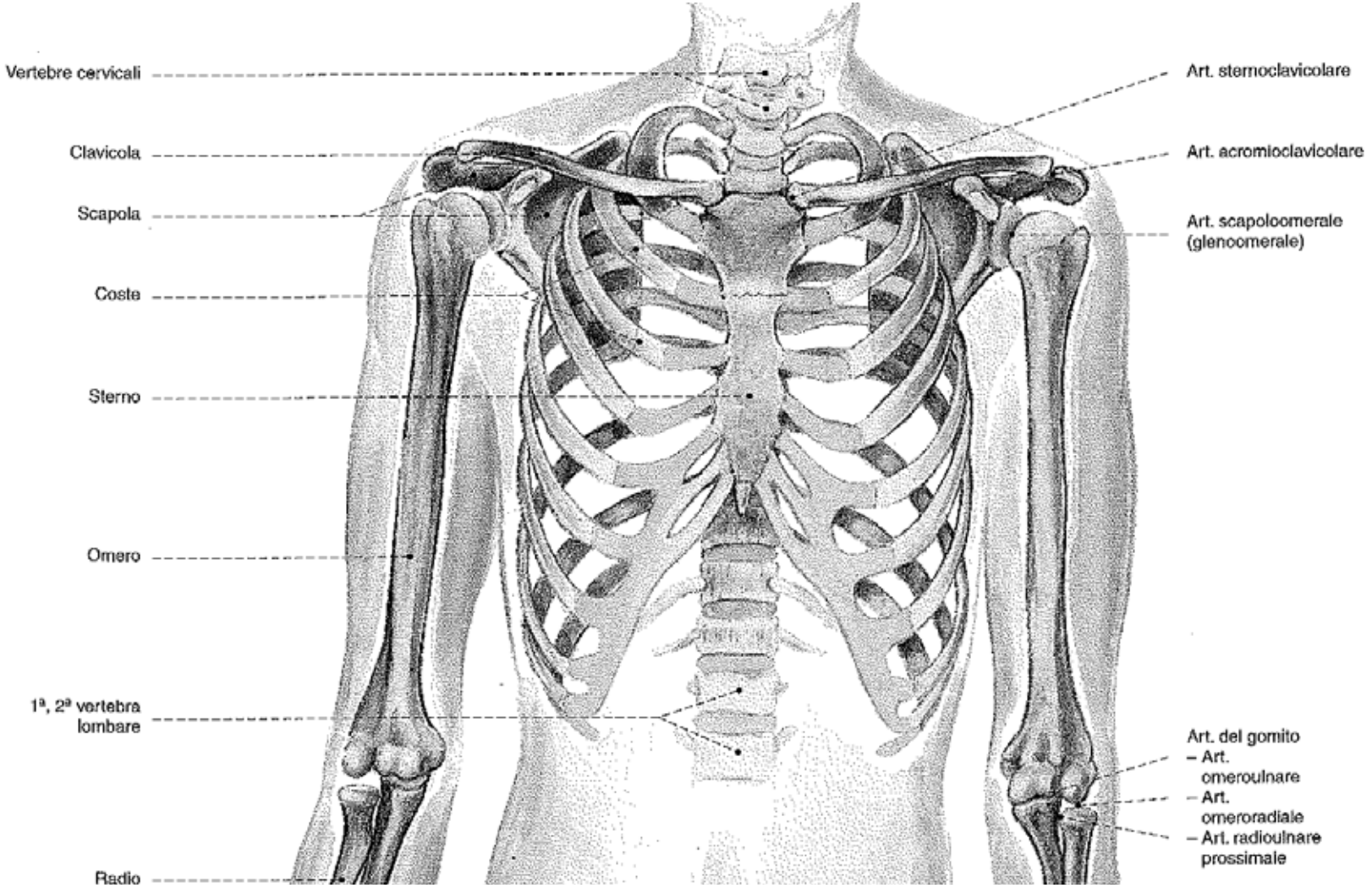
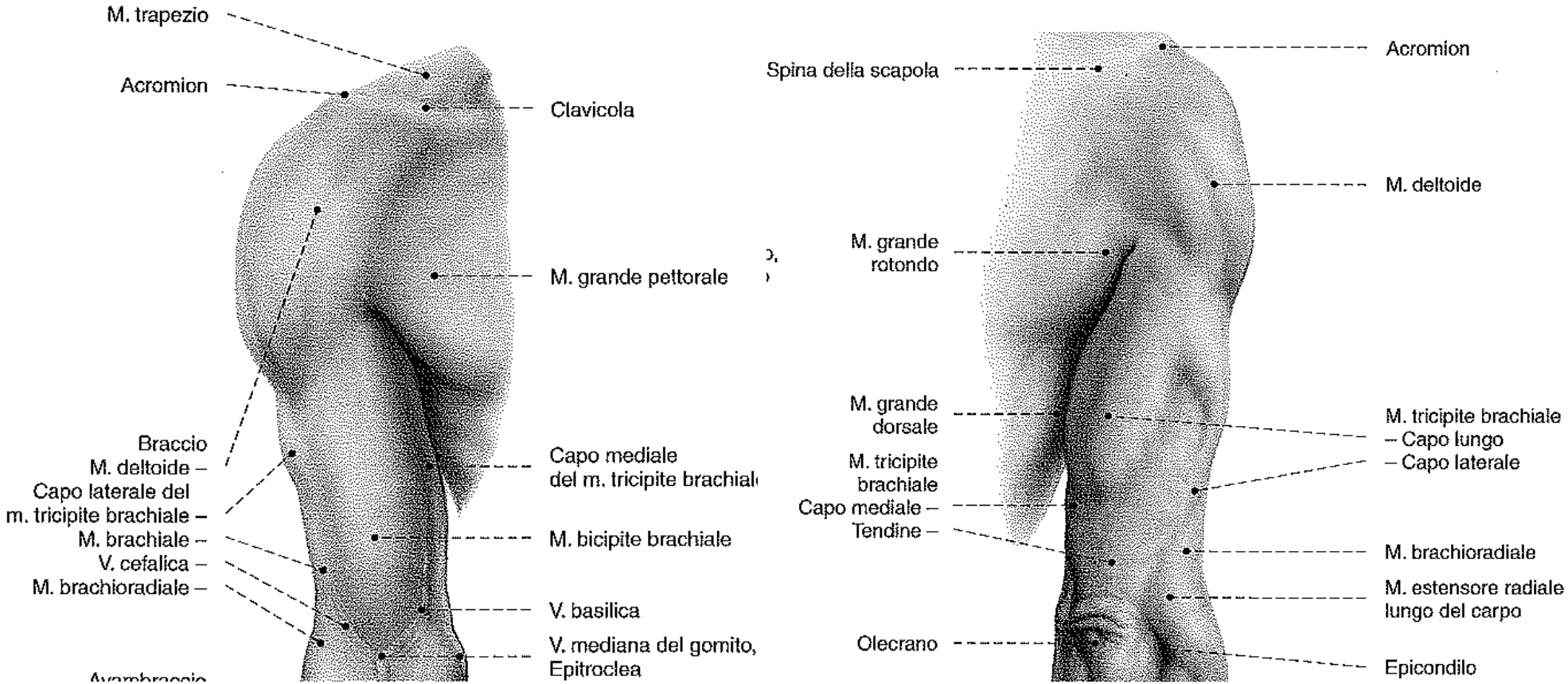
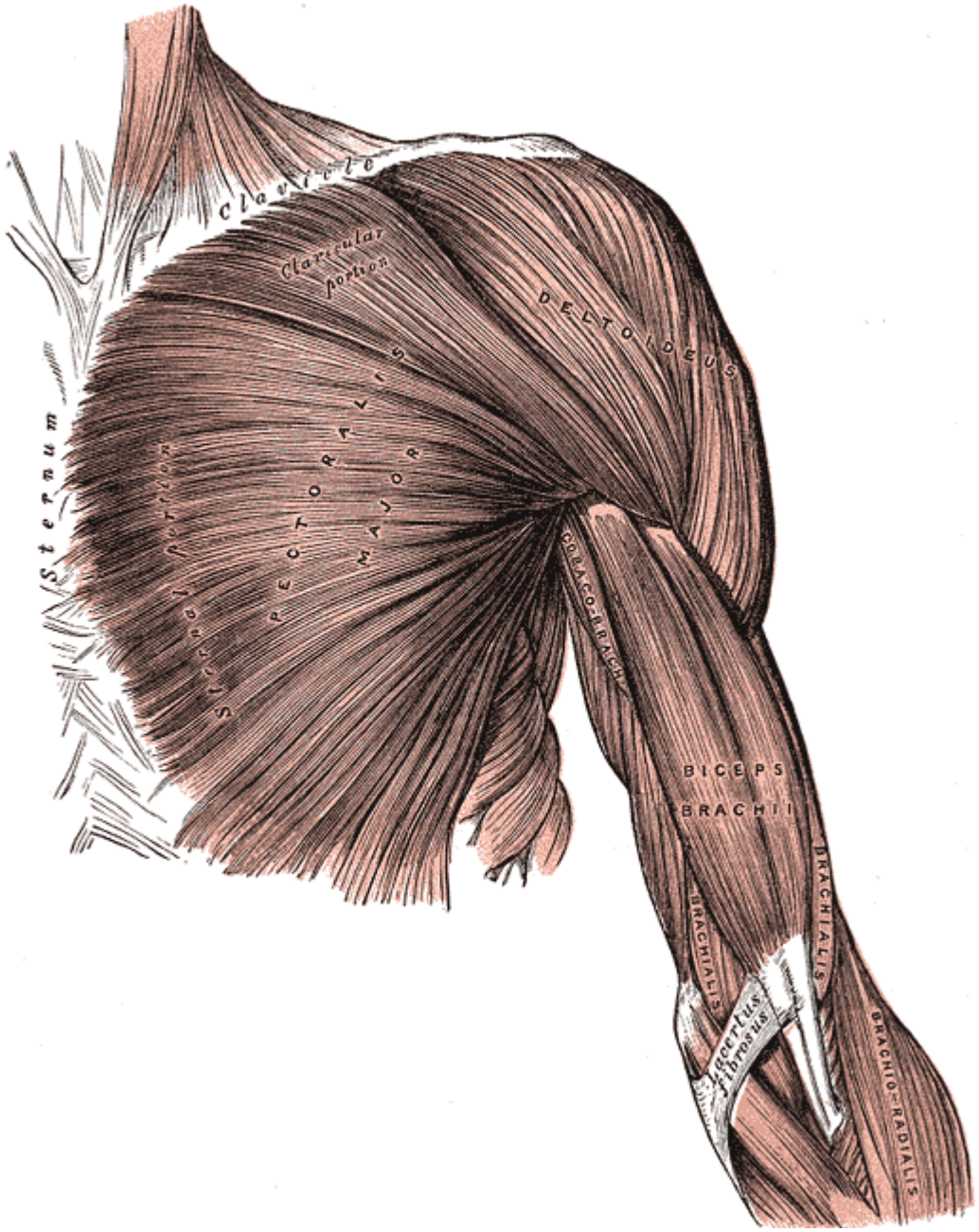
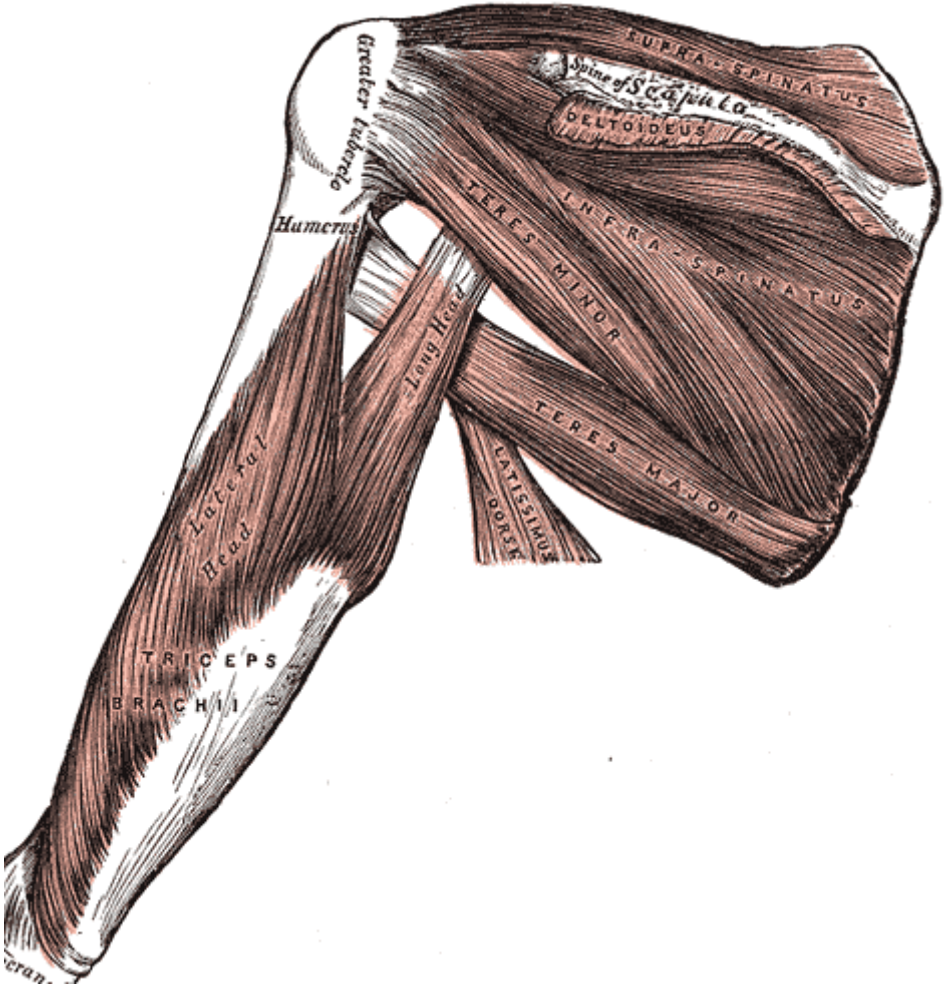


