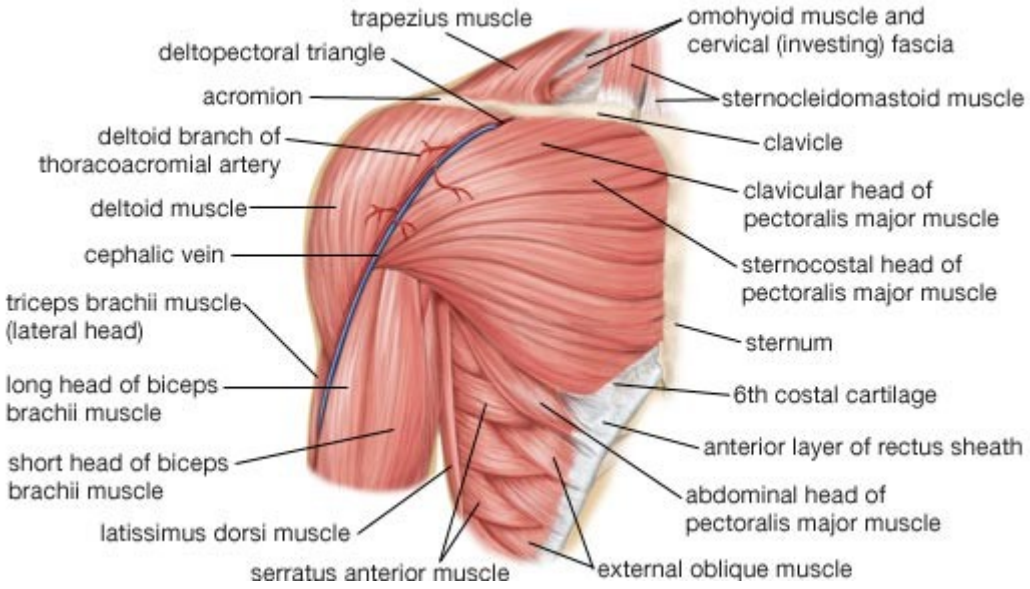
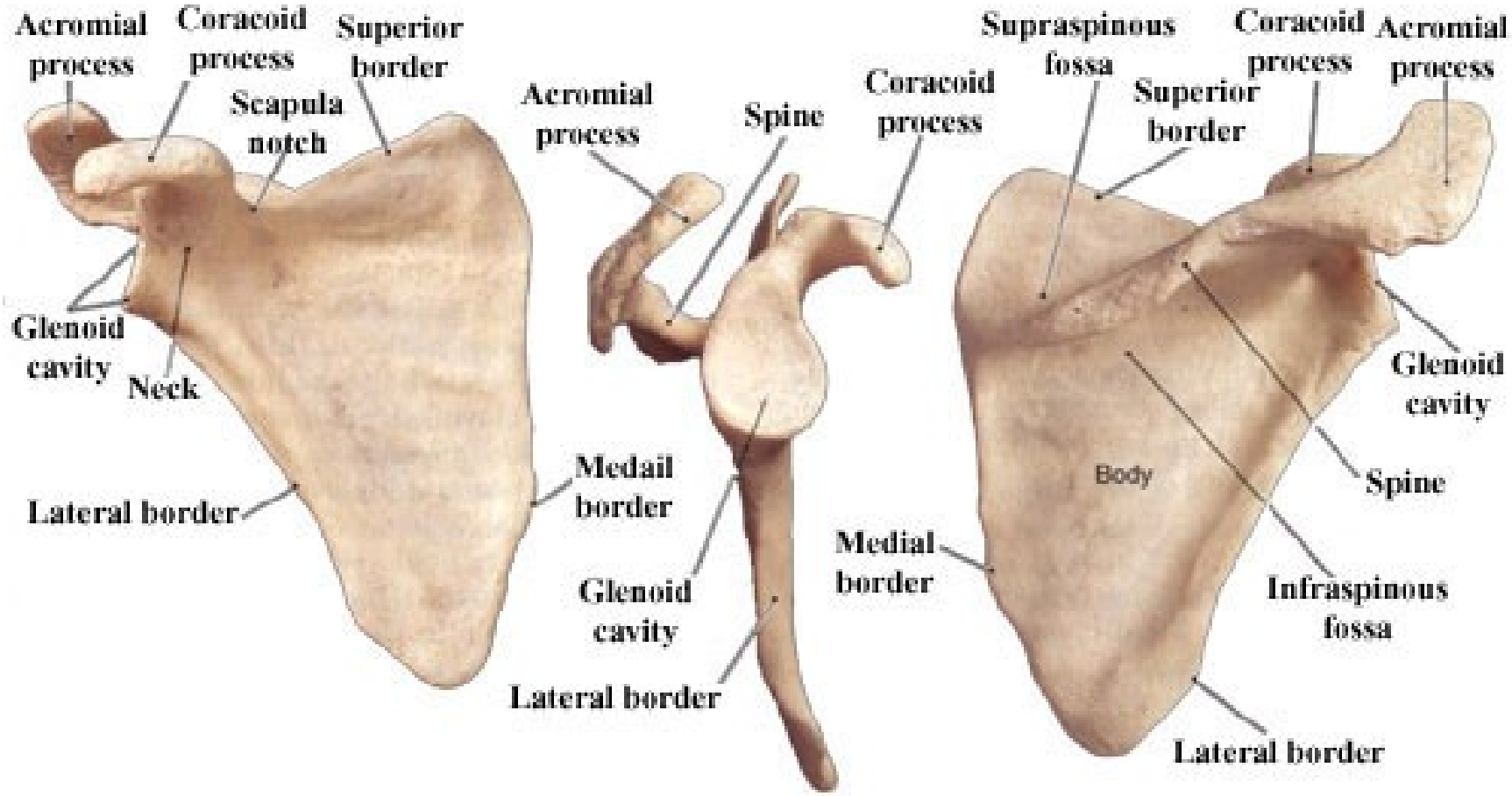
Examination Methods in Rehabilitation (19.10.2020)

Manual muscle test: Scapula, shoulder

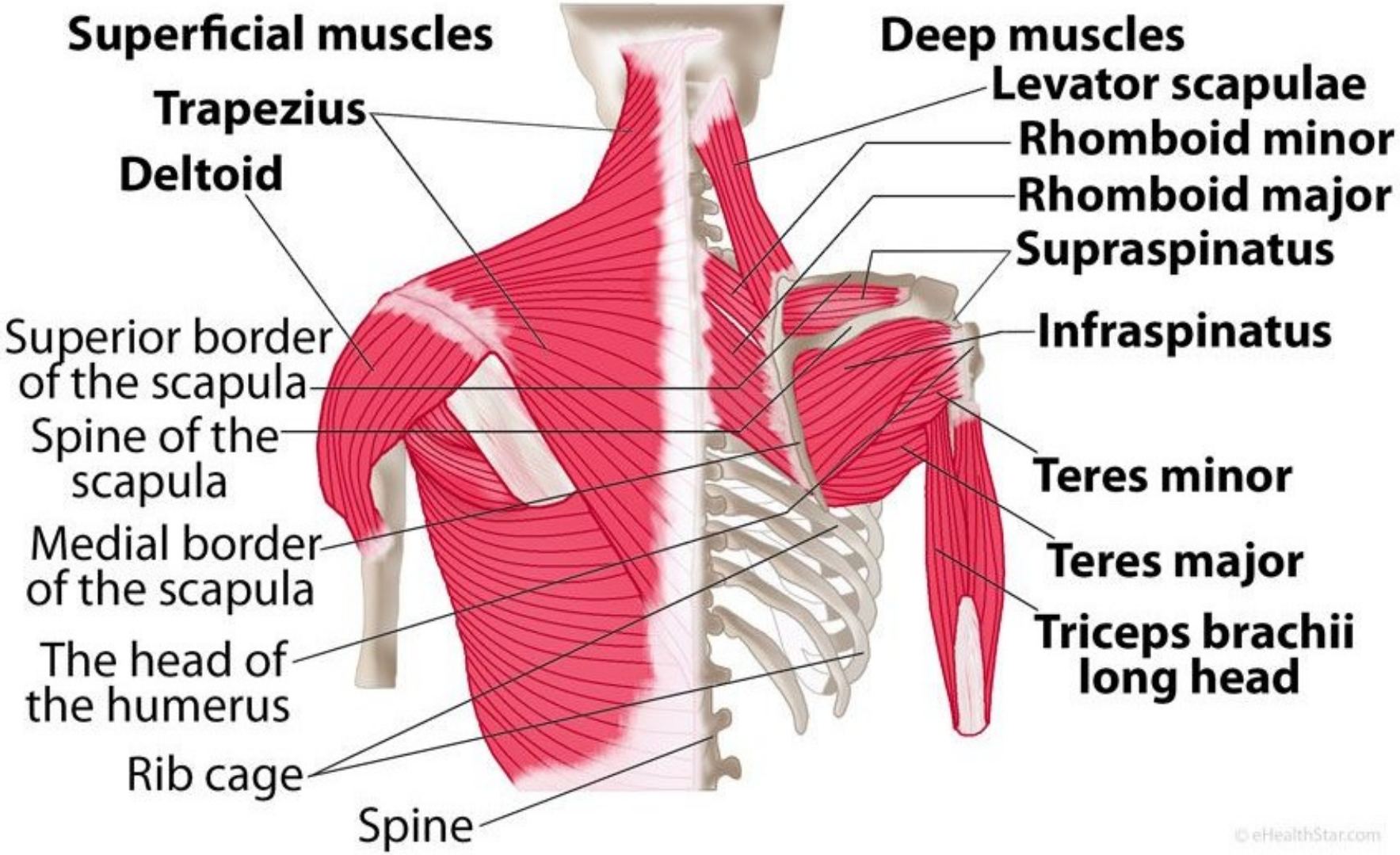


Mgr. Veronika Mrkvicová (physiotherapist)

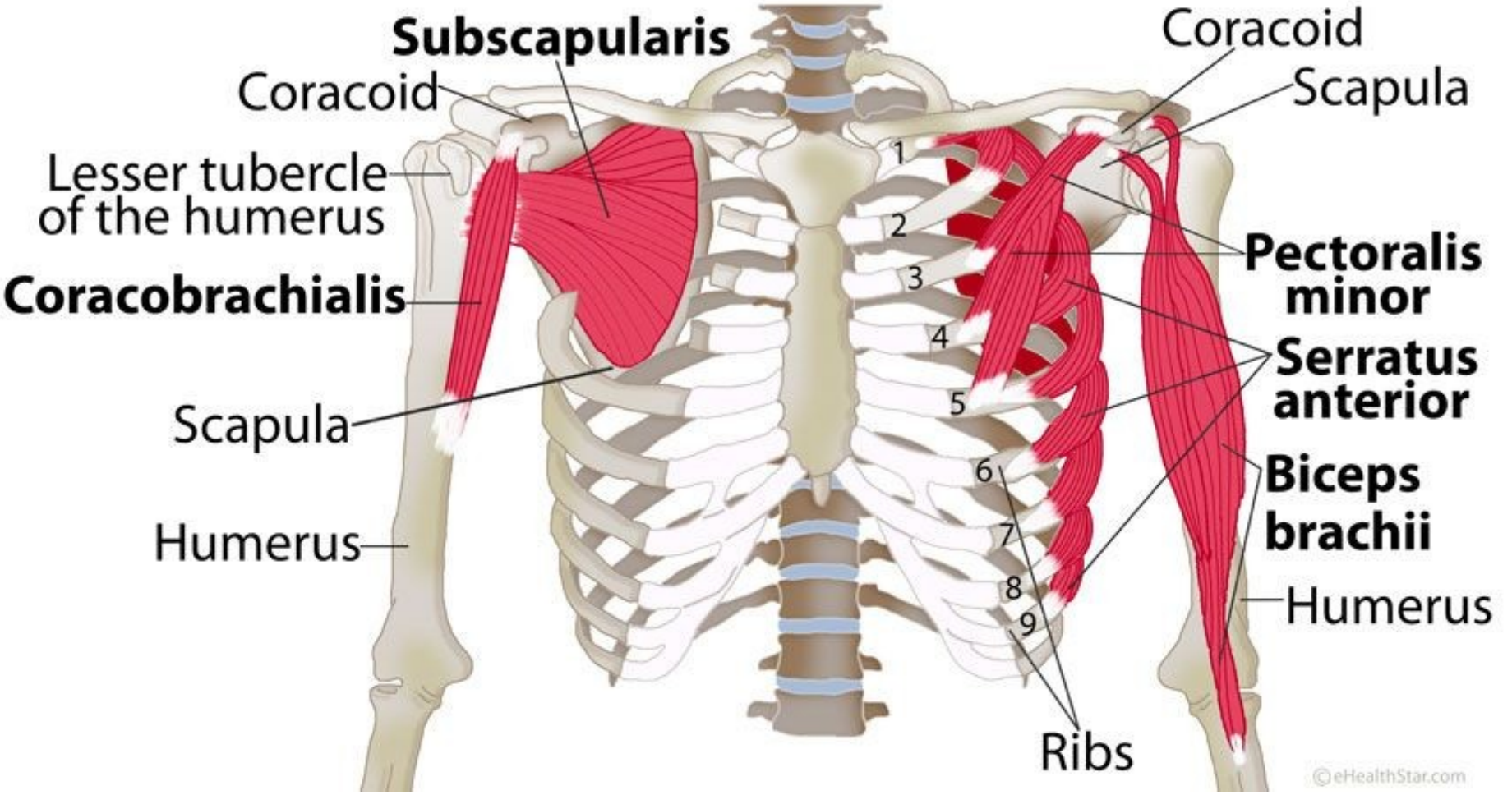
Scapula


Acromial process
Coracoid process
Superior border
Scapula notch
Glenoid cavity
Neck
Lateral border
Medail border
Acromial process
Spine
Coracoid process
Glenoid cavity
Lateral border
Supraspinous fossa
Coracoid process
Acromial process
Superior border
Glenoid cavity
Body
Spine
Medial border
Infraspinous fossa
Lateral border

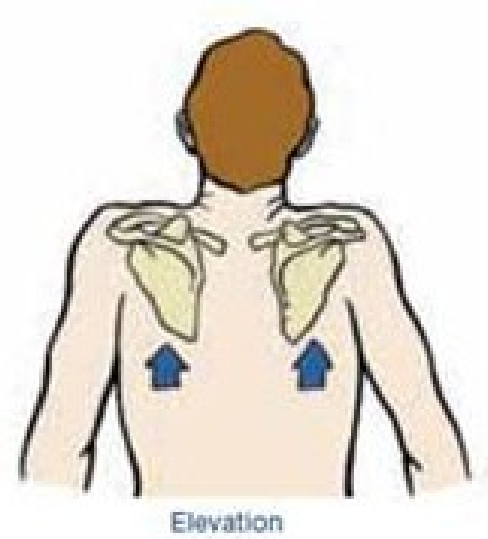
Scapular muscles (from behind)

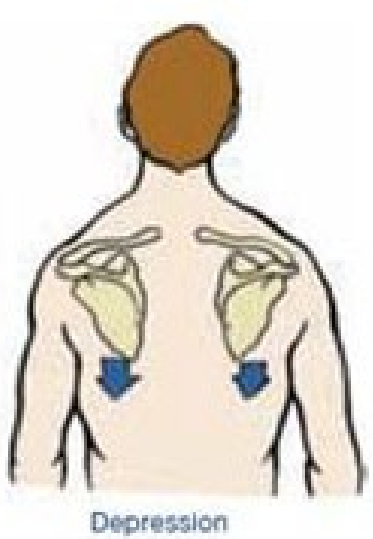


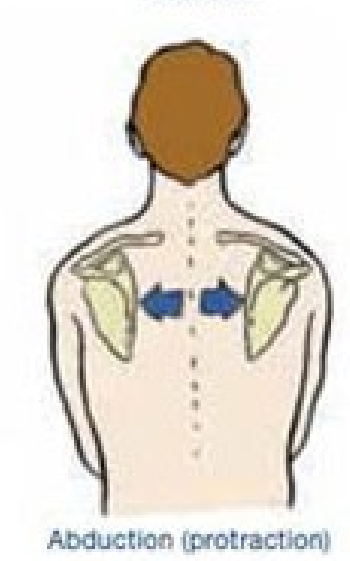
Scapular muscles (from the front)

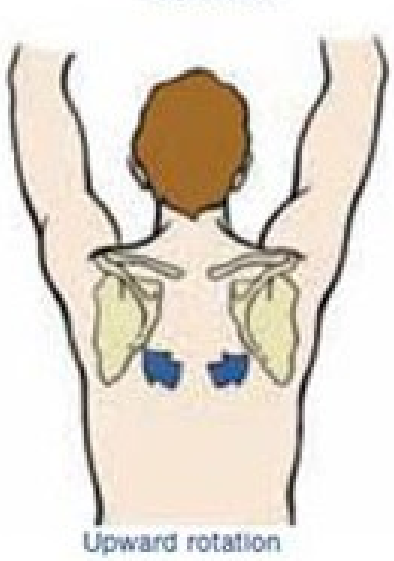


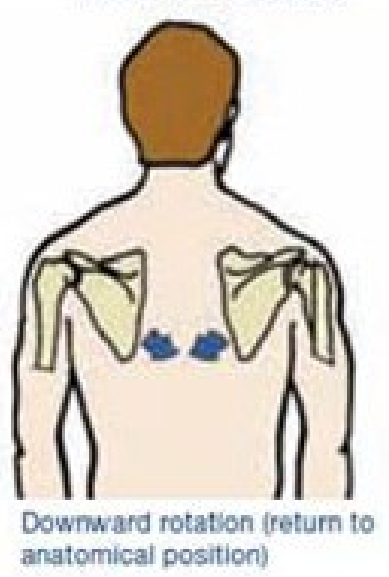
Scapular movements











Muscles of the shoulder girdle

Muscles distribution according their **location**:

- **Muscles going downward to the scapula**
  (trapezius – upper part, levator scapulae, rhomboidei, serratus anterior – upper part)

- **Horizontal shape**
  (trapezius – medial part, serratus anterior, pectoralis – partially)

- **Muscles going upward to the scapula**
  (serratus anterior – lower part, trapezius – lower part, latissimus dorsi, pectoralis minor, pectoralis maior – lower part)

Muscles of the shoulder girdle

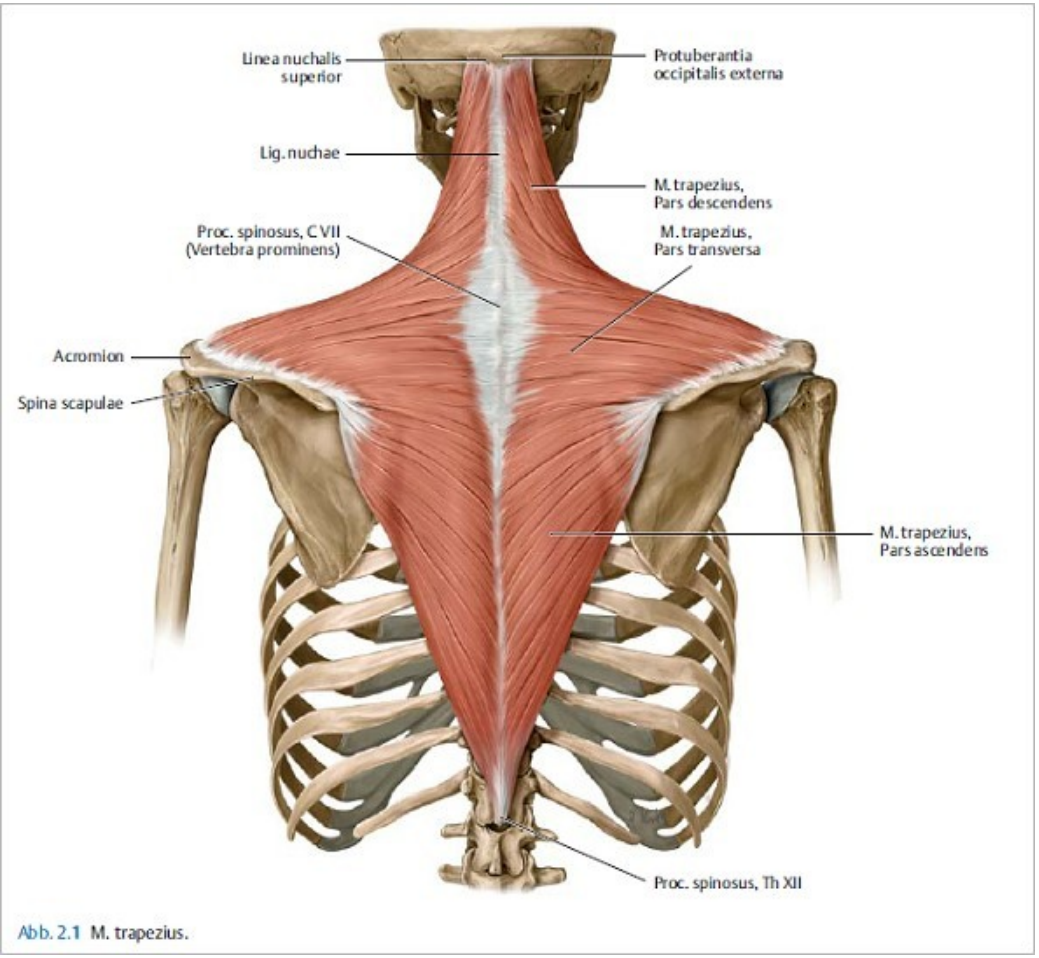
Muscles distribution according muscle **function**:

