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Muscle shortening

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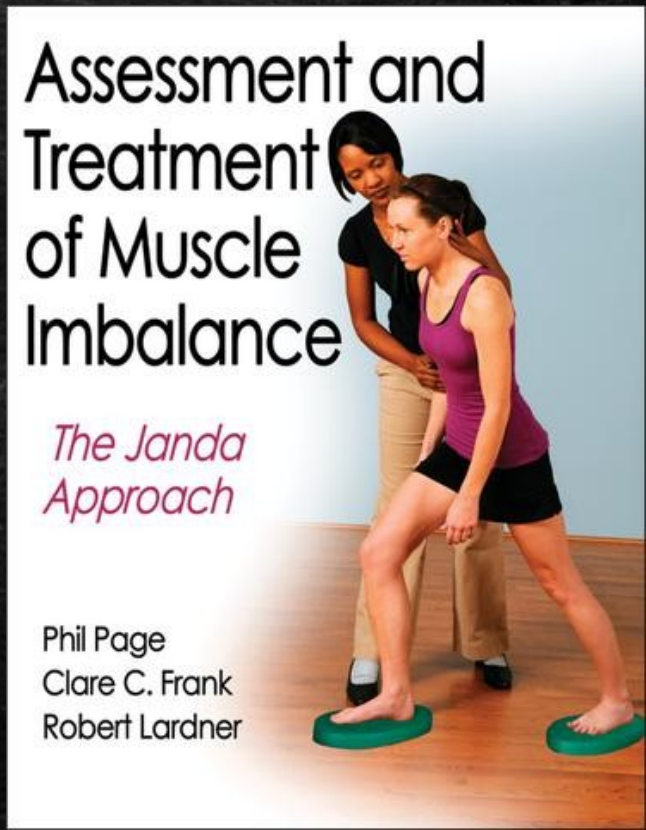
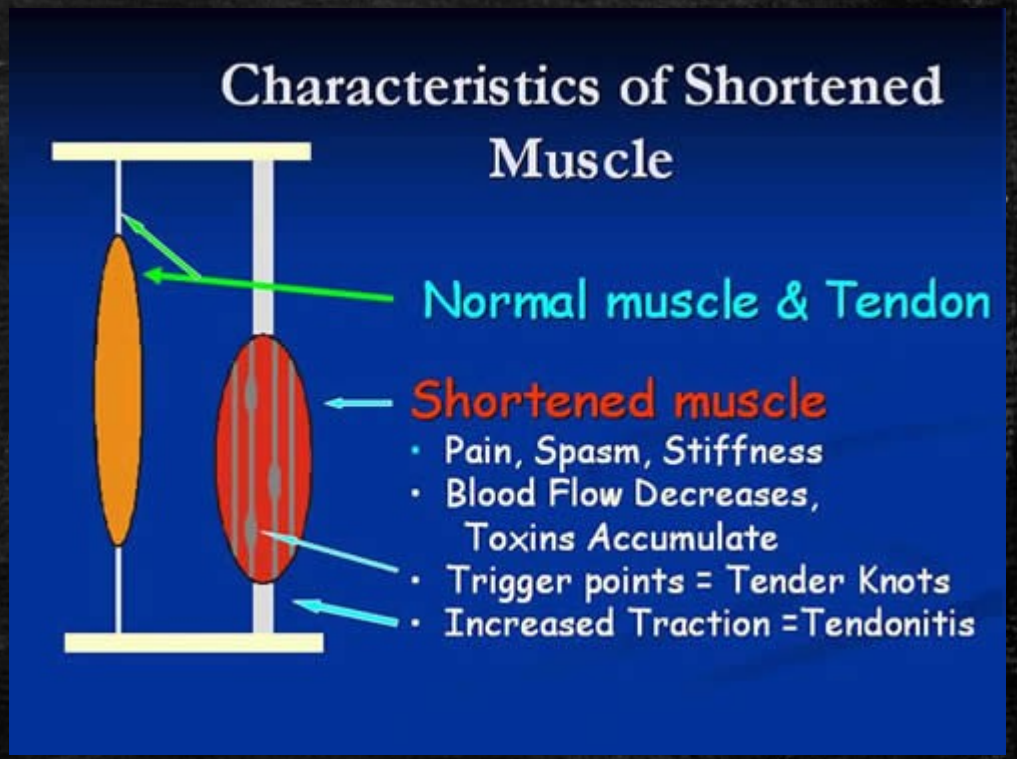


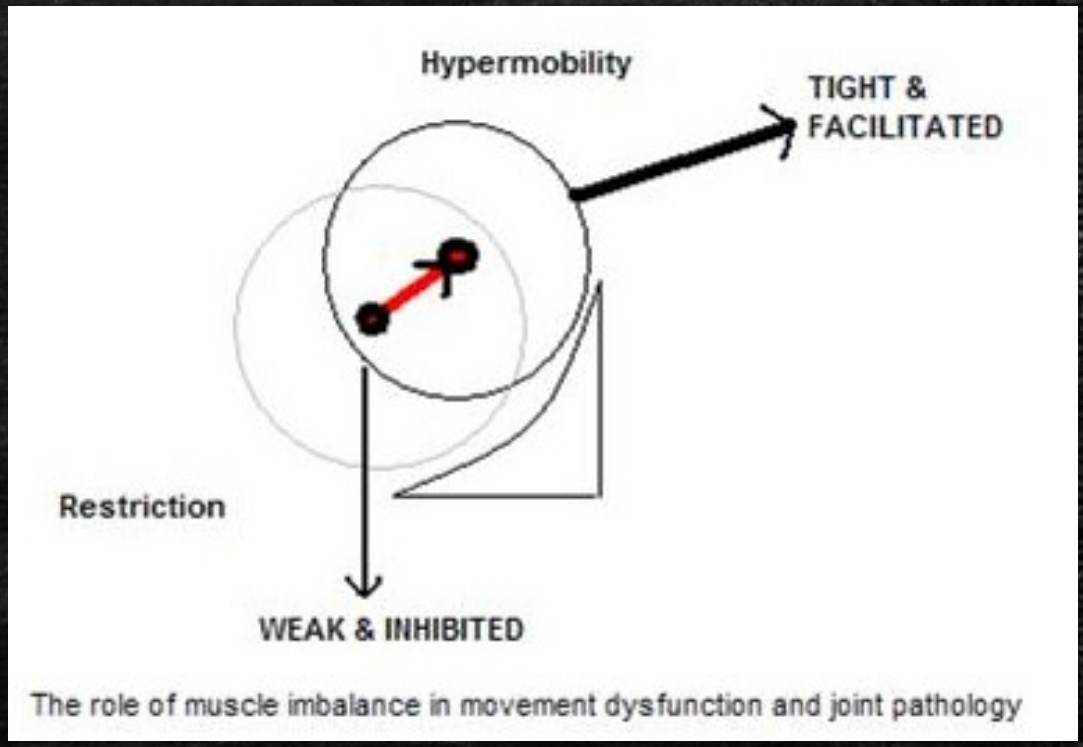
Muscle Shortening

- ✓ muscle at rest does not reach its normal length
- ✓ passive stretching does not allow a full range of physiological motion of the joint
- ✓ has increased muscle tone, the state is not accompanied by evidence of increased electrical activity
- ✓ this is a functional disorder of the motor system – it is reversible



The Importance of Shortened Muscle

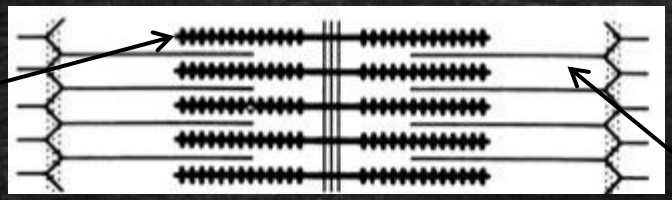
- ✓ muscle activation is greater than is economical, leads to overloading
- ✓ limit the range of motion in the joint
- ✓ leads to:
  - ✓ decentred joint
  - ✓ thighness weakness
  - ✓ muscle imbalance
- ✓ affects:
  - ✓ the body statics
  - ✓ locomotive programs



The role of muscle imbalance in movement dysfunction and joint pathology

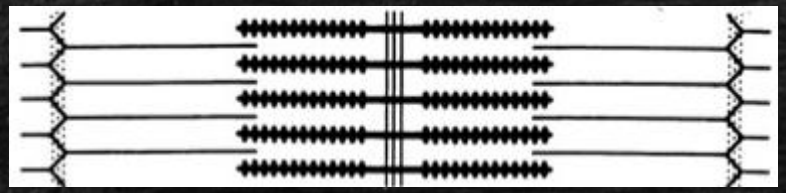
Representation of the shift of actin and myosin microfilaments in the sarcomere when stretched muscle contraction, by easy contraction and strong contraction (**www.smw.ch/content/smw-2011-13319**)