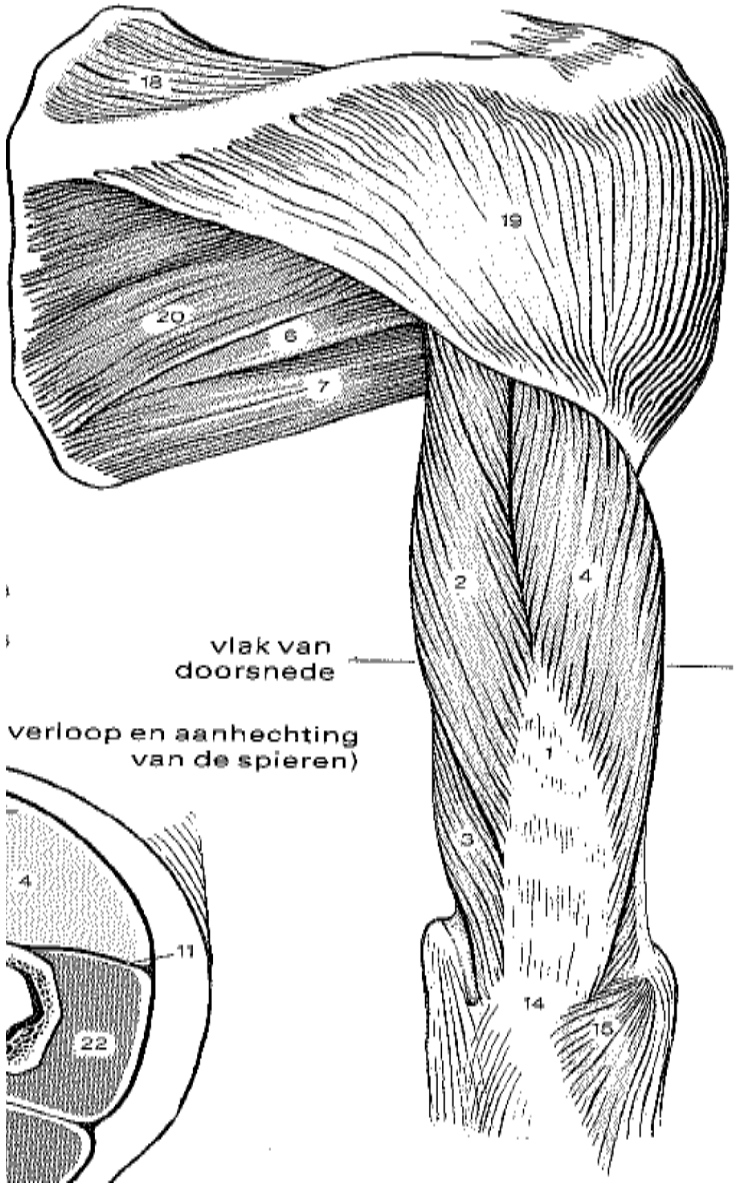
Fig.23: Anatomical landmarks on the human body in dorsal and frontal view


Vertebre cervicali
Clavicola
Scapola
Coste
Sterno
Omero
1ª, 2ª vertebra lombare
Radio
Art. sternoclavicolare
Art. acromioclavicolare
Art. scapoloomerale (glenoomerale)
Art. del gomito
– Art. omeroulnare
– Art. omeroradiale
– Art. radioulnare prossimale


M. trapezio
Acromion
Clavicola
M. grande pettorale
Braccio
M. deltoide –
Capo laterale del
m. tricipite brachiale –
M. brachiale –
V. cefalica –
M. brachioradiale –
Capo mediale
del m. tricipite brachiale
M. bicipite brachiale
V. basilica
V. mediana del gomito,
Epitroclea
Spina della scapola
Acromion
M. deltoide
M. grande
rotondo
M. grande
dorsale
M. tricipite
brachiale
Capo mediale –
Tendine –
M. tricipite brachiale
– Capo lungo
– Capo laterale
M. brachioradiale
M. estensore radiale
lungo del carpo
Olecrano
Epicondilo