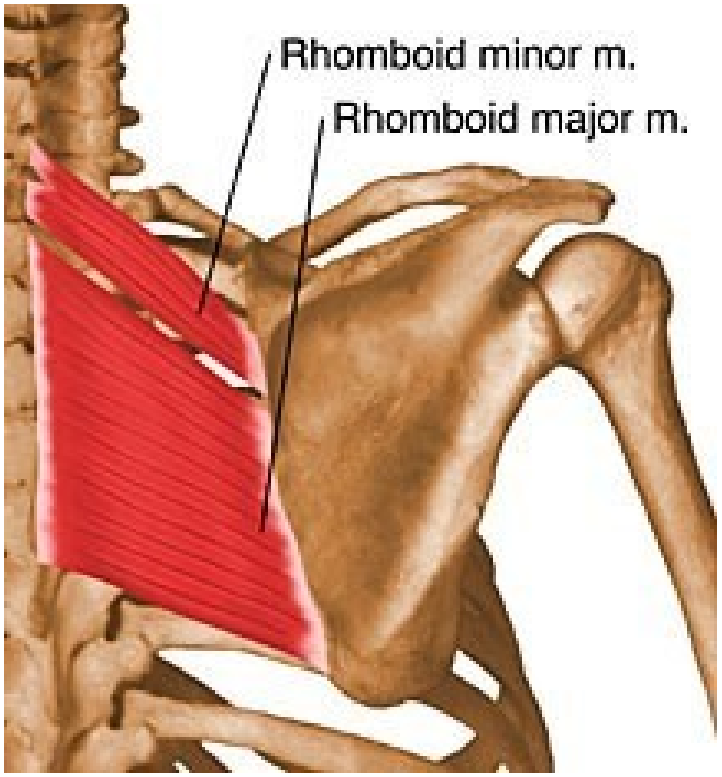
- **Group of muscles connecting shoulder girdle with the trunk**
  (trapezius, rhomboidei, levator scapulae, serratus anterior, pectoralis minor)

- **Group of muscles connecting shoulder girdle with the arm** (supraspinatus, infraspinatus, teres maior et minor, subscapularis, deltoideus, coracobrachialis, pectoralis maior, lattisimus dorsi)

- **Group of muscles connecting shoulder blade with forearm** (biceps brachii et triceps brachii)

Scapular adduction
(retraction)





Trapezius muscle

Rhomboid maj. et min.

Trapezius

Origin

- Medial third of superior nuchal line; external occipital protruberance, nuchal ligament, and spinous processes of C7 - T12 vertebrae

Insertion

- Lateral third of clavicle, acromion, and spine of scapula

Action

- Elevates, retracts and rotates scapula
- superior fibers elevate, middle fibers retract, and inferior fibers depress scapula
- superior and inferior fibers act together in superior rotation of scapula

Innervation

- Spinal root of accessory nerve (CN XI) (motor) and cervical nerves (C3 and C4) (pain and proprioception) (XI, C3, C4)

Rhomboid Major and Minor

Origin
- Minor: nuchal ligament and spinous processes of C7 and T1 vertebrae
- Major: spinous processes of T2 - T5 vertebrae

Insertion
- Medial border of scapula from level of spine to inferior angle

Action
- Retract scapula and rotate it to depress glenoid cavity
- fix scapula to thoracic wall

Innervation
- Dorsal scapular nerve (C4 and C5) (C4, C5)

Scapular adduction – grade 5,4

Position: lying prone, head on the chin, upper limbs extended, relaxed, palms up
Movement: adduction of scapula (draw up the shoulder blades)
Resistance: PT puts the resistance against the movement of scapula using his/her palms on the patients vertebral edge of scapula

Scapular adduction – grade 3

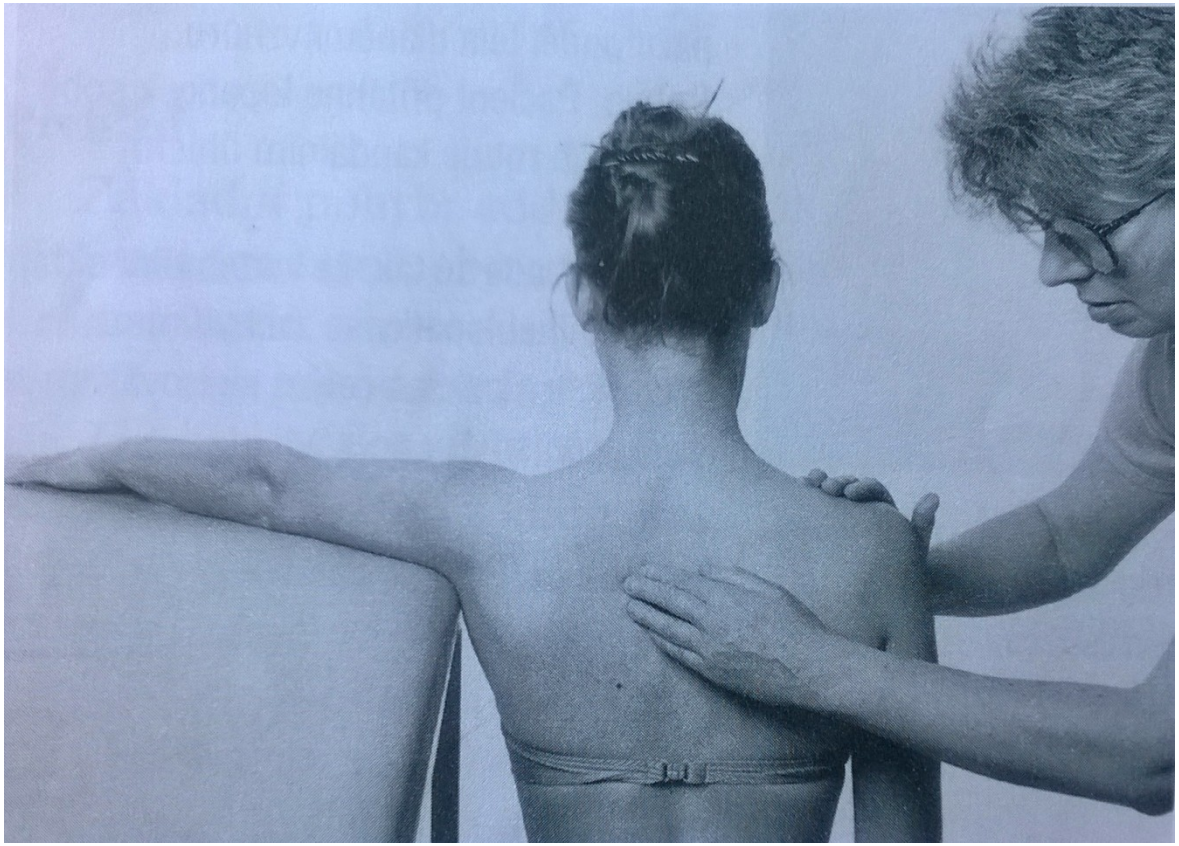
Position: lying prone, head on the chin, upper limbs extended, relaxed, palms up

Movement: adduction of scapula (draw up the shoulder blades)

Scapular adduction – grade 2

Position: siting on the chair, the tested upper limb lying on the table (horizontal plane), elbow extended, palm down
Fixation: shoulder of the uninvolved side and the chest on the tested side
Movement: adduction of scapula by pulling the whole arm on the table

Scapular adduction – grade 1,0

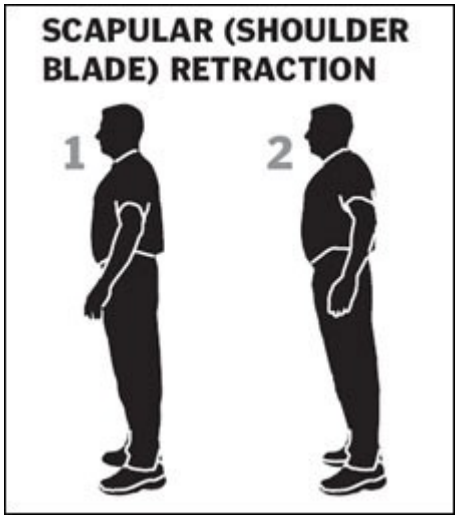


Position: siting on the chair, the tested upper limb lying on the table (horizontal plane), elbow extended, palm down

Fixation: shoulder of the uninvolved side

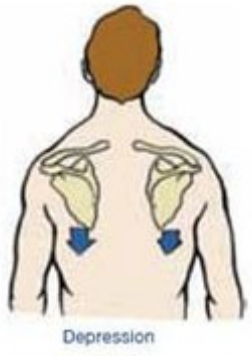
Attempt to move: palpate the area between scapula and Th spine during patients attempt of scapula adduction

Scapular adduction – notes:



- Don´t allow the patient to do a rotation of trunk, elevation of the upper limb, elevation of scapula or shoulders
- Put the same level of resistance against the movement of scapula
- The position of the head is important

Adduction with depression



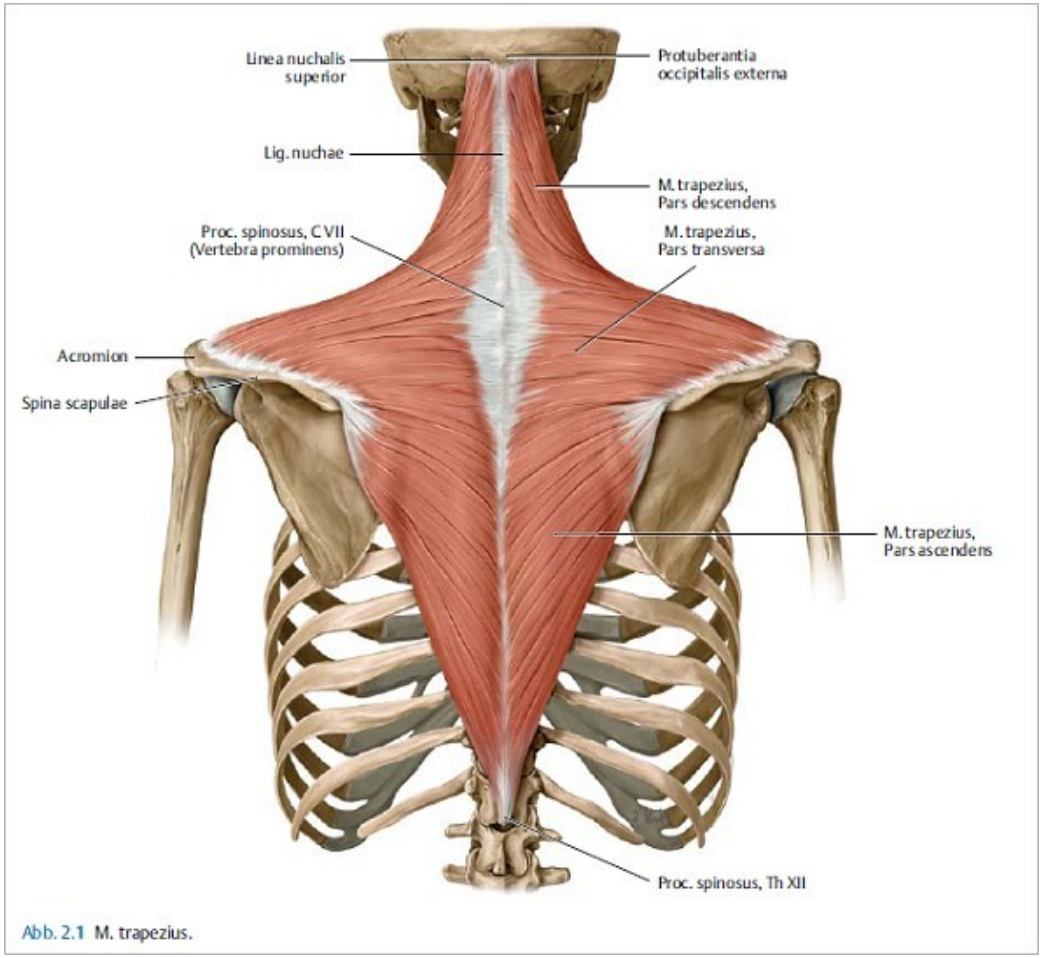


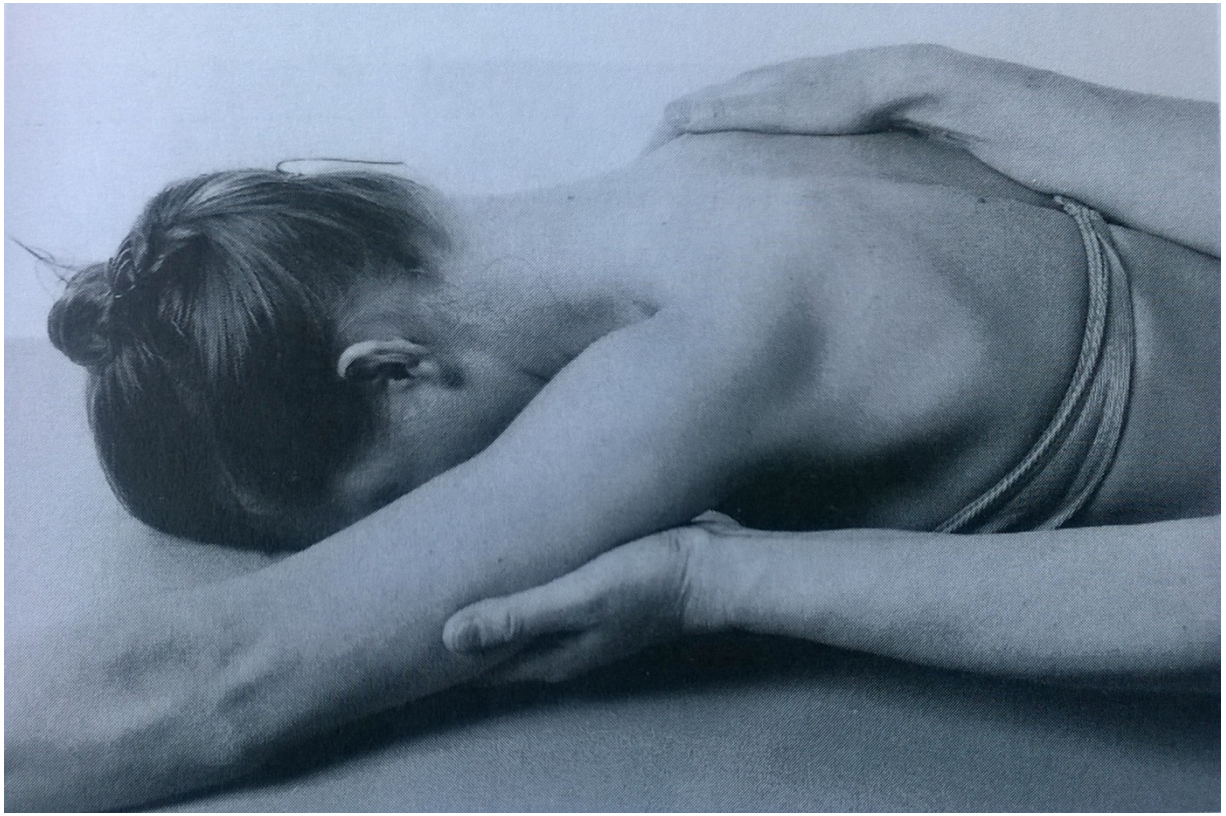
Abb. 2.1 M. trapezius.

Trapezius muscle (lower part)

Adduction with depression – grade 5,4,3

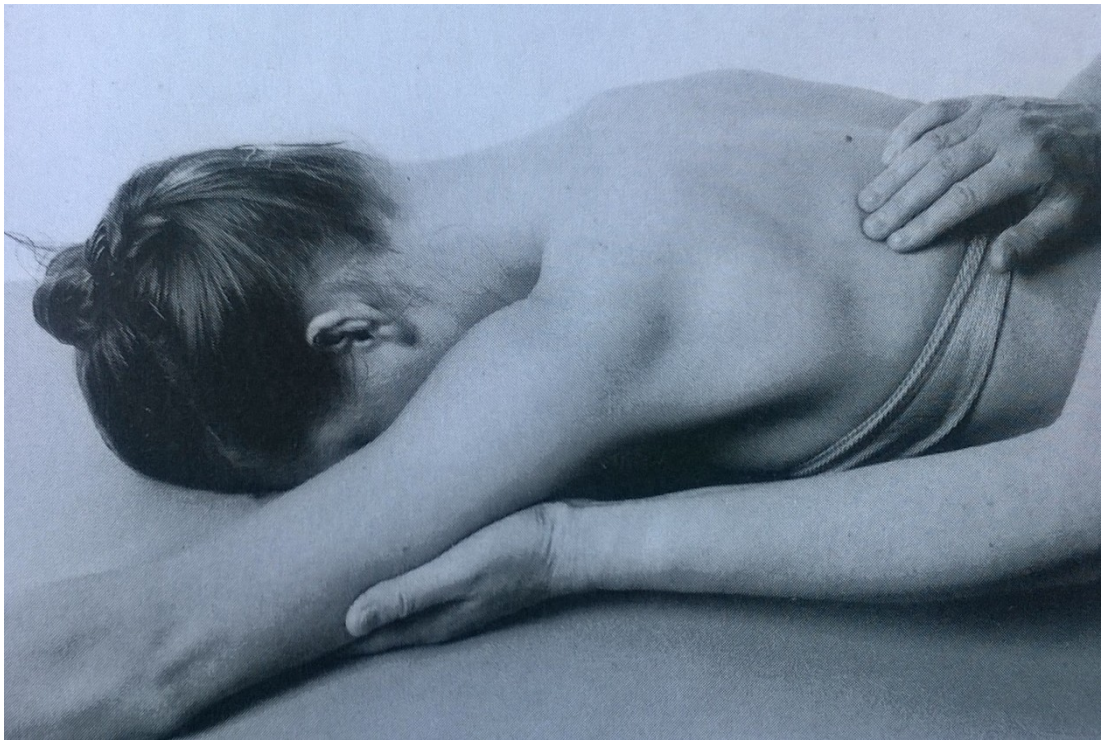
Position: prone position, head on the forhead, uninvolved upper limb lying relaxed along the body, the tested upper limb elevated, elbow extended, ulnar part of the forearm on the table
Fixation: supporting the patients arm
Movement: adduction and depression of scapula
Resistance: PT put resistance against the lower angle of scapula and its movement down and rotation inward. The grades 5,4,3 differentiate according the amount of resistance

Adduction with depression – grade 2



Position: prone position, head on the forhead, uninvolved upper limb lying relaxed along the body, the tested upper limb elevated, elbow extended, ulnar part of the forearm on the table
Fixation: the trunk on the uninvolved side, support the patients arm
Movement: adduction and depression of scapula