myosin

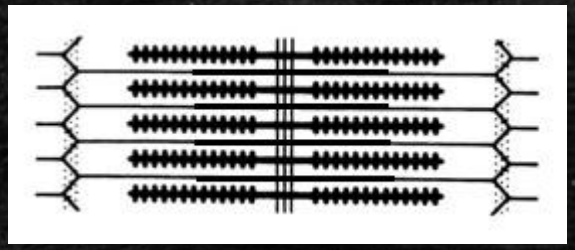


aktin

EASY CONTRACTION

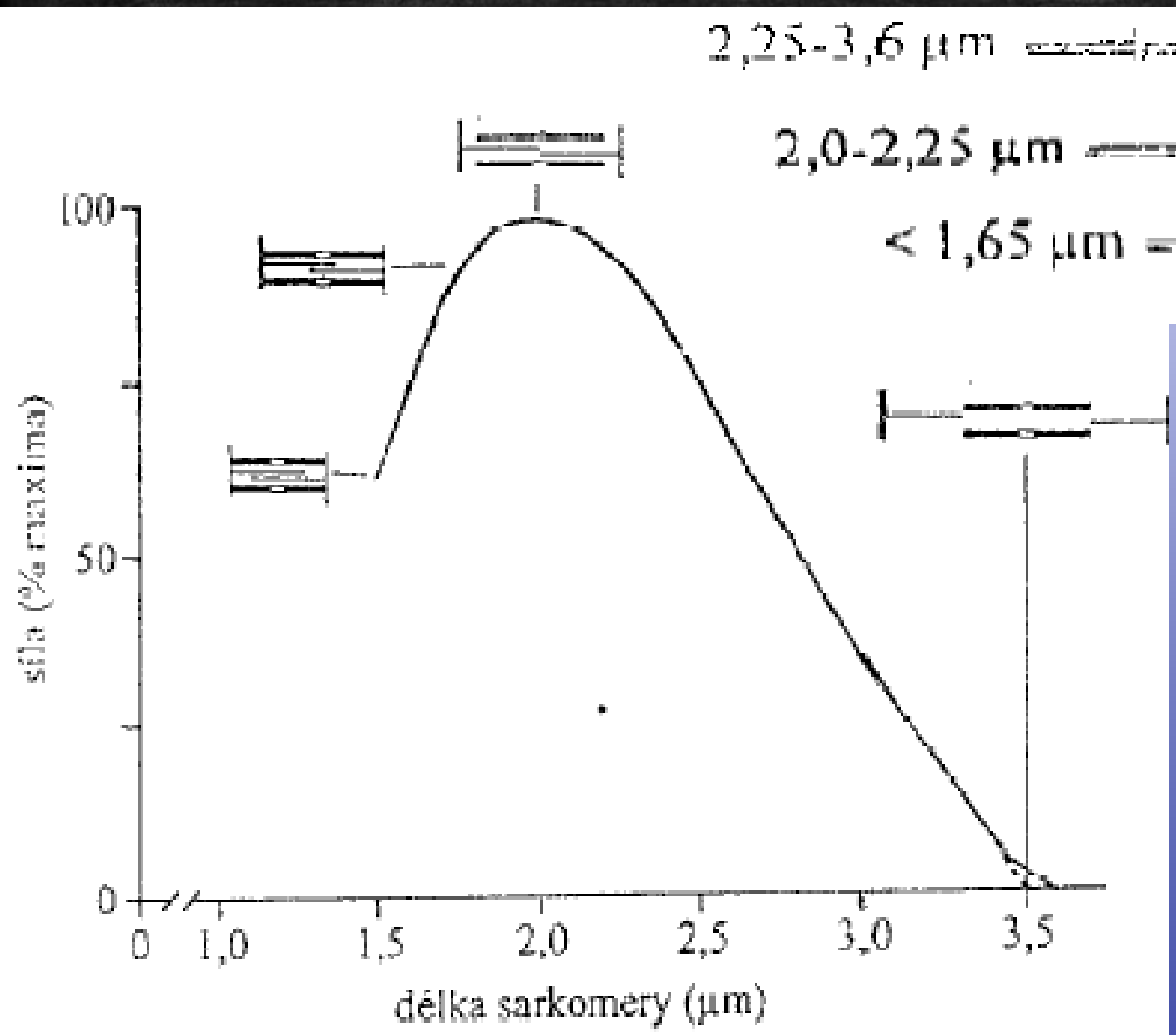


STRETCHED MUSCLE CONTRACTION



CONTRACTION IN SHORTENING
= weakness in thighness

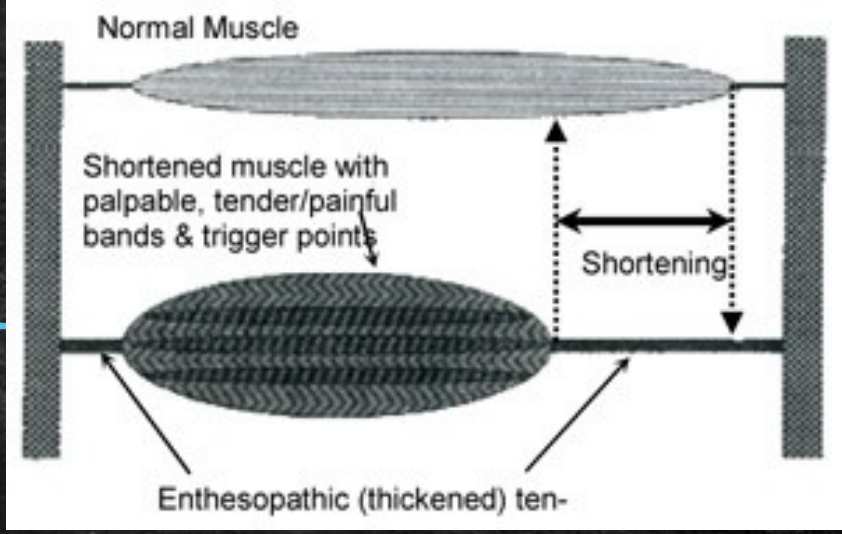
Scheme of muscle strength depending on the length of the sarcomere (Janura, 2003)



Weakness in tighness

The mechanism of formation is as follows: in the resting length of the muscle is to create the maximum number of cross-bridges. Sarcomere length reaches 2-2.5 microns. This way you can achieve maximum muscle strength. With the stretching of the muscle fiber number of cross-linking decreases, because there is a reduced overlap of actin and myosin. And therefore reduces the potential strength. Otherwise - in sarcomere shortening below 2 microns – begin to overlap thin actin filaments. And there is again a decreased active tension.

Postural Muscles



- A tendency of muscle shortening is noticeable not only during illness but also as an apparently typical reaction by some muscle groups even in normal circumstances.
- These muscles are responsible for standing position, and above all standing on one leg. This is the most common postural position for human
- Those muscles with a postural function are genetically older and demonstrate less reaction to different injuries.
- They have different physiological and probably also biochemical qualities than muscles with mainly phasic function.

Postural Muscles

- muscles with a predominance of tonic function (= muscles with a tendency to shorten and hypertrophy) – ensure upright posture (because they have permanent working resting tension)

- contain mostly red muscle fibers, rich in myoglobin

- are evolutionarily older, have a low threshold of irritation, characterized by a slower process of contraction, longer latency and greater resistance to stress (slower fatigue)

- its function often replace muscle activity of weakened phasic muscles (they discard them of the muscle interplay and may cause muscle imbalances)

The Assessment of Shortened Muscle Groups

- Must be exact as a muscle function test for a weakened muscles, and the same standardized routine must be maintained.
- As it is difficult to determine the exact grade of many muscles, a general estimate is considered sufficient.
- Where it is possible we measure the angle between two extremities
- To obtain a reliable evaluation, the assessment of shortened muscles can be very accurate: the starting position, method of fixation and direction of movement must be observed extremely carefully
- As in muscle function testing the prime mover must not be exposed to external pressure

The Assessment of Shortened Muscle Groups

- If possible, the force exerted on the tested muscle must not work over two joints.
- The examiner performs at an even speed a slow movement that brakes slowly at the end of the range.
- To keep the stretch and the muscle irritability about equal the movement must not be jerky.
- Pressure or pull must always act in the required direction of movement.
- Muscle shortening can only be correctly evaluated if the joint range is not decreased as is a bony limitation or joint restriction.

Muscles with Mainly Postural Function

- Sternocleidomastoid
- Pectoralis major (clavicular and sternal end)
- Trapezius (upper part)
- Levator scapulae
- The upper extremity flexors
- Quadratus lumborum
- Back extensors
  - Erector spinae
  - Longissimus thoracis
  - Rotatores
  - Multifidus
- Hip flexors
  - Iliopsoas
  - Tensor fasciae latae
  - Rectus femoris
- Hip external rotators
  - Piriformis
- Hip adductors
  - Pectineus
  - Adductor longus
  - Adductor brevis
  - Adductor magnus
- Hamstrings
  - Biceps femoris
  - Semitendinosus
  - Semimembranosus
- Ankle plantar flexors
  - Gastrocnemius
  - Soleus
  - Tibialis posterior

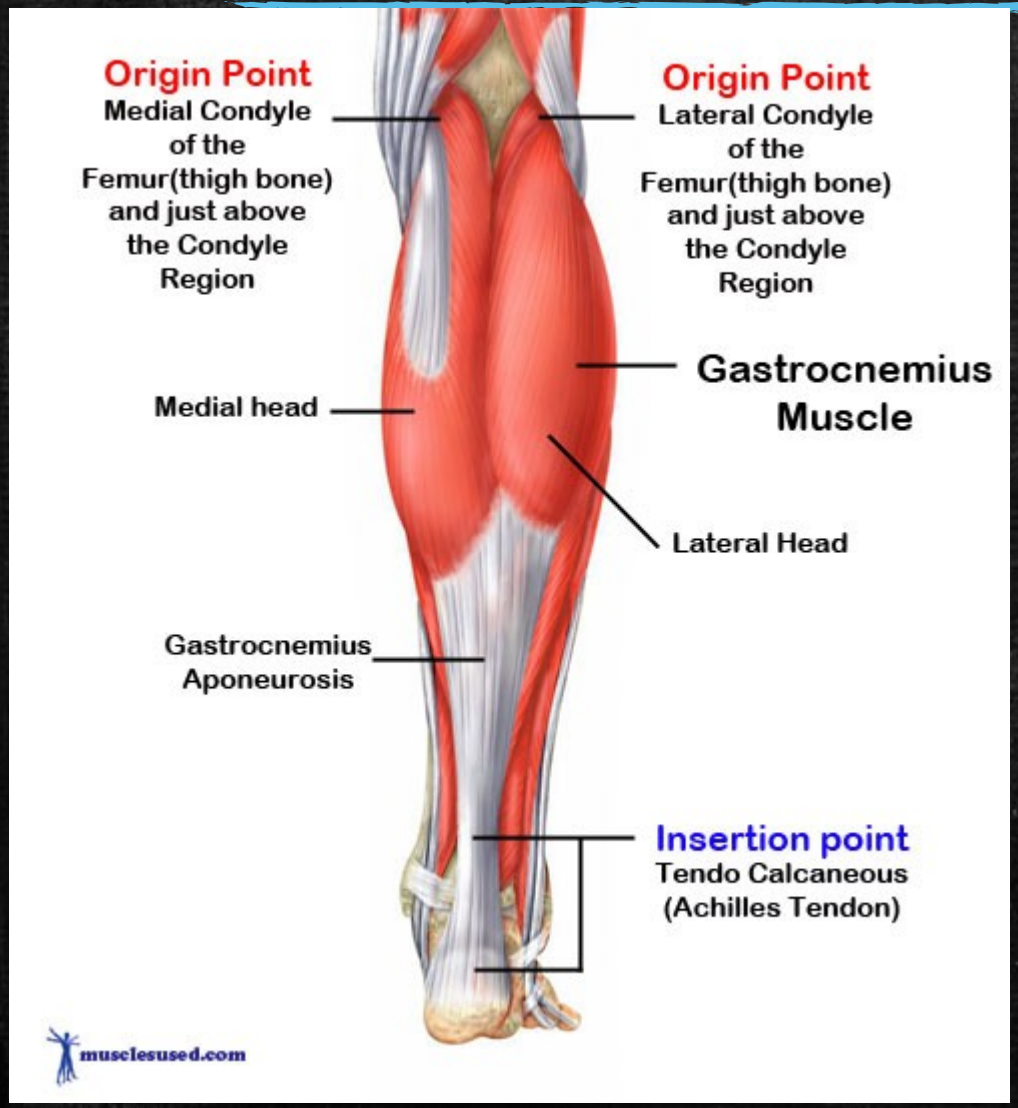
Muscles with Mainly Phasic (Dynamic) Function