Clavicle
Clavicular portion
DELTOIDEUS
Sternum
Sternal portion
PECTORALIS MAJOR
CORACO-BRACH.
BICEPS BRACHII
BRACHIALIS
BRACHIALIS
Tendon fibrosus
BRACHIO-RADIALIS


Greater Tubercle
Humerus
SUPRA-SPINATUS
Spine of Scapula
DELTOIDEUS
INFRA-SPINATUS
TERES MINOR
TERES MAJOR
LATISSIMUS DORSI
Long Head
Lateral Head
TRICEPS BRACHII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vlak van doorsnede
verloop en aanhechting van de spieren)
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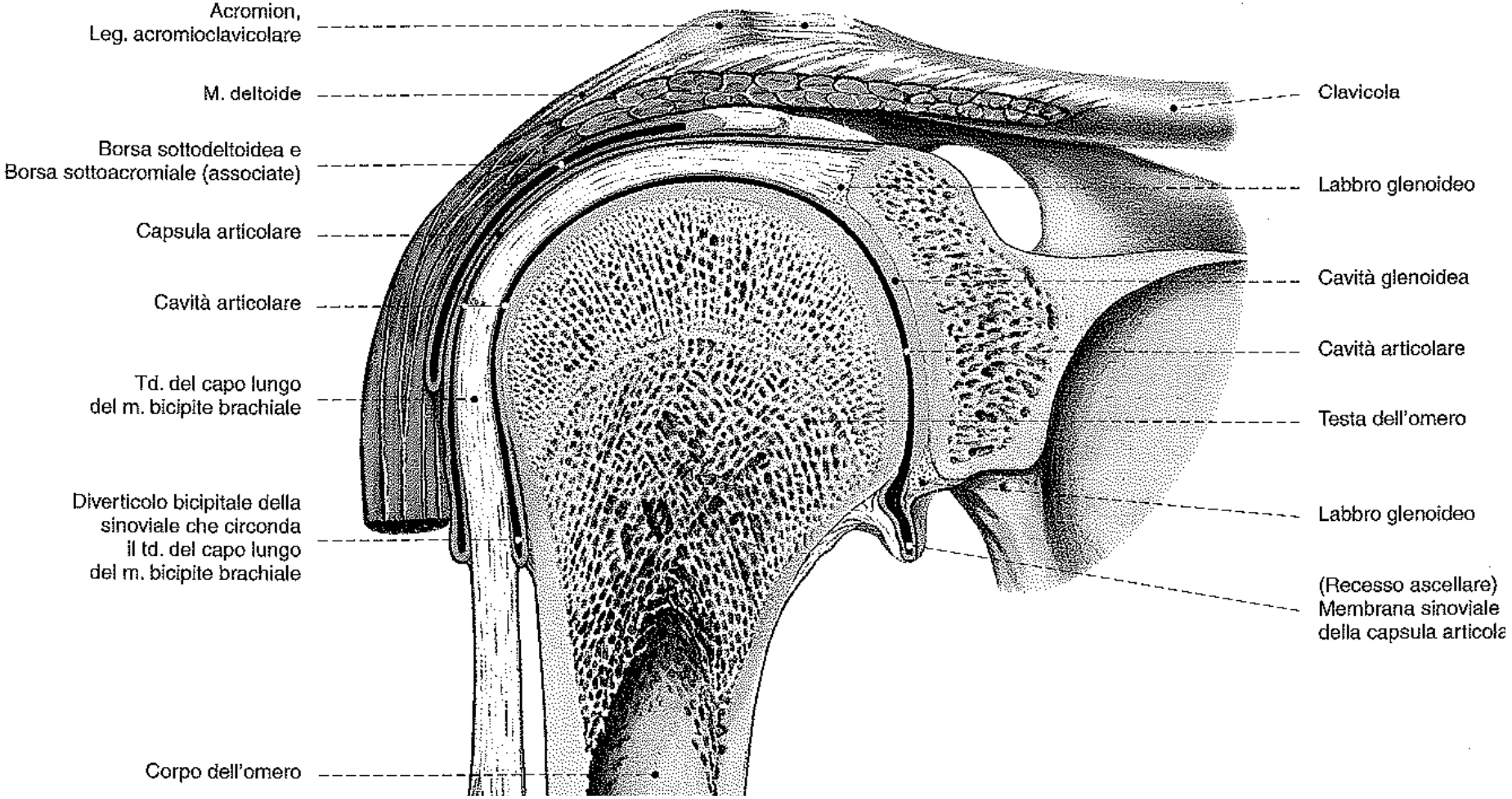

Acromion,
Leg. acromioclavicolare
M. deltoide
Borsa sottodeltoidea e
Borsa sottoacromiale (associate)
Capsula articolare
Cavità articolare
Td. del capo lungo
del m. bicipite brachiale
Diverticolo bicipitale della
sinoviale che circonda
il td. del capo lungo
del m. bicipite brachiale
Corpo dell'omero
Clavicola
Labbro glenoideo
Cavità glenoidea
Cavità articolare
Testa dell'omero
Labbro glenoideo
(Recesso ascellare)
Membrana sinoviale
della capsula articola

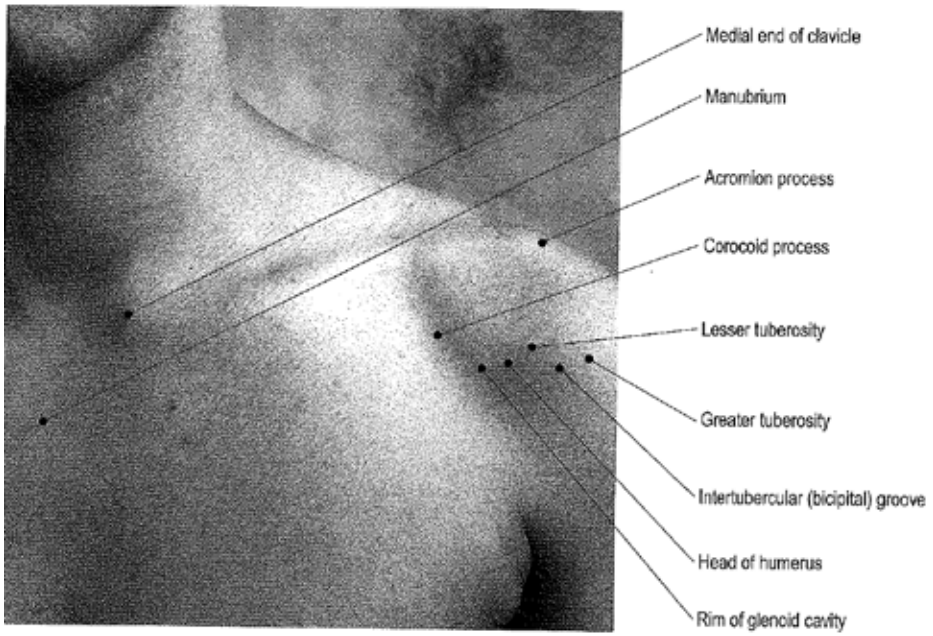


Fig. 2.1 (a)
The left shoulder (anterior view)

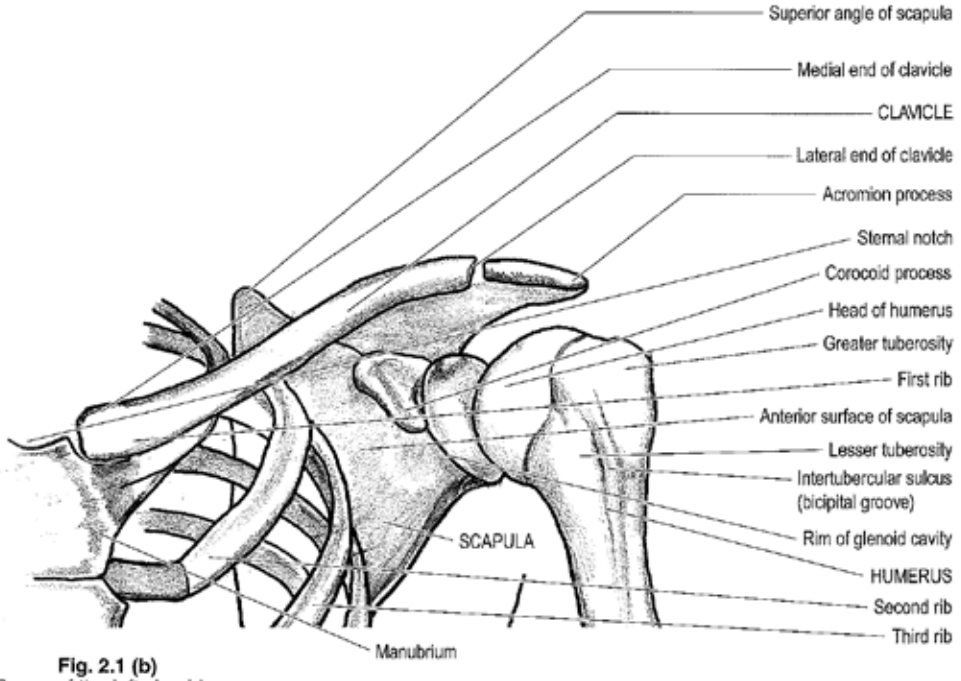


Fig. 2.1 (b)
Bones of the left shoulder
(anterior view)

