MUSCULOSKELETAL SYSTEM -- SKELETAL SYSTEM: BONES

FUNCTIONS:

-- support
-- protection
-- lever for movement
-- storage - fat (white marrow)
- minerals (esp calcium, phosphate)
-- hematopoeisis - red & white blood cell production

STRUCTURE: overall size,shape, markings

flat - *e.g. skull, sternum, ribs, scapula*
cuboidal = short - *e.g. wrist & ankle (carpal, tarsal)*
irregular - *e.g. vertebrae, some bones of face*
odd or variable (and variable number)
a. wormian = sutural: clusters between joints of some cranial bones esp. *occipital suture*
b. sesamoid: in tendons where considerable pressure may develop *e.g. kneecap = patella (everyone) & sometimes in tendons at wrist, ankle*

long: *e.g. arm, leg, finger, toe, hand, foot*
-- diaphysis
-- epiphysis
-- metaphysis
-- epiphyseal plate
-- medullary cavity

osteoblasts
osteoclasts
enchondral growth
intramembranous growth

endosteum

periosteum
outer (fibrous) layer
inner (osteogenic) layer

-- functions: growth
nutrition
repair
attach to ligament, tendon

articular cartilage

AXIAL SYSTEM: 80 major bones: *skull, vertebral column, ribs*

SKULL: 22 bones: 8 cranial + 14 facial:

suture: *coronal, sagittal, lambdoidal, squamosal*

fontanel
-- anterior (frontal)
-- posterior (occipital)
-- anterolateral (sphenoid)
-- posterolateral (mastoid)

SPECIFIC BONES:

-- cranial --

frontal (1): forehead, anterior cranium, includes floor of orbit;
frontal sinuses

parietal (2): sides (wall) of cranium

temporal (2): *squamous*, *zygomatic*, *petrous portions*

occipital (1): posterior & base of cranium:

sphenoid (1): ("wedge") = "keystone" of cranial floor

ethmoid (1): anterior floor between orbits
cribiform plate with olfactory foramina
crista galli
superior & middle nasal *conchae*

-- facial --

nasal bone (2): bridge of nose

maxilla (2): articulate with all facial bones except mandible

zygomatic (2): cheek bones; with temporal bone --> arch

mandible (1): lower jaw; only moveable bone in skull
- *ramus*: each has a **condylar process** which articulates with
mandibular fossa & **articular tubercle** of temporal bone = **TMJ**

lacrimal (2): lacrimal fossa - tear ducts

palatine (2): post. 1/4 of hard palate

inferior nasal conchae (2): lat. wall of nasal cavity

vomer (2) "plowshare":inferior, post. part of nasal septum

hyoid (1): U-shaped; doesn't articulate with any other bone

-- vertebral column = spine <==> vertebrae --

intervertebral discs
ANNULUS FIBROSUS
NUCLEUS PULPOSUS
intervertebral foraminae

26 vertebrae:
7 cervical
12 thoracic
5 lumbar
5 sacral (fused --> sacrum)
4 coccygeal (fused --> 1 or 2 coccyx)

curvatures:
1° curves: thoracic & sacral
2° curves: cervical & lumbar

A typical vertebra has several characteristic features:

1. BODY

2. ARCH
   pedicles
   laminae

3. 7 processes of each arch:

   2 transverse
   1 spinous process
   2 superior articular processes
   2 inferior " "

DIFFERENCES:

A. cervical: small bodies, large arches; spinous processes often cleft
* *atlas* (#1) supports head; has ant & post arches with lateral masses
* *axis* (#2) has body & *DENS*
* *vertebra prominens* (#7): large non-bifid spine

B. thoracic: larger, stronger, heavy body.
   long spine points inferiorly
   facets (or demi-facets) on sides for rib articulation

C. lumbar: largest & strongest

D. sacrum: triangular; articulates laterally with pelvis

E. coccyx

<u>THORACIC BODY WALL</u>:

sternum
- manubrium: articulates with ribs 1 & 2
- body: articulates directly or indirectly with ribs 2-10
- xiphoid process: no ribs, but some abdominal muscles attach

ribs: increase in length # 1--7; decrease in length # 8 -- 12

posterior articulation with vertebrae (at corresponding T-level)

"true ribs" - "vertebrosternal" articulations

"false ribs" - "vertebrochondral" articulations # 8-10

"floating ribs"

"typical" rib (#3-9):
- head
- neck
- tubercle
- body = shaft
  - costal groove

intercostal spaces

clinical notes:

slipped disc

curvatures: scoliosis
kyphosis
lordosis
spina bifida

fractures

APPENDICULAR SKELETON: GIRDLES & LIMBS:

PECTORAL GIRDLE (shoulder)
clavicle
scapula

UPPER EXTREMITY:
humerus

radius

ulna

carpals

metacarpals

phalanges (sing. phalynx)

PELVIC GIRDLE (hip):
os(sa) coxae = innominate bones = pelvic bones
ilium
ischium
pubis
symphysis pubis
acetabulum