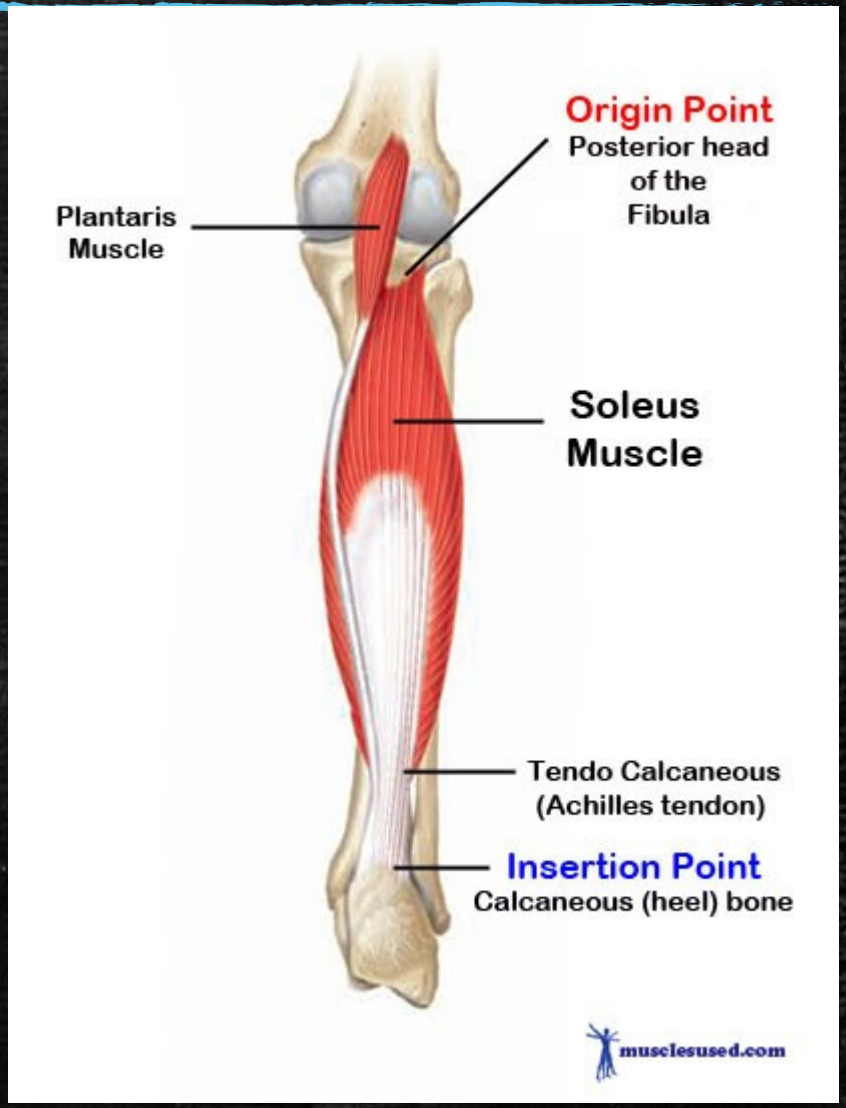
- Scaleni
- Pectoralis major (abdominal part)
- Subscapularis
- The upper extremity extensors
- Trapezius (lower part)
- Rhomboidei
- Serratus anterior
- Rectus abdominis
- Obliquus abdominis externus
- Obliquus abdominis internus
- Gluteus minimus, medius, maximus
- Vastus medialis and lateralis
- Tibialis anterior
- Peronei

- https://www.youtube.com/watch?v=SPlBzpIug2o
- https://www.youtube.com/watch?v=9JMEvmXSgUI

Assessment

M.Triceps Surae

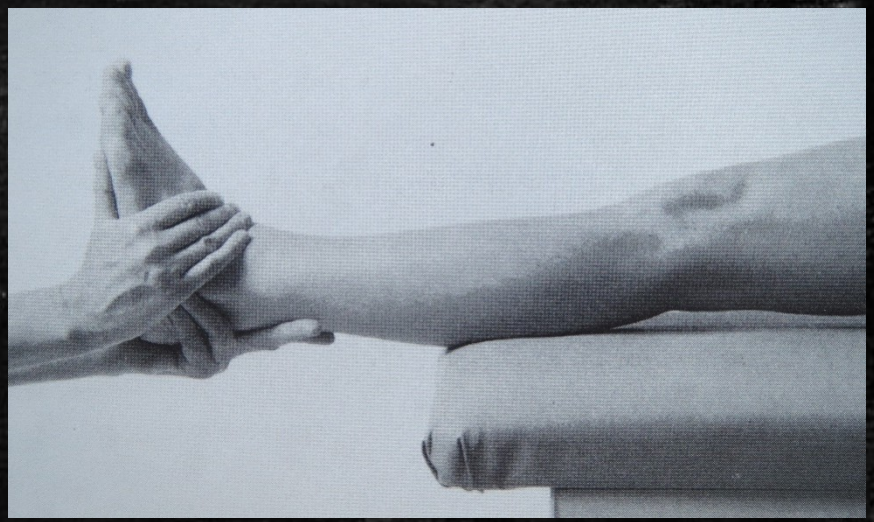




Gastrocnemius and Soleus

Gastrocnemius

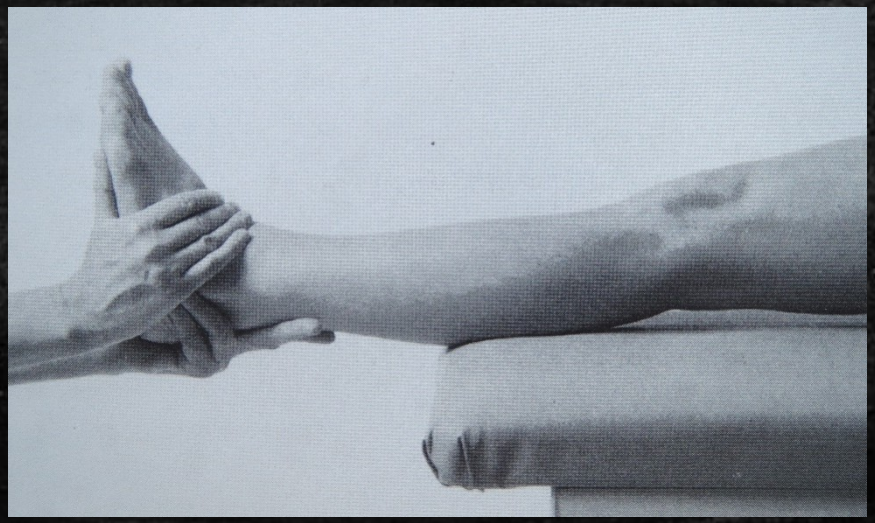
- Starting position: Supine lying with both legs outstretched and the heels outside of the examination table.
- Grasp: The right hand of the examiner grasps the right Achilles tendon iust above the heel without causing pressure on the tendons (when examining the left leg the examiner uses the left hand). The fingers are outstretched and the lower arm is held as a prolongation of the lower leg. The other hand is placed on the outside edge of the foot with the fingers on the dorsum of the foot and the thumb on the sole parallel with the outside edge.



Gastrocnemius and Soleus

Gastrocnemius

- Fixation: Not necessary.
- Stretch: The main stretch is applied to the heel distally in the direction of the muscle fibres. The thumb of the other hand steers the forefoot wit h a light perpendicular pressure to prevent sideways movement of the foot.
- Range of movement: Flexion to 90 degrees should be achieved without difficulty.



Gastrocnemius and Soleus

Soleus

- The assessment is the same but the knee joint should be passively flexed to exclude gastrocnemius activity.
- The examiner passively bend the knee joint after reaching the maximum possible dorsiflexion and tries to increase the range of dorsiflexion. If it remains limited range of motion as well, the restriction is caused by the shortening of m. soleus. If the range of motion increases, then it is a shortening of m. gastrocnemius.

https://www.youtube.com/watch?v=78-zzdJ4tvA

Gastrocnemius and Soleus

Ratings:

We evaluate the size of achieved dorsiflexion, and separately for the m. soleus and m. gastrocnemius.

0 - not a reduction - in the ankle joint can be achieved at least 90 degrees

1 - small shortening – in the ankle joint is missing into the 90-degree position 5 degrees

2 - large shortening – in the ankle joint is missing into the 90-degree position more than 5 degrees

Gastrocnemius and Soleus

Possible errors

1. If the examiner's thumb is not on top and not parallel with the outside edge of the foot but more towards the middle of the sole of the foot, then a reflex reaction of the gastrocnemius and soleus will result.
2. If the thumb does not press along the whole foot length , but only close to its tip, then the direction of the movement is altered and different structures are stimulated (in particular the plantar aponeurosis and quadratus plantae).
3. When pressure is applied incorrectly to the dorsum of the forefoot and the necessary strong stretch of the heel does not take place, the muscles in the sole of the foot but not the gastrocnemius and soleus are caused to stretch.
4. If the forearm is not held as a prolongation of the lower leg the direction of the stretch is changed.

