Upper Limb Muscles I
Innervation, Blood Supply

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Muscle groups of upper limb

- Spinohumeral muscles (muscles of back)
- Thoracohumeral muscles (muscles of thorax)
- Shoulder muscles
- Muscles of arm
- Muscles of forearm
- Muscles of hand

Brachial plexus
Arteries of upper limb
Muscle compartments on the upper limb

Stingl, Grim, Druga: Regional Anatomy, Prague, 2012
Nerves of the upper limb

Brachial plexus C5 - T1

Pars supraclavicularis

Truncus sup.

Truncus medius

[post.]

Truncus inf.

Divisiones ventrales [ant.]

N. ulnaris
Brachial plexus: anterior roots, trunks, divisions, cords
Pathway of main vessels and nerves of upper limb:

- Scalenic fissure
- Axillary fossa
- Medial bicipital groove
- Cubital fossa

Supraclavicular part
Infraclavicular part of brachial plexus
**Brachial plexus**

**Supraclavicular part:**
Ventral branches of spinal nerves C5 – T1  
  + part C4
Upper trunk - C5+6,
Middle trunk - C7,
Inferior trunk - C8+T1
Anterior division, Posterior division

**Infraclavicular part:**
Lateral cord, Medial cord, Posterior cord
Main branches:
PC: Radial nerve, Axillary nerve
LC: Musculocutaneous nerve  
  + a part of Median nerve
MC: Ulnar nerve  
  + a part of Median nerve
Supraclavicular part of brachial plexus (for innervation of thoracohumeral, spimohumeral and shoulder muscles)

Dorsal scapular nerve C5-6
  ( m. levator scapulae, mm. rhomboidei )

Long thoracic nerve C5-6
  ( m. serratus anterior )

Subclavian nerve C5-6
  ( m. subclavius )

Suprascapular nerve C5-7
  ( m. supraspinatus, m. infraspinatus )

Subscapular nerve, C5-7
  ( m.subscapularis, m. teres major )

Thoracodorsal nerve C6-8
  ( m. latissimus dorsi )

Medial et lateral pectoral nerves C5-Th1
  ( m. pectoralis major et minor )

Muscular branches
Arteries of upper limb
Axillary artery
Brachial artery
Radial artery
Ulnar artery
Deep palmar arch
Superficial palmar arch
Palmar digital arteries

Veins of upper limb
Deep veins
(named as arteries)
Superficial veins:
Basilic vein
Cephalic vein
Pathway of main vessels and nerves of upper limb into axillary fossa
Pathway of main vessels and nerves of upper limb:
Scalenic fissure → axillary fossa → bicipital medial sulcus →
cubital fossa

Intraclavicular region:
cords of brachial plexus, axillary artery and vein

Axillary fossa: axillary artery, axillary vein, cords of brachial
plexus, axillary lymph nodes
Transverse section of axillary fossa
AS - Subclavian artery
AA - Axillary artery
AB - Brachial artery
AR – radial artery
AU – Ulnar artery

APB – Profunda brachii artery
ASS – Suprascapular artery
Basilic vein, Cephalic vein
Muscle groups of upper limb

- Spinohumeral muscles
- Thoracohumeral muscles
- Shoulder muscles
- Muscles of arm
- Muscles of forearm
- Muscles of hand
• Spinohumeral muscles

• Latissimus dorsi
• Trapezius
• Levator scapulae
• Rhombid major
• Rhomboid minor
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Nerve Supply</th>
<th>Nerve Roots*</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trapezius</td>
<td>Occipital bone, ligamentum nuchae, spine of seventh cervical vertebra, spines of all thoracic vertebrae</td>
<td>Upper fibers into lateral third of clavicle; middle and lower fibers into acromion and spine of scapula</td>
<td>Spinal part of accessory nerve (motor) and C3 and 4 (sensory)</td>
<td>XI cranial nerve (spinal part)</td>
<td>Upper fibers elevate the scapula; middle fibers pull scapula medially; lower fibers pull medial border of scapula downward.</td>
</tr>
<tr>
<td>Latissimus dorsi</td>
<td>Iliac crest, lumbar fascia, spines of lower six thoracic vertebrae, lower three or four ribs, and inferior angle of scapula</td>
<td>Floor of bicipital groove of humerus</td>
<td>Thoracodorsal nerve</td>
<td>C6, 7, 8,</td>
<td>Extends, adducts, and medially rotates the arm.</td>
</tr>
<tr>
<td>Levator scapulae</td>
<td>Transverse processes of first four cervical vertebrae</td>
<td>Medial border of scapula</td>
<td>C3 and 4 and dorsal scapular nerve</td>
<td>C3, 4, 5</td>
<td>Raises medial border of scapula.</td>
</tr>
<tr>
<td>Rhomboid minor</td>
<td>Ligamentum nuchae and spines of seventh cervical and first thoracic vertebrae</td>
<td>Medial border of scapula</td>
<td>Dorsal scapular nerve</td>
<td>C4, 5</td>
<td>Raises medial border of scapula upward and medially.</td>
</tr>
<tr>
<td>Rhomboid major</td>
<td>Second to fifth thoracic spines</td>
<td>Medial border of scapula</td>
<td>Dorsal scapular nerve</td>
<td>C4, 5</td>
<td>Raises medial border of scapula upward and medially.</td>
</tr>
</tbody>
</table>

