Muscles of the shoulder and upper extremities

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Muscles Crossing the Shoulder

- Nine muscles cross the shoulder joint and insert into the humerus
- Prime movers include:
  - Pectoralis major – arm flexion
  - Latissimus dorsi and posterior fibers of the deltoid – arm extension
  - Middle fibers of the deltoid – arm abduction
Anterior Chest Wall Muscles
Pectoralis Major

**PECTORALIS MAJOR**

**Description:**
- Large, thick, fan-shaped muscle covering the superior part of the thorax.

**Two parts:**
- Clavicular head
- Sternocostal head

**Origin:**
- Anterior surface of the medial half of clavicle
- Anterior surface of sternum and costal cartilages of the upper seven ribs

**Insertion:**
- Intertubercular groove of the humerus

**Function:**
- Flexion of the humerus (clavicular head)
- Adduction and medial rotation of the humerus (sternocostal head)

**Muscleization:**
- Two vectors from clavicle and sternum to intertubercular groove of humerus

**Notes:**
Deltoid Muscle

The Deltoid muscles are made up of three different divisions of muscles. They are as follows:

1. The anterior deltoid, is located on the front of your shoulder just above the chest muscles.
2. The middle (medial) deltoid, is located on the outside aspect of your shoulder.
3. The posterior deltoid, is located on the backside of the shoulder joint.
**Origin**
Lateral third clavicle (Anterior)
Lateral border of acromion (middle)
Spine of scapula (posterior)

**Insertion**
Middle of lateral surface of shaft of humerus to deltoid tuberosity

**Nerve supply**
Axillary nerve \( C5, 6 \)

**Action**
- **Anterior fibers** flex and medially rotate arm
- **Middle fibers** Abducts arm;
- **Posterior fibers** extend and laterally rotate arm
- Abduction from 15-90 degrees
Anterior thoracic Muscles Do not Crossing the Shoulder

PECTORALIS MINOR

Description: lies in the anterior wall of the axilla, and is covered by the pectoralis major

Origin: the 3rd to 5th ribs near their costal cartilages

Insertion: medial border and superior surface of coracoid process of scapula

Function: - inferior drawing of scapula - anterior drawing of scapula

Modelization: one vector from the coracoid process to the 4th rib near costal cartilage

Notes:
Coracobrachialis

- Origin - Coracoid process of scapula
- Insertion - Middle of medial surface of shaft of humerus.
- Action - Flexion and adduction arm at shoulder joint.
- Nerve supply - Musculocutaneous nerve
Rotator Calf Muscles
Pectoralis minor  Rotator calf
• The rotator cuff muscles
• Is a group of tendons and muscles in the shoulder, connecting the upper arm (Humerus) to the shoulder blade (Scapula).
• The rotator cuff tendons provide stability to the shoulder; the muscles allow the shoulder to rotate.
• The muscles in the rotator cuff include:
  – Teres minor
  – Infraspinatus
  – Supraspinatus
  – Subscapularis
• Each muscle of the rotator cuff inserts at the scapula, and has a tendon that attaches to the humerus. Together, the tendons and other tissues form a cuff around the humerus.
Muscles Crossing the Shoulder

- **Rotator cuff muscles**
  - Supraspinatus
  - Infraspinatus
  - Teres minor
  - Subscapularis
    - Function mainly to reinforce the capsule of the shoulder
    - Secondarily act as synergists and fixators
- The coracobrachialis and teres major:
  - Act as synergists
  - Do *not* contribute to reinforcement of the shoulder joint
Rotator cuff muscles

Supraspinatus muscle

Subscapularis muscle

Infraspinatus muscle

Teres minor muscle

Anterior shoulder

Posterior shoulder
**Infraspinatus**

**Description:** triangular muscle occupying most of the infraspinous fossa of the scapula

**Origin:** the infraspinous fossa of the scapula

**Insertion:** middle facet on greater tubercle of humerus

**Function:** laterally rotate arm

**Modelization:** one vector between the scapula and the humeral head

**Notes:**

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Supraspinatus
Spine of scapula
Deltoid (cut)
Greater tubercle of humerus
Infraspinatus
Teres minor
Teres major
Triceps brachii:
- Lateral head
- Long head
Latissimus dorsi
Humerus
Olecranon process of ulna
Anconeus
Supraspinatus

**Description:**
- Rounded, conical muscle
- Lying in the supraspinous fossa of the scapula

**Origin:**
- Supraspinous fossa of the scapula

**Insertion:**
- Superior facet on greater tubercle of humerus

**Function:**
- Acts with rotator cuff muscles
- Helps deltoid to abduct arm

**Modelization:**
- One vector between humeral head and superior part of spine of scapula

**Notes:**
**Teres minor Muscle**

**TERES MINOR**

**Description:**
- Elongated, tapering muscle lying along the inferior border of the infraspinatus.

**Origin:**
- Superior part of lateral border of scapula.

**Insertion:**
- Interior facet on greater tubercle of humerus.

**Function:**
- Lateral rotation and adduction of the humerus.

**Modelization:**
- One vector between the humeral head and the lateral border of scapula.

**Notes:**
- W. MAUREL – LIG/DEPFL – CHARM PROJECT.
Subscapularis Muscle

**Origin**
Subscapular fossa

**Insertion**
Lesser tuberosity of humerus

**Nerve supply**
Upper and lower subscapular nerves C5, 6, 7

**Action**
Medially rotates arm and stabilizes shoulder joint

**Important:** Multipennate
Muscles of the arm
Brachial
Muscles Crossing the Elbow

- **Forearm flexion**
  - Brachialis and biceps brachii are the chief forearm flexor muscles
  - The brachioradialis acts as a synergist and helps stabilize the elbow

- **Forearm extension**
  - The triceps brachii is the prime mover of forearm in extension
  - The anconeus is a weak synergist
Biceps brachii

**Origin**
- **Short head:** tip of coracoid process of scapula;
- **Long head:** supraglenoid tubercle of scapula, passes through the shoulder joint and emerges from the joint through the intertubercular groove.

**Insertion** Tuberosity of radius and fascia of forearm via bicipital aponeurosis

**Action**
- Supinates forearm and, when it is supine, flexes forearm
- Weak flexion of arm

**Innervation** Musculocutaneous nerve (C5, C6)
Brachialis muscle

**Origin:** Humerus

**Action:** Elbow flexion

**Insertion:** Ulna
Triceps brachii

Origin
- Long head on scapula just above shoulder joint
- Other two heads on the posterior of the humerus

Insertion
- Olecranon of ulna
- Joints crossed
- Elbow and shoulder

Joint action
- Extension of elbow
- Assists in shoulder extension and adduction (long head only)
Triceps and biceps Brachii Muscles

- Supraspinatus
- Spine of scapula
- Deltoid (cut)
- Greater tubercle of humerus
- Infraspinatus
- Teres minor
- Teres major
- Triceps brachii:
  - Lateral head
  - Long head
- Latissimus dorsi
- Humerus
- Olecranon process of ulna
- Anconeus
- Clavicle
- Deltoid
- Sternum
- Pectoralis major
- Coracobrachialis
- Triceps brachii:
  - Lateral head
  - Long head
  - Medial head
- Biceps brachii
- Brachialis
- Brachioradialis
Muscles of the forearm

Anterior group

Flexor Muscles
Muscles of the Forearm: Anterior Compartment

- Superficial First layer:
  - These muscles are primarily flexors of the wrist and fingers

- Superficial group
  - Common origin from medial epicondyle of the humerus.
  - Pronator teres
  - Flexor carpi radialis
  - Palmaris longus
  - Flexor carpi ulnaris
Pronator Teres

- Origin by two heads
  - **Superficial head**: Medial epicondyle.
  - **Deep Head**: Coronoid process of ulna.
- Insertion: middle of lateral side of shaft of radius.
- Innervated by **median nerve**.
- Action: Pronates and flexes forearm.