Adduction with depression – grade 1,0

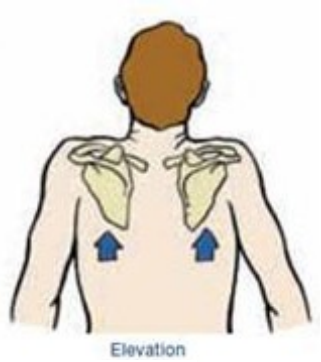


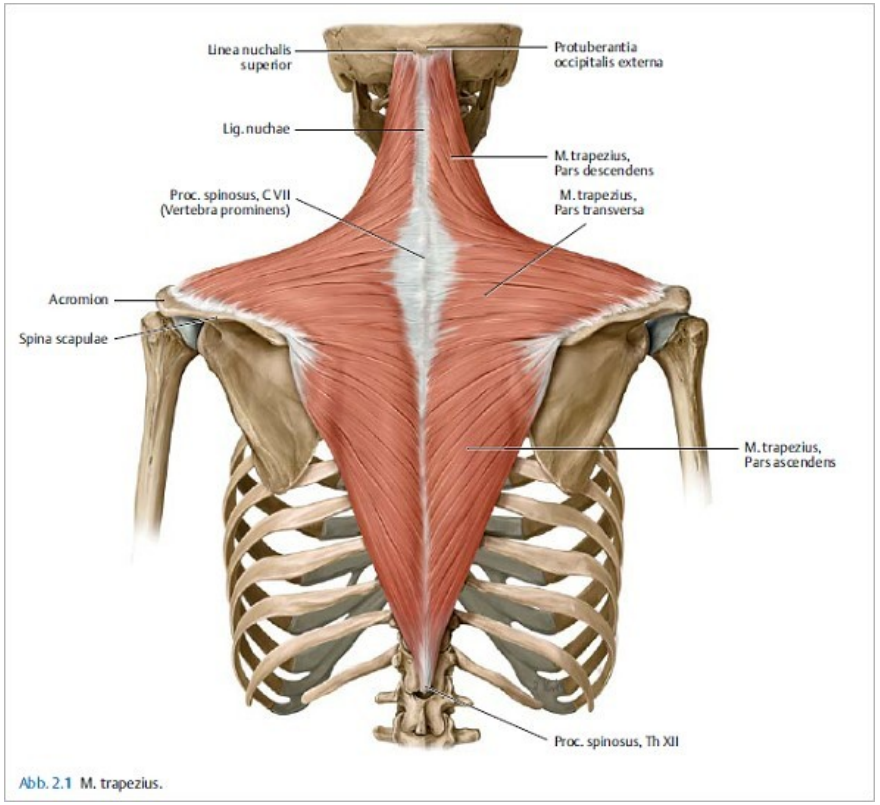
Position: prone position, head on the forhead, uninvolved upper limb lying relaxed along the body, the tested upper limb elevated, elbow extended, ulnar part of the forearm on the table
Fixation: support the patients arm
Attempt to move: PT palpate a trace of contraction of lower part of trapezius muscle, in the area between lower angle of scapula and the lower Th spine

Adduction with depression – notes:

- The correct position of the tested upper limb is important

Scapular elevation





Trapezius muscle (upper part)

Levator scapulae

Levator scapulae

Origin
- Posterior tubercles of transverse processes of C1 - C4 vertebrae

Insertion
- Superior part of medial border of scapula

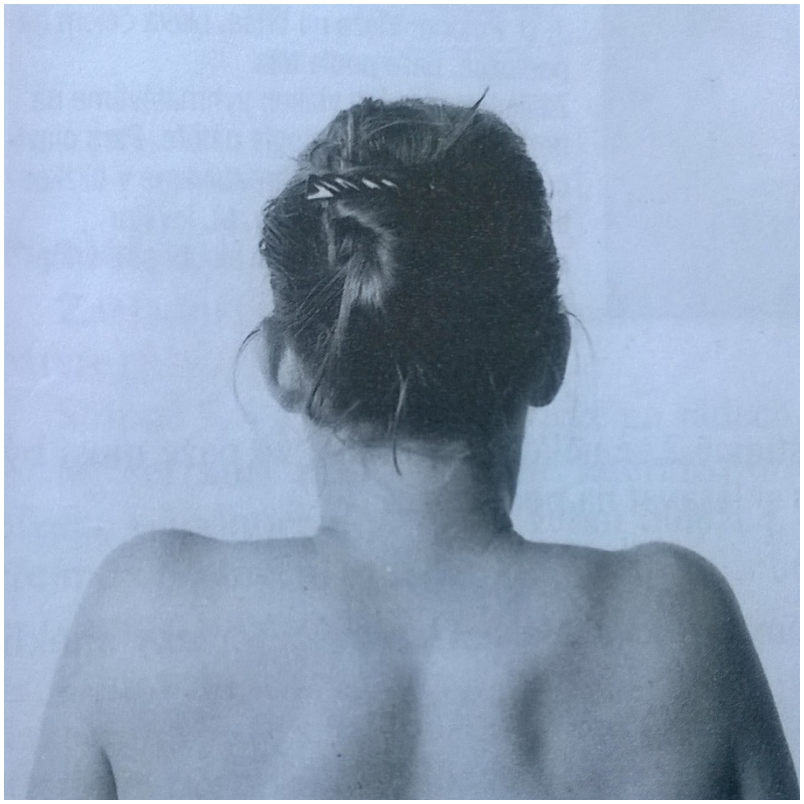
Action
- Elevates scapula and tilts its glenoid cavity inferiorly by rotating scapula

Innervation
- Dorsal scapular (C5) and cervical (C3 and C4) nerves (C3, C5, C4)

Scapular elevation – grade 5,4

Position: patient sits on the chair without backrest, upper limbs relaxed along body side
Fixation: not necessary
Movement: elevation of shoulders in full range of motion
Resistance: PT put resistance against shoulder movement

Scapular elevation – grade 3



Position: patient sits on the chair without backrest, upper limbs relaxed along body side
Movement: elevation of shoulders in full range of motion

Scapular elevation – grade 2

Position: prone position, head on the table, upper limbs relaxed, lying along body side
Fixation: not necessary, PT supports patients´ arm
Movement: elevation of shoulders in full range of motion

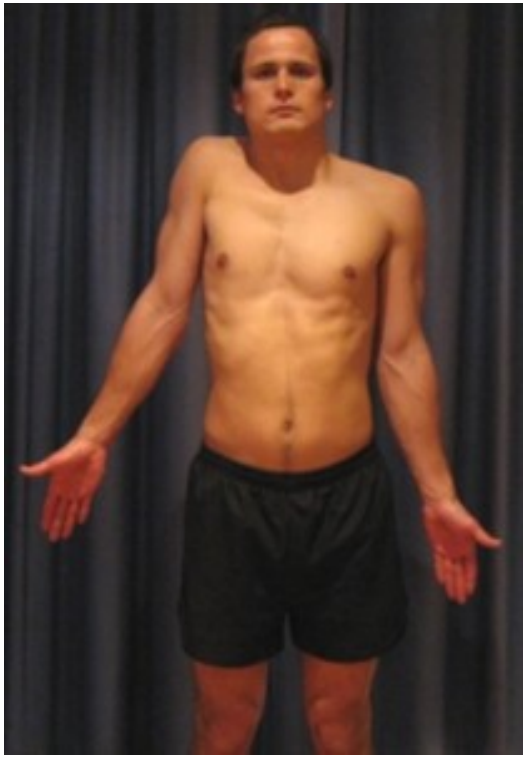
Scapular elevation – grade 1,0

Position: prone position, head on the table, upper limbs relaxed, lying along body side

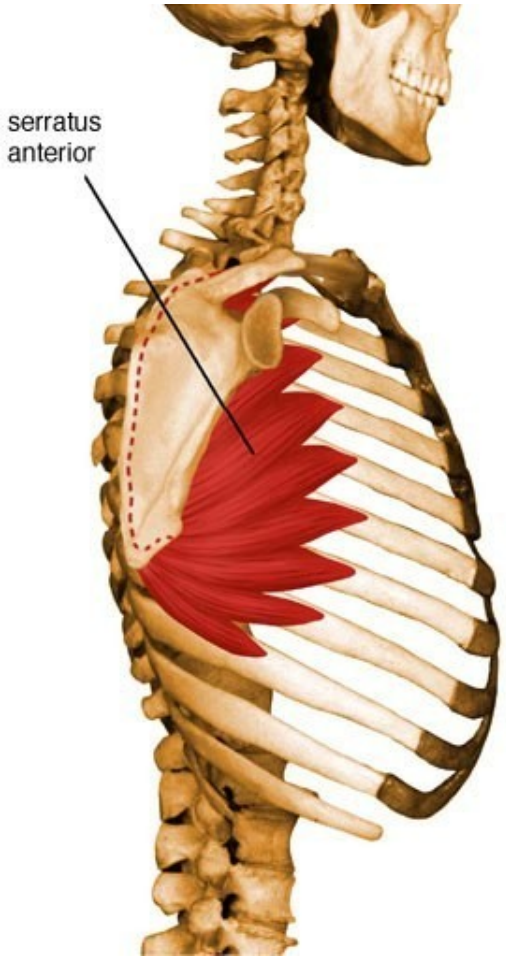
Attempt to move: PT palpates the trace of levator scapulae and trapezius muscle contraction during patients´ attempt to elevate the shoulders

Scapular elevation – notes:

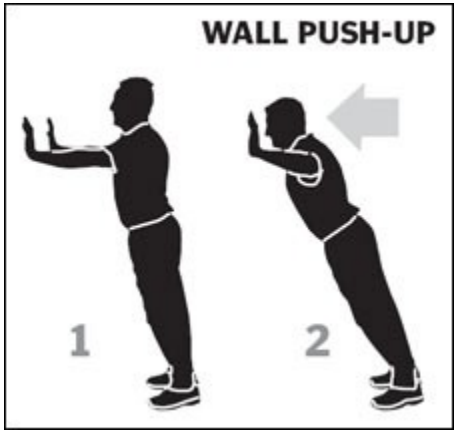
- The movement is tested on both sides together
- The arms should be supported during testing grade 2
- The head should be in central position, no movement of the head should be allowed



Scapular abduction with rotation



Serratus anterior



Serratus anterior

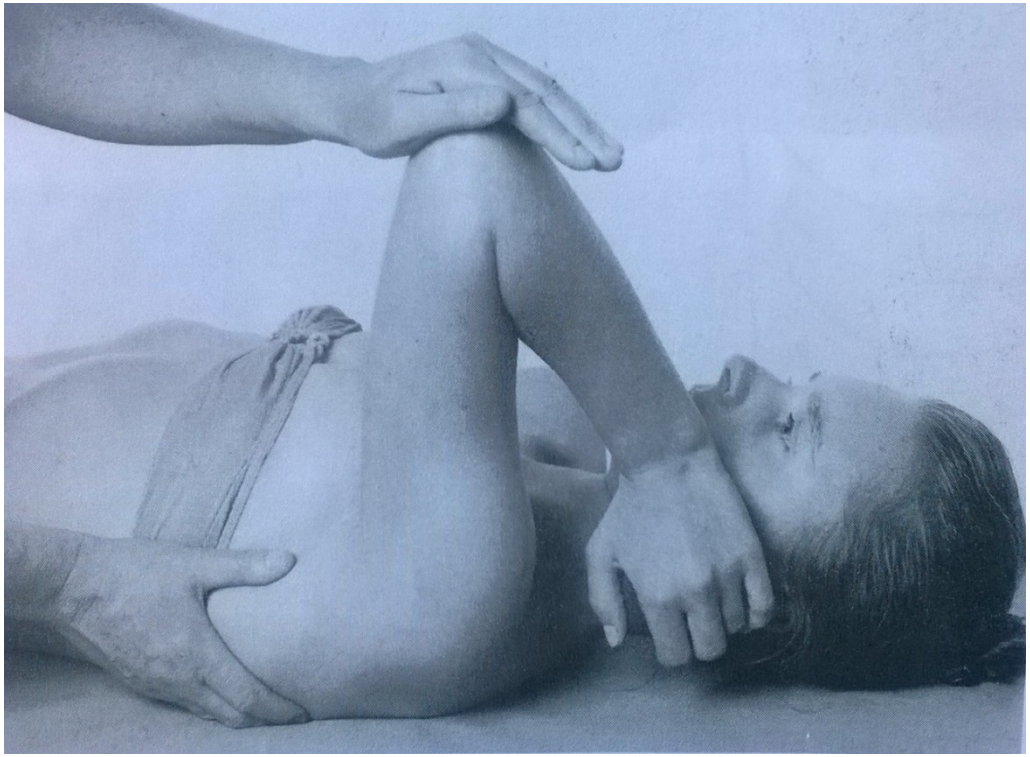
Origin
- Superolateral surfaces of upper 8 or 9 ribs at the side of chest

Insertion
- Vertebral border of scapula

Action
- Draws scapula forward and upward
- abducts scapula and rotates it
- stabilizes vertebral border of scapula

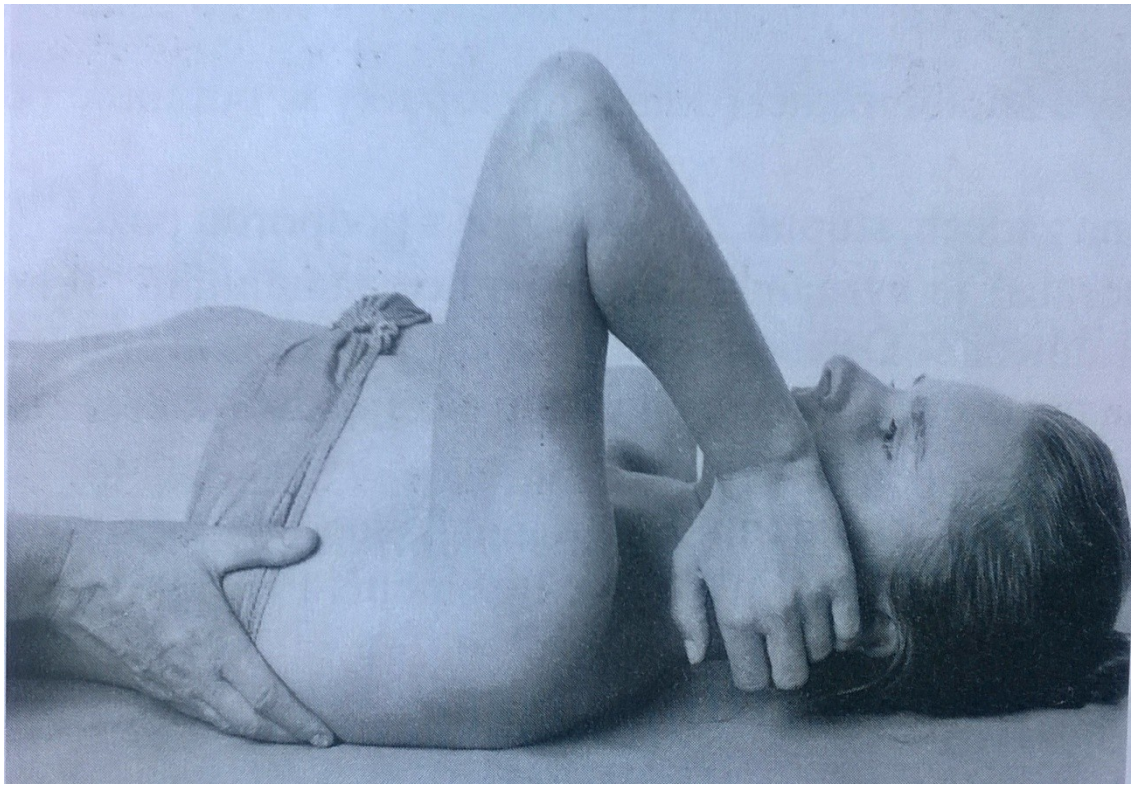
Innervation
- Long thoracic nerve (C5, C6, C7) (C5, C6, C7)

Scapular abduction with rotation – grade 5,4



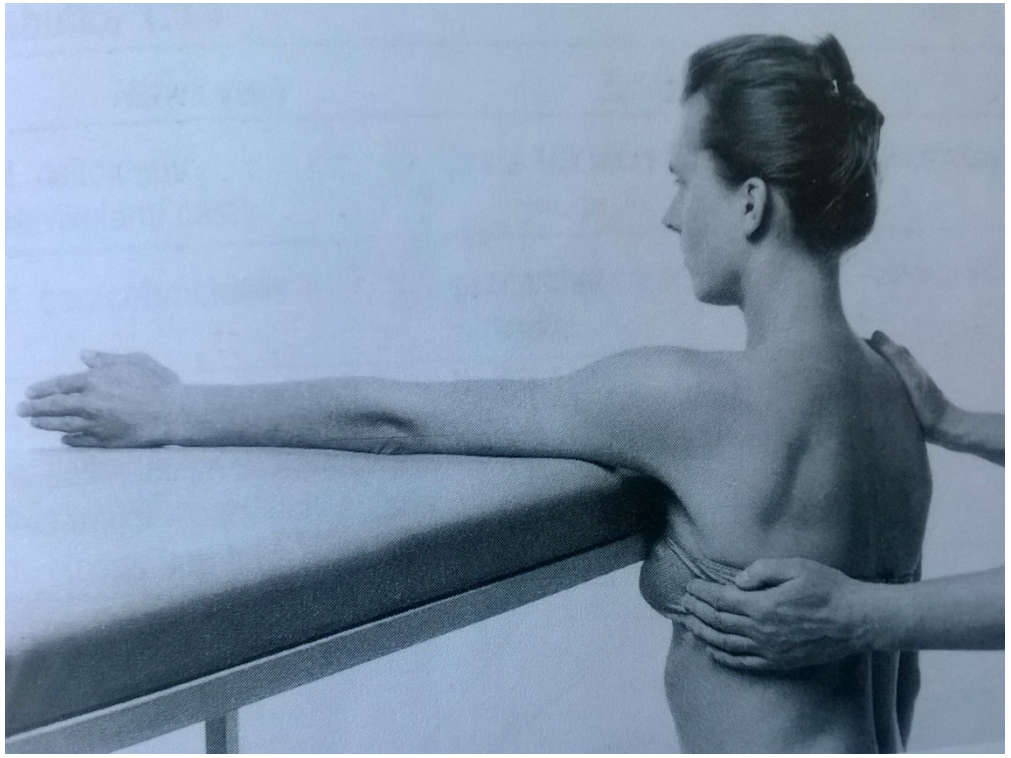
Position: supine position, lower limbs flexed, tested upper limb fully flexed in elbow, 90° flexion in the shoulder, scapula on the table
Fixation: PT fix patients trunk below the lower angle of scapula
Movement: patient moves the arm up (thus the scapula abduct and rotate)
Resistance: PT put the resistance on patients´ flexed elbow, against the movement upwards

Scapular abduction with rotation – grade 3



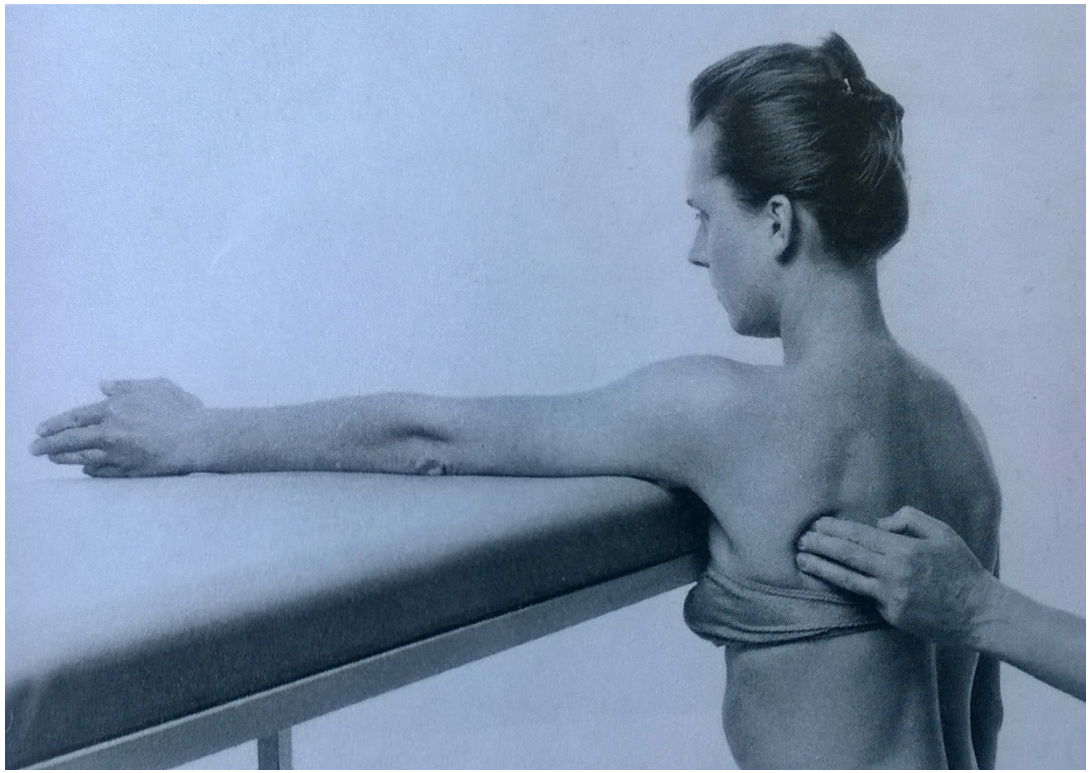
Position: supine position, lower limbs flexed, tested upper limb fully flexed in elbow, 90° flexion in the shoulder, scapula on the table
Fixation: PT fix patients trunk below the lower angle of scapula
Movement: patient moves the arm up (thus the scapula abduct and rotate)