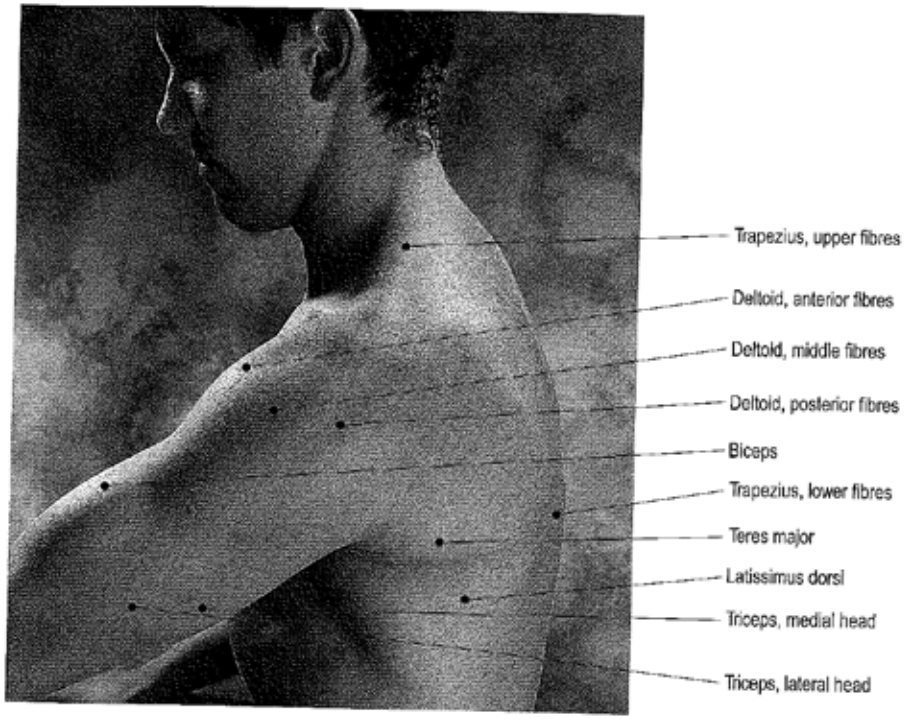


Fig. 2.17 (a)
Muscles that move the arm and forearm (lateral view of left arm)