sacrum

coccyx

LOWER EXTREMITY:
femur

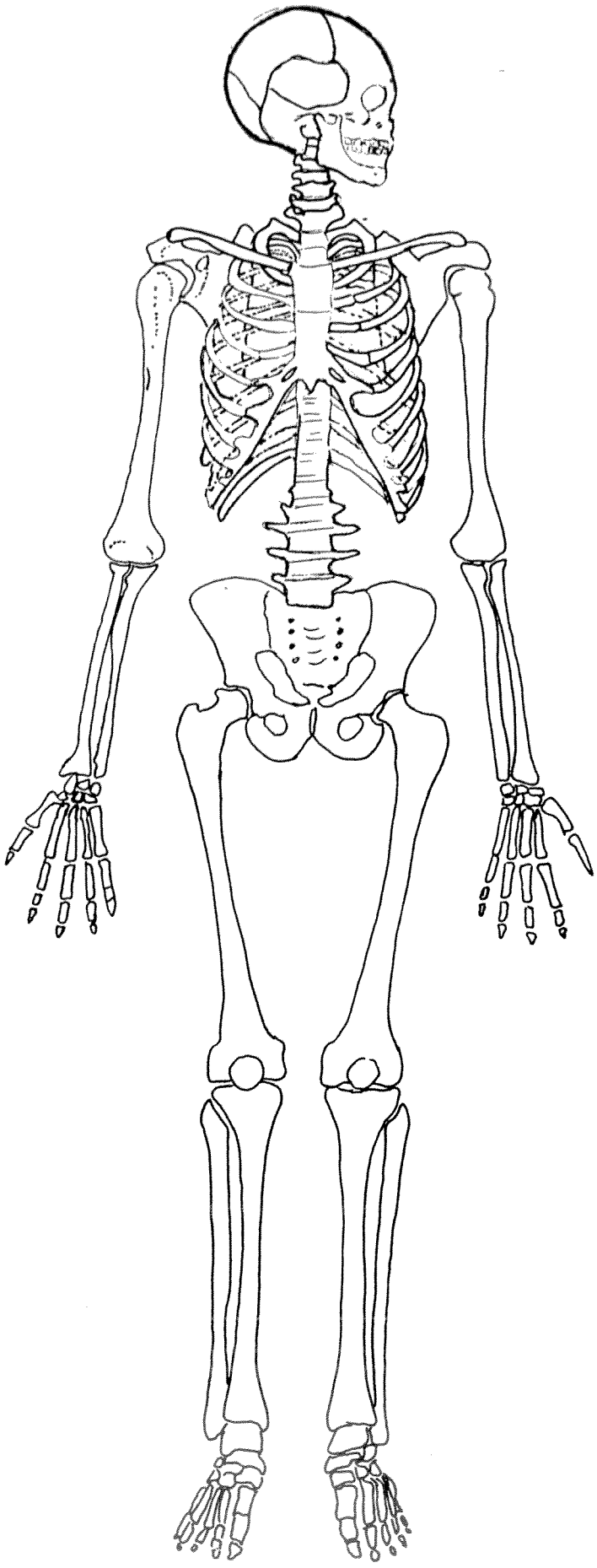
patella

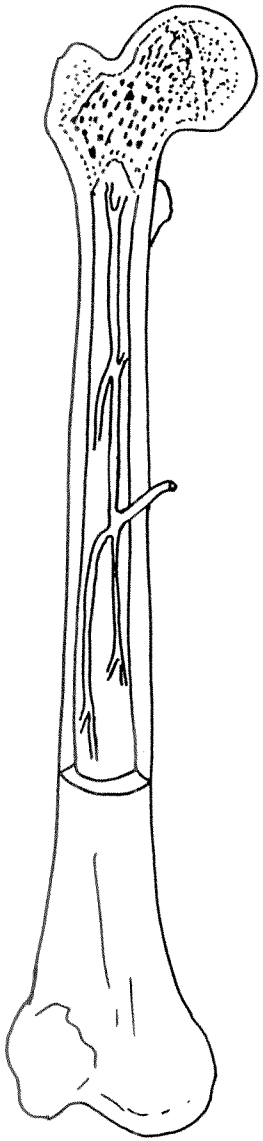
tibia
fibula

tarsals

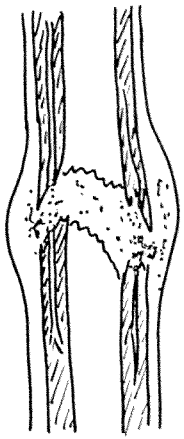
metatarsals

phalanges (sing. phalynx)