Scapular abduction with rotation – grade 2



Position: patient sits in front of the table, tested upper limb lying on the table (90° flexion in the shoulder, elbow extended, forearm on the ulnar side)
Fixation: lateral part of the trunk on the tested side, below the lower scapula angle, shoulder on the untested side
Movement: patient move the arm lying on the ulnar side forward (thus the scapula abduct and rotate)

Scapular abduction with rotation – grade 1,0



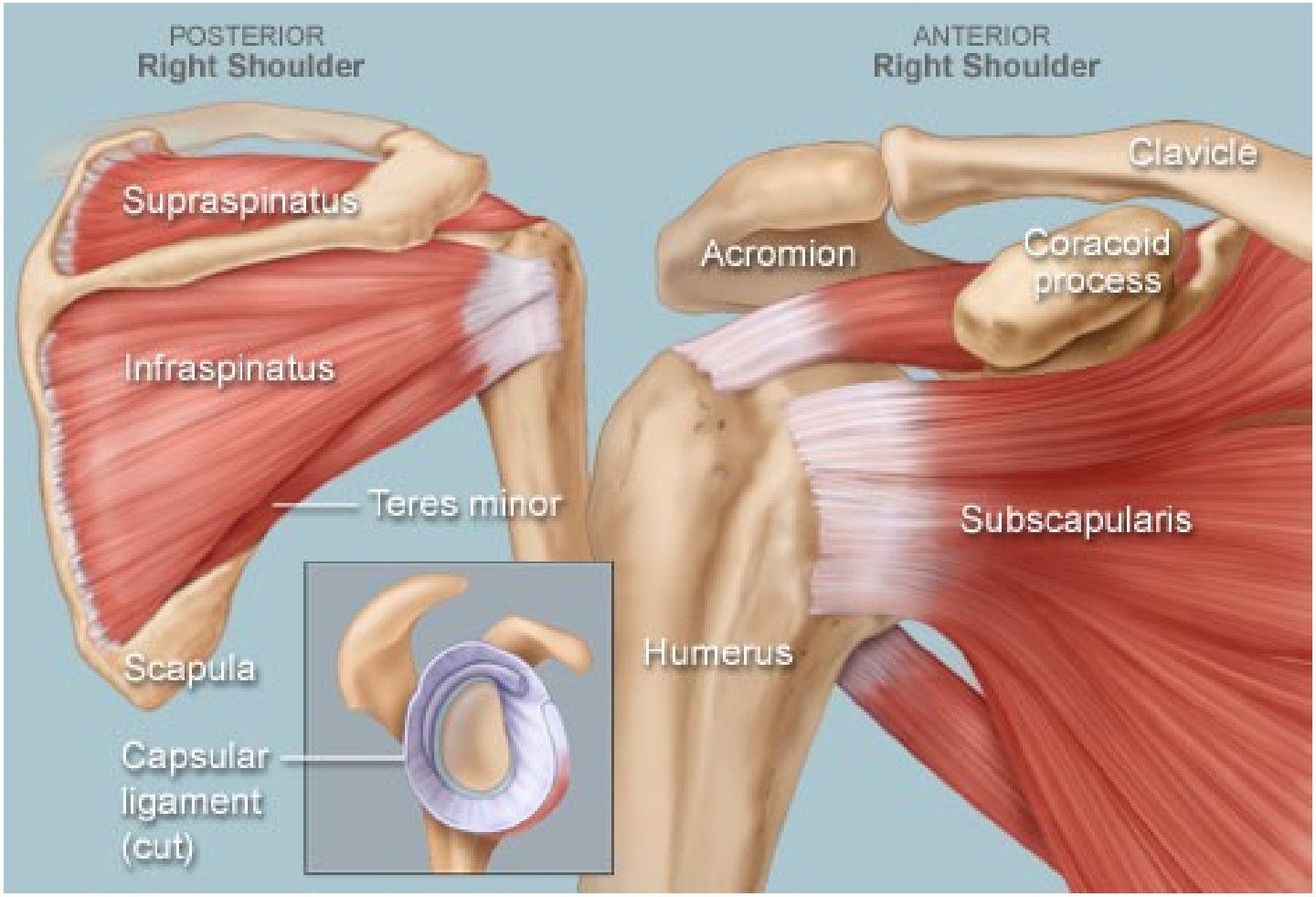
Position: patient sits in front of the table, tested upper limb lying on the table (90° flexion in the shoulder, elbow extended, forearm on the ulnar side)
Fixation: if it´s need, lateral part of the trunk on the tested side, below the lower scapula angle
Attempt to move: during patients´ attempt to move the arm forward, PT palpate the serratus anterior on the vertebral edge of scapula

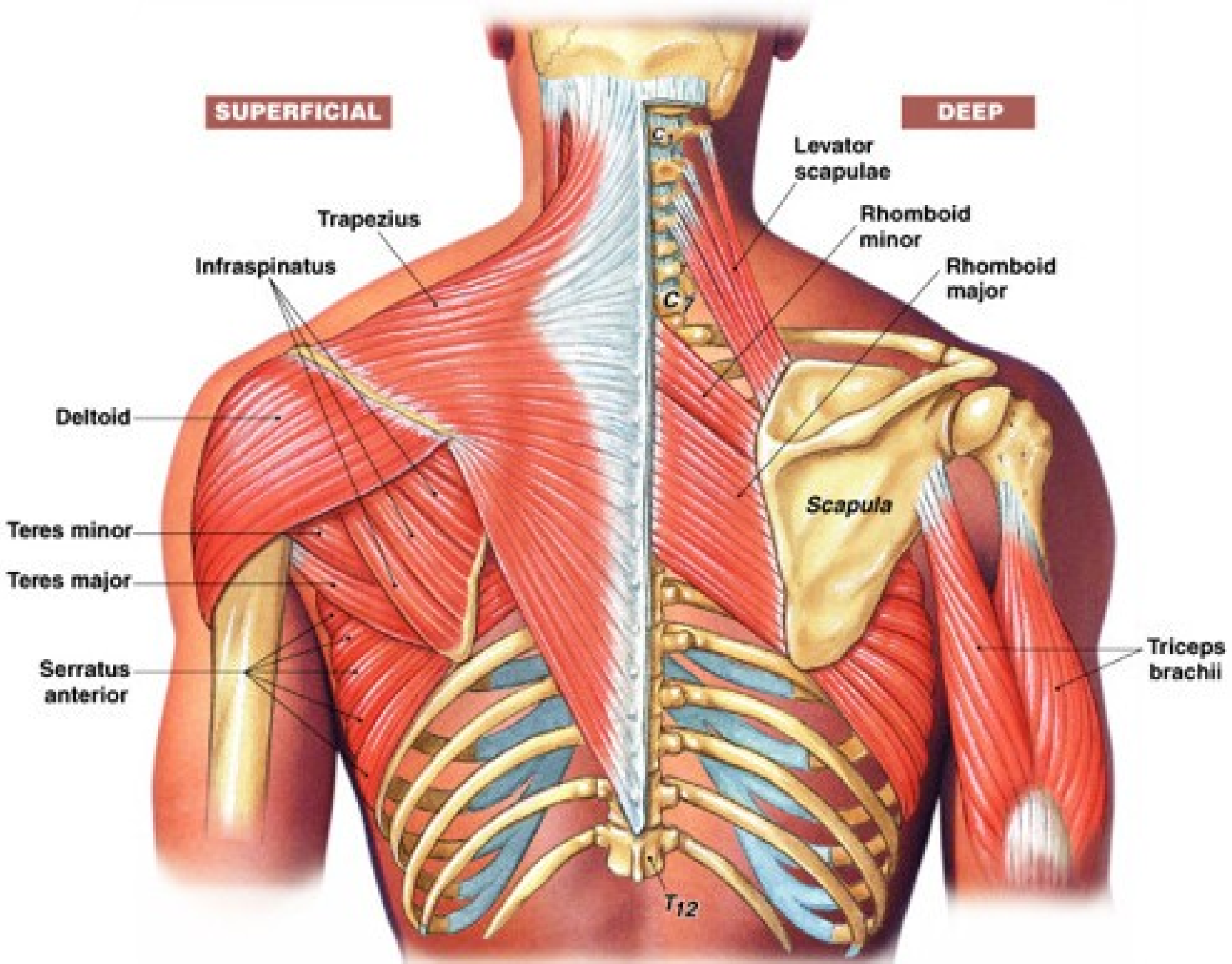
Scapular abduction with rotation – notes:

- Fixation of the trunk is necessary, any attempt of rotation of the trunk should be allowed, no elevation of the shoulders
- Be precise during palpation of the serratus anterior contraction, the trace can be often overlook

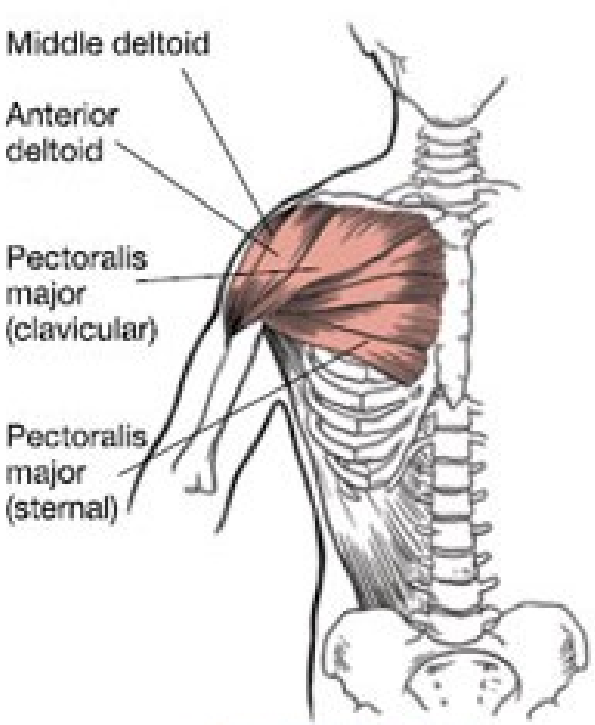
- Weakness of serratus anterior leads to **scapula alata**

Shoulder

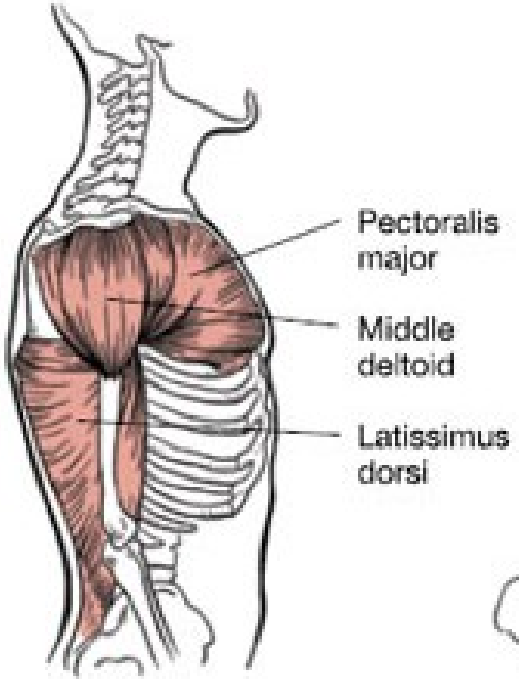

POSTERIOR
Right Shoulder
ANTERIOR
Right Shoulder
Supraspinatus
Infraspinatus
Teres minor
Scapula
Capsular ligament (cut)
Humerus
Clavicle
Acromion
Coracoid process
Subscapularis


SUPERFICIAL
DEEP
Levator scapulae
Trapezius
Rhomboid minor
Infraspinatus
Rhomboid major
C7
Deltoid
Scapula
Teres minor
Teres major
Triceps brachii
Serratus anterior
T12

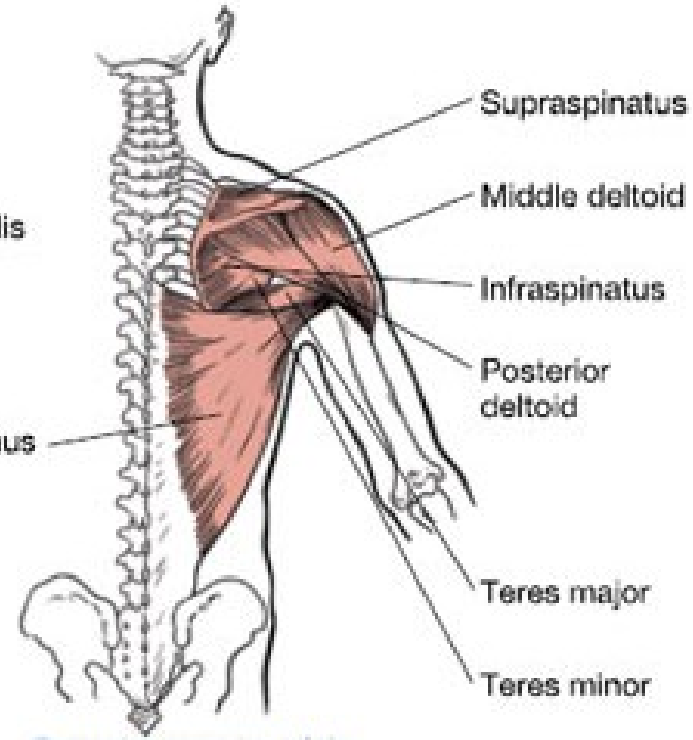
Superficial shoulder muscles



Anterior deltoid and pectoralis major

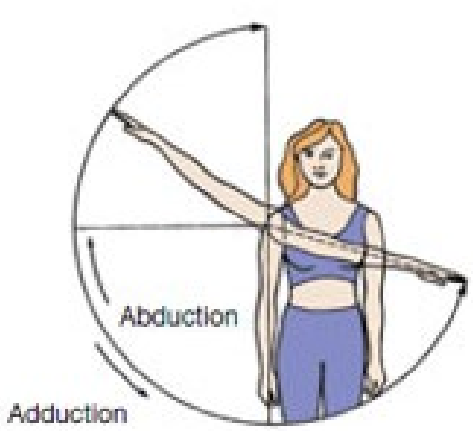


Latissimus dorsi, pectoralis, and deltoid, lateral view

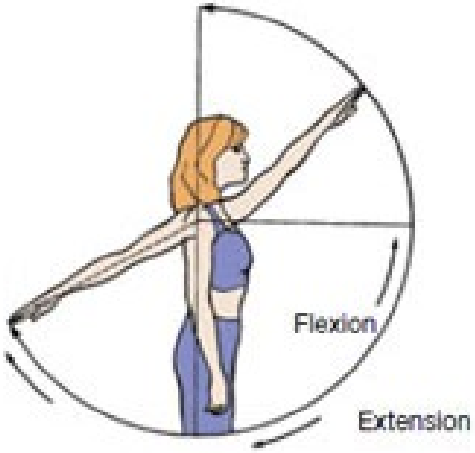


Posterior muscles of the shoulder (glenohumeral) joint

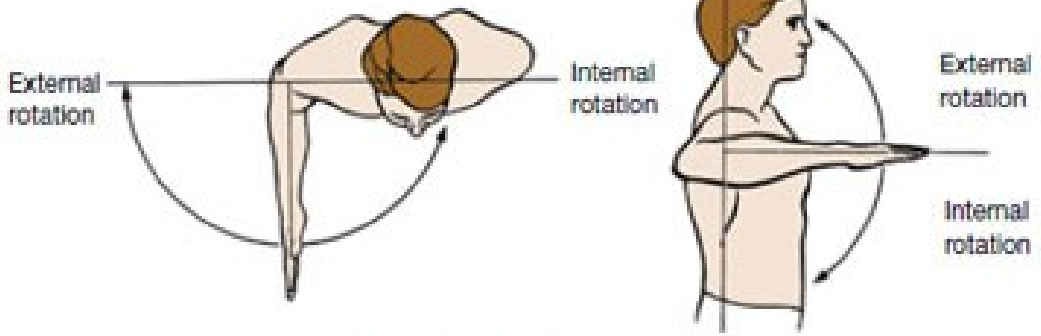
Movement of the shoulder



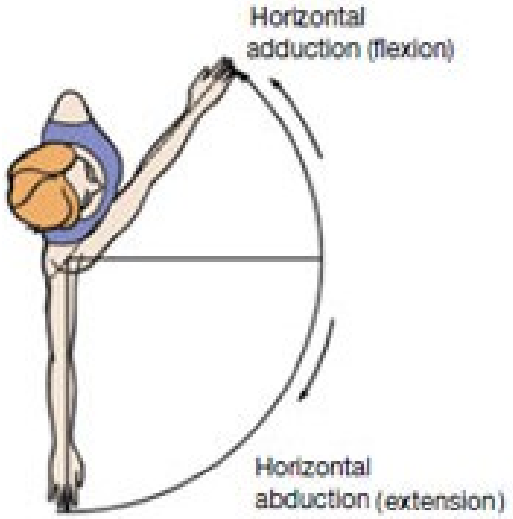
Abduction & Adduction



Flexion & Extension

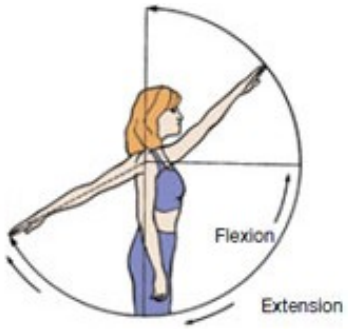


Internal & External Rotation



Horizontal Abduction & Adduction

Shoulder flexion



Flexion & Extension

Deltoid muscle

Coracobrachialis muscle

Deltoid muscle

Origin
- Lateral third of clavicle, acromion, and spine of scapula

Insertion
- Deltoid tuberosity of humerus

Action
- Anterior part: flexes and medially rotates arm
- Middle part: abducts arm
- Posterior part: extends and laterally rotates arm

Innervation
- Axillary nerve (C5 and C6) (C5, C6)

Coracobrachialis muscle

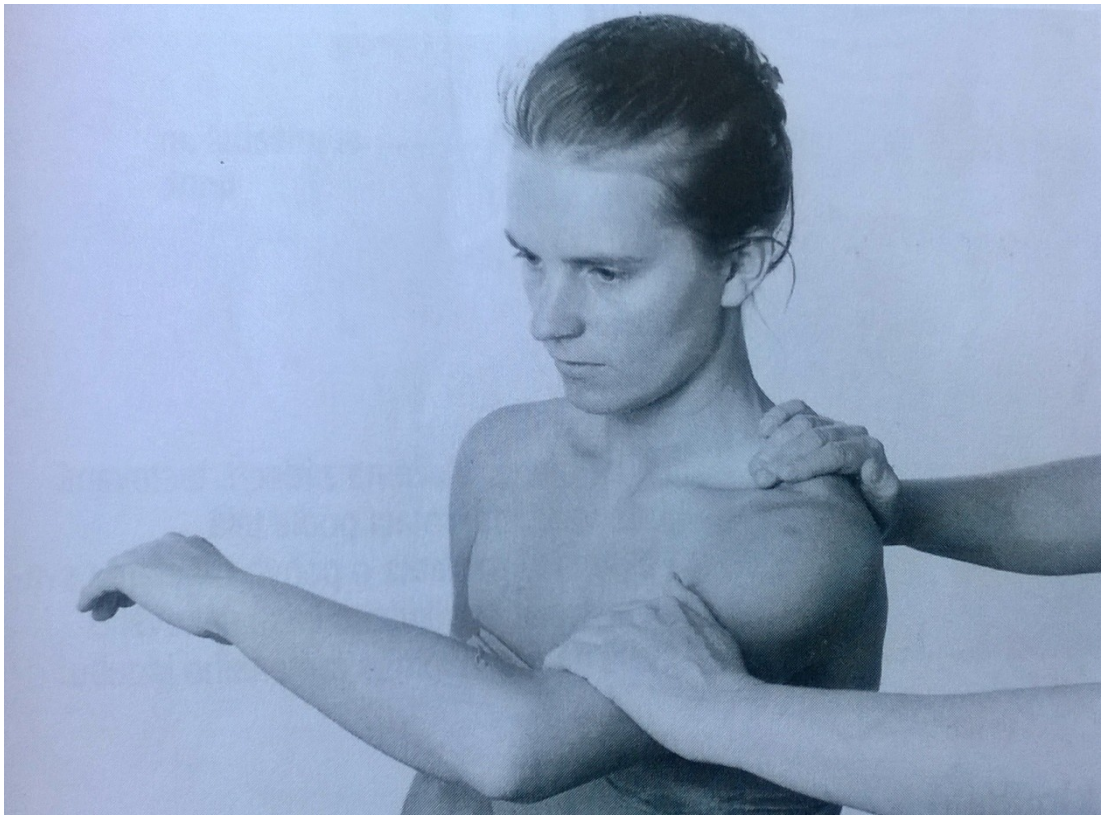
Origin
- Tip of coracoid process of scapula

Insertion
- Middle third of medial surface of humerus

Action
- Helps to flex and adduct arm

Innervation
- Musculocutaneous nerve (C5, C6 and C7) (C5, C6, C7)

Shoulder flexion – grade 5,4

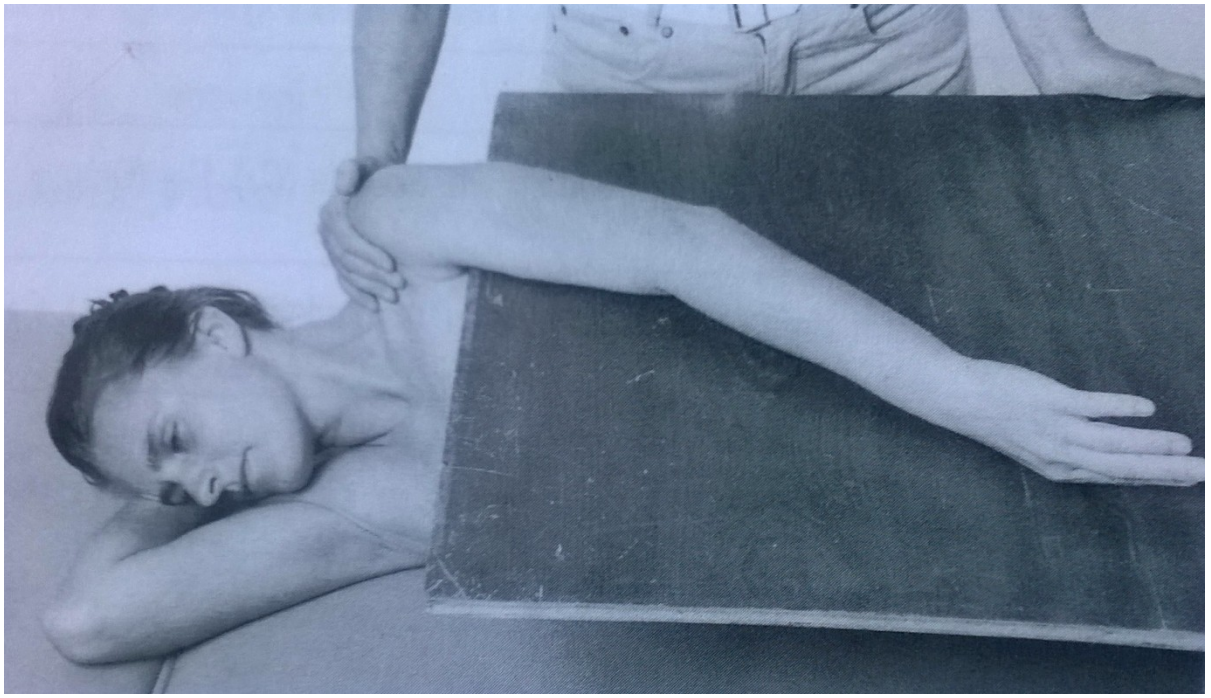


Position: patient sits, tested upper limb along body side, 90° flexion of the elbow, forearm in prone position
Fixation: upper part of the scapula
Movement: 90° flexion in the shoulder
Resistance: PT put resistance on the lower part of the arm against the movement (arched)

Shoulder flexion – grade 3

Position: patient sits, tested upper limb along body side, 90° flexion of the elbow, forearm in prone position
Fixation: upper part of the scapula
Movement: 90° flexion in the shoulder

Shoulder flexion – grade 2



Position: lying on the untested side, lower limbs flexed, tested upper limb lying extended inner rotated on the desk
Fixation: upper part of the scapula
Movement: 90° flexion in the shoulder (pushing the arm along the desk)

Shoulder flexion – grade 1,0

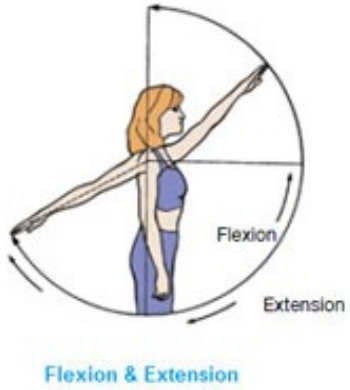
Position: supine position, tested upper limb extended, in inner rotation, lying along body side

Attempt to move: PT palpates a trace of deltoid muscle contraction on the anterior part of shoulder during patients´ attempt to move the arm forward

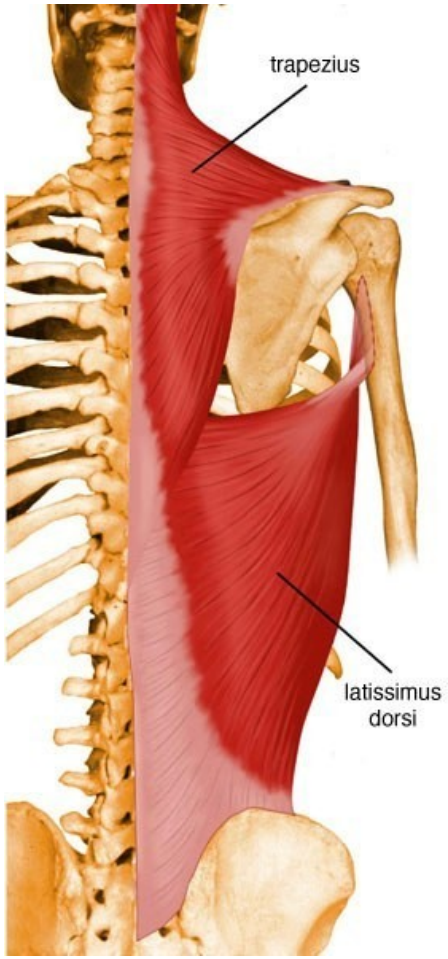
Shoulder flexion – note:

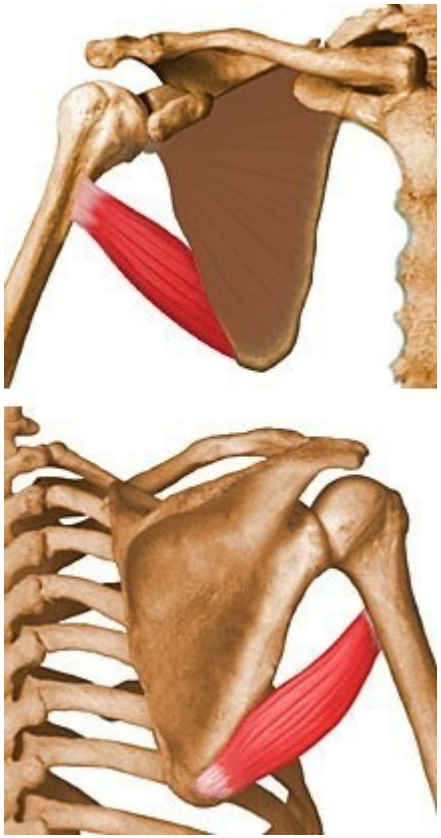
- The movement has to be done with arm inner rotated. Dont´ allow the patient to do outer rotation (substitution of biceps muscle can then occur)
- Dont´ allow to move the scapula (elevation or protraction) or move the trunk (usually extension)
- Do the movement just in sagital plane (any abduction or rotation of the shoulder)

Shoulder extension



Flexion & Extension





Latissimus dorsi

Teres maior

Deltoid

Latissimus dorsi

Origin

- Spinous processes of inferior 6 thoracic vertebrae, thoracolumbar fascia, iliac crest, and inferior 3 or 4 ribs

Insertion

- Floor of intertubercular groove of humerus

Action

- Extends, adducts, and medially rotates humerus
- raises body toward arms during climbing

Innervation

- Thoracodorsal nerve (C6, C7, and C8) (C6, C7, C8)

Teres maior

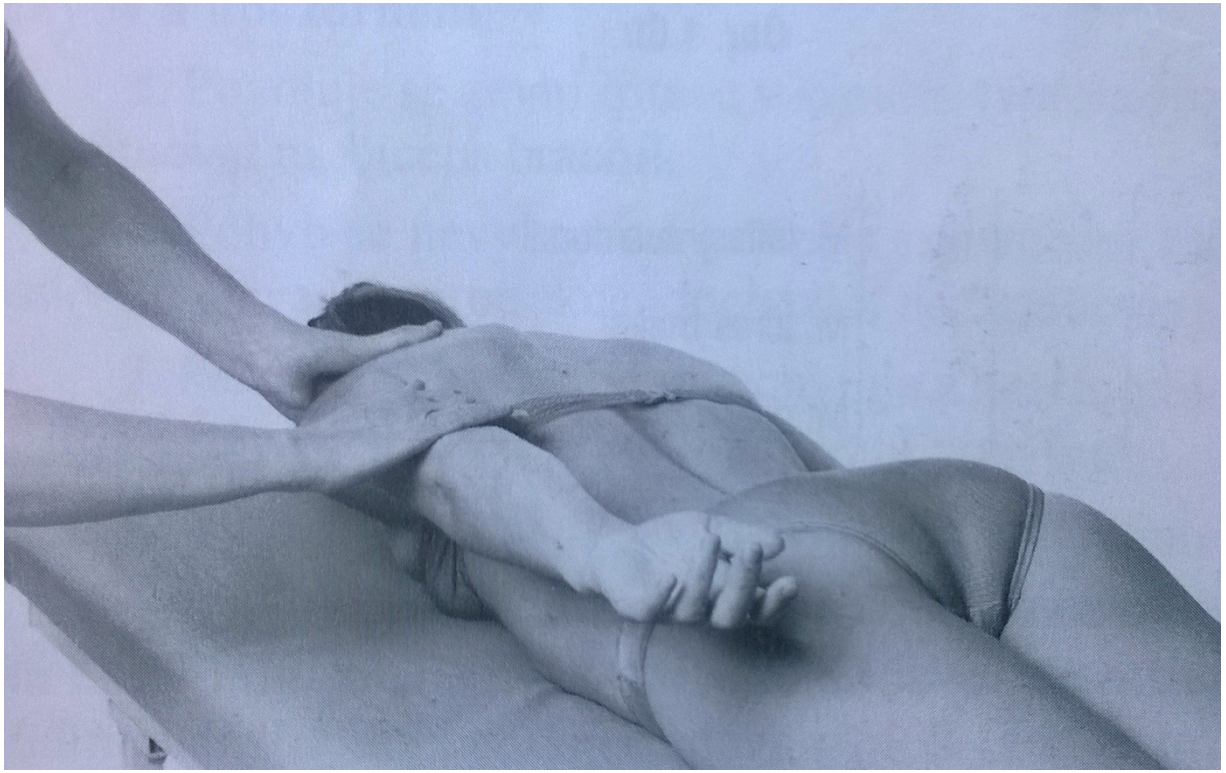
Origin
- Dorsal surface of inferior angle of scapula

Insertion
- Medial lip of intertubercular groove of humerus

Action
- Adducts and medially rotates arm

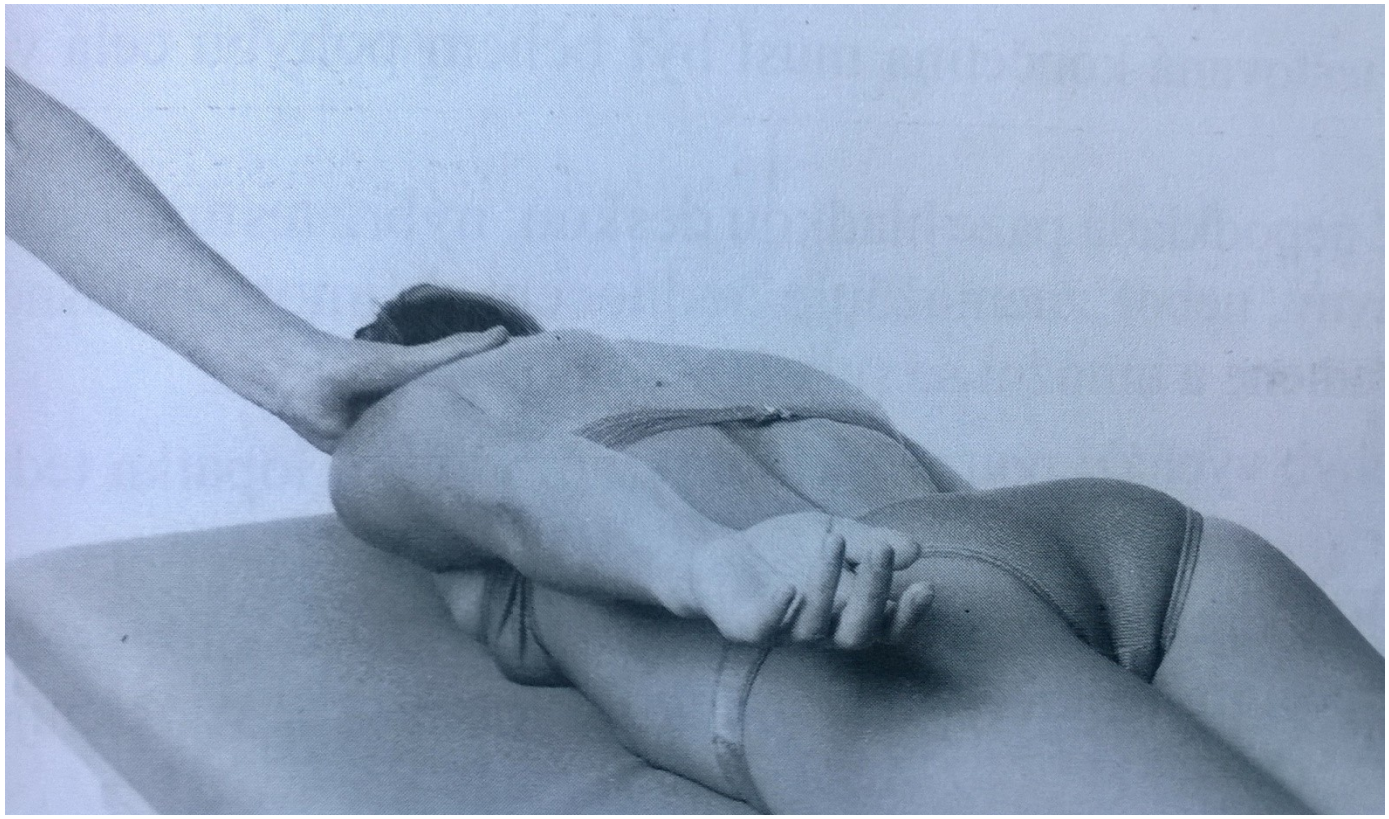
Innervation
- Lower subscapular nerve (C6 and C7) (C6, C7)

Shoulder extension – grade 5,4



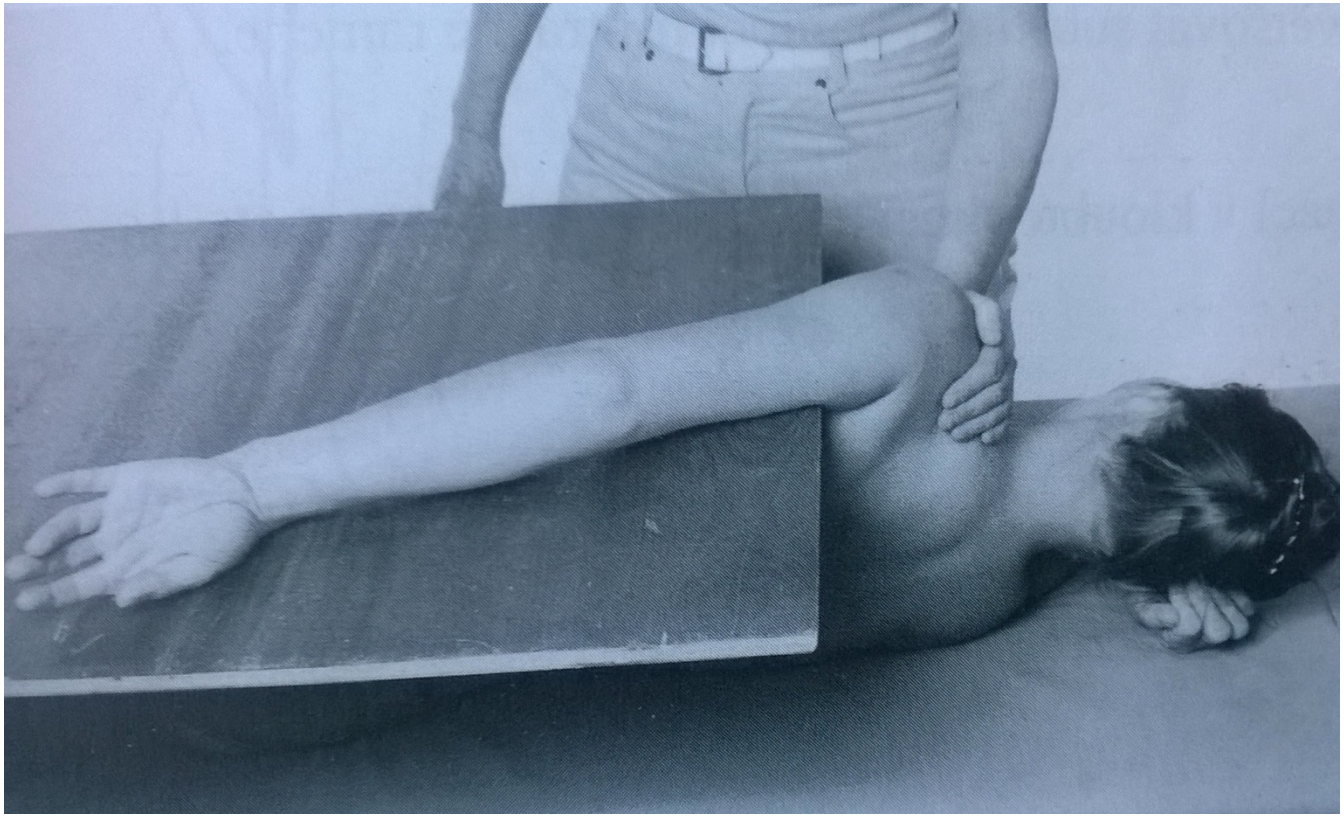
Position: lying prone, head on the table, upper limbs internal rotated, lying relaxed along body side
Fixation: upper part of scapula
Movement: shoulder extension (30-40°)
Resistance: PT puts resistance on the lower part of the arm against the patients´ elevation of the arm

Shoulder extension – grade 3



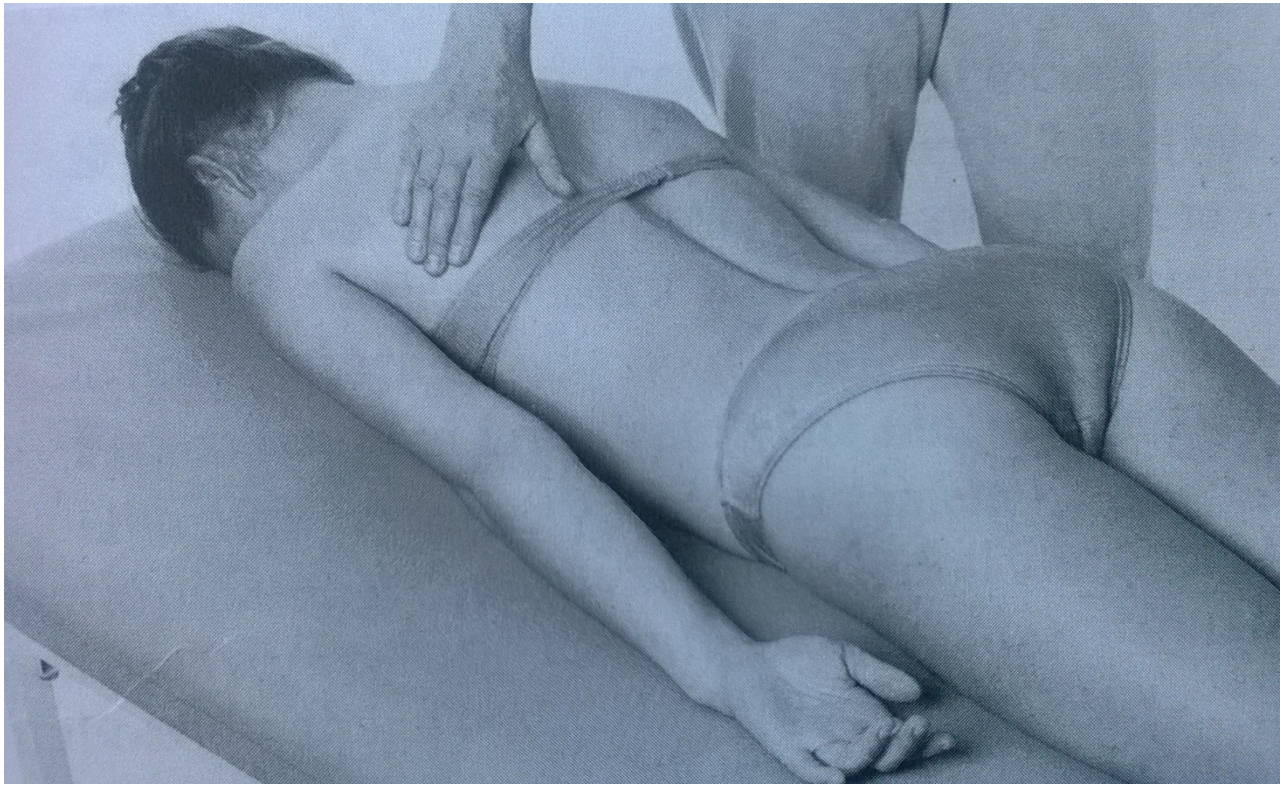
Position: lying prone, head on the table, upper limbs internal rotated,
lying relaxed along body side
Fixation: upper part of scapula
Movement: shoulder extension (30-40°)

Shoulder extension – grade 2



Position: lying on the untested side, lower limbs flexed, uninvolved arm flexed, below the head, tested upper limb lying extended inner rotated on the desk
Fixation: upper part of scapula
Movement: shoulder extension (30-40°) pushing the arm along the desk

Shoulder extension – grade 1,0



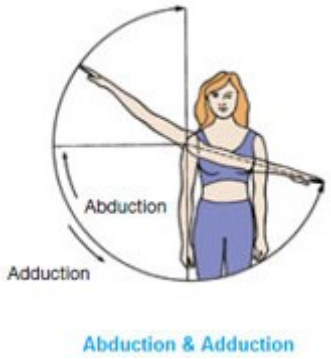
Position: lying prone, head on the table, upper limbs internal rotated, lying relaxed along body side

Attempt to move: PT palpates the trace of contraction of latissimus dorsi and teres maior, during patients´ attempt to elevate the arm

Shoulder extension – notes:

- The arm should be inner rotated during the whole movement
- The trunk and scapula shouldn´t move during testing
- Don´t allow the patient to adduct the scapulas or protract the shoulders

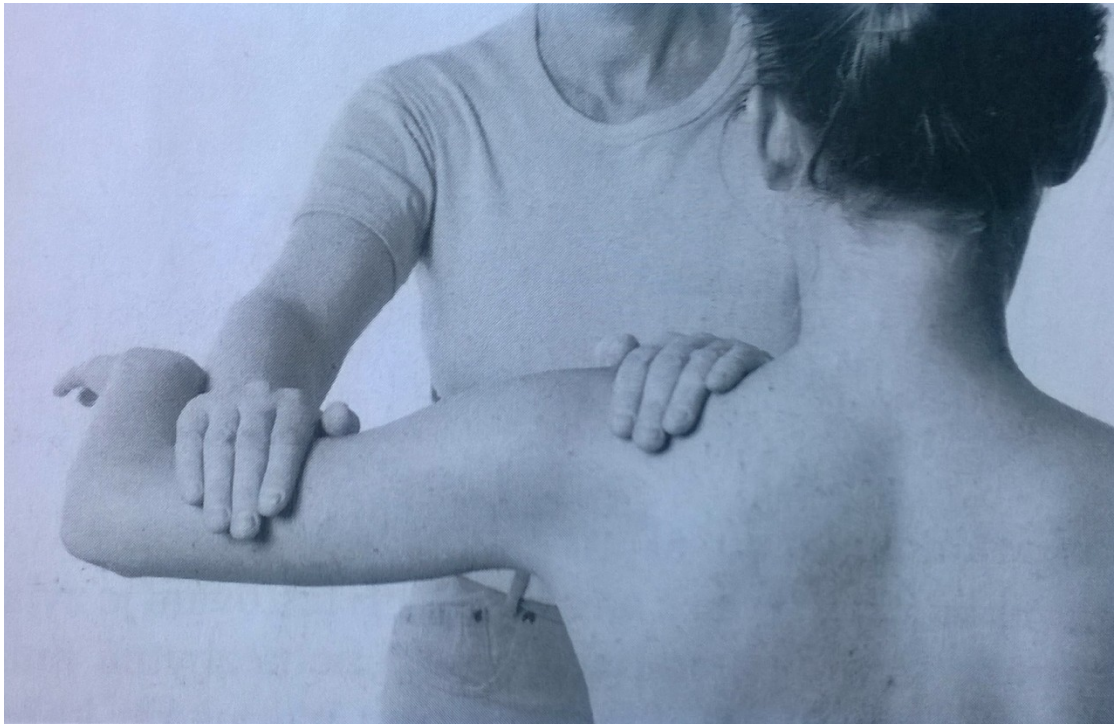
Shoulder abduction



Deltoid

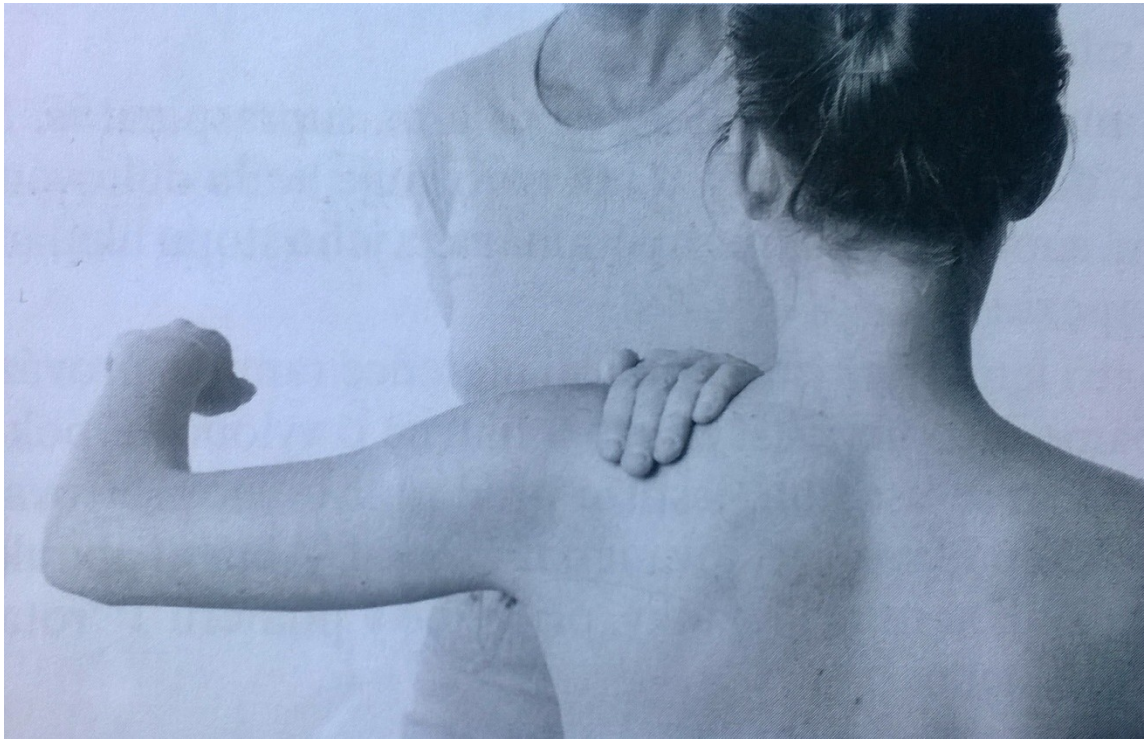
Supraspinatus

Shoulder abduction – grade 5,4



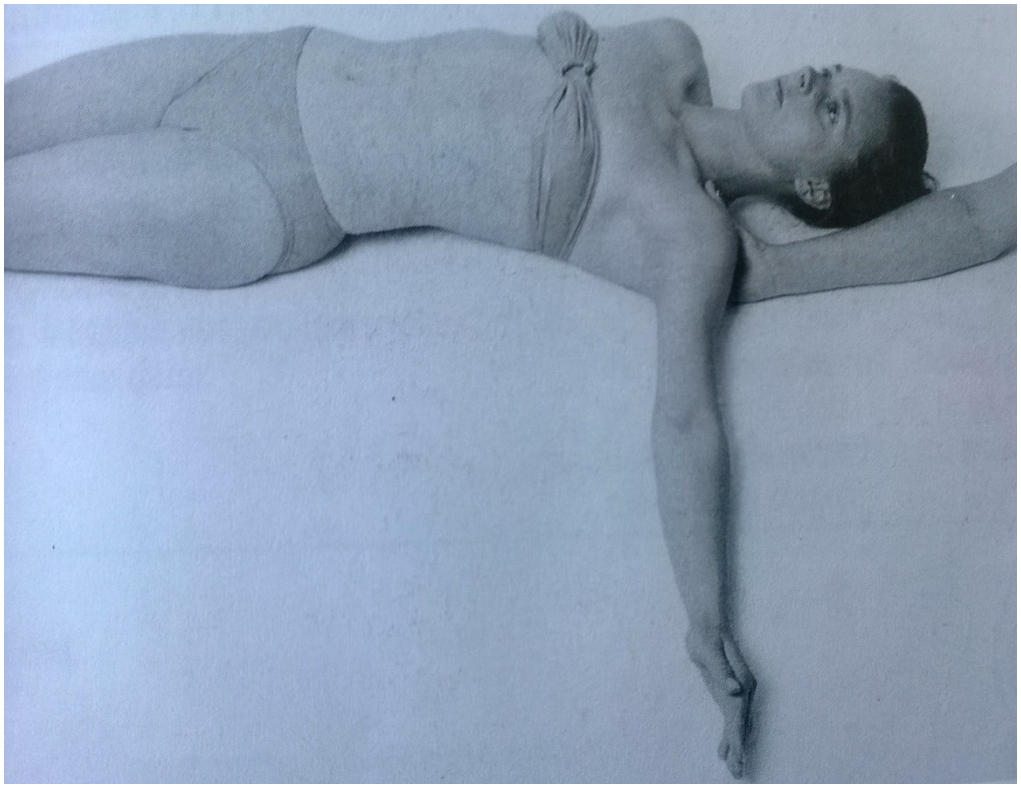
Position: sitting, elbow 90° flexed
Fixation: upper part of scapula
Movement: 90° shoulder abduction
Resistance: PT put resistance at the lower part of the arm, against the movemet (arched)

Shoulder abduction – grade 3



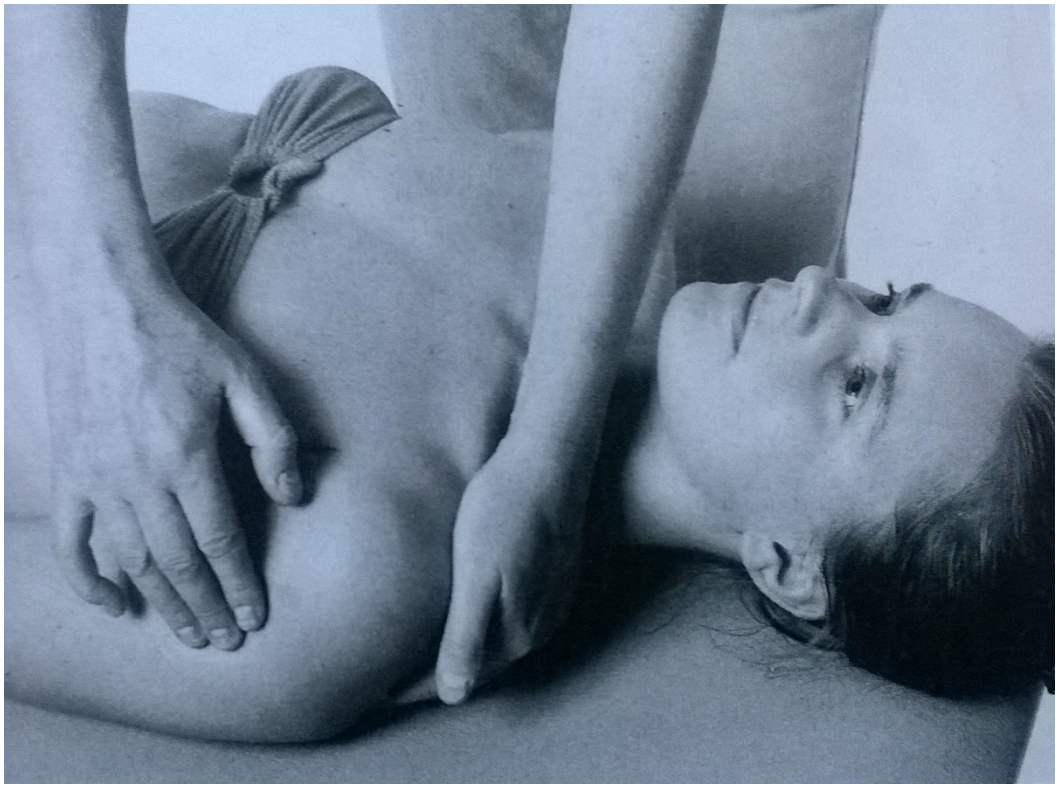
Position: sitting, elbow 90° flexed
Fixation: upper part of scapula
Movement: 90° shoulder abduction

Shoulder abduction – grade 2



Position: lying supine, tested upper limb extended lying on the ulnar part of the forearm
Fixation: upper part of scapula
Movement: 90° shoulder abduction (pushing the arm along the table/desk)

Shoulder abduction – grade 1,0



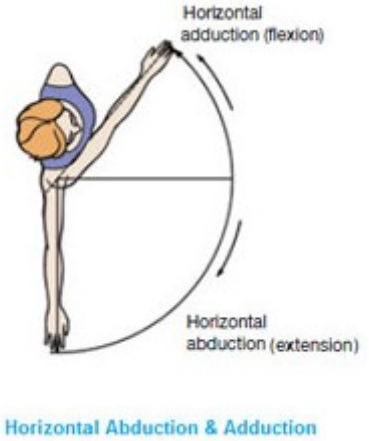
Position: lying supine, tested upper limb extended lying on the ulnar part of the forearm

Attempt to move: PT palpates the trace of contraction of deltoid and supraspinatus

Shoulder abduction – notes:

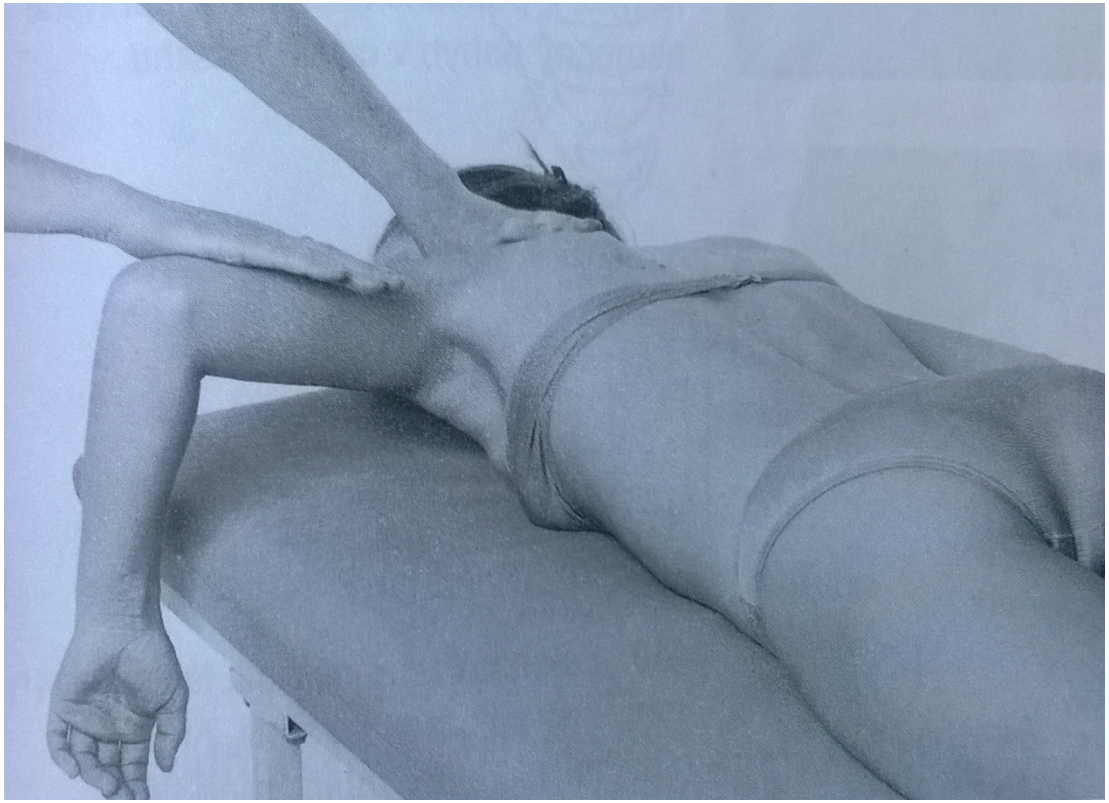
- Don´t allow the patient to: elevate the shoulder, do the external rotation of the arm (substitution of biceps brachii or front part of deltoid can occur), move the trunk

Extension in abduction
(horizontal abduction)



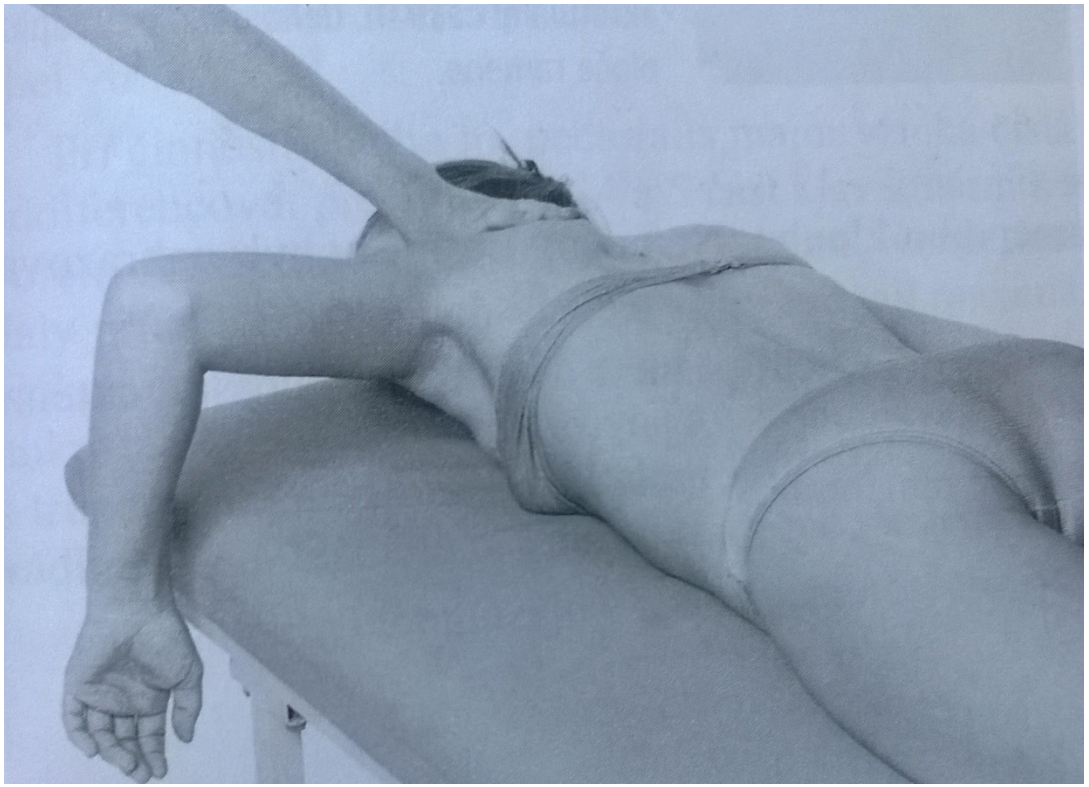
Deltoid muscle (scapular part)

Extension in abduction – grade 5,4



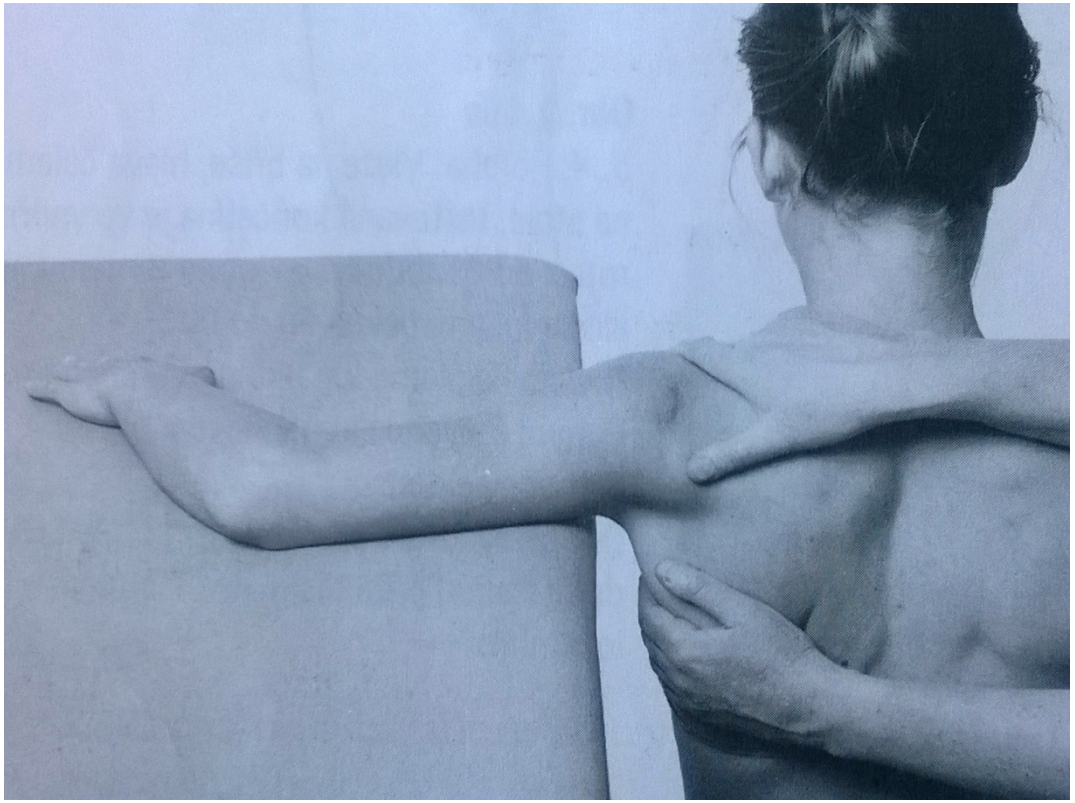
Position: lying prone, head on the table, tested upper limb 90° abducted and inner rotated in shoulder, 90° flexion in elbow
Fixation: fix scapula over the spina scapulae
Movement: extension from the above mentioned position
Resistance: PT put resistance on the lower part of the arm against the movement

Extension in abduction – grade 3



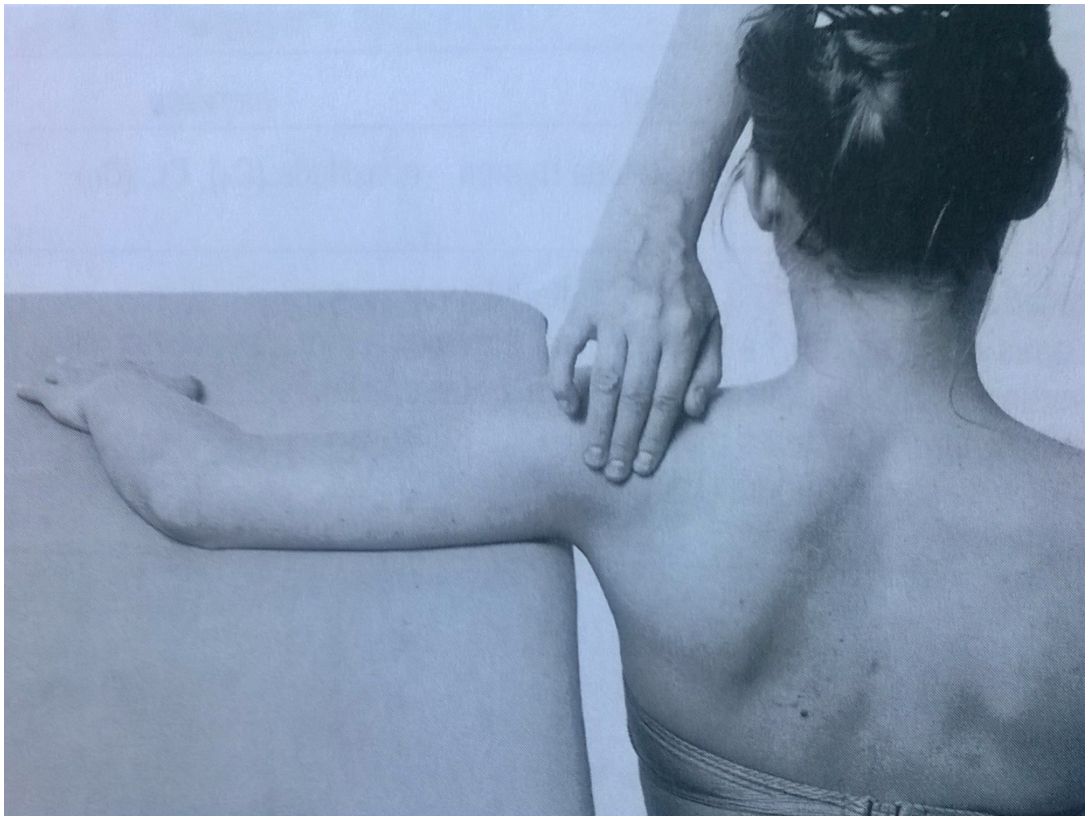
Position: lying prone, head on the table, tested upper limb 90° abducted and inner rotated in shoulder, 90° flexion in elbow
Fixation: fix scapula over the spina scapulae, lower trunk if needed
Movement: extension from the above mentioned position

Extension in abduction – grade 2



Position: sitting next to the table, tested upper limb lying on the table – shoulder 90° abducted and inner rotated, elbow in 90° flexion
Fixation: fix scapula over the spina scapulae, lateral side of the trunk
Movement: extension from the above mentioned position

Extension in abduction – grade 1,0



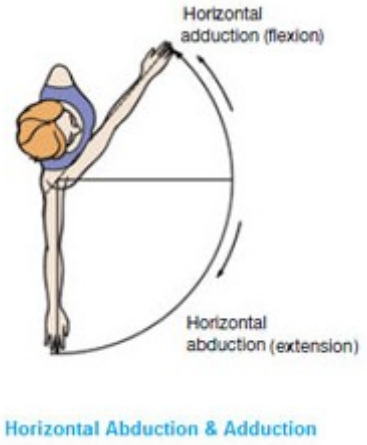
Position: sitting next to the table, tested upper limb lying on the table – shoulder 90° abducted and inner rotated, elbow in 90° flexion

Attempt to move: PT palpates the trace of contraction of deltoid muscle during patients´ attempt of extension

Extension in abduction – notes:

- The movement should occur just in shoulder joint – no adduction of scapula or rotation of the trunk, no elevation of the shoulder

Flexion in abduction
(horizontal adduction)



Pectoralis maior

Pectoralis maior

Origin

- Clavicular head: anterior surface of medial half of clavicle
- Sternocostal head: anterior surface of sternum, superior six costal cartilages, and aponeurosis of external oblique muscle

Insertion

- Lateral lip of intertubercular groove of humerus

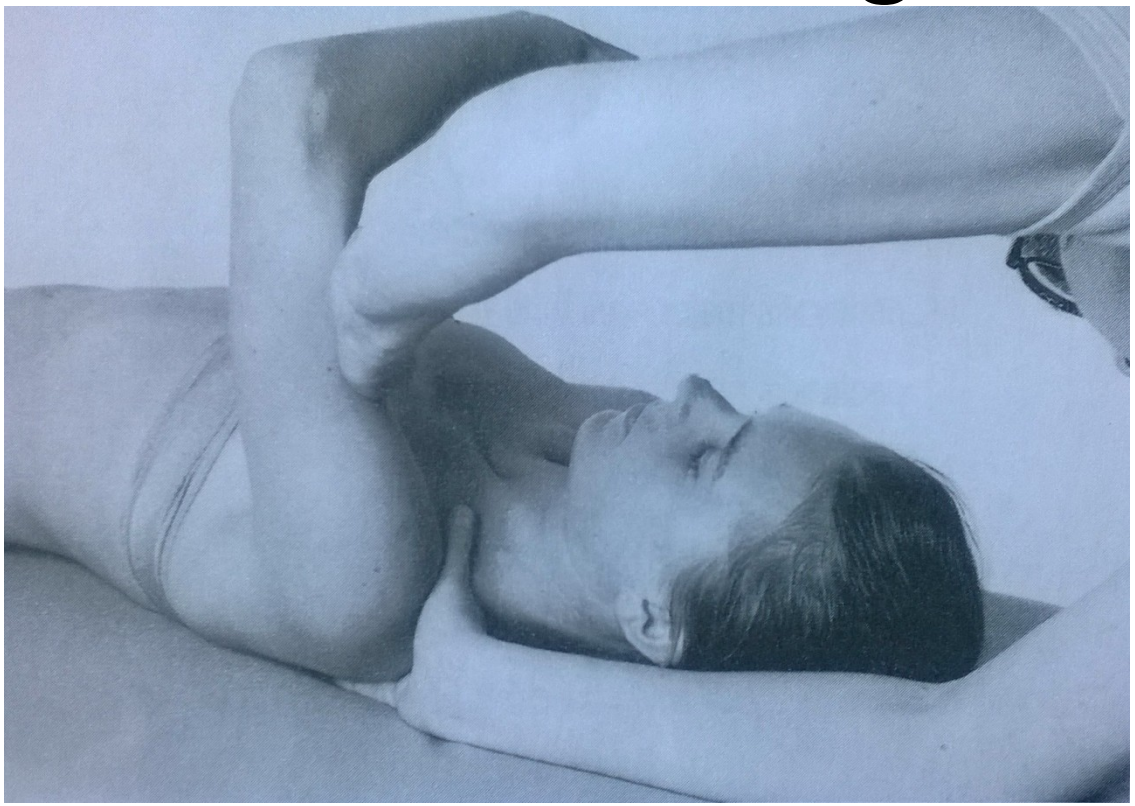
Action

- Adducts and medially rotates humerus
- draws scapula anteriorly and inferiorly
- Acting alone: clavicular head flexes humerus and sternocostal head extends it

Innervation

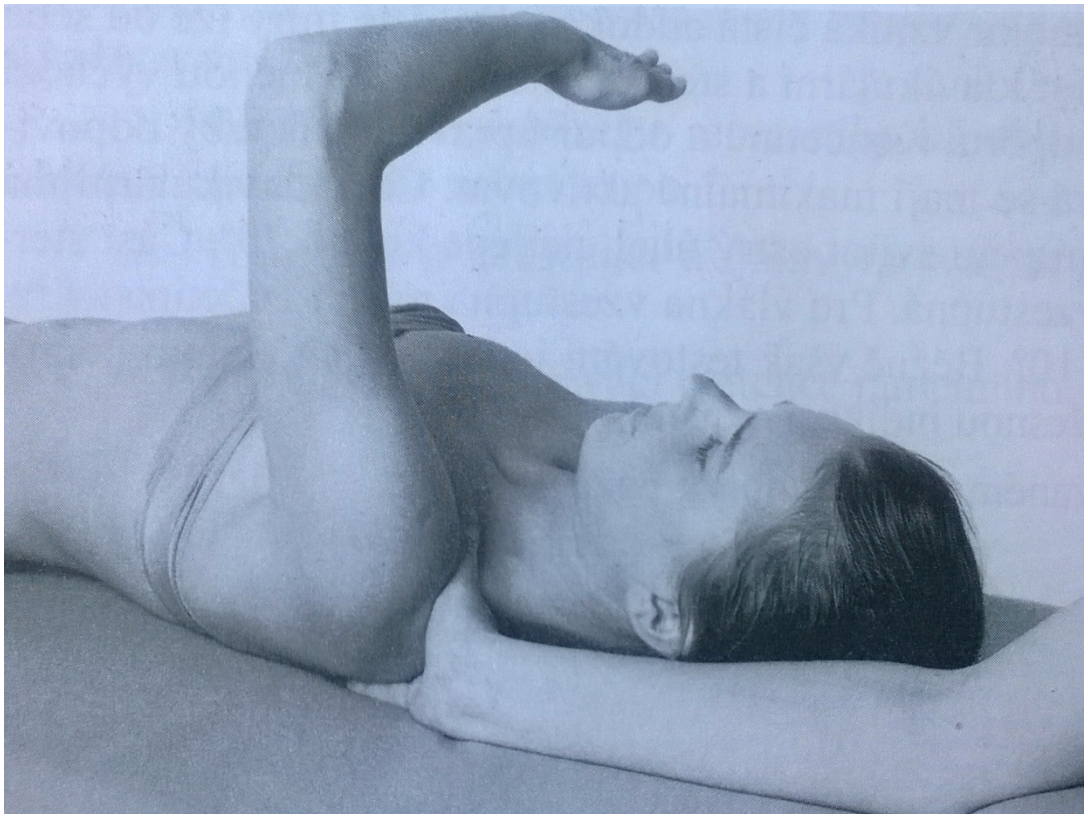
- Lateral and medial pectoral nerves; clavicular head (C5 and C6, sternocostal head (C7, C8, and T1) (C5, C6, C7, C8, T1)

Flexion in abduction – grade 5,4



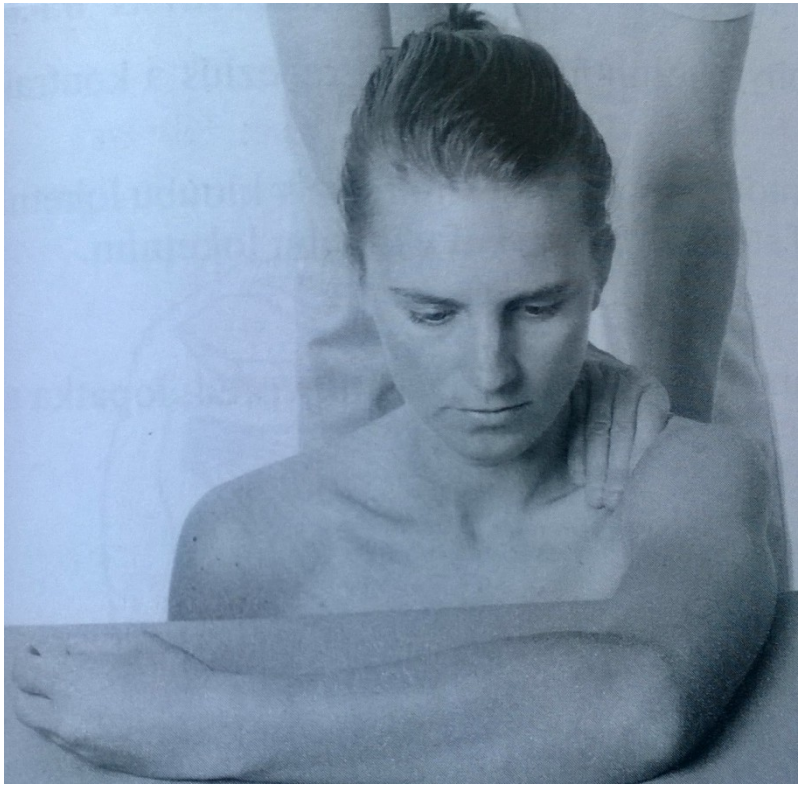
Position: lying supine, lower limbs flexed, tested upper limb 90° abduct in the shoulder, 90° flexed in the elbow
Fixation: fix the shoulder from above
Movement: 90° flexion in the shoulder from the position mentioned above
Resistance: PT put resistance at the lower part of the arm (arched) against the movement

Flexion in abduction – grade 3



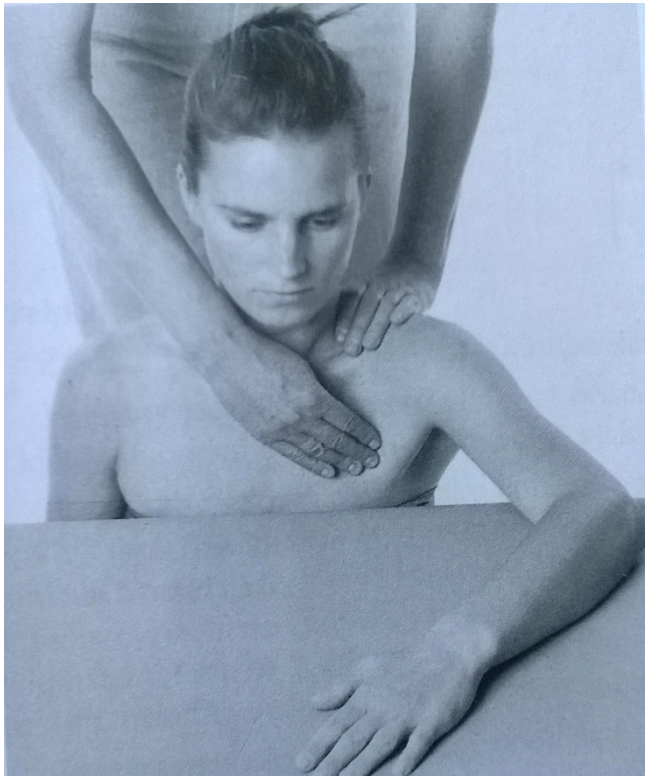
Position: lying supine, lower limbs flexed, tested upper limb 90° abduct in the shoulder, 90° flexed in the elbow
Fixation: fix the shoulder from above
Movement: 90° flexion in the shoulder from the position mentioned above

Flexion in abduction – grade 2



Position: sitting in front of the table, tested upper limb lying on the table, 90° abduction and inner rotation in the shoulder, 90° flexion in the elbow
Fixation: fix the shoulder from above, lateral side of the trunk on the tested side
Movement: horizontal flexion in the shoulder, pushing the arm on the table, in full range of movement

Flexion in abduction – grade 1,0



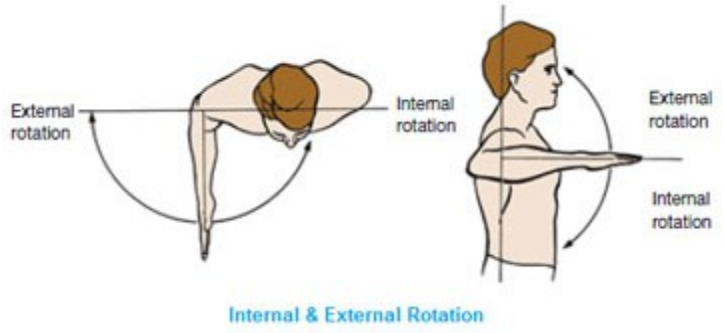
Position: sitting in front of the table, tested upper limb lying on the table, 90° abduction and inner rotation in the shoulder, 90° flexion in the elbow

Attempt to move: PT palpates trace of contraction of pectoralis muscle during patients´ attempt to move the arm forward

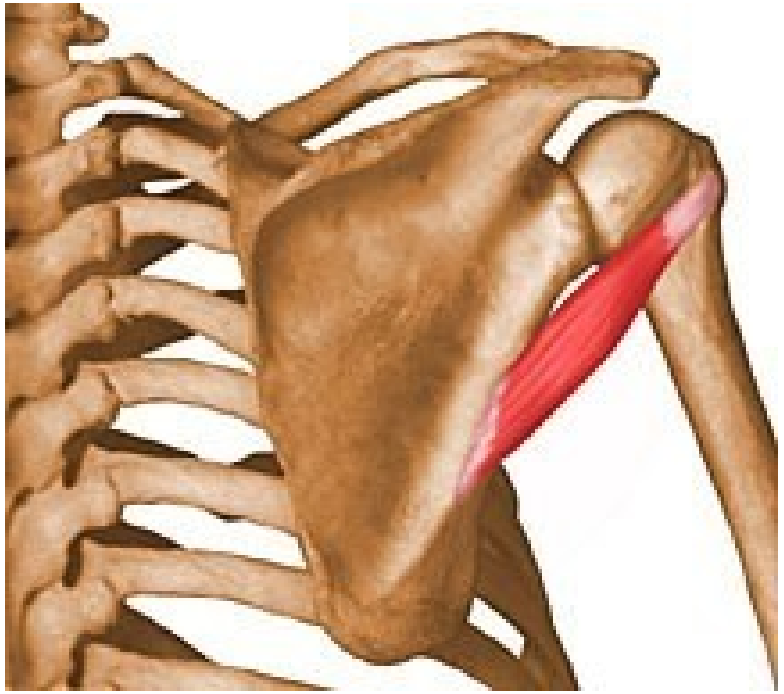
Flexion in abduction – notes

- Don´t allow the patient to do elevation or protraction of the shoulder
- Flexion of the elbow should be 90° during whole tested movement

External rotation



Infraspinatus



Teres minor

Infraspinatus

Origin
- Infraspinous fossa of scapula

Insertion
- Middle facet on greater tuberosity of humerus

Action
- Laterally rotate arm
- helps to hold humeral head in glenoid cavity of scapula

Innervation
- Suprascapular nerve (C5 and C6) (C5, C6)

Teres minor

Origin
- Superior part of lateral border of scapula

Insertion
- Inferior facet on greater tuberosity of humerus

Action
- Laterally rotate arm
- helps to hold humeral head in glenoid cavity of scapula

Innervation
- Axillary nerve (C5 and C6) (C5, C6)

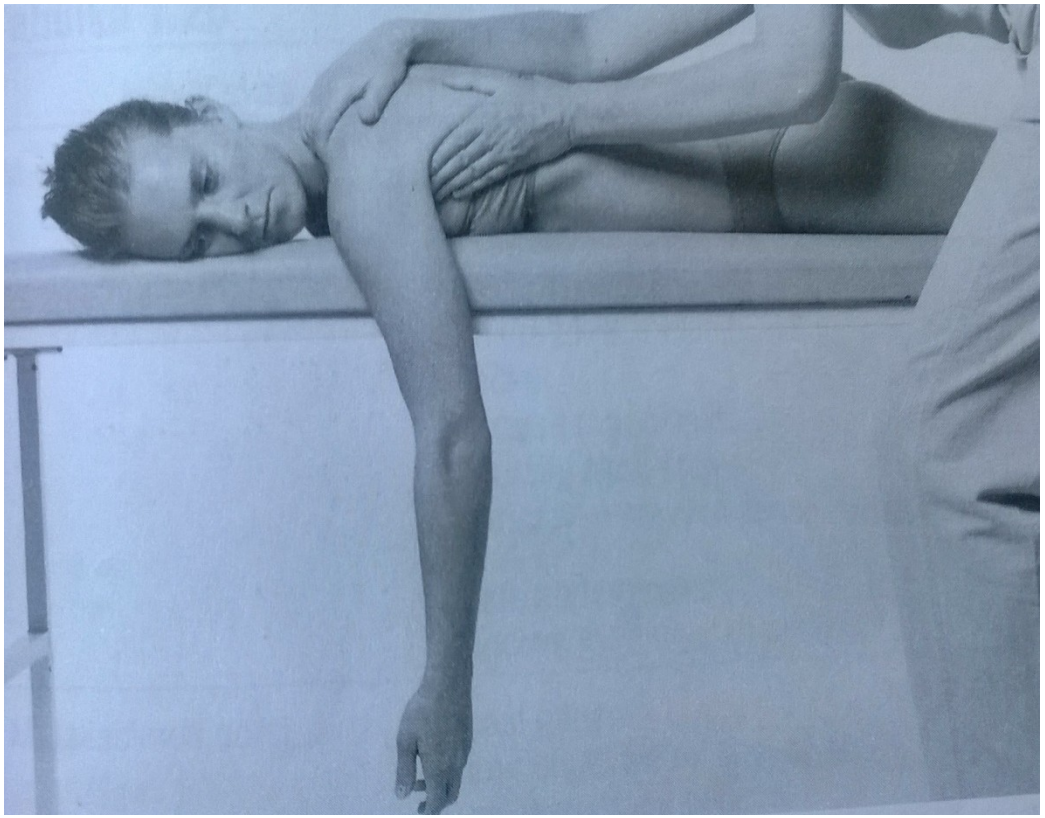
External rotation – grade 5,4

Position: lying prone, head rotated to the tested side, tested upper limb lying on the table – shoulder 90° abducted, elbow 90° flexed (arm supported with the pillow, forearm relaxed)
Fixation: fix the lower part of the arm (lightly), scapula over the spina scapulae if needed
Movement: external rotation in full range of motion from the position mentioned above
Resistance: PT put resistance on the distal part of the forearm

External rotation – grade 3

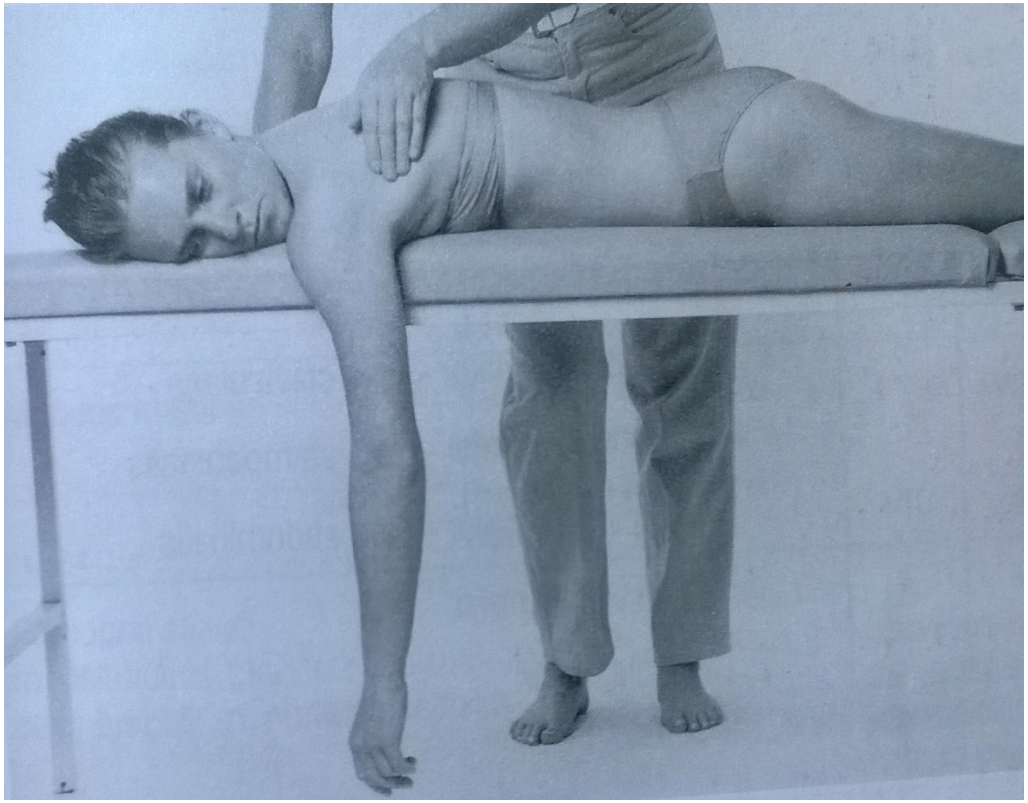
Position: lying prone, head rotated to the tested side, tested upper limb lying on the table – shoulder 90° abducted, elbow 90° flexed (arm supported with the pillow, forearm relaxed)
Fixation: fix the lower part of the arm (lightly), scapula over the spina scapulae if needed
Movement: external rotation in full range of motion from the position mentioned above

External rotation – grade 2



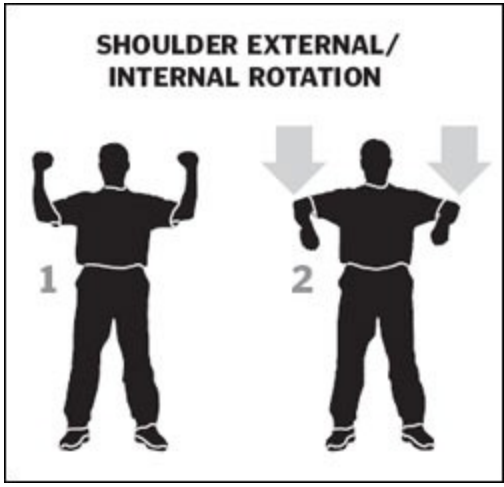
Position: lying prone, head rotated to the tested side, tested upper limb in 90° flexion and inner rotation in the shoulder (hanging from the table, relaxed)
Fixation: fix the lower part of the arm (lightly), scapula over the spina scapulae if needed
Movement: external rotation in full range of motion from the position mentioned above

External rotation – grade 1,0



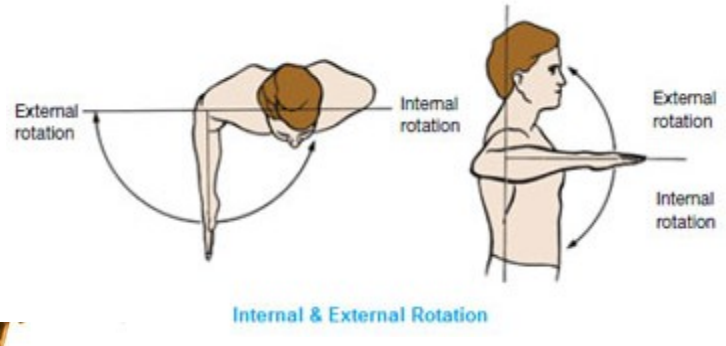
Position: lying prone, head rotated to the tested side, tested upper limb in 90° flexion and inner rotation in the shoulder (hanging from the table, relaxed)
Attempt to move: PT palpates contraction at the dorsal part of the shoulder during patients´ attempt to external rotate the arm

External rotation – notes:

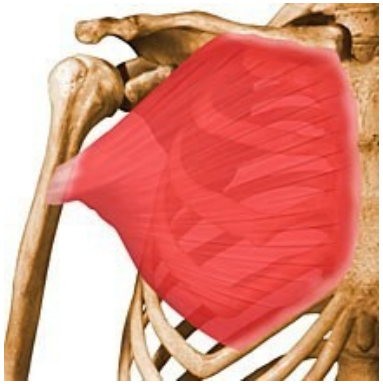


- The muscles of the forearm and the hand should be relaxed during testing
- No extension of the elbow or wrist is allowed
- When testing grade 2, no rotation of the forearm

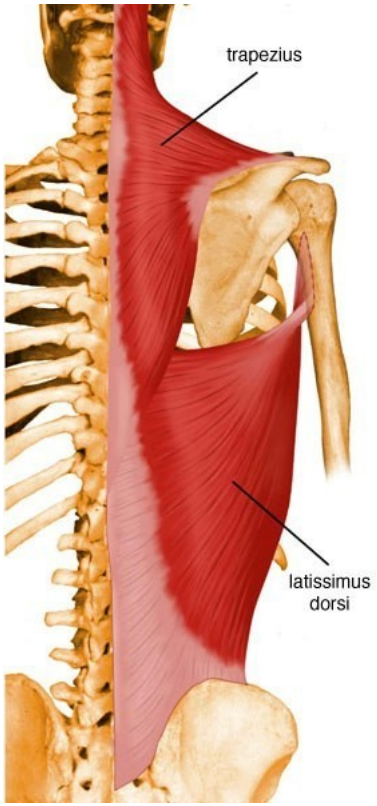
Internal rotation



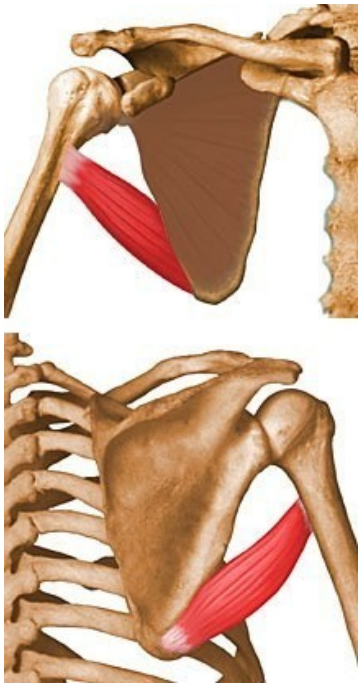
Subscapularis



Pectoralis maior



Latissimus dorsi



Teres maior

Subscapularis

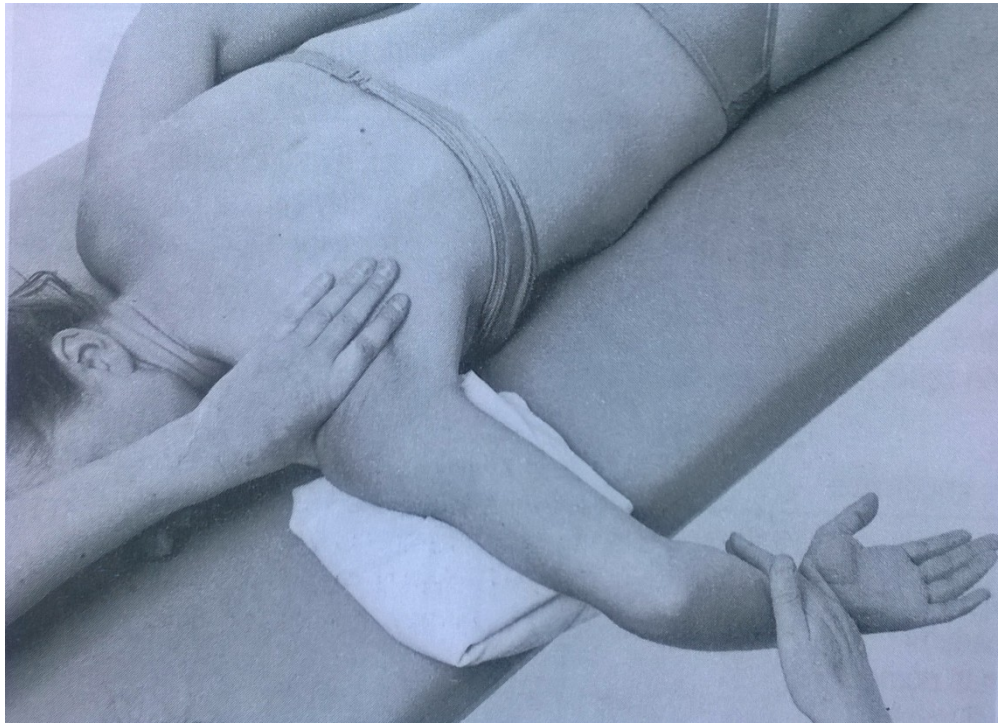
Origin
- Subscapular fossa of scapula

Insertion
- Lesser tuberosity of humerus

Action
- Medially rotates arm and adducts it
- helps to hold humeral head in glenoid cavity of scapula

Innervation
- Upper and lower subscapular nerves (C5, C6 and C7) (C5, C6, C7)

Internal rotation – grade 5,4

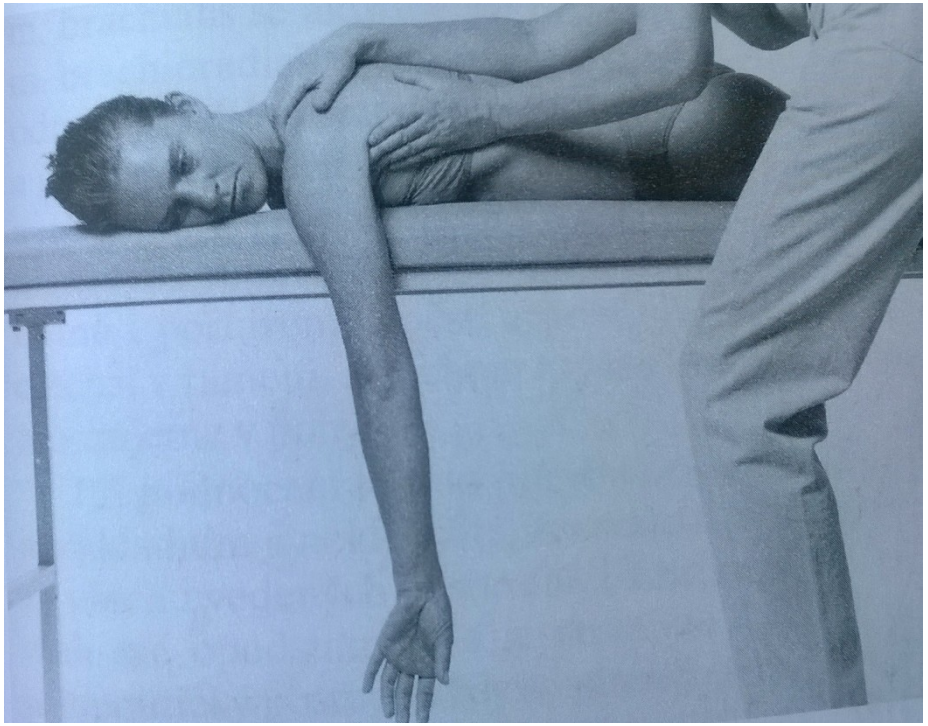


Position: lying prone, head rotated to the tested side, tested upper limb lying on the table – shoulder 90° abducted, elbow 90° flexed (arm supported with the pillow, forearm relaxed)
Fixation: fix the lower part of the arm (lightly), scapula over the spina scapulae if needed
Movement: internal rotation in full range of motion from the position mentioned above
Resistance: PT put resistance on the distal part of the forearm

Internal rotation – grade 3

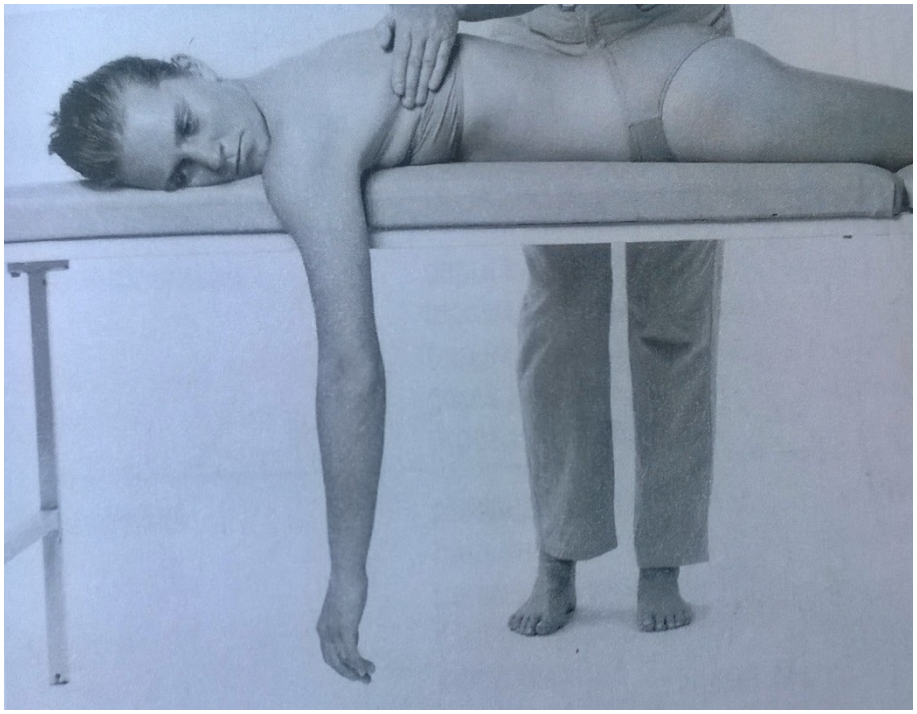
Position: lying prone, head rotated to the tested side, tested upper limb lying on the table – shoulder 90° abducted, elbow 90° flexed (arm supported with the pillow, forearm relaxed)
Fixation: fix the lower part of the arm (lightly), scapula over the spina scapulae if needed
Movement: internal rotation in full range of motion from the position mentioned above

Internal rotation – grade 2



Position: lying prone, head rotated to the tested side, tested upper limb in 90° flexion and external rotation in the shoulder (hanging from the table, relaxed)
Fixation: fix the lower part of the arm (lightly), scapula over the spina scapulae if needed
Movement: internal rotation in full range of motion from the position mentioned above

Internal rotation – grade 1,0



Position: lying prone, head rotated to the tested side, tested upper limb in 90° flexion and inner rotation in the shoulder (hanging from the table, relaxed)
Attempt to move: PT palpates contraction at the dorsal part of the shoulder during patients´ attempt to internal rotate the arm (deep palpation)

Internal rotation – notes:

- The muscles of the forearm should be relaxed during whole tested movement
- Flexion of the elbow should be 90° during whole tested movement

Literature, e-sources

- http://www.webmd.com/pain-management/picture-of-the-shoulder
- https://www.acefitness.org/blog/3535/muscles-that-move-the-arm
- http://www.rad.washington.edu/academics/academic-sections/msk/muscle-atlas/upper-body

Thank you for your attention ☺