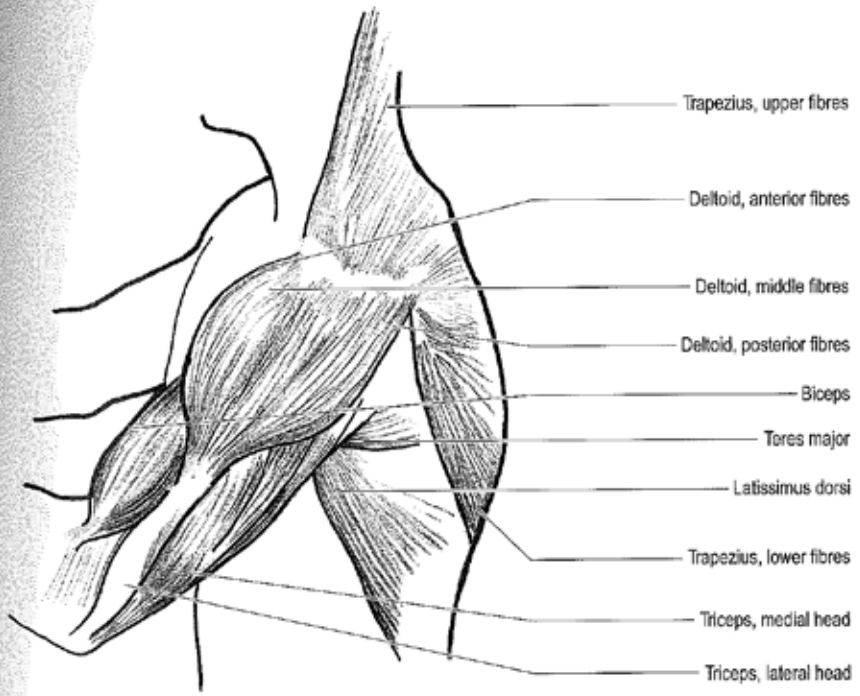
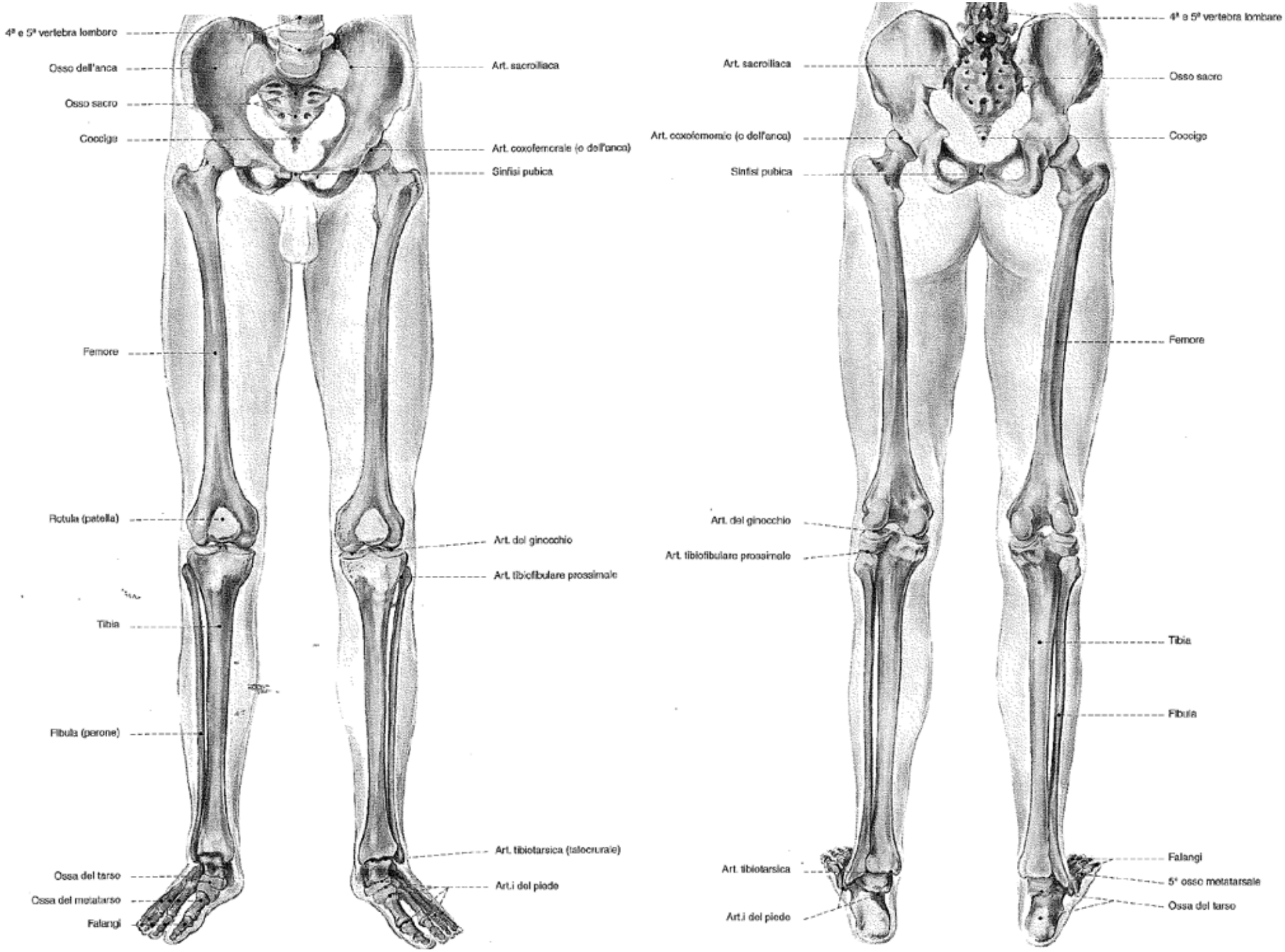
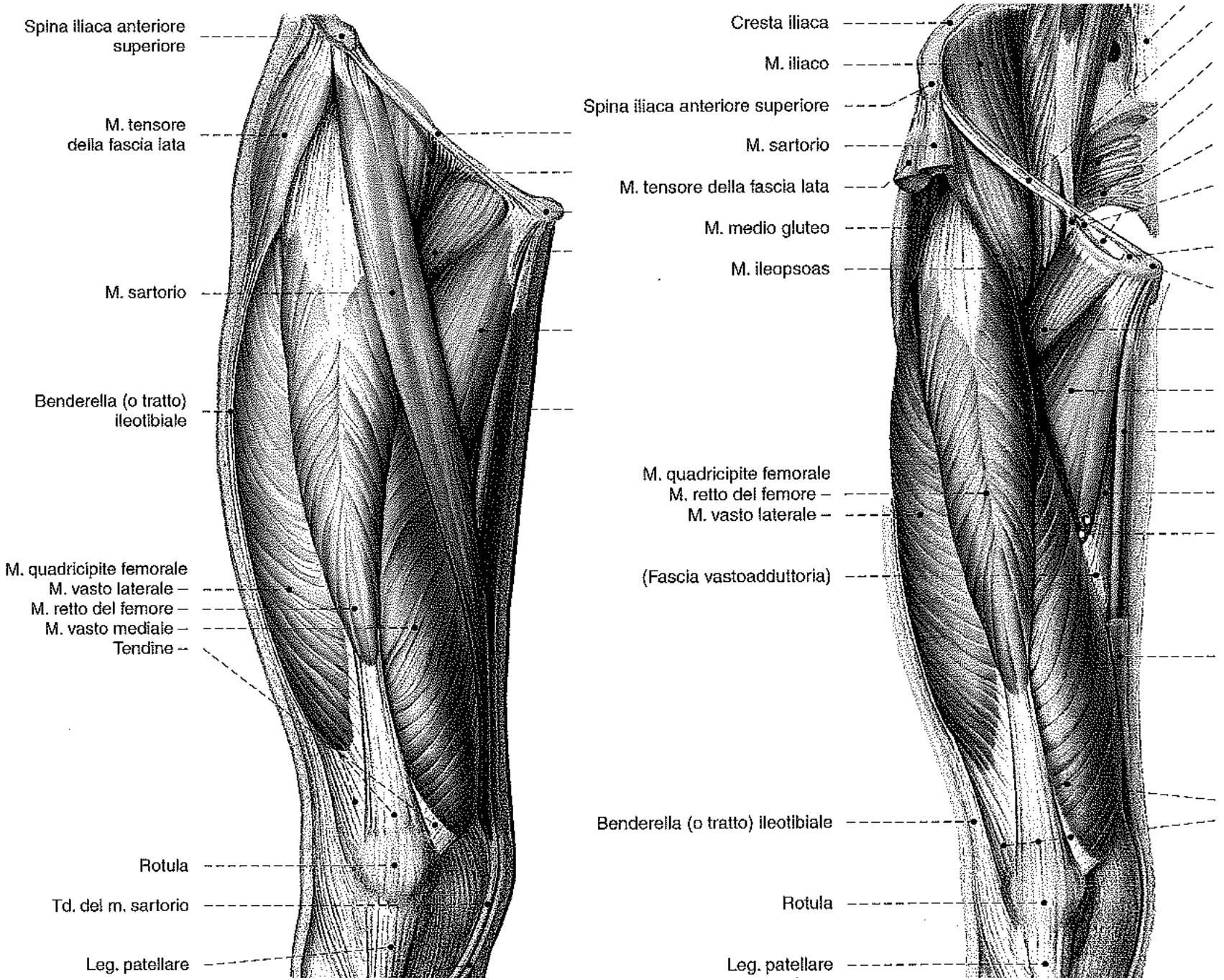
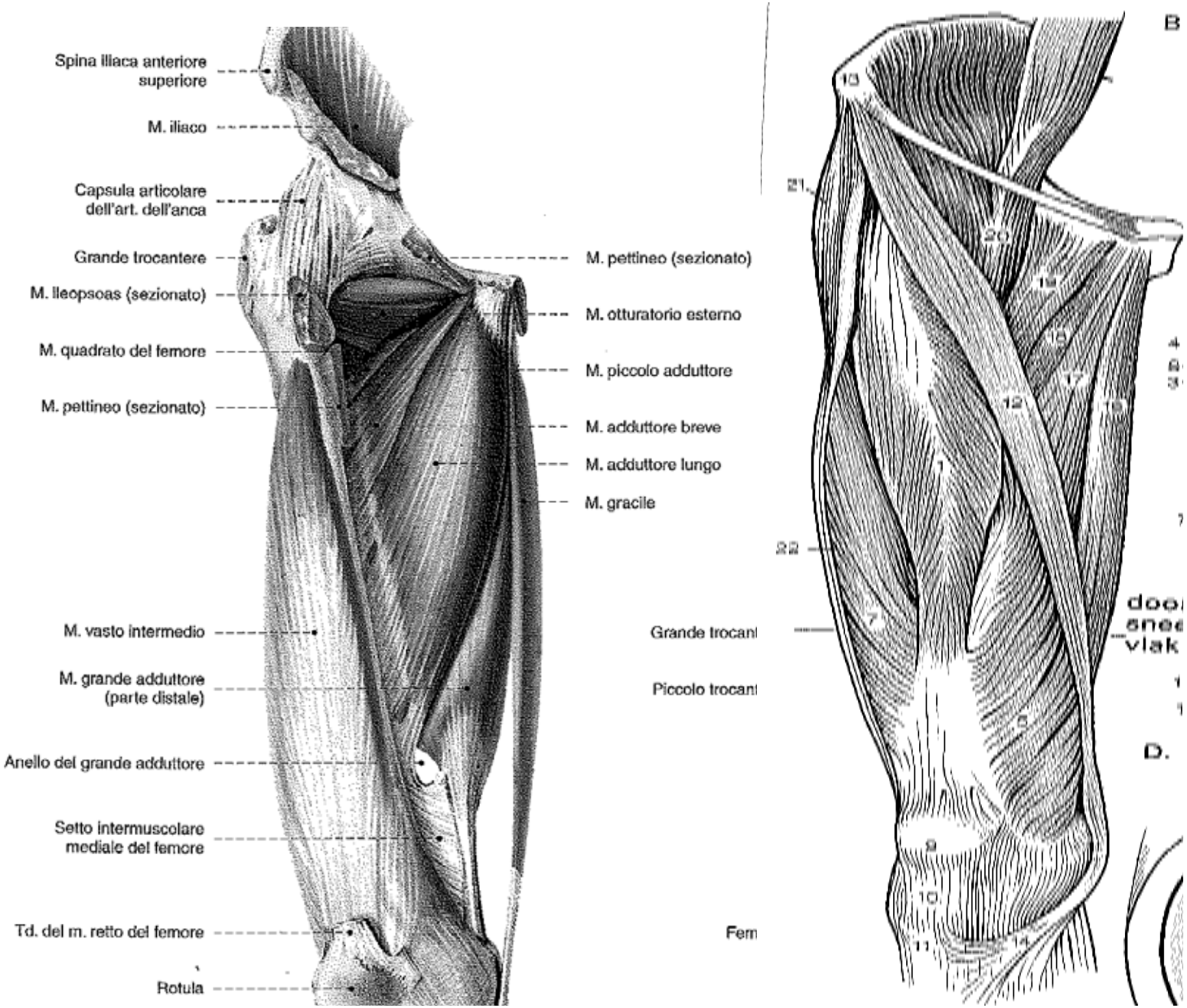


Fig. 2.17 (b)
Muscles that move the arm and forearm (lateral view of left arm)


4ª e 5ª vertebra lombare
Osso dell'anca
Osso sacro
Coccige
Femore
Rotula (patella)
Tibia
Fibula (perone)
Ossa del tarso
Ossa del metatarso
Falangi
Art. sacroiliaca
Art. coxofemorale (o dell'anca)
Sinfisi pubica
Art. del ginocchio
Art. tibiofibulare prossimale
Art. tibiotarsica (talocrurale)
Art.i del piede
4ª e 5ª vertebra lombare
Art. sacroiliaca
Art. coxofemorale (o dell'anca)
Sinfisi pubica
Art. del ginocchio
Art. tibiofibulare prossimale
Art. tibiotarsica
Art.i del piede
Osso sacro
Coccige
Femore
Tibia
Fibula
Falangi
5° osso metatarsale
Ossa del tarso


Spina iliaca anteriore superiore
M. tensore della fascia lata
M. sartorio
Benderella (o tratto) ileotibiale
M. quadricipite femorale
M. vasto laterale –
M. retto del femore –
M. vasto mediale –
Tendine –
Rotula
Td. del m. sartorio
Leg. patellare
Cresta iliaca
M. iliaco
Spina iliaca anteriore superiore
M. sartorio
M. tensore della fascia lata
M. medio gluteo
M. ileopsoas
M. quadricipite femorale
M. retto del femore –
M. vasto laterale –
(Fascia vastoadduttoria)
Benderella (o tratto) ileotibiale
Rotula
Leg. patellare