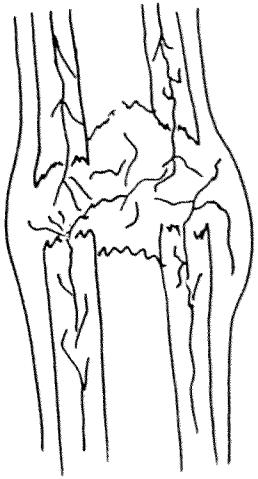


HEMATOMA



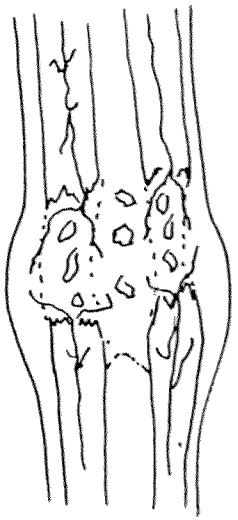
BROKEN PERIOSTEUM

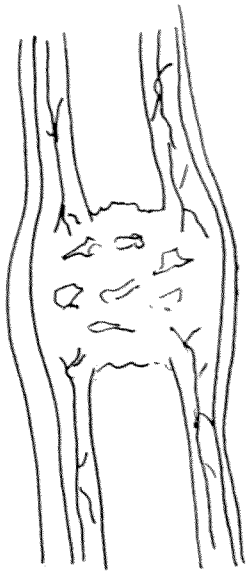
GRANULATION TISSUE



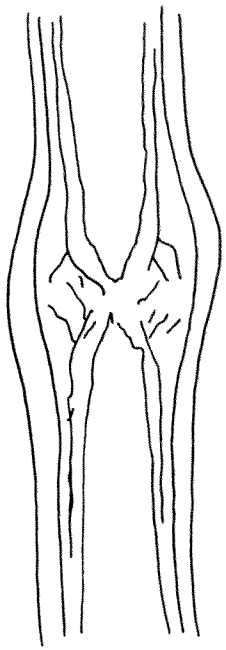
FIBROCARTILAGE
RE-EST. PERIOSTEUM

FIBROCARTILAGENOUS CALLUS



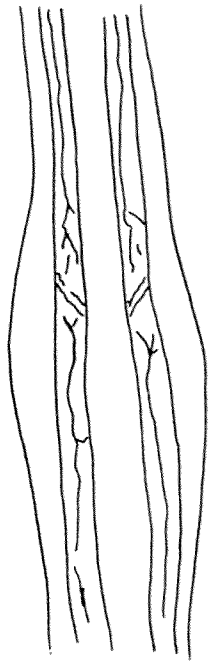


CALCIFIED CARTLAGE

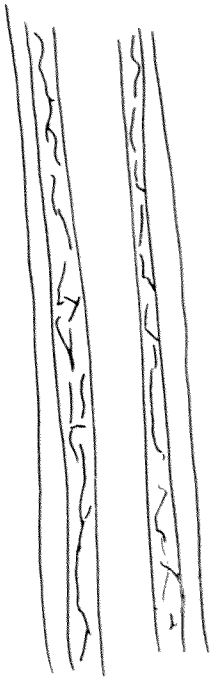


HARD CALLUS

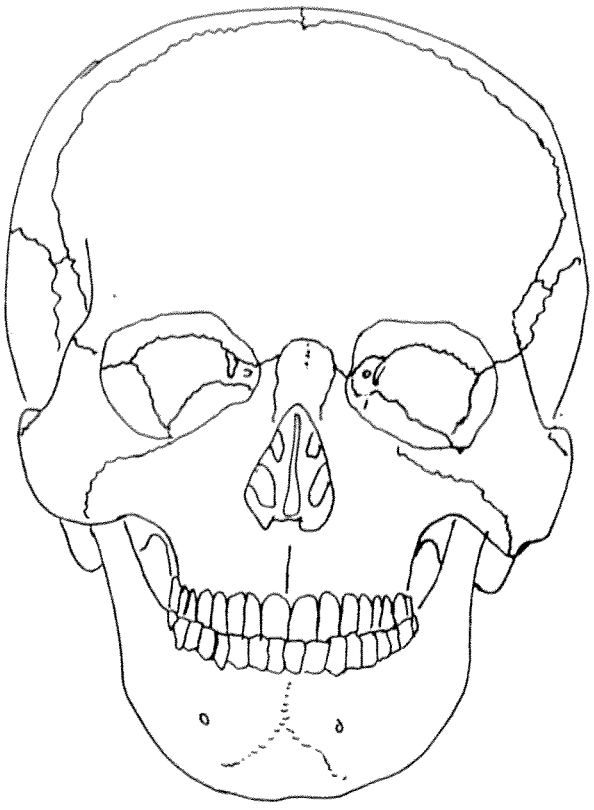
OSTEOGENIC CELLS REPLACE DYING CARTILAGE

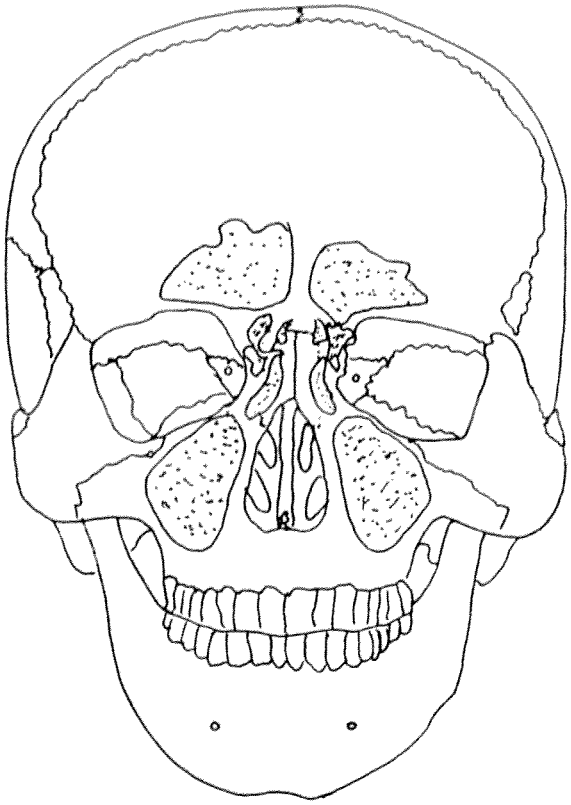


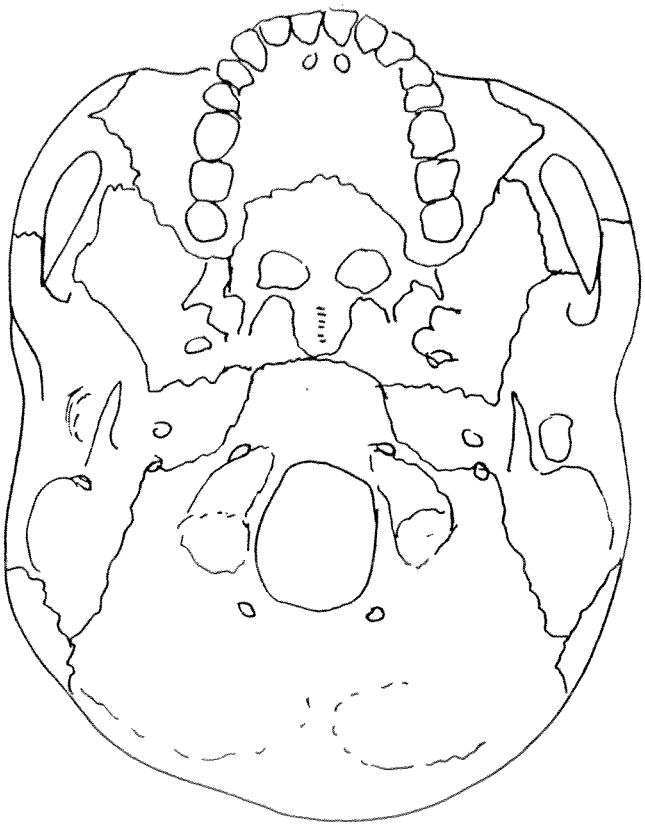
RESORPTION, CONVERSION TO LAMELLAR BONE

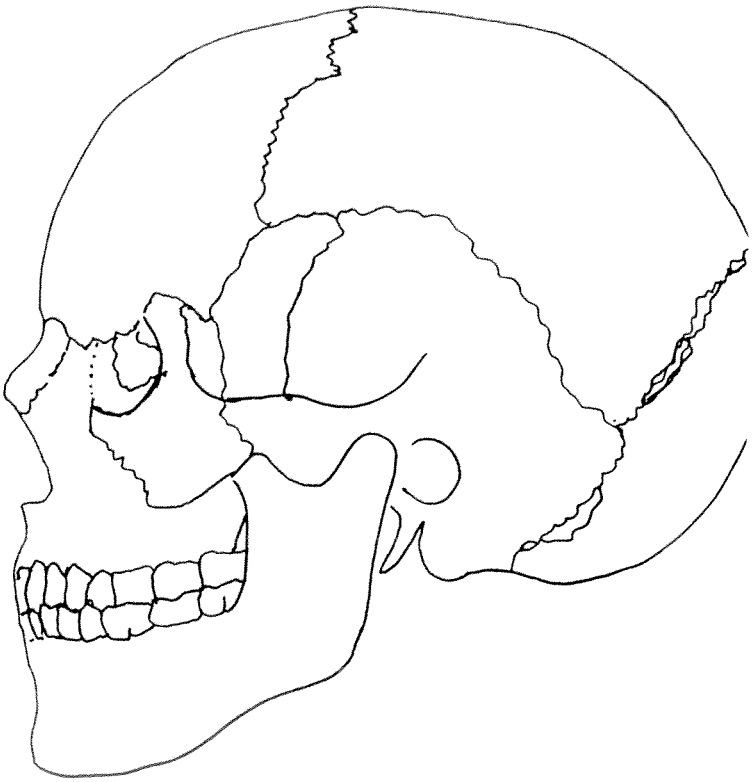


REMODELING









MUSCULOSKELETAL SYSTEM -- ARTICULATIONS = JOINTS

LEVERS: FULCRUM, RESISTANCE, EFFORT
compare & contrast; know examples of each (in body)