Gastrocnemius and Soleus

Possible errors

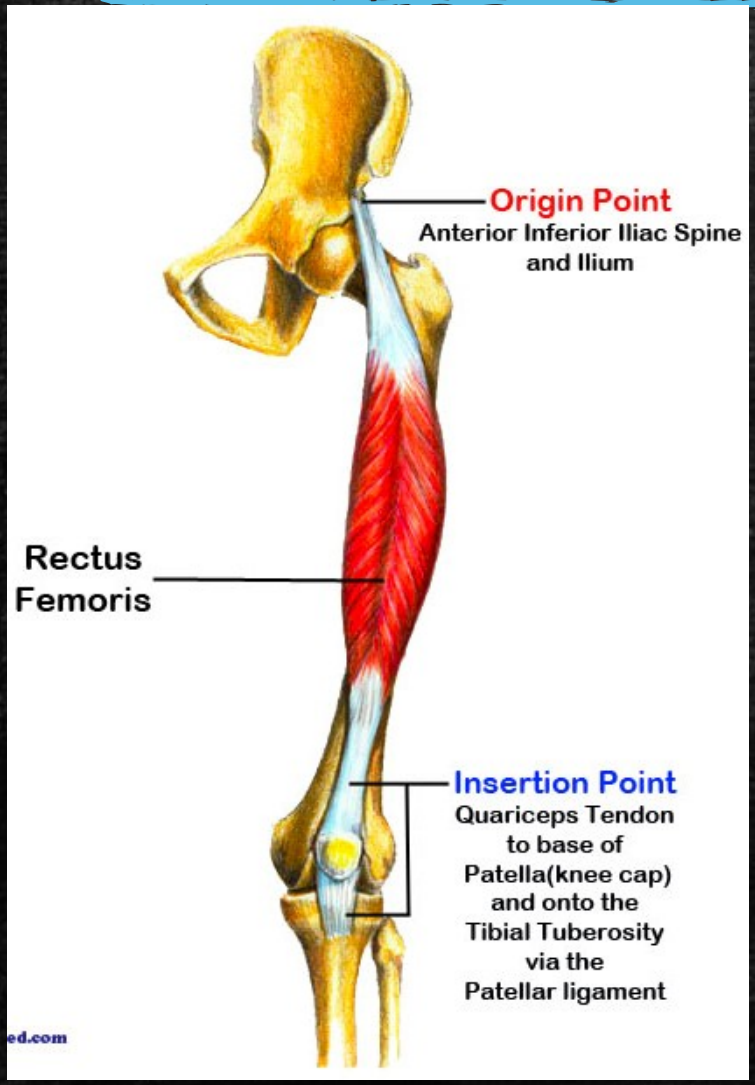
5. The leg should be stationary on the table and may not be lifted upwards.
6. We enable active foot dorsiflexion.
7. When previously tested m. soleus reached foot dorsiflexion is not hold.
8. We enable active flexion of the knee joint.

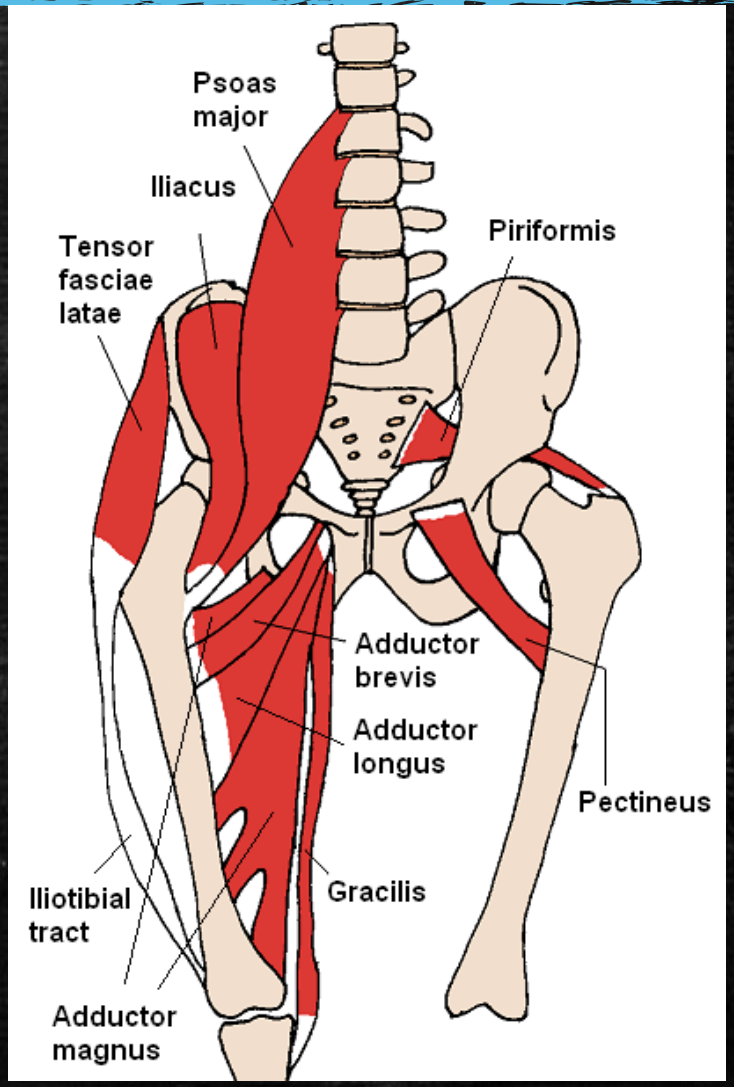
Gastrocnemius and Soleus

An orientation test for the soleus

- The patient crouches with slight forward flexion of the trunk. The knees should be parallel to, but not touching each other. If the range of movement in the joint is not restricted, the patient should be able to squat with the heels on the floor.

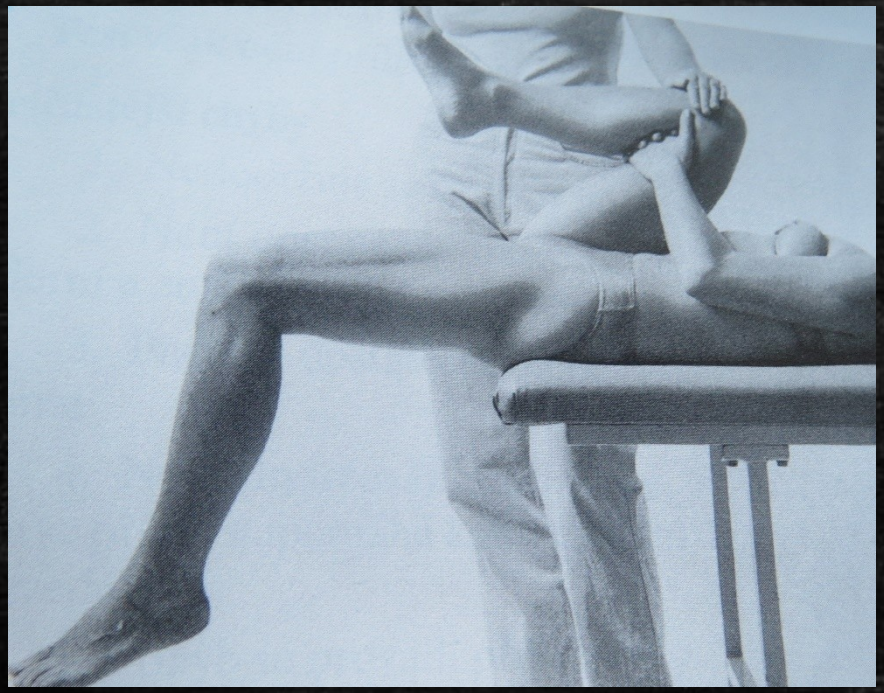
The Hip Flexors - Iliopsoas, Rectus Femoris, Tensor Fasciae Latae and Short Adductors





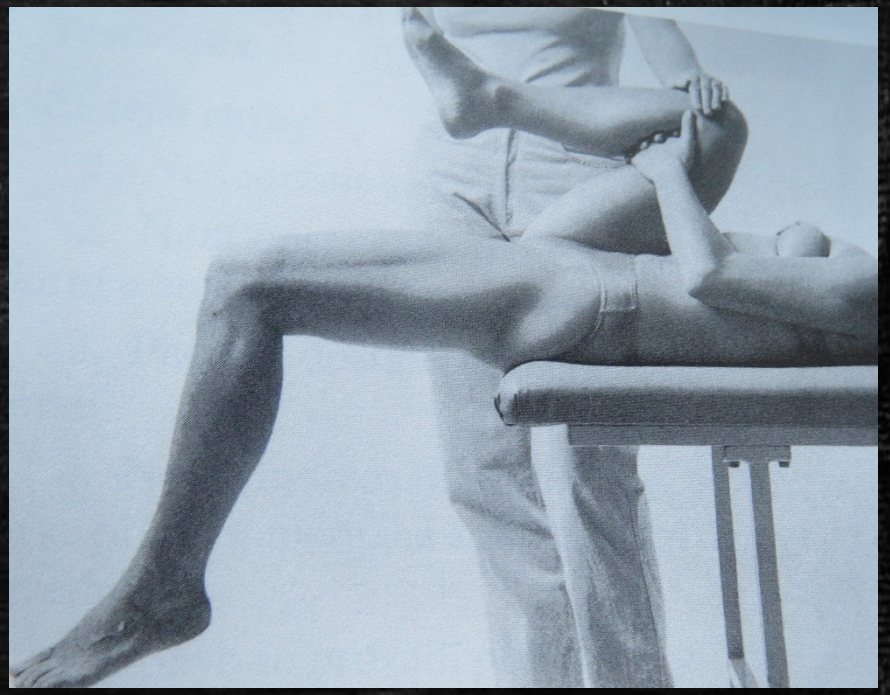
The Hip Flexors - Iliopsoas, Rectus Femoris, Tensor Fasciae Latae and Short Adductors

- Starting position: Supine lying, with the coccyx just outside the table. The passive leg is flexed as far as possible so that the pelvis is tilted backwards and the lumbar lordosis is eliminated. The leg is fixed in this position by holding the fixed knee (a long lever). If this knee flexion is painful it is better to fix the whole knee joint.



The Hip Flexors - Iliopsoas, Rectus Femoris, Tensor Fasciae Latae and Short Adductors

- Fixation: Throughout the test the passive leg must be fixed towards the trunk by constant pressure to eliminate the lordosis of the lumbar spine. During the evaluation the examiner pushes the leg further against the trunk.
- Normal finding: The thigh is horizontal and the lower leg hangs vertically. The patella is situated slightly lateral to the knee joint. On the outer side of the thigh there is a very slight deepening.