**Note**:
- **Median nerve** lies between its two heads and the **ulnar artery** passes deep to the deep head.
- It forms medial border of cubital fossa.
Anterior wrist pronator and flexors
Origin on medial epicondyle of humerus: pronator teres, flexor carpi radialis, palmaris longus, flexor carpi ulnaris, flexor digitorum superficialis

http://www.rad.washington.edu/academics/academic-sections/msk/muscle-atlas
FLEXOR DIGITORUM SUPERFICIALIS

**Origin** medial epicondyle of humerus

**Insertion** middle phalanges of digits 2 - 5

**Action** Flexes middle phalanges at proximal interphalangeal joints also flexes proximal phalanges at metacarpophalangeal joints and hand

**Innervation** Median nerve (C7, C8 and T1)
Muscles of the Forearm: Anterior Compartment
Meddle and Deep Layers

- Extensor carpi radialis longus
- Tendon of biceps brachii (cut)
- Supinator
- Flexor digitorum profundus
- Flexor digitorum superficialis
- Flexor pollicis longus
- Pronator quadratus
- Tendon of flexor carpi ulnaris (cut)
- Thenar muscles of thumb
- Tendon of flexor pollicis longus
- Lumbricales
- Tendon of flexor digitorum superficialis
- Tendon of flexor digitorum profundus (c)
**Flexor Digitorum Profundus**

**Origin** Proximal 3/4 of ulna

**Insertion** Base of the distal phalanx of digits 2 – 5

**Action** Flexes distal phalanges at distal interphalangeal joints

**Innervation**
- **Medial part:** ulnar nerve
- **Lateral part:** median nerve
FLEXOR POLLICIS LONGUS

**Origin** Anterior surface of radius and adjacent interosseous membrane

**Insertion** Base of distal phalanx of thumb

**Action** Flexes phalanges of 1st digit (thumb)

**Innervation** Anterior interosseous nerve from median nerve (C8 and T1)
Muscles That Move the Forearm

• Rotator:
  – Pronator Quadratus
    • Origin: anterior distal end of ulna
    • Insertion: anterior distal end of radius
    • Action: rotates forearm medially and pronates hand
Pronation and supination

- Pronator teres
- Pronator quadratus
- Supinator
- Biceps brachii

Supination  Pronation
Muscles of the forearm

Posterior group

Extensor Muscles
Forearm Muscles superficial Posterior Compartment

- **Anconeus**
- **Brachioradialis**
- **Extensor Carpi Radialis Brevis**
- **Extensor Carpi Radialis Longus**
- **Extensor Carpi Ulnaris**
- **Extensor Digiti Minimi**
- **Extensor Digitorum - All**
Muscles of the Forearm: Posterior Compartment

- These muscles are primarily extensors of the wrist and fingers.
Forearm Muscles Deep Posterior Compartment

- Abductor Pollicis Longus
- Extensor Indicis
- Extensor Pollicis Brevis
- Extensor Pollicis Longus
- Flexor Digitorum Profundus
- Supinator
Muscles of the Forearm: Posterior Compartment

- These muscles are primarily extensors of the wrist and fingers
Surface Anatomy of Upper Limb

- **Carpal Tunnel**
  - Carpals concave anteriorly
  - Carpal ligament covers it
  - Contains: long tendons, Median nerve
  - Inflammation of tendons = compression of Median nerve

- **Anatomical Snuffbox**
  - Lateral = E.pollicis brevis
  - Medial = E. pollicis longus
  - Floor = scaphoid, styloid of radius
  - Contains Radial Artery (pulse)
Lumbricals & Interossei

- Extensor expansions
- FDP
- Lumbricals (1–4)
- Flex MCP joints
- Extend IP joints

- Axial line
- Dorsal interossei (1–4)
- Between metacarpals
- DAB - ABduct
- Palmar views

- Axial line
- Palmar interossei (1–3)
- On palmer surface
- PAD - ADduct
Lumbrical muscles

- Deep transverse metacarpal ligament
- Attached to dorsal hood
- First and second lumbrical (unipennate)
- Third and fourth lumbricals (bipennate)
- Flexor digitorum superficialis tendon (cut)
- Flexor digitorum profundus tendon
- Flexor pollicis longus tendon
- Flexor retinaculum

Flex metacarpophalangeal
Extend interphalangeals