CLASS I

CLASS II

CLASS III

ARTICULATIONS:

amount of movement:
-- synarthrotic

-- amphiarthrothic

-- diarthrotic

types of movement:
-- extension - flexion
-- abduction - adduction - opposition
-- medial rotation - lateral rotation (supination - pronation)
-- circumduction
-- inversion - eversion
-- protraction - retraction
-- elevation - depression

TYPES OF ARTICULATIONS:

A. FIBROUS

a. suture

b. syndesmosis

c. gomphosis

B. CARTILAGINOUS

a. synchondrosis

b. symphysis

C. SYNOVIAL

a. gliding = plane

b. hinge

c. pivot

d. ellipsoidal, condyloid

e. saddle

f. ball & socket

SPECIFIC JOINTS:

TEMPOROMANDIBULAR

HUMEROSCAPULAR = SHOULDER

ELBOW

WRIST

COXAL = HIP
- acetabulum

TIBIOFEMORAL = KNEE
- -- intermediate patellofemoral joint
- -- lateral tibiofemoral joint
- -- medial tibiofemoral joint

major structures associated with knee:
- femur
- tibia
- patella
- menisci: lateral meniscus
  medial meniscus
- cruciate ligaments - anterior & posterior
- capsule

ANKLE

clinical notes:

bursitis

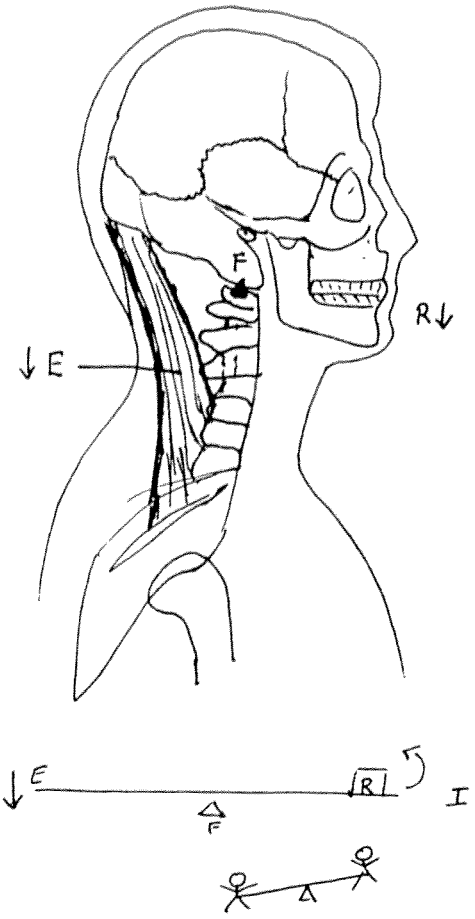
strain

sprain

dislocation

tendonitis

arthritis
- rheumatoid arthritis
- osteoarthritis
- gouty arthritis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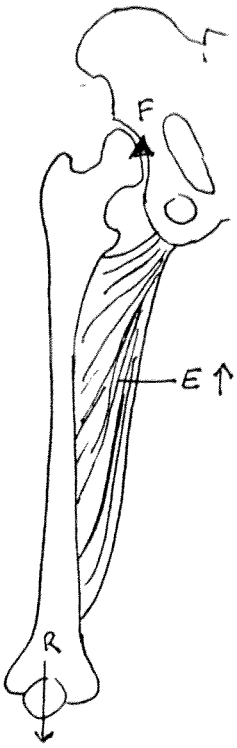
F
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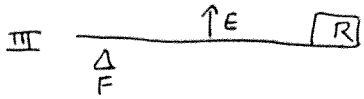
III
↑E
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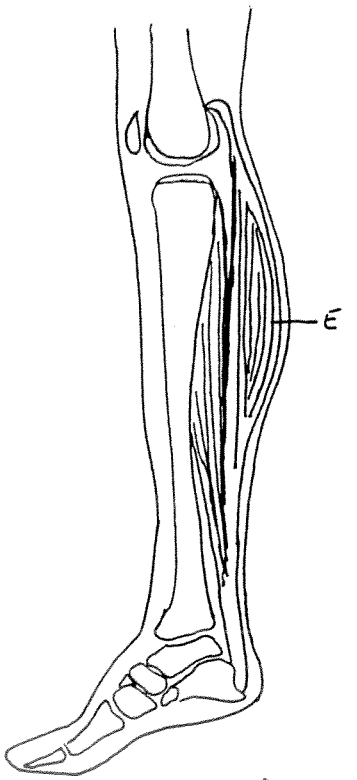
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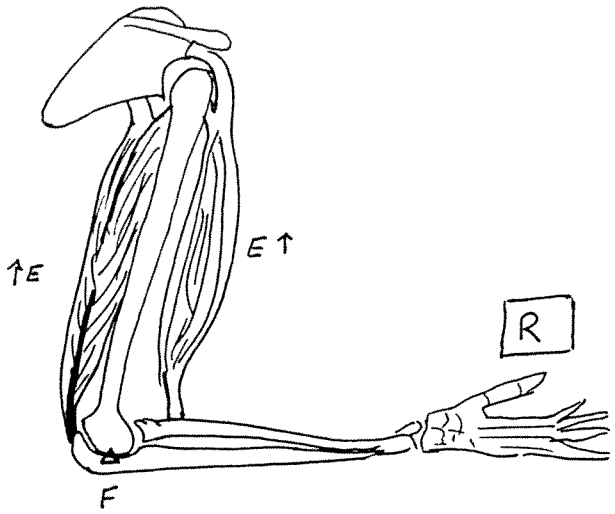
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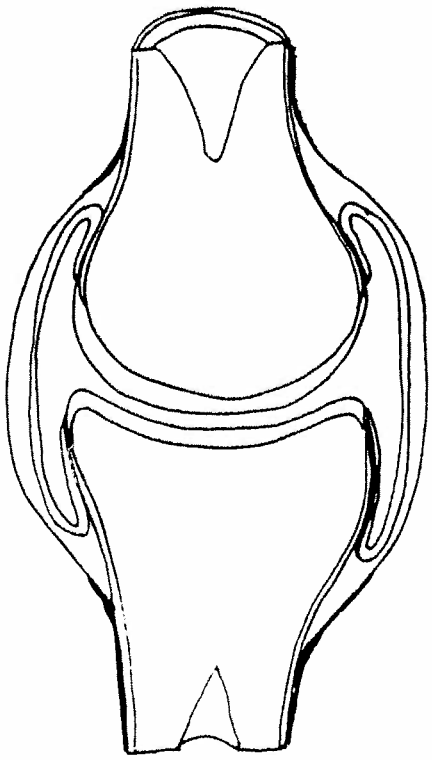
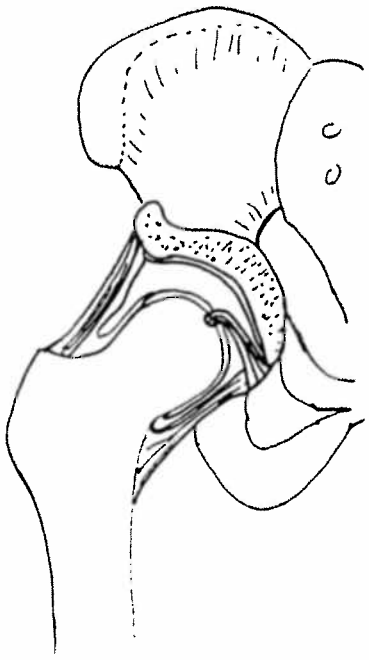
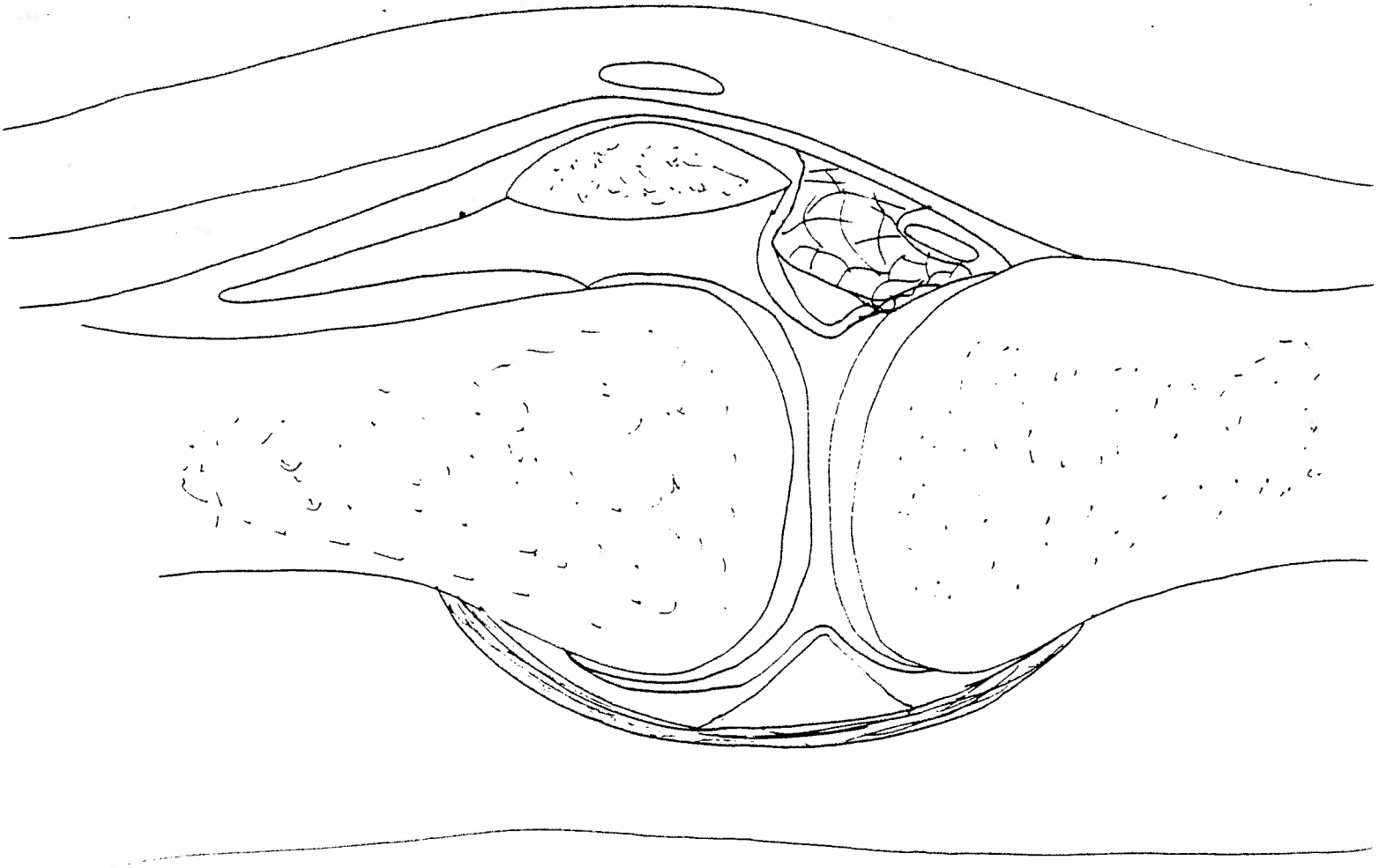
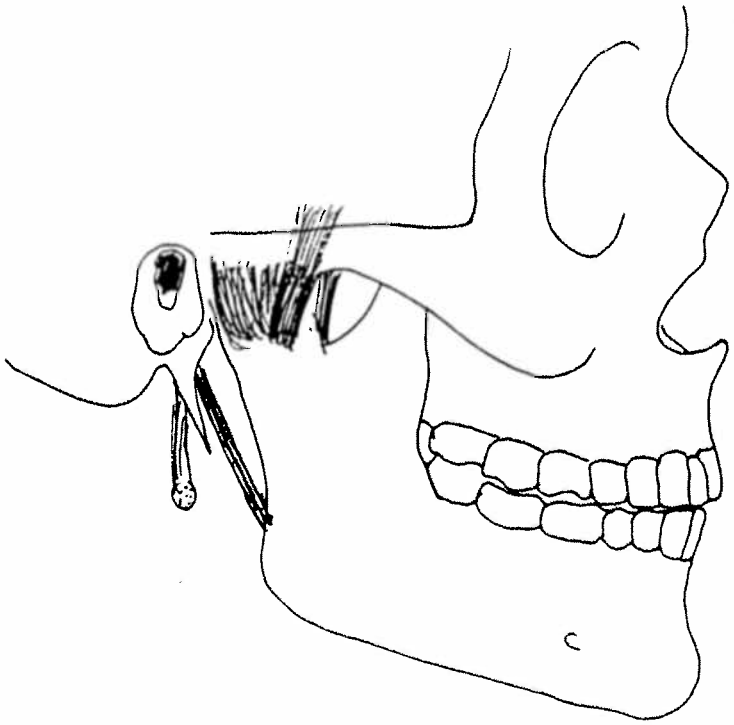
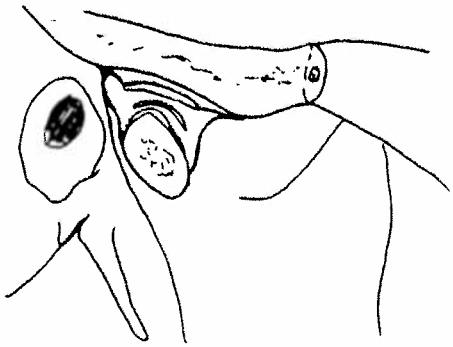
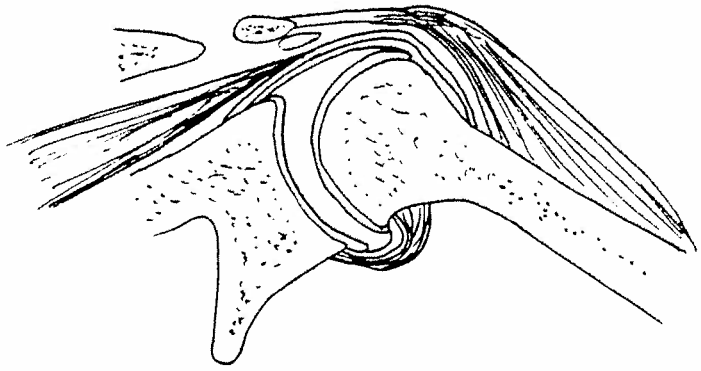