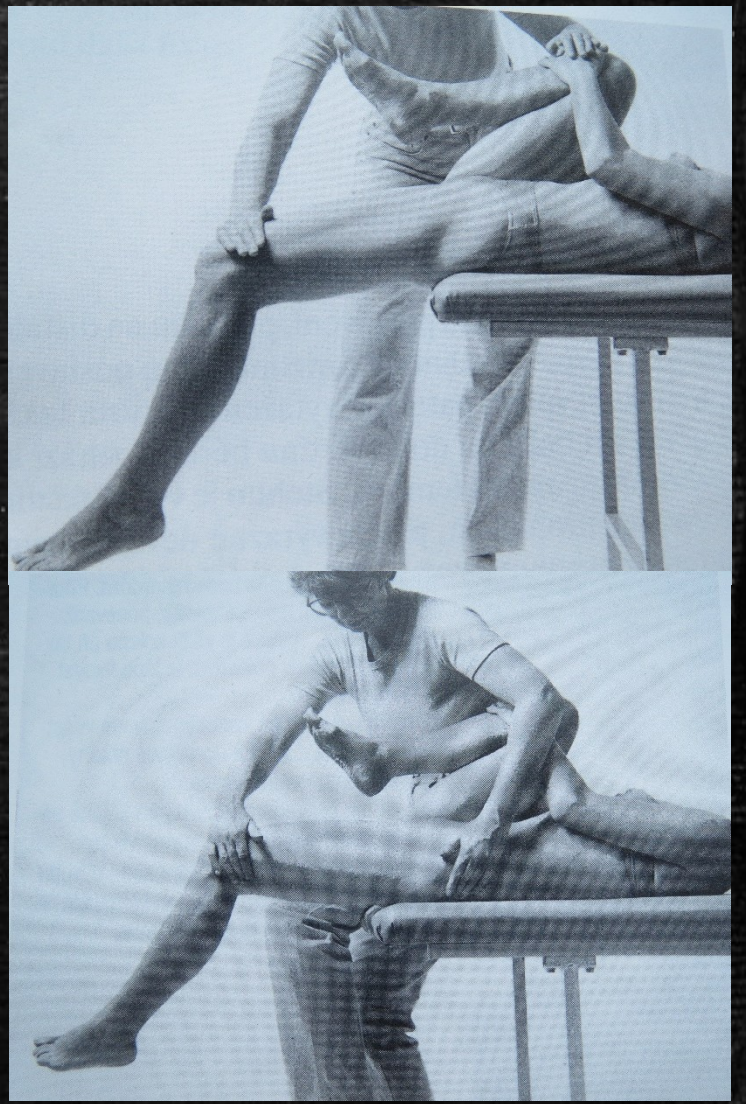
The Hip Flexors

- Pathological finding:
- A flexion position in the hip joint shows shortening of the iliopsoas.
- The lower leg positioned diagonally downwards indicates that the rectus femoris is shortened.
- A flexion position of the hip joint with a simultaneous tendency to extension in the knee joint points to shortening of both the iliopsoas and rectus femoris.
- Lateral deviation of the patella and more pronounced deepening on the outside of the thigh shows on a shortened tensor fasciae latae and iliotibial band.

The Hip Flexors

To differentiate even more the following tests may be performed:

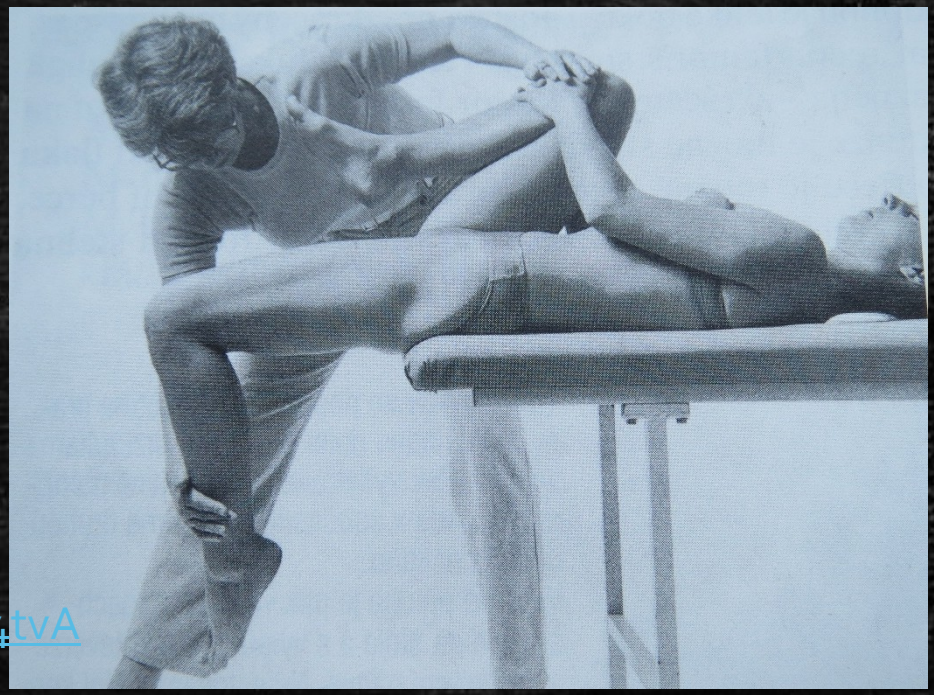
1. Pressure is applied to the lower third of the thigh:
   - in the direction of the hyperextension of the hip joint. When extension cannot increase, this indicates shortening of the iliopsoas. When there is a simultaneous compensatory extension in the knee joint, this points to shortening of the rectus femoris.
   - in the direction of the adduction of the hip joint. Increased deepening on the outside of the thigh over the iliotibial tract shows shortening of the tensor fasciae latae and the iliotibial tract.
   - in the direction of the abduction of the hip joint. The decreased range of movement and compensatory flexion of the hip joint are signs of shortening of the one-joint thigh adductors.



The Hip Flexors

To differentiate even more the following tests may be performed:

2. Pressure is applied to the lower third of the lower leg to increase knee flexion.
   - If flexion is painful and difficult, this shows shortening of the rectus femoris. Further pressure may cause compensatory flexion in the hip joint, simultaneously a deepening appears immediately above the patella. This shows shortening of the rectus femoris.



https://www.youtube.com/watch?v=78-zzdJ4tvA

The Hip Flexors

Ratings:

We assess according to the position of the thigh, shin and by deviation of the patella. Further, according to possibility to compress the thigh into the hyperextension, the lower leg to flexion and thigh to hyperabduction.

0 - not a reduction – the thigh in horizontal without deviation, the lower leg hanging vertically to the ground with relaxed knee, patella slightly shifted laterally. On the outer surface of the thigh is only a slight depression. When there is a pressure on the distal third of the thigh to hyperextension, we can compress the thigh slightly bellow the horizontal, when there is a pressure on the lower third of the tibia towards flexion, we may slightly larger flexion in the knee joint.

The Hip Flexors

Ratings:

1 - small shortening – the hip is slightly in flexion position – shortened m. iliopsoas, lower leg sticking out diagonally forward – shortened m. rectus femoris, thigh in a light abduction and depression on the lateral side of the thigh is highlighted – shortened m. tensor fasciae latae.

When there is a pressure on the distal third of the thigh to hyperextension, we can compress the thigh into the horizontal, when there is a pressure on the lower third of the tibia towards flexion, it is possible to achieve vertical position of the lower leg, but without a compensatory flexion of the hip joint. When there is a pressure on the lower third of the thigh from
the lateral side, we can achieve position without any deviation into abduction.

The Hip Flexors

Ratings:

2 - large shortening – the hip is in significant flexion position, when there is a pressure on the distal surface of the thigh towards the hyperextension, there is not possible to achieve a horizontal position of the thigh – shortened m. iliopsoas.

Leg sticking out diagonally forward, patella is pulled upwards, so it is visible and easy to palpate the upper edge. When there is a pressure on the lower third of the tibia, it leads to compensatory flexion of the hip – shortened m. rectus femoris.

Thigh in abduction position, on the lateral surface of the thigh is significant depression, patella significantly deviates outside and we can see its outer edge. When there is a pressure on the lateral side of the lowet third of the thigh towards the adduction the depression on the lateral surface of the thigh is highlighted and adduction can not be done – shortened m. tensor fasciae latae.

The Hip Flexors

Possible errors

1. Insufficient fixation of the pelvis enables a change of position and increased lordosis of the lumbar spine.
2. The patient is not relaxing sufficiently and the lower leg is knowingly held in slight flexion in the knee joint.
3. The direction of the pressure may not be maintained. In particular during examination of a shortened rectus femoris, compensatory flexion in the hip may be supported if pressure is wrongly directed upwards during passive flexion in the knee joint.
4. The movement may be performed too quickly.
5. The muscle groups may not be differentiated.
6. The patient fixes the not tested leg only by himself and no additional fixation may be given.
7. In the orientation test in standing, forward flexion of the trunk or increased lumbar lordosis may be allowed during the movement, together with lateral rotation in the hip joint of the leg to be tested.

The Hip Flexors

Orientation tests for the iliopsoas and rectus femoris

Starting position: Prone with the legs outstretched. If the iliopsoas is shortened the hip joint remains in flexion. Passive flexion in the knee joint provokes a compensatory increase of flexion in the hip joint, and hyperlordosis of the lumbar spine is a sign of shortened rectus femoris. This test is not very sensitive.

The Hip Flexors

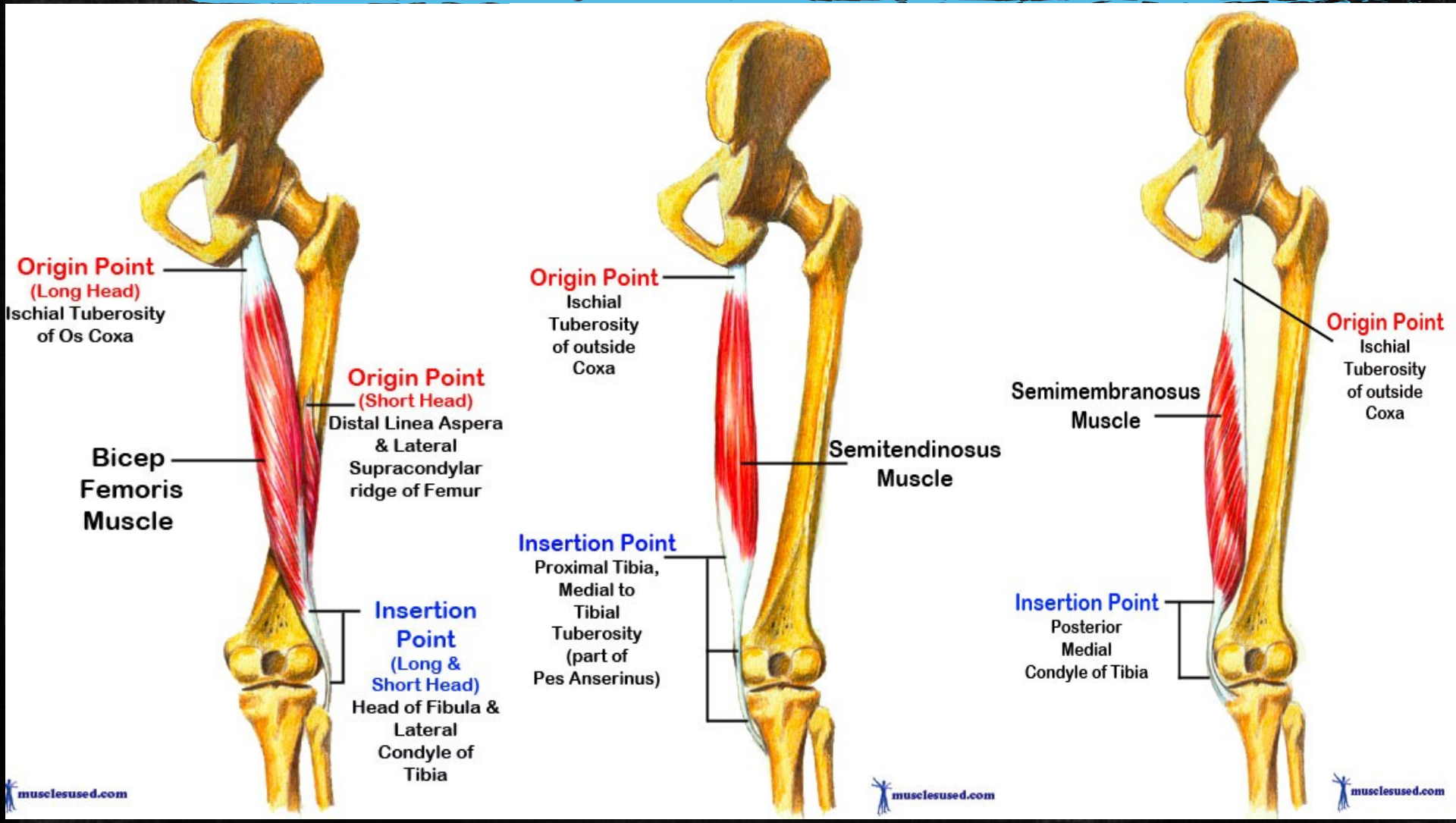
An orientation test in standing for the iliopsoas

and gastrocnemius and soleus

The patient stands as far as possible from the table while steadying the leg that is not to be tested against it. The leg to be tested is situated exactly in between medial and lateral rotation. The foot is in the sagittal plane and the sole rests on the floor. The knee is in extension. The position of the sole of the foot and the hip joint is checked for shortening of the gastrocnemius and soleus, and of the iliopsoas respectively. From the standing position the patient shifts the pelvis forwards without rotating it and without increasing the lumbar lordosis. With a shortened gastrocnemius and soleus the heel is lifted from the floor, and with a shortened iliopsoas the hyperextension of 5-10 degrees in the hip joint is not possible. This test is also suitable as a home exercise to stretch these muscles.

https://www.youtube.com/watch?v=l_vadzJXnco

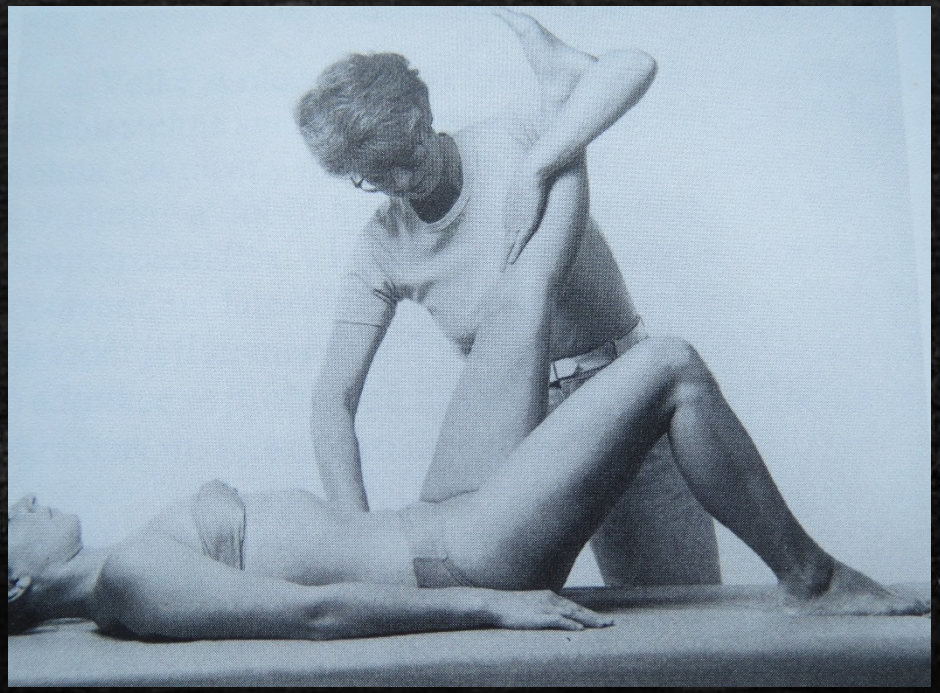
The Hamstrings - M. Biceps Femoris, M. Semitendinosus and M. Semimembranosus



The Hamstrings - M. Biceps Femoris, M. Semitendinosus and M. Semimembranosus

Starting position: Supine, with the leg not to be tested flexed in the hip and knee joints (passively) or (less suitably) flexed with the sole of the foot on the table. Thus the lumbar spine is kept flat on the table and there is no kyphosis or lordosis of the lumbar spine.

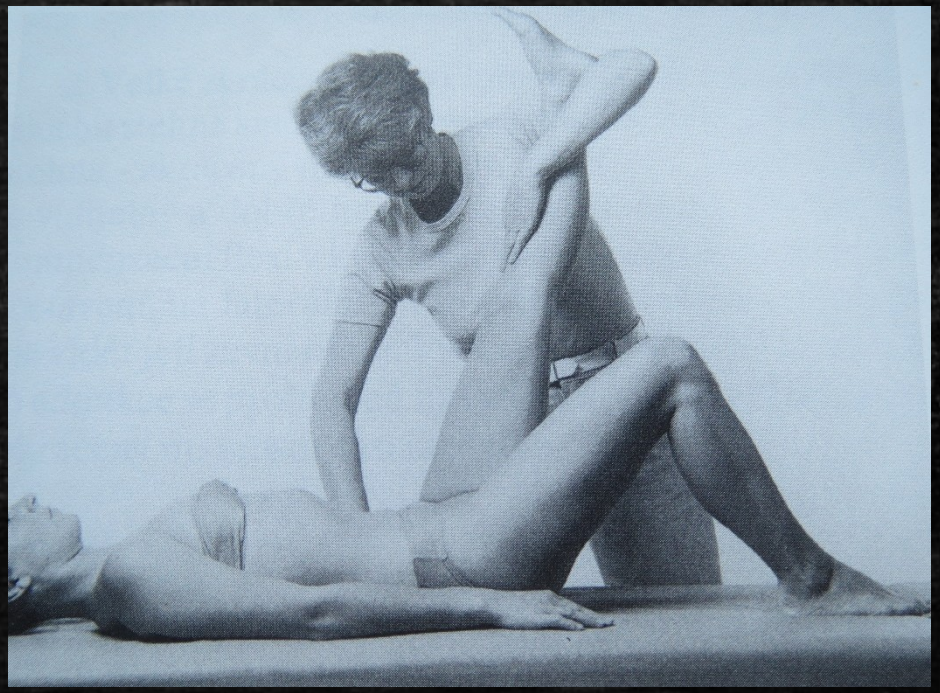
Fixation: The pelvis.



The Hamstrings - M. Biceps Femoris, M. Semitendinosus and M. Semimembranosus

Grasp: The examiner grasps the lower leg of the patient so that the knee is kept in extension through pressure from above (not patella!). The heel is held in the crook of the examiner's elbow with the foot against her upper arm to prevent lateral rotation of the leg.

Range of motion: Flexion to 90 degrees



https://www.youtube.com/watch?v=78-zzdJ4tvA

The Hamstrings - M. Biceps Femoris, M. Semitendinosus and M. Semimembranosus

Ratings:

We evaluate the extent of the flexion in the hip joint. We end the examination when we begin to feel a tendency to flex the knee of tested leg or pelvis movement (ie. tilting the pelvis backward), or when there is a muscle soreness on the dorsal side of the thigh.

0 - not a reduction – flexion of the hip joint 90 degrees

1 - small shortening – flexion in the hip joint in range of 80-90 degrees

2 - large shortening – flexion of the hip joint is smaller than 80 degrees

The Hamstrings - M. Biceps Femoris, M. Semitendinosus and M. Semimembranosus

Possible errors

1. Fixation is given over the knee joint on top of the patella despite the fact that the joint should be free.
2. At the examination the knee flexion increases together with abduction and external rotation of the hip joint. This can be made even worse if the examiner does not start the movement from his/her own shoulder joint and if he/she turns in such way that abduction is performed by the leg of the patient.
3. If there is shortening of the hip flexors, which is very common, the not tested leg is not put in the flexion position during the test.
4. Pelvis is not fixed.