* The predominant nerve root supply is indicated by boldface type.
**Spinohumeral muscles** - trapezius, latissimus dorsi, levator scapulae, rhomboid major et minor (muscles of back)

Innervated from accessory nerve and supraclavicular part of brachial plexus
Teres major
antagonist of Deltoideus

Latissimus dorsi during exercise on a trapeze
Muscles that move the scapula: cranial - Trapezius and Levator scapulae; back – Trapezius (middle part), Rhomboid major and minor; ventrally - Serratus anterior, Pectoralis minor;
Rotation of the scapula:  
Trapezius (upper part)  
Serratus anterior (lower section)  

Pectoralis major and Latissimus dorsi lift the trunk when the arm is fixed
Thoracohumeral muscles

Pectoralis major,
Pectoralis minor,
Serratus anterior
Subclavius
Pectoralis major
Thoracohumeral muscles

- Pectoralis minor
- Subclavius
- Serratus anterior
- Thoracohumeral muscles

- Subscapularis
- Long head of biceps
- Short head of biceps
- Coracobrachialis
- Latissimus dorsi
- Teres major

Biceps

Serratus anterior

Brachialis
Thoracohumeral muscles

Shoulder muscles

Deltoid
Supraspinatus
Infraspinatus
Teres major
Teres minor
Subscapularis
Shoulder muscles

- Greater tubercle
- Supraspinatus
- Spine of scapula
- Deltoid
- Quadrangular space
- Infraspinatus
- Teres major
- Latissimus dorsi
- Humerus
- Long head of triceps
- Triangular space
- Lateral head of triceps
- Olecranon
- Teres minor
Rotator cuff - 4 muscles: Supraspinatus, Infraspinatus, Teres minor, Subscapularis
**Shoulder muscles**

**Triangular space:** circumflex scapular artery – anastomosis with suprascapular artery

**Quadrangular space:** axillary nerve, posterior circumflex humeral artery
Quadrangular space, triangular space
Suprascapular artery
Circumflex scapular artery
Posterior circumflex humeral artery
Axillary nerve
Mm. brachii,
Muscles of the arm
Muscles of the arm

Cross section of arm
MRI cross section of arm

- humerus
- m. biceps brachii
- m. brachialis
- a. et. v. profunda brachii
- et n. radialis
- m. triceps brachii, c. laterale
- n. medianus
- a. et v. brachialis
- n. ulnaris
- v. basilica
- m. triceps brachii, c. longum
- m. triceps brachii, c. mediale
Brachial fascia,
Medial and lateral intermuscular septum of arm
**Anterior compartment of arm:**
BB, B, CB
Nerves: MC, M, U, CAM
Brachial a.
Brachial veins, Basilic vein

**Posterior compartment of arm:** TB (L, M, L head)
Radial n., deep a. of arm
AS - Subclavian artery
AA - Axillary artery
AB - Brachial artery
AR - radial artery
AU - Ulnar artery

APB - Profunda brachii artery
ASS - Suprascapular artery
Muscles of arm  
FI: BB (LH, SH), B, CB  
Ex: TB (LH, MH, LH), A
Cubital fossa
October 8, 2008
Karl Merk, the world's first person to receive a complete double arm transplant.

Farmer Merk who received the world's first complete double arm transplant is recovering well and able to perform some basic tasks. Doctors spent 15 hours on July 25-26, 2008 grafting the donor arms onto the body of 54-year-old Karl Merk, who lost his own just below the shoulder in a farm accident six years ago.
First they exposed the muscle, nerves and blood vessels to be connected. Before the bones of the donor could be cut, blood vessels in the teen’s arms were filled with a cooled preservation solution. Both arms were then removed exactly at the point matching Karl’s arm stumps. The bones were joined, then arteries and veins to ensure blood circulation as quickly as possible. The surgeons then attached the muscles and tendons, then the nerves and finally the skin. There had been no sign that Karl’s immune system was rejecting the foreign tissue and his scars were healing well.
"The feeling is indescribable. Every day I gain more mobility," said Mr Merk as he showed off the arms, which are being supported by a special "corset" while the healing continues. Karl can already open a door and turn lights on and off.
Vorsichtig legt Karl Merk (55) die Handflächen aufeinander und stützt sich mit den Ellenbogen auf. Dann wackelt er mit den Fingern. Was für andere Menschen selbstverständlich ist, ist für den Bauern aus Memmingen (Bayern) ein Wunder. Denn: Er hat die Arme eines Toten.
Sources of used illustrations:
Gray’s Anatomy,
Stingl, Grim, Druga: Regional Anatomy, 2012
Benninghoff, Drenckhahn: Anatomie I., II. 2003 or
Sadler: Langman’s Medical Embryology, 11th edit. 2009

Recommended Textbooks:

Stingl, Grim, Druga: Regional Anatomy, 2012
Snell: Clinical Anatomy by systems, Lippincott Williams and Wilkins 2007 or
model myšlení, model of thinking