Spina iliaca anteriore superiore
M. iliaco
Capsula articolare dell'art. dell'anca
Grande trocantere
M. ileopsoas (sezionato)
M. quadrato del femore
M. pettineo (sezionato)
M. vasto intermedio
M. grande adduttore (parte distale)
Anello del grande adduttore
Setto intermuscolare mediale del femore
Td. del m. retto del femore
Rotula
M. pettineo (sezionato)
M. otturatorio esterno
M. piccolo adduttore
M. adduttore breve
M. adduttore lungo
M. gracile
Grande trocant
Piccolo trocant
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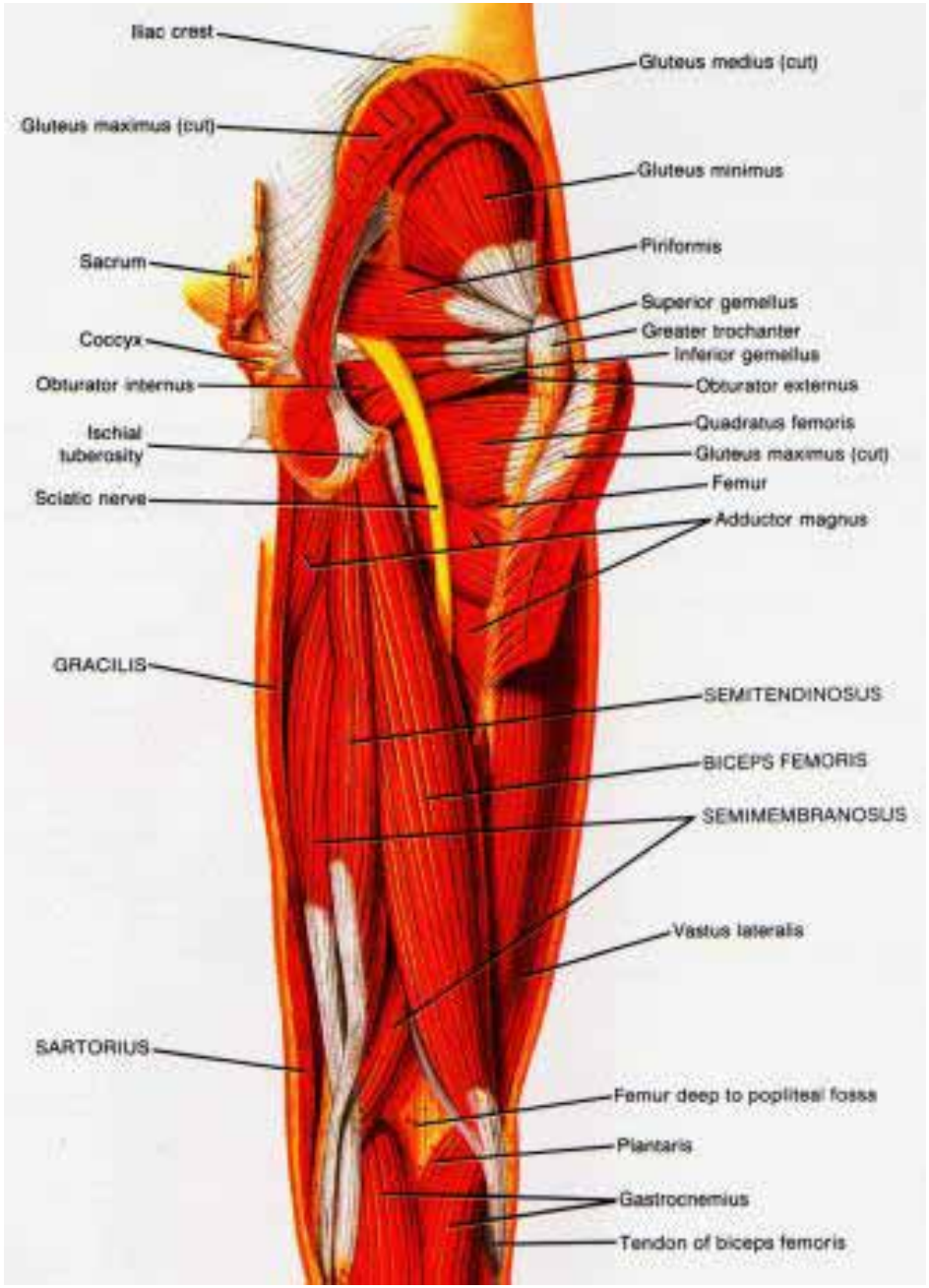
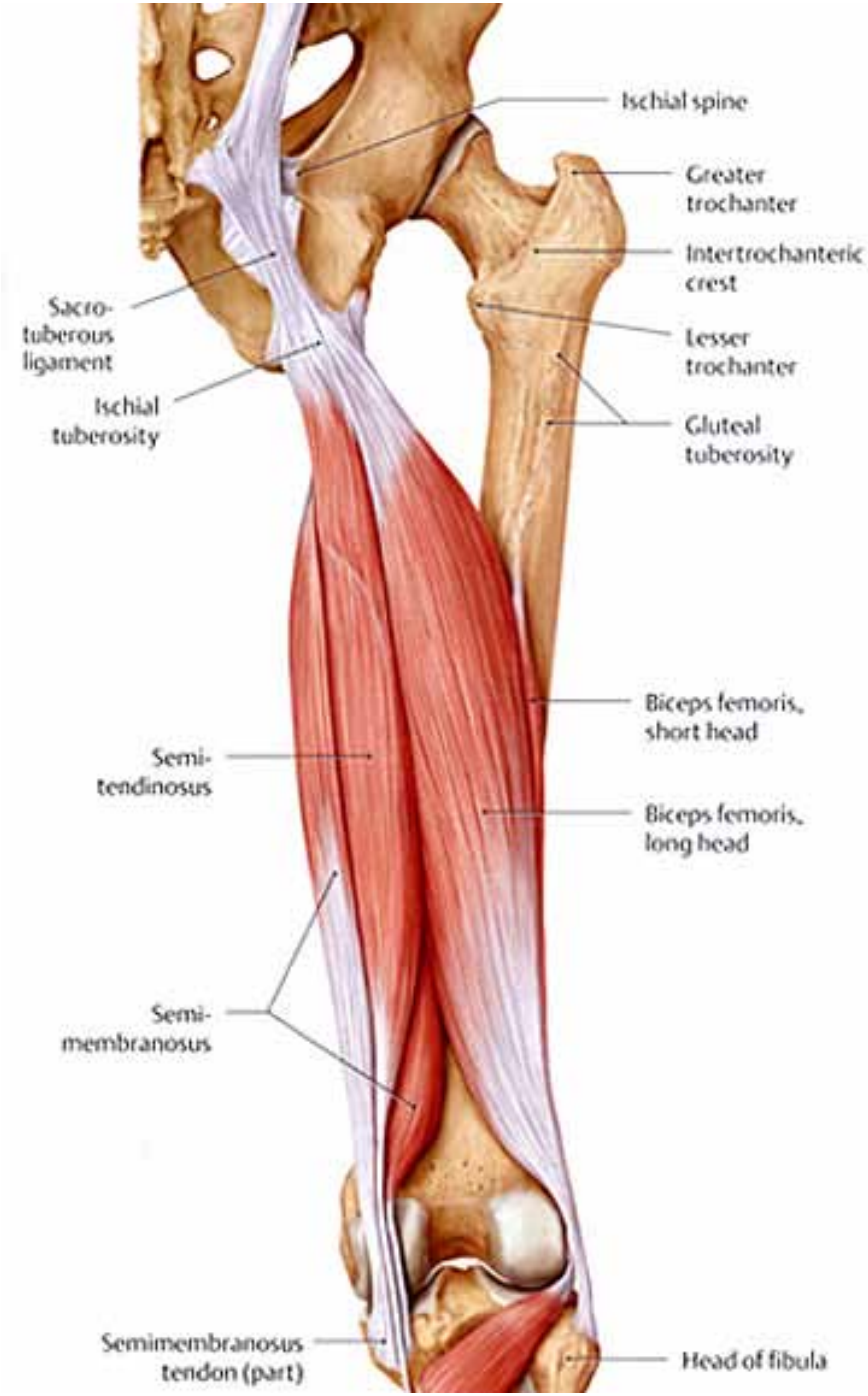

Iliac crest
Gluteus medius (cut)
Gluteus maximus (cut)
Gluteus minimus
Piriformis
Sacrum
Superior gemellus
Coccyx
Greater trochanter
Inferior gemellus
Obturator internus
Obturator externus
Quadratus femoris
Ischial tuberosity
Gluteus maximus (cut)
Femur
Sciatic nerve
Adductor magnus
GRACILIS
SEMITENDINOSUS
BICEPS FEMORIS
SEMIMEMBRANOSUS
Vastus lateralis
SARTORIUS
Femur deep to popliteal fossa
Plantaris
Gastrocnemius
Tendon of biceps femoris


Ischial spine
Greater trochanter
Intertrochanteric crest
Sacro-tuberous ligament
Lesser trochanter
Ischial tuberosity
Gluteal tuberosity
Biceps femoris, short head
Semi-tendinosus
Biceps femoris, long head
Semi-membranosus
Semimembranosus tendon (part)
Head of fibula