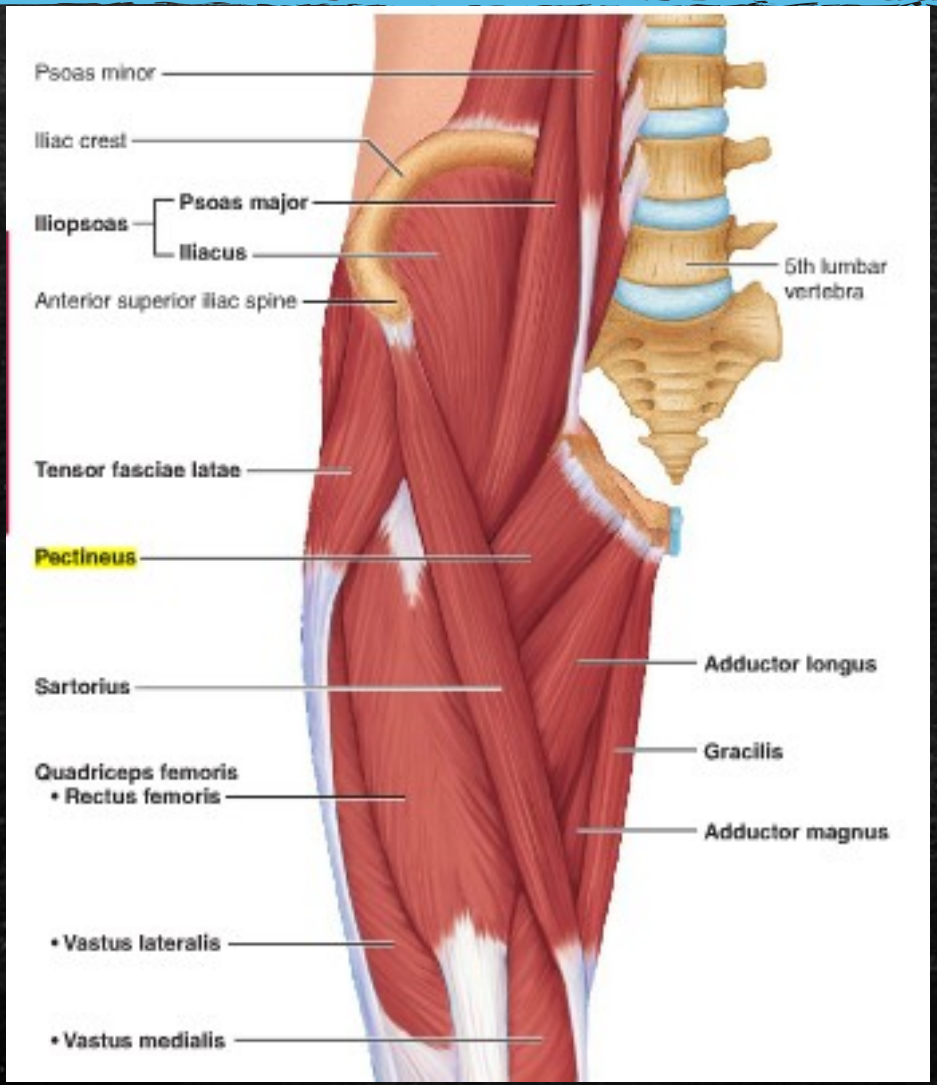
The Hamstrings - M. Biceps Femoris, M. Semitendinosus and M. Semimembranosus

An orientation test of knee flexors

We can persuade about the lenght quality of ischiocrural muscles in a sitting position, with extended legs in the knee joints.

Examinee should be able to achieve the vertical position of the pelvis and 90 flexion in the hip joints without flexion in knee joints.

Hip Adductors – Pectineus, Adductor Brevis, Adductor Magnus, Adductor Longus, Gracilis



Hip Adductors – Pectineus, Adductor Brevis, Adductor Magnus, Adductor Longus, Gracilis

Starting position: Supine lying, with the leg to be tested close to the edge of the table. The leg not to be tested is 15-25 degrees abducted in the hip joint.

Grip: The leg to be tested is placed with the heel in the crook of the examiner's elbow. Her/his hand is placed on the anterolater side of the tibia, so maintaining the knee in extension through forward pressure on the lower leg. The foot of the patient is steadied on the upper arm of the examiner to prevent lateral rotation in the hip joint.

Fixation: The pelvis or leg not to be tested (as far as possible).

Hip Adductors – Pectineus, Adductor Brevis, Adductor Magnus, Adductor Longus, Gracilis

Movement: Abduction of the extended leg in the hip joint over the maximal range. When the full movement is performed the knee joint is passively flexed and abduction continues.

Normal range of movement: Abduction to about 40 degrees with an extended and flexed knee. If the range of movement of the hip joint with the knee extended or flexed is limited to the same or almost the same extent, the one-joint adductors, mainly the pectineus and the adductors, are proved to be shortened. If the range of movement increased with a flexed knee then the two-joint adductors (namely the gracilis, biceps femoris, semimembranosus and semitendinosus) are shortened.

Hip Adductors – Pectineus, Adductor Brevis, Adductor Magnus, Adductor Longus, Gracilis

Ratings:

We evaluate the extent of abduction in the hip joint when extanded and slightly flexed knee. If the abduction is limited in the same or almost the same extent in the extended and flexed knee – in terms of shortening 1-articular adductors. If enlarges the scope of abduction when flexed knee – in terms of shortening 2-articular adductors.

0 - not a reduction – abduction of the hip joint 40 degrees

1 - small shortening – abduction in the hip joint in range of 30-40 degrees

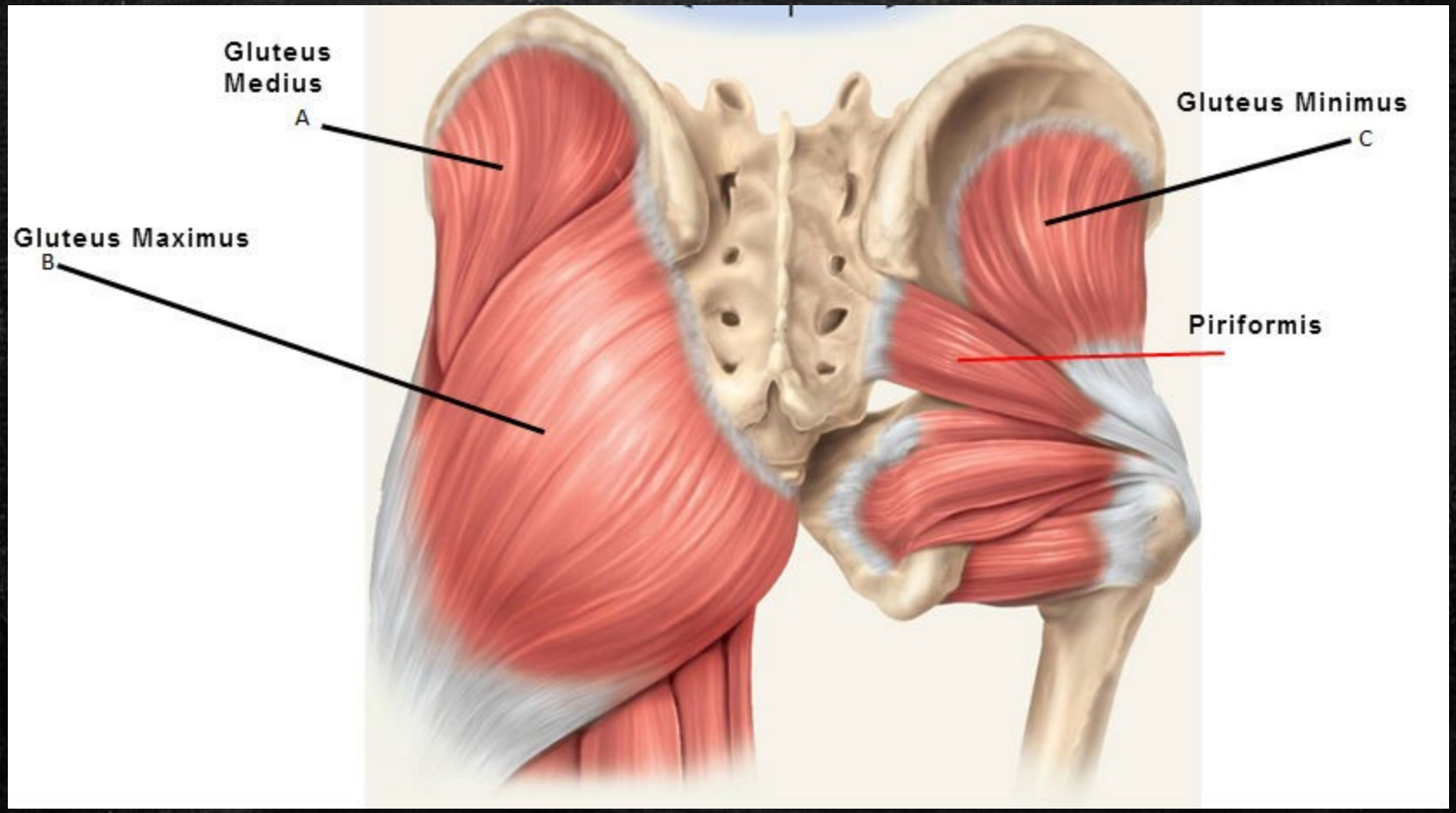
2 - large shortening – abduction of the hip joint is smaller than 30 degrees

Hip Adductors – Pectineus, Adductor Brevis, Adductor Magnus, Adductor Longus, Gracilis

Possible errors

1. During abduction there is also some flexion or lateral rotation in the hip joint.
2. The examination does not take place in the two different positions described, that is with an extended and a flexed knee.
3. The necessary slight abduction of the leg not to be tested does not take place and so the fixation of the pelvis is insufficient.
4. The pelvis is not fixed.
5. In the second phase of testing is permitted large flexion of the knee, which by shortening of the m. rectus femoris leads to facilitation of adductors.
6. Forgetting that the lower leg must always be supported.

Piriformis


Gluteus Medius
A
Gluteus Maximus
B
Gluteus Minimus
C
Piriformis

Piriformis

Starting position: Supine, with the leg to be tested flexed at the hip and knee joints.

Fixation: The pelvis through pressure from the examiner's hand against the knee in the direction of the longitudinal axis of the thigh.

Piriformis

Movement: Examiner performs 60-degree flexion in the hip joint. Examiner's hands performed the pressure on the knee side of the tested leg, thus ensuring stabilization of the pelvis (forearm of the examiner is on the thigh of the patient, and his hand is hooked on the knee. The second upper limb grips examining lower leg of the patient, which is in horizontal position. Thus gripped lower leg, the examiner performs the maximal adduction in the hip joint and then internal rotation in the hip joint.

https://www.youtube.com/watch?v=78-zzdJ4tvA

Piriformis

Ratings:

We evaluate according the possibility of performance of internal rotation and adduction.

0 - not a reduction – can be performed freely adduction and internal rotation, ie. the end feeling is soft

1 - small shortening – in case of shortened m. piriformis internal rotation is limited, moreover, adduction is limited as well.

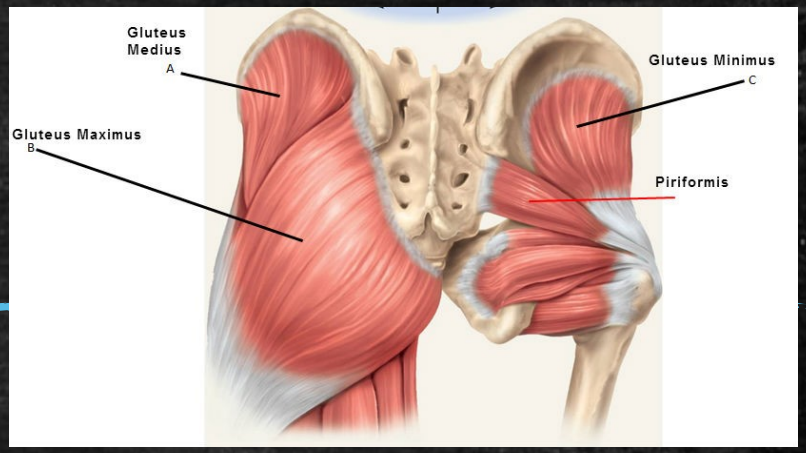
2 - large shortening – in case of shortened m. piriformis internal rotation is limited or even impossible with hard end feel, moreover, adduction is limited.

Piriformis

Possible errors

1. Pressure against the knee is not constant during the examination and so the fixation of the pelvis is insufficient.
2. Adduction and medial rotation is not carried out to the end of the range.

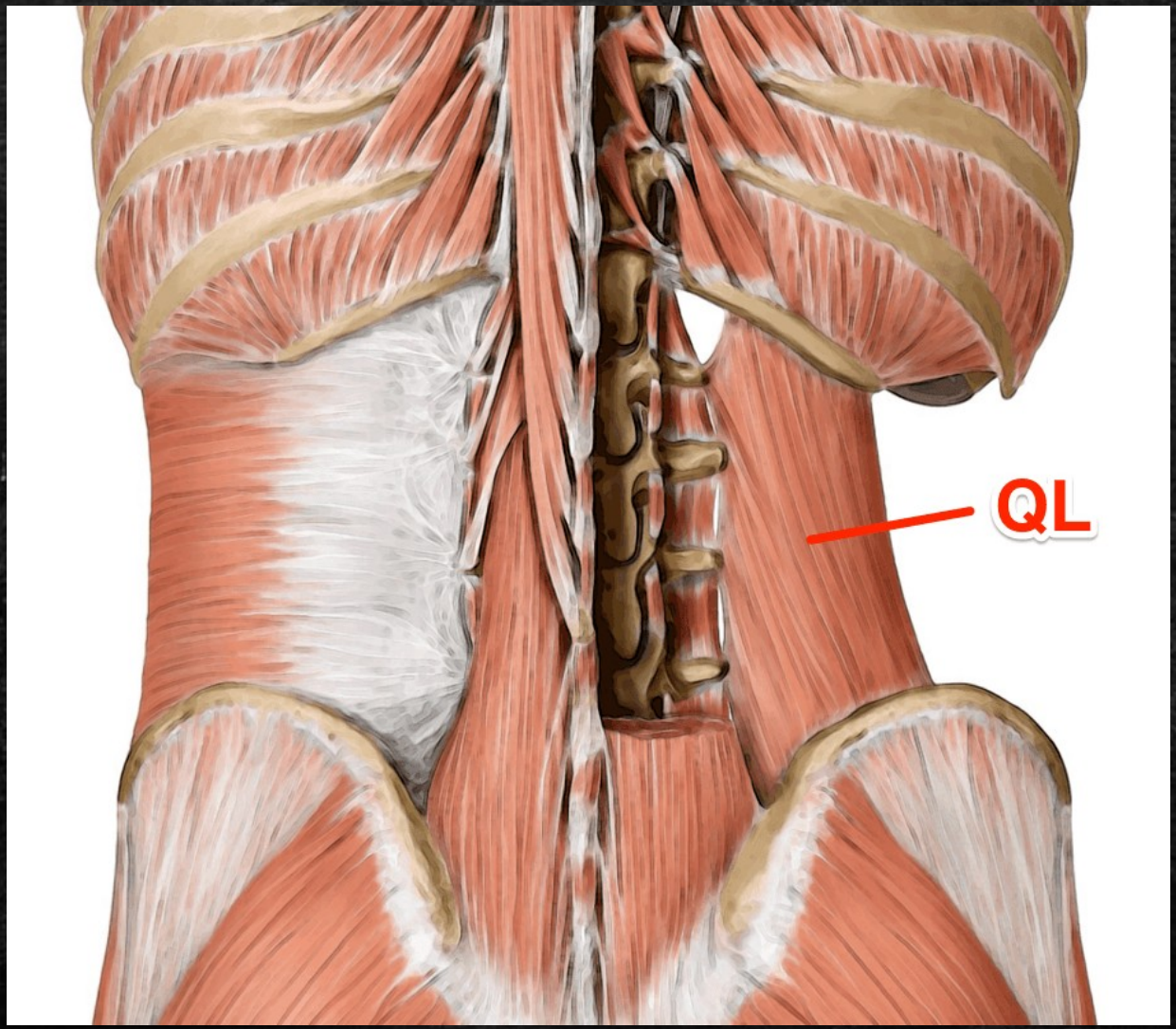
Piriformis



Palpation examination

If there is shortening of the piriformis, adduction and medial rotation are decreased and are painful at the end of the range of motion. Palpation of the piriformis usually gives better results than the stretch test. The palpation is performed deeply in the area of the greater sciatic foramen across the muscle fibres. Normally the muscle is not palpable, but if there is shortening then it is felt and it moves away under the examiner's fingers.

Quadratus Lumborum

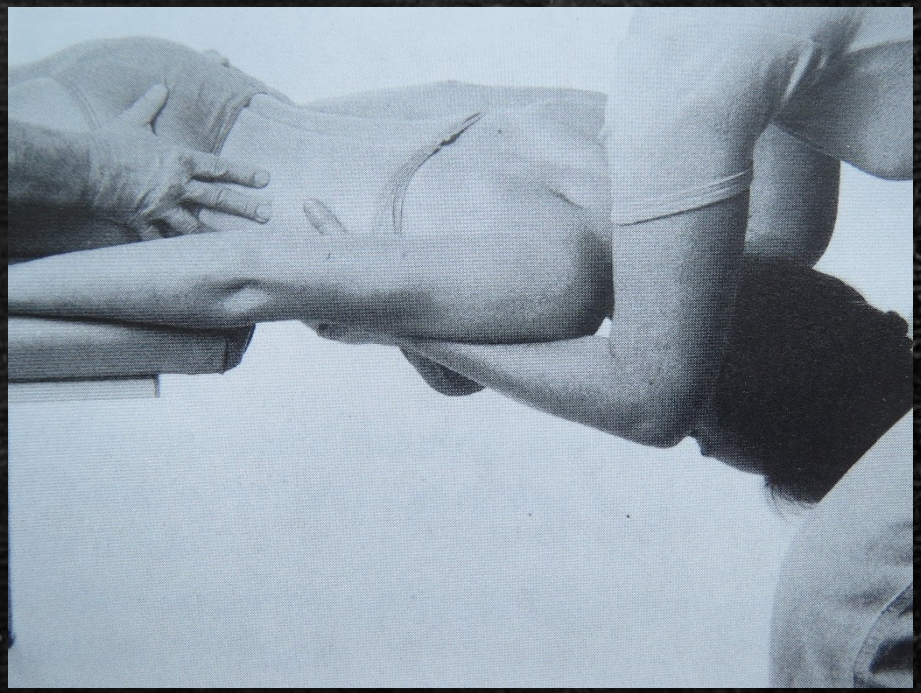


Quadratus Lumborum

First testing method

Starting position: Prone lying, with the upper part of the body over the end of the table.

Fixation: One examiner fixes the pelvis and the legs, and during the movement palpates the tension of the quadratus lumborum. The other examiner steadies the upper part of the patient's body with his/her forearm without putting pressure on the throat of the patient.

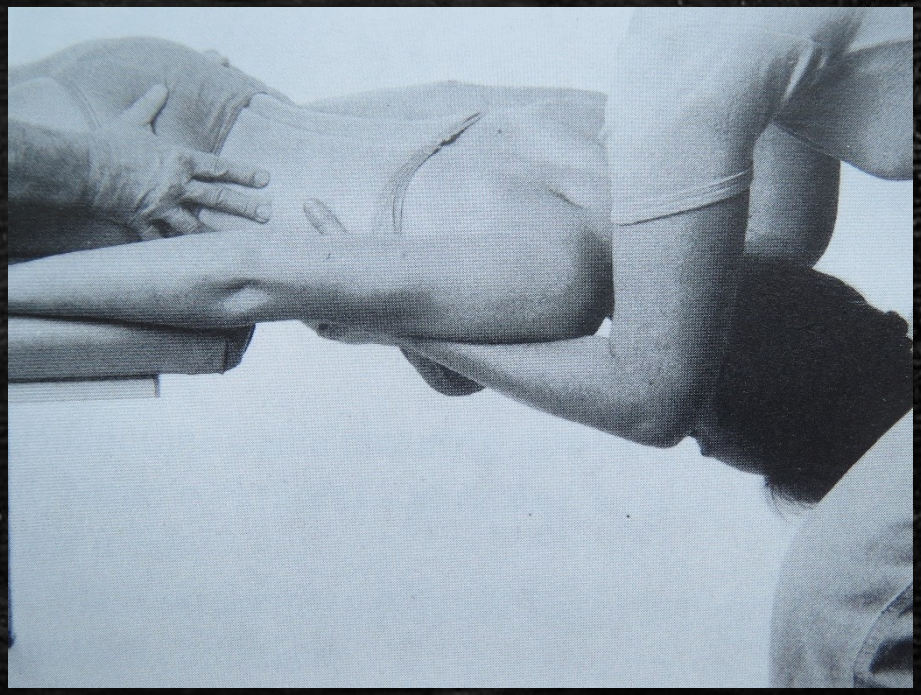


Quