FUNCTIONAL ANATOMY

STERNOCOSTAL JOINTS:
Bones:
Costal cartilages
Sternum

The **first sternocostal joint** (ribs 1 and the manubrium) = **synchrondosis** joint (primary → cartilaginous → **synarthrosis** → no movement).
The 2nd – 7th sternocostal joints are **SYNOVIAL PLANE JOINTS.**

JOINTS OF THE PELVIS:
SACROILIAC JOINTS:
Bones:
Lateral auricular surfaces of the **sacrum** and **ilium**
Tubercles of the **sacrum** and **ilium**

Movements:
The **anterior articulation** (auricular surfaces) is classified as a synovial joint.
The posterior articulation (tubercles) is classified as a fibrous/syndesmosis joint.

LUMBOSACRAL JOINT:
Bones:
L5 and S1

Anteriorly = intervertebral joint → symphysis (2nd cartilaginous → fibrocartilage → ampithrosis → permits some movement).

Posteriorly it is a zygopophyseal joint of the superior and inferior articular facets → plane/gliding joint.

SACROCOCCYGEAL JOINT: SYMPHYSIS (2ND CARTILAGENOUS)
Bones:
Apex of the **sacrum** + base of the **coccyx**

Intervertebral disc (joint) = symphysis (2nd cartilaginous → fibrocartilage → **ampithrosis** → permits some movement).

PUBIC SYMPHYSIS: SYMPHYSIS (2ND CARTILAGENOUS)
Bones:
Fibrocartilage disc (symphysis)
Pubic bones
SECONDARY CARTILAGINOUS JOINT= **symphysis** → **ampithrosis** → some movement.

FUNCTIONAL ANATOMY

MUSCLES OF THE VERTEBRAL COLUMN:

POSTERIOR:

SPLENIUS CAPITIS: **DEEP**

O - spinous processes of C7 - T3, and the inferior half of the nuchal ligament.
I - mastoid process of the temporal bone; between the superior and inferior nuchal lines on the lateral-posterior aspect of the occipital bone.
A - **unilaterally** = laterally flexes head and neck to the same side + rotates the head and neck to the same side; **bilaterally** = extends the head and neck.

SPLENIUS CERVICIS: **DEEP**

O - spinous processes of T3 - T6.
I - posterior tubercle of C1 - C3.
A - **unilaterally** = laterally flexes head and neck to the same side + rotates the head and neck to the same side; **bilaterally** = extends the head and neck.

ERRECTOR SPINAE **SPINALIS** COLUMN: **INTERMEDIATE**

O – broad tendon that spans the iliac crests, sacrum, sacral and lumbar spinous processes.
I – **spinous processes** of thoracic and lumbar regions.
A – as a group: **unilaterally =** lateral flexion to the same side; **bilaterally =** extension of the vertebral column.

ERRECTOR SPINAE **LONGISSIMUS** COLUMN: **INTERMEDIATE**

O – broad tendon that spans the iliac crests, sacrum, sacral and lumbar spinous processes.
I – **mastoid process** of the temporal bone, and ribs.
A – as a group: **unilaterally =** lateral flexion to the same side; **bilaterally =** extension of the vertebral column. **ILIUM CRANIUM.**

ERRECTOR SPINAE **ILIOCOSTALIS** COLUMN: **INTERMEDIATE**

O – broad tendon that spans the iliac crests, sacrum, sacral and lumbar spinous processes.
I – **ribs** and cervical transverse processes.
A – as a group: **unilaterally =** lateral flexion to the same side; **bilaterally =** extension of the vertebral column.

ERRECTOR SPINAE = PRIMARY EXTENSOR OF THE VERTEBRAL COLUMN.

FUNCTIONAL ANATOMY

HIP

Pes anserinus attaches to the tibia medially.

The three tendons that make up the pes anserinus are:

- Sartorius
- Gracilis
- Semitendinosus

Nerves and arteries above the piriformis = superior gluteal.

Nerves and arteries below the piriformis = inferior gluteal.

Sciatic nerve has a close relationship to the **piriformis** muscle.

Hip compartments:

Anterior → flexion

Medial → adduction, medial rotation

Posterior → extension, abduction, lateral rotation

Femoral triangle: N. A. V.

Nerve

Artery

Vein

All **gluteal** muscles **abduct** the hip.

Only Maximus extends.

Only Maximus laterally rotates.

The ligaments of the hip pull the head of the femur into the acetabulum as they tighten.

Sacroiliac joints are synovial plane joints anteriorly (auricular surfaces), and fibrous syndesmosis joints posteriorly (tuberosites).

JOINT	ARTICULATIONS	TYPE	MOVEMENTS
SACROILIAC (ANTERIOR)	AURICULAR SURFACE ILIUM + SACRUM	SYNOVIAL PLANE	**WEIGHT BARING**
SACROILIAC (POSTERIOR)	AURICULAR SURFACE ILIUM + SACRUM	**SYNDESMOSIS (FIBROUS)**	**WEIGHT BARING**
ACETABULOFEMORAL	ACETABULUM OF THE HIP BONE + HEAD OF THE FEMUR	SYNOVIAL **BALL AND SOCKET**	FLEXION EXTENSION ABDUCTION ADDUCTION EXTERNAL ROTATION INTERNAL ROTATION
TIBIOFEMORAL + PATELLOFEMORAL	TIBIA + FEMUR & PATELLA + FEMUR	SYNOVIAL **HINGE (MODIFIED)**	FLEXION EXTENSION ROTATION
PROXIMAL TIBIOFIBULAR	TIBIA + FIBULA	SYNOVIAL PLANE	GLIDING
DISTAL TIBIOFIBULAR	TIBIA + FIBULA	**SYNDESMOSIS (FIBROUS)**	

HIP

COMPARTMENT	MUSCLES	ORIGIN / INSERTION	ARTERY	NERVE
ANTERIOR	iliopsoas	lesser trochanter		lumbar plexus
ANTERIOR	quadriceps	tibial tuberosity	deep femoral	femoral
MEDIAL	adductors	linea aspera	obturator	obturator
POSTERIOR	gluteus maximus	gluteal tuberosity	inferior gluteal	inferior gluteal
POSTERIOR	gluteus medius + minimus	greater trochanter	superior gluteal	superior gluteal
POSTERIOR	hamstrings	ischial tuberosity	deep femoral	tibial division of the sciatic nerve
POSTERIOR	hamstrings **short head of biceps femoris**	**linea aspera**	deep femoral	**comon fibula** division of the sciatic nerve
POSTERIOR	lateral rotators	greater trochanter		obturator / quadratus femoris

ANKLE

ACTION	COMPARTMENT	MUSCLES
DORSIFLEXION (FLEXION TALOCRURAL)	ANTERIOR	TIBIALIS ANTERIOR EXTENSOR DIGITORUM LONGUS EXTENSOR HALLICUS LONGUS
PLANTARFLEXION (EXTENSION TALOCRURAL)	POSTERIOR	**POSTERIOR** TIBIALIS POSTERIOR FLEXOR DIGITORUM LONGUS FLEXOR HALLICUS LONGUS **LATERAL** X **Other:** Gastrocnemius Soleus Plantaris
INVERSION (SUBTALAR JOINT)	ANTERIOR + POSTERIOR	**ANTERIOR** TIBIALIS ANTERIOR EXTENSOR DIGITORUM LONGUS EXTENSOR HALLICUS LONGUS **POSTERIOR** TIBIALIS POSTERIOR FLEXOR DIGITORUM LONGUS FLEXOR HALLICUS LONGUS
EVERSION (SUBTALAR JOINT)	LATERAL	**LATERAL** FIBULARIS LONGUS FIBULARIS BREVIS
FLEXES DIGITS	POSTERIOR	**POSTERIOR** FLEXOR DIGITORUM LONGUS FLEXOR HALLICUS LONGUS
EXTENDS DIGITS	ANTERIOR	**ANTERIOR** EXTENSOR DIGITORUM LONGUS EXTENSOR HALLICUS LONGUS

FUNCTIONAL ANATOMY

- **Precision grip:**

  Intrinsic hand muscles

  Long contraction duration.

- **Superficial palmar** arch is a direct continuation of the **ulnar artery**.

- **Deep palmar** arch is a direct continuation of the **radial artery**.

- The **palmar arches drain** into the **deep veins** of the hand - ulnar and radial veins.

- The **dorsal arch** of the hand drain into the **superficial veins** - cephalic and basilic veins.

- Biceps brachii supinates against force and in a flexed position.

- Supinator supinates when there is no resistance, and when the arm is extended.

- Lateral epicondylitis = tennis elbow.

- Medial epicondylitis = golfer's elbow.

UPPER LIMB

JOINT	ARTICULATIONS	TYPE	MOVEMENTS
PECTORAL GIRDLE			
STERNOCLAVICULAR			
ACROMIOCLAVICULAR			
SCAPULOTHORACIC			
SHOULDER			
GLENOHUMERAL			
FOREARM			
PROXIMAL RADIOULNAR			
DISTAL RADIOULNAR			

PECTORAL GIRDLE

ACTION	COMPARTMENT	MUSCLES
ELEVATION	**POSTERIOR**	Upper trapezius (descending) Levator scapulae Rhomboids major + minor
DEPRESSION	**ANTERIOR** **+** **POSTERIOR**	Lower trapezius (ascending) Pectoralis minor
PROTRACTION	**ANTERIOR**	**SERRATUS ANTERIOR** Pectoralis minor
RETRACTION	**POSTERIOR**	Middle trapezius (transverse) Rhomboids major + minor
UPWARD ROTATION	**ANTERIOR** **+** **POSTERIOR**	Trapezius (descending + ascending) Serratus anterior
DOWNWARD ROTATION	**ANTERIOR** **+** **POSTERIOR**	Rhomboids major + minor Levator scapulae Pectoralis minor

ELBOW + FOREARM

ACTION	MUSCLES	ORIGIN / INSERTION	OTHER	NERVE
ELBOW + FOREARM				
FLEXION	BRACHIALIS	ULNAR TUBEROSITY	ULNA	MUSCULOCUTANEOUS
EXTENSION	TRICEPS BRACHII	T = OLECRANON LONG = INFRAGLENOID TUBERCLE LATERAL = SUPERIOR RADIAL GROOVE MEDIAL = INFERIOR RADIAL GROOVE		RADIAL
SUPINATION	BICEPS BRACHII	LONG = SUPRAGLENOID TUBERCLE O = RADIAL TUBEROSITY SHORT = CORACOID PROCESS	RADIUS	MUSCULOCUTANEOUS
ANTERIOR FOREARM + WRIST				
PRONATION	PRONATOR TERES	MEDIAL EPICONDYLE via COMMON FLEXOR TENDON		MEDIAN
ABDUCTS WRIST	FLEXOR CARPI RADIALIS		BILATERAL CONTRACTION = WRIST FLEXION	MEDIAN
ADDUCTS WRIST	FLEXOR CARPI ULNARIS			ULNAR ←

NERVES:

MUSCULOCUTANEOUS:

* ↳ PIERCES CORACOBRACHIALIS
- ↳ INNERVATES
  - CORACOBRACHIALIS
  - BRACHIALIS
  - BICEPS BRACHII

AXILLARY:

- ↳ INNERVATES DELTOID
* ↳ WRAPS AROUND HEAD OF HUMERUS

RADIAL:

- ↳ RUNS UNDERNEATH TRICEPS BRACHII
- ↳ RUNS IN RADIAL GROOVE
- ↳ INNERVATES POSTERIOR ARM, FOREARM + HAND (INCLUDING BRACHIO RADIALIS.

MEDIAN:

- ↳ RUNS WITH BRACHIAL ARTERY
- ↳ RUNS MIDLINE IN THE FOREARM
* ↳ TRAVELS WITHIN THE CARPAL TUNNEL
- ↳ INNERVATES ANTERIOR FOREARM + LATERAL HAND (THENAR)

ULNAR:

* ↳ RUNS BEHIND THE MEDIAL EPICONDYLE
- ↳ RUNS DOWN ARM MEDIALLY
- ↳ INNERVATES FLEXOR CARPI ULNARIS + MOST OF THE HAND (HYPOTHENAR).

CARPAL TUNNEL:

10 STRUCTURES TRAVEL WITHIN

9 TENDONS

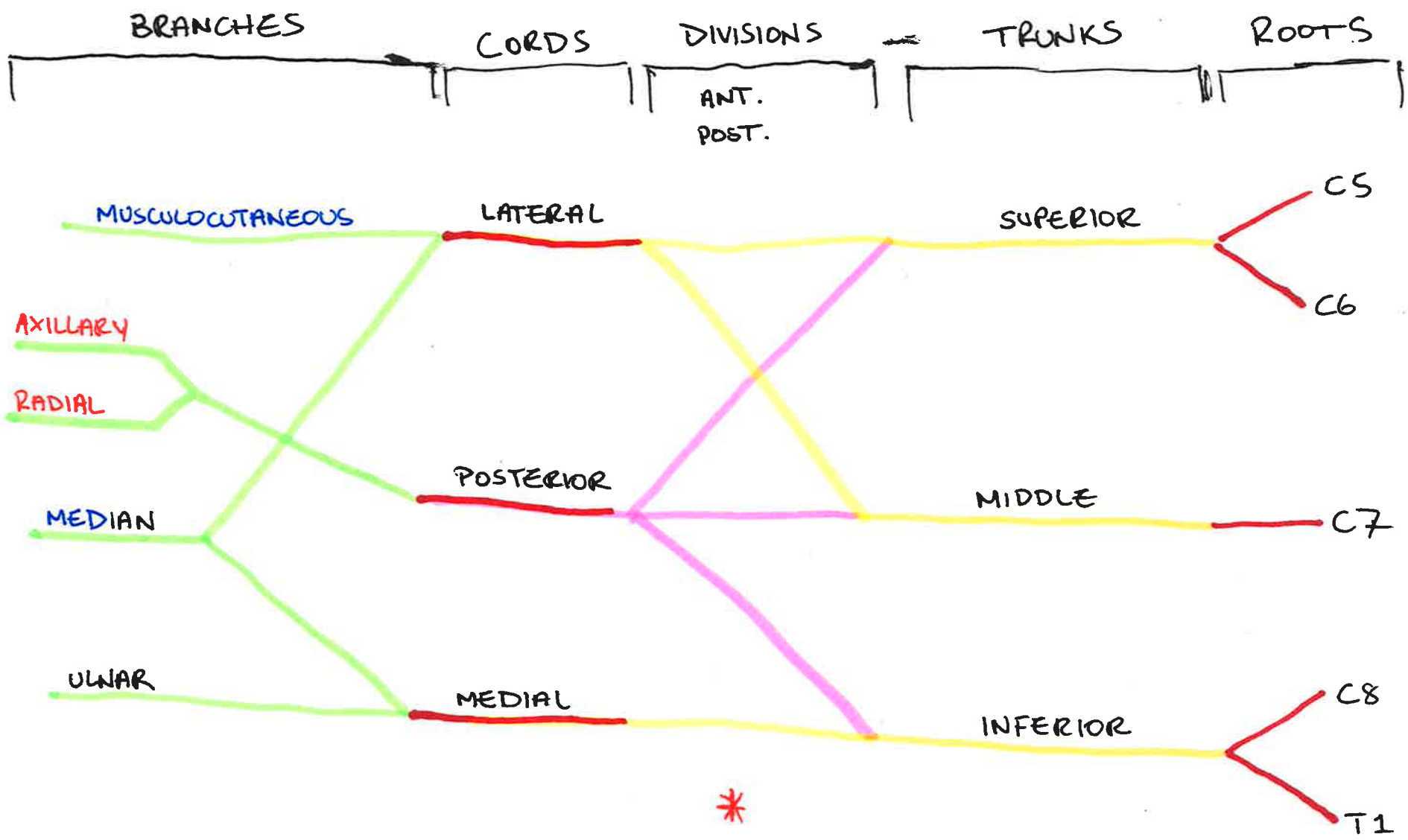
1 NERVE

4 TENDONS OF FLEXOR DIGITORUM SUPERFICIALIS

4 TENDONS OF FLEXOR DIGITORUM PROFUNDUS

1 TENDON OF FLEXOR POLLICIS LONGUS

MEDIAN NERVE


BRANCHES
CORDS
DIVISIONS
ANT.
POST.
TRUNKS
ROOTS
MUSCULOCUTANEOUS
AXILLARY
RADIAL
MEDIAN
ULNAR
LATERAL
POSTERIOR
MEDIAL
SUPERIOR
MIDDLE
INFERIOR
C5
C6
C7
C8
T1
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