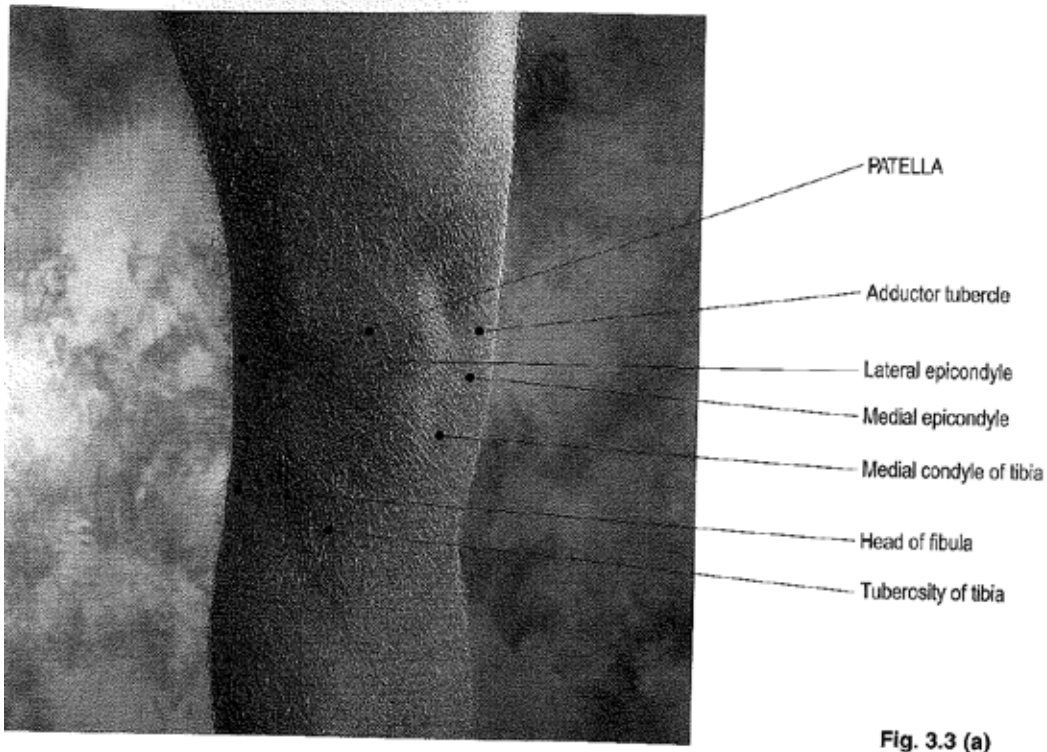


Fig. 3.3 (a)
The right knee region (anterior aspect)

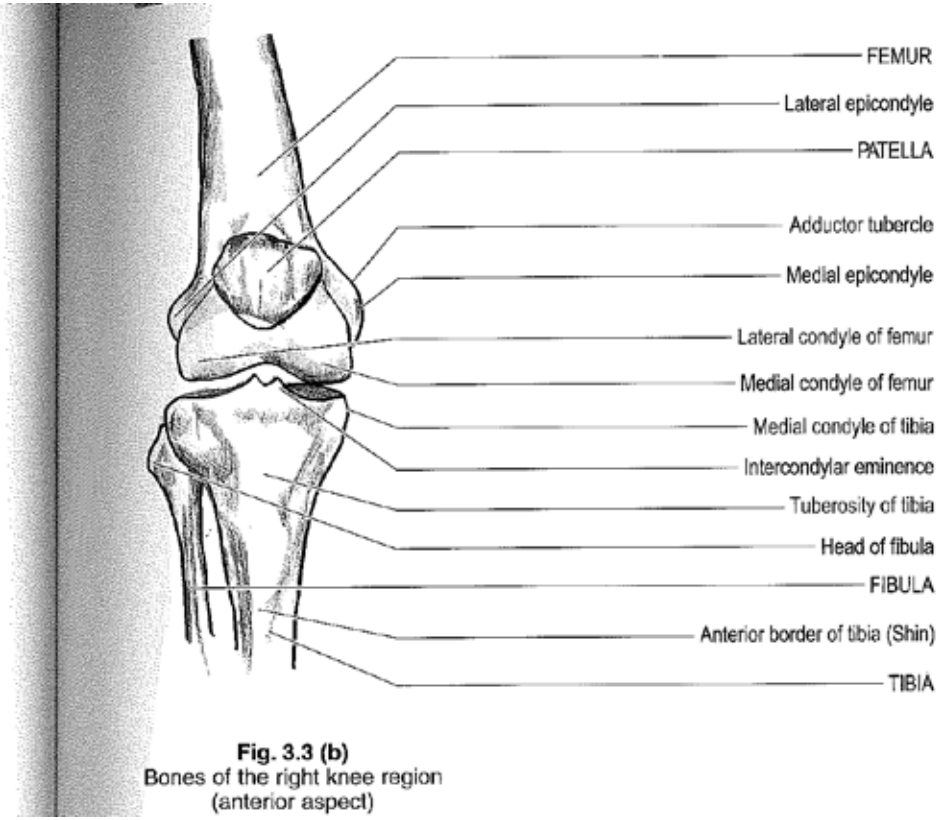
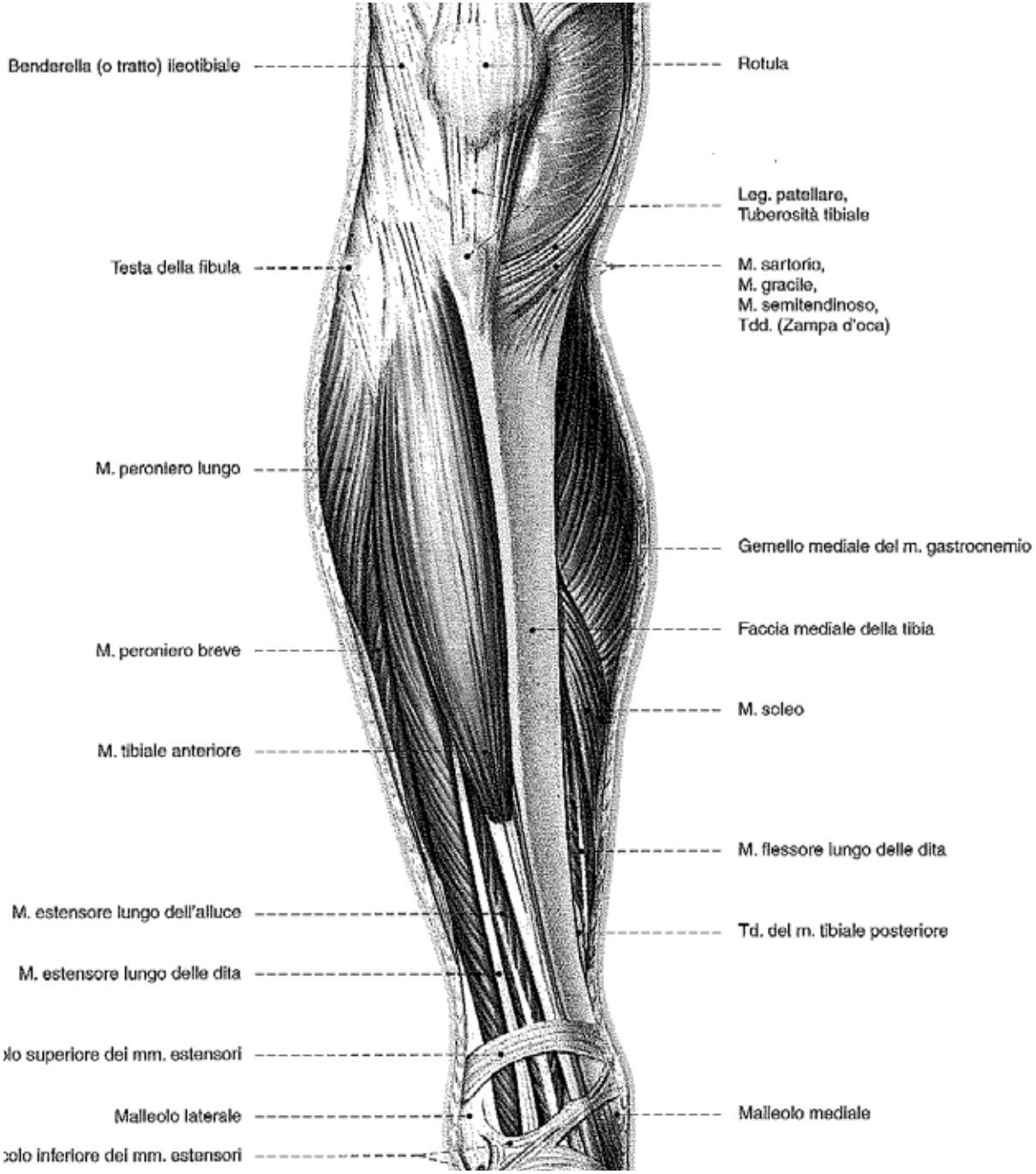
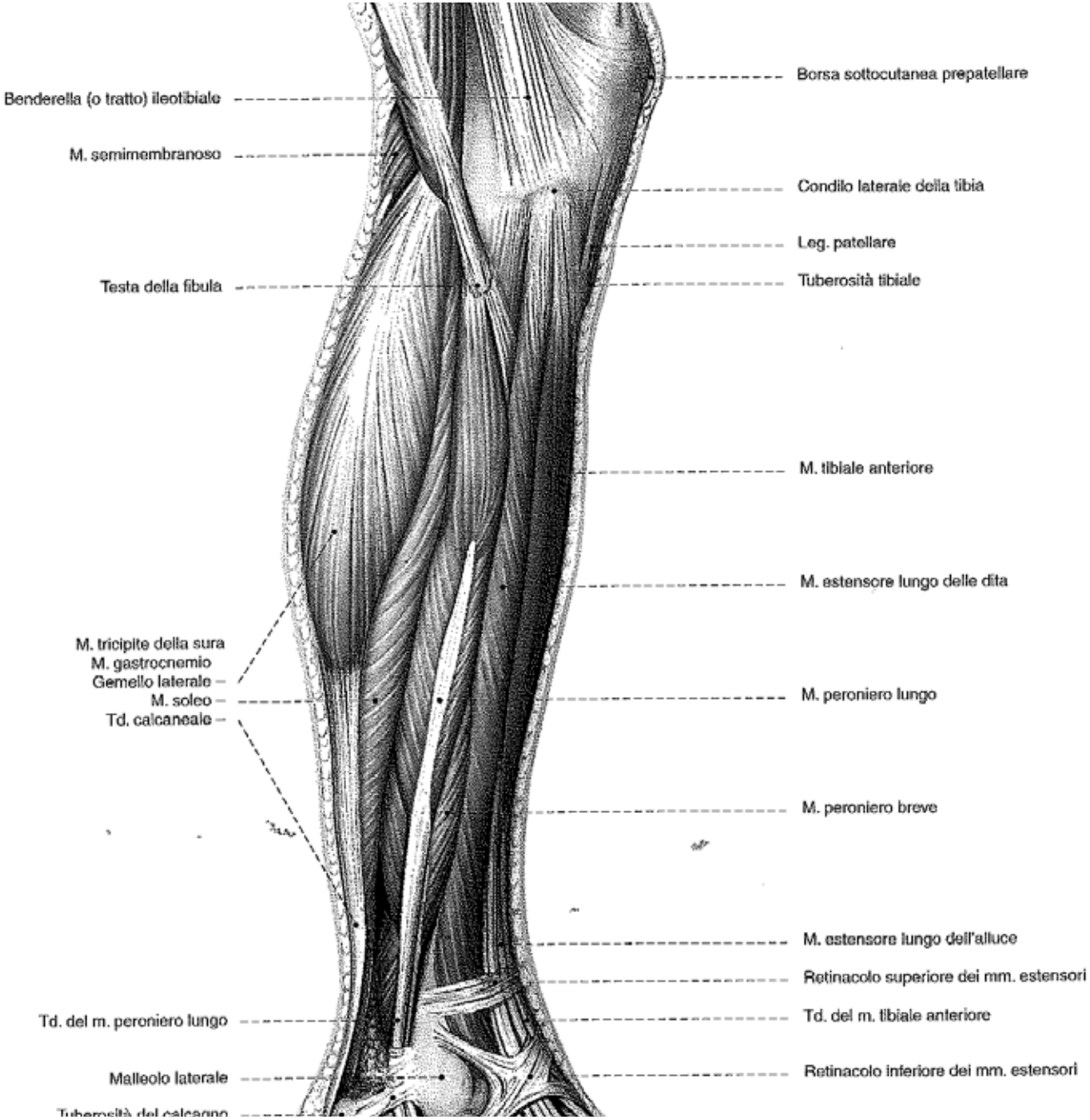
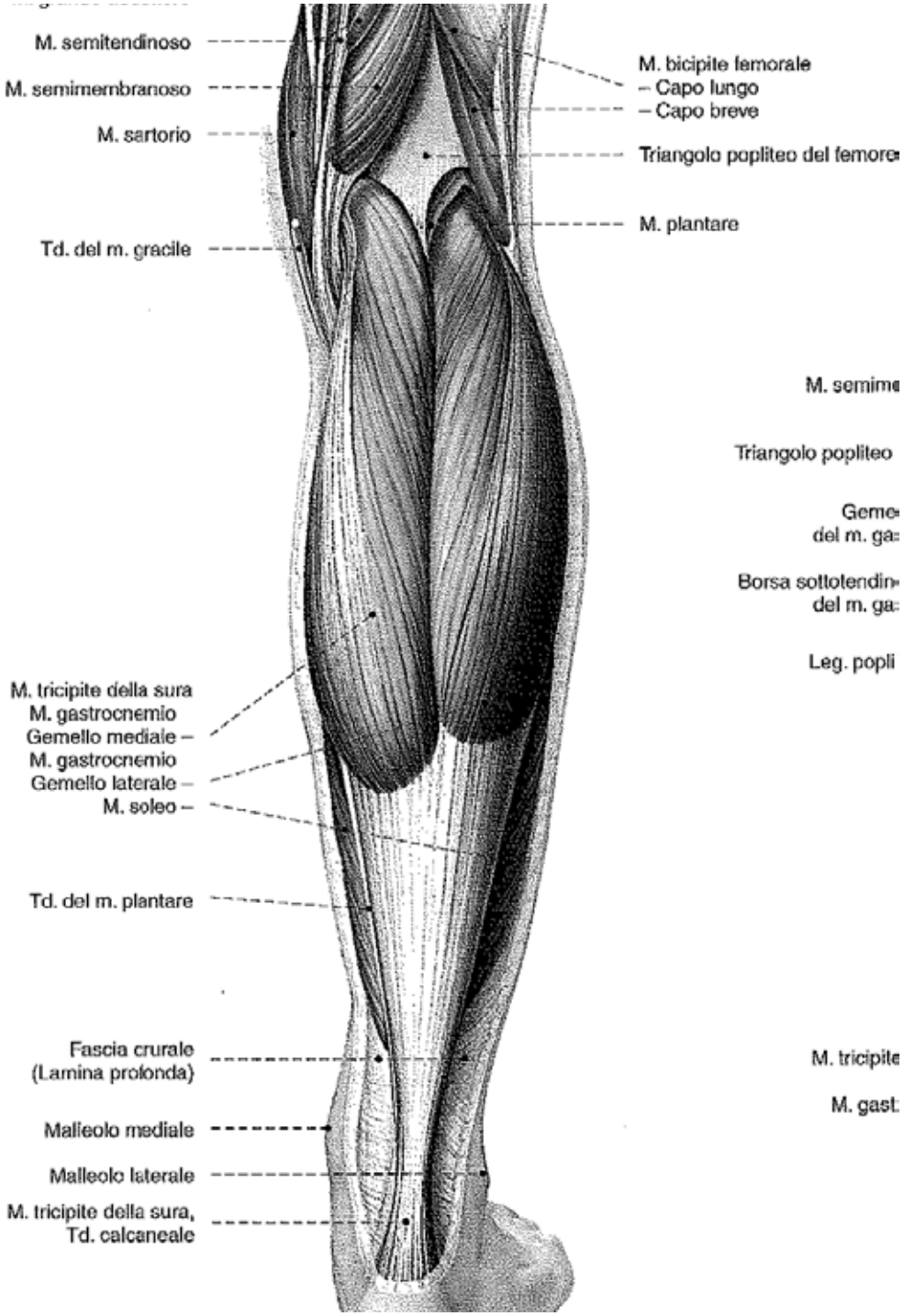


Fig. 3.3 (b)
Bones of the right knee region (anterior aspect)


Benderella (o tratto) ileotibiale
Rotula
Leg. patellare,
Tuberosità tibiale
Testa della fibula
M. sartorio,
M. gracile,
M. semitendinoso,
Tdd. (Zampa d'oca)
M. peroniero lungo
Gemello mediale del m. gastrocnemio
Faccia mediale della tibia
M. peroniero breve
M. soleo
M. tibiale anteriore
M. flessore lungo delle dita
M. estensore lungo dell'alluce
Td. del m. tibiale posteriore
M. estensore lungo delle dita
lo superiore dei mm. estensori
Malleolo laterale
Malleolo mediale
olo inferiore dei mm. estensori


Benderella (o tratto) ileotibiale
M. semimembranoso
Testa della fibula
M. tricipite della sura
M. gastrocnemio
Gemello laterale
M. soleo
Td. calcaneale
Td. del m. peroniero lungo
Malleolo laterale
Tuberosità del calcagno
Borsa sottocutanea prepatellare
Condilo laterale della tibia
Leg. patellare
Tuberosità tibiale
M. tibiale anteriore
M. estensore lungo delle dita
M. peroniero lungo
M. peroniero breve
M. estensore lungo dell'alluce
Retinacolo superiore dei mm. estensori
Td. del m. tibiale anteriore
Retinacolo inferiore dei mm. estensori


M. semitendinoso
M. semimembranoso
M. sartorio
Td. del m. gracile
M. bicipite femorale
– Capo lungo
– Capo breve
Triangolo popliteo del femore
M. plantare
M. semime
Triangolo popliteo
Geme
del m. ga
Borsa sottotendin
del m. ga
Leg. popli
M. tricipite della sura
M. gastrocnemio
Gemello mediale –
M. gastrocnemio
Gemello laterale –
M. soleo –
Td. del m. plantare
Fascia crurale
(Lamina profonda)
Malleolo mediale
Malleolo laterale
M. tricipite della sura,
Td. calcaneale
M. tricipite
M. gast