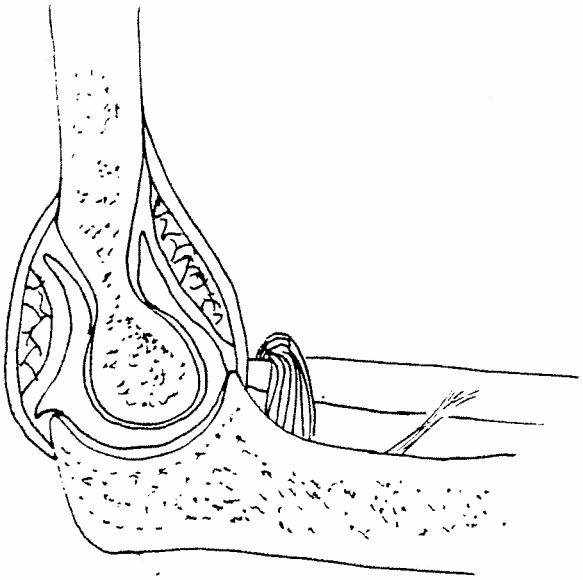












MUSCULOSKELETAL SYSTEM -- MUSCLES

MUSCLE: comprises about 40-50% of body weight

excitability

contractility

extensibility

elasticity

Functions include: motion
maintenance of posture
heat production

Types: 1. smooth = not striated

2. cardiac = striated but not skeletal, not voluntary:
intercalated discs separate individual cells.

3. skeletal
-- striated
-- mostly voluntary
-- myofibers = multinucleate

Overall organization of muscles:

connective tissue: FASCIA: (a) superficial = subcutaneous

-- inner layer

-- between layers:

-- outer layer

(b) deep

-- endomysium

-- epimysium

-- fascicles

-- perimysium

-- TENDON

-- APONEUROSIS

-- tendon sheath

-- retinaculum

ORIGIN

INSERTION

GASTER

CONFIGURATION = arrangement of fasciculi = bundles of fibers w/in muscle and with respect to its tendon.

1. parallel = fasciculi extend length of muscle, terminating in tendons at either end. ==> quadrate shape *e.g.* stylohyoid

   -- fusiform = nearly parallel but tapers = "typical" *e.g.* biceps

2. convergent = broad origin --> narrow restricted insertion --> triangular shape *e.g.* deltoid ("triangular shape")

3. pennate (pinnate) = short fasciculi + long tendon running almost the whole length of the muscle; fascicles run obliquely into tendon like plumes of a feather.

   a. unipennate = all fascicles on one side *e.g.* extensor digitorum
   b. bipennate = fascicles on 2 sides of tendon *e.g.* rectus femoris
   c. multipennate = many tendons *e.g.* deltoid

4. circular = enclose an orifice *e.g.* orbicularis oculi, o. oris

-- **agonist**: prime mover. for example, to flex the elbow = biceps

-- **synergist**: act together to perform movement *e.g.* 2 heads of biceps + brachialis, etc. ... OR help agonist by reducing other undesired forces *e.g.* deltoid & pectoralis major hold humerus & shoulder in appropriate positions.

-- **antagonist**: acts in opposition to agonist *e.g* triceps extends elbow

NAMES: muscles' names usually have pertinent meanings for example:

1. direction of fibers:
   a. rectus = parallel to midline of body:*r.abdominis, femoris*
   b. transverse = perpendicular " " " :*transversus abdominis*
   c. oblique = diagonal to " " ":*external, internal oblique*

2. location *temporalis, tibialis*

3. size *e.g.* maximus, minimus, longus, brevis *gluteus maximus, minimus; adductor longus; extensor digitorum longus, brevis*

4. number of origins *biceps brachii, triceps brachii, quadriceps*

5. shape *trapezius (trapezoid); deltoid (triangle); rhomboideus*

6. origin - insertion *sternocleidomastoid; stylohyoid*

7. action *e.g.* flexor, extensor, adductor, pronator, levator (lifter), etc. *flexor, extensor digitorum*

MUSCLE GROUPS:

FACIAL EXPRESSION

MASTICATION: 4 muscle pairs

1. temporalis
2. masseter
3. medial pterygoid
4. lateral pterygoid

OCULAR MUSCLES

TONGUE:

A. INTRINSIC

B. EXTRINSIC: _____-glossus *e.g.*
genio....
stylo...
hyo...
stylohyoid

NECK

A. POSTERIOR:
sternocleidomastoid
semispinalis capitis
longissimus capitis

B. SUPRAHYOID:
digastric
mylohyoid
stylohyoid

C. INFRAHYOID
sternohyoid
thyrohyoid
omohyoid (scapula)
sternothyroid

PECTORAL GIRDLE:

ANTERIOR:
serratus anterior
pectoralis minor
subclavius

POSTERIOR:
trapezius
levator scapulae
major & minor rhomboids

MOVE HUMERUS

A. "scapular muscles": 7/9 originate on scapula:

deltoid:
supraspinatus
infraspinatus
teres major
teres minor
subscapularis
coracobrachialis

B. "axial muscles": 2/9 originate elsewhere:

pectoralis major
latissimus dorsi

MOVE FOREARM:

biceps brachii
brachialis
brachioradialis
triceps brachii

WRIST, HAND, FINGERS

supinator
pronator teres
flexor carpi radialis
flexor carpi ulnaris
flexor digitorum superficialis (-> middle phalanges)
& " " profundus (-> distal phalanges)
extensor carpi radialis
extensor carpi ulnaris
extensor digitorum superficialis (-> middle phalanges)
& " " profundus (-> distal phalanges)

& intrinsic muscles of hand

RESPIRATION: diaphragm &
external intercostals - elevates & draws ribs together
internal intercostals - depresses & draws ribs together

ABDOMINAL WALL:
external oblique
internal oblique
transversus abdominus
rectus abdominus

VERTEBRAL COLUMN:
rectus abdominus
quadratus lumborum
erector spinae

THIGH:

A. anterior = extensors:
- iliacus
- psoas major

B. posterior = flexors:
- gluteus maximus, medius, minimus
- tensor fasciculata
- 6 internal rotators all at different angles

c. medial adductors
- gracilis
- pectineus
- adductor longus, brevis, magnus

MOVE LOWER LEG:

anterior = extensor - sartorius
- quadriceps femoris
- rectus femoris
- vastus lateralis, medialis, intermedius

posterior = flexor = hamstrings:
- biceps femoris
- semitendinosus
- semimembranosus

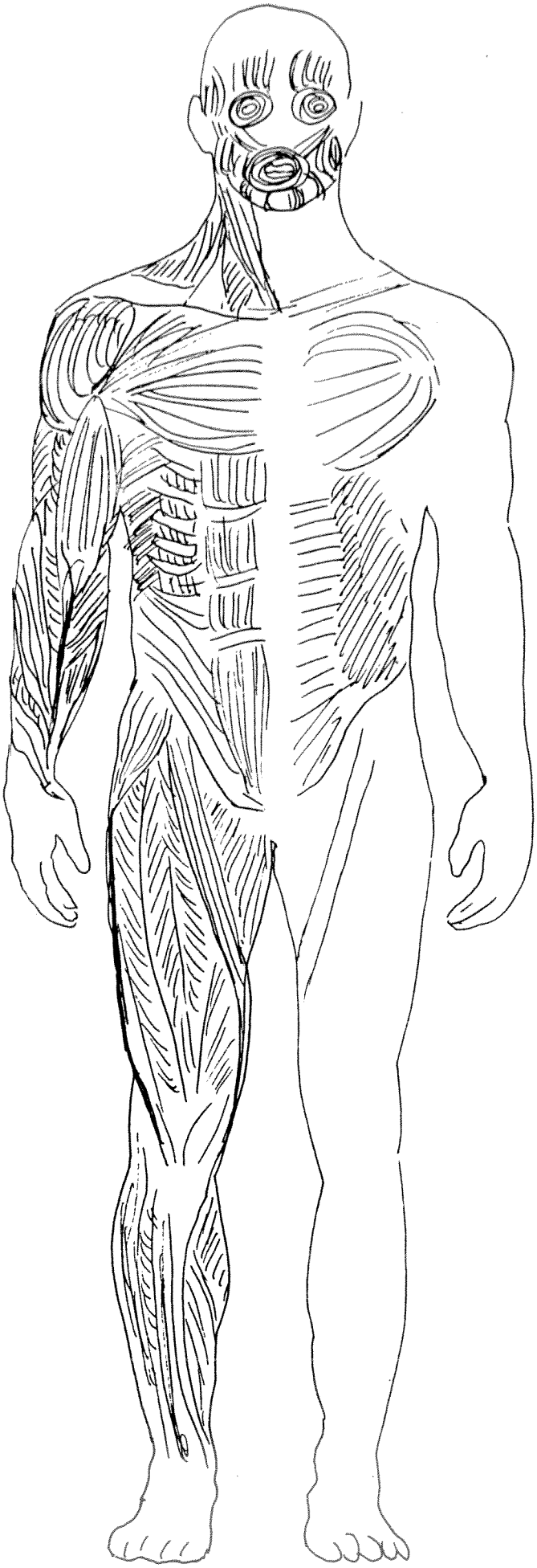
LOWER LEG: move ANKLE, FOOT, TOES: crural muscle = shank;

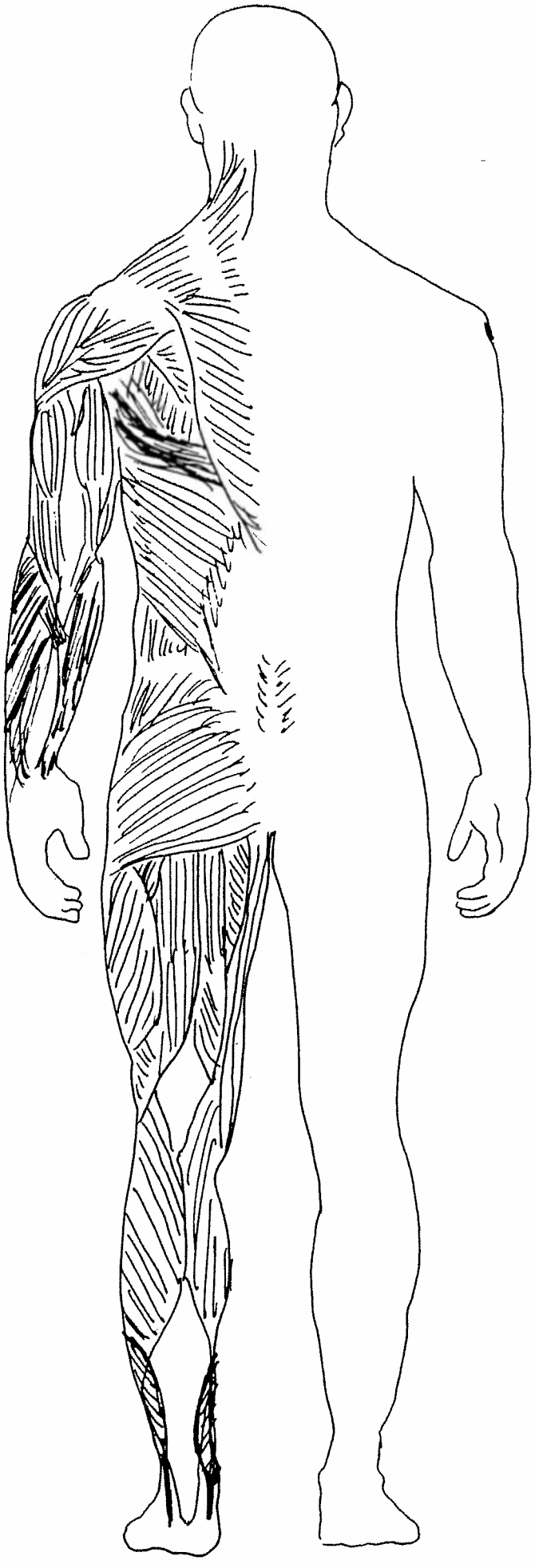
anterior:
- tibialis anterior
- extensor digitorum longus
- extensor hallucis longus
- peroneus tertius

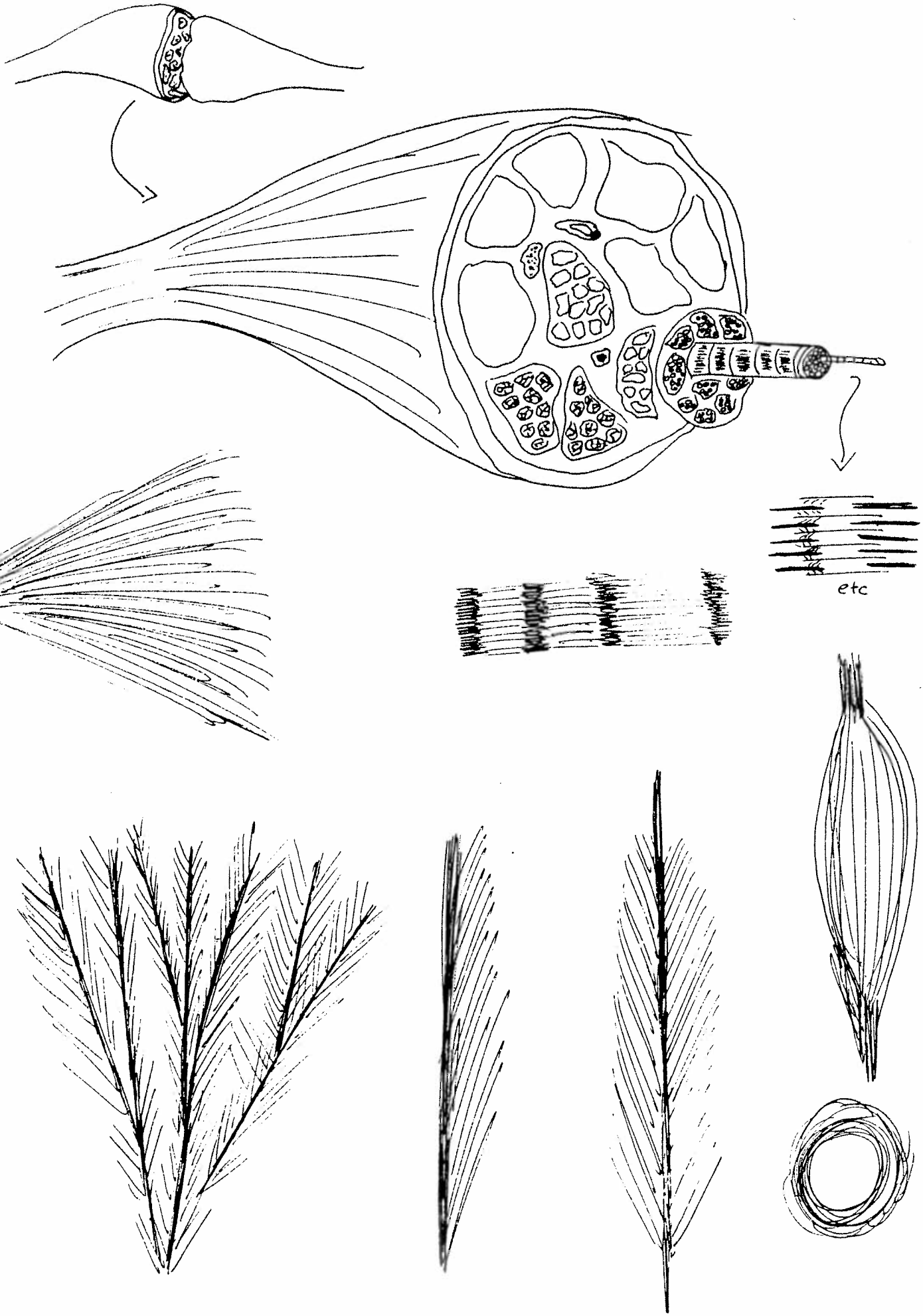
lateral:
- peroneus longus
- peroneus brevis

posterior:
- gastrocnemius - Achilles tendon
- soleus
- plantaris
- flexor hallucis longus
- flexor digitorum longus
- tibialis

intrinsic muscles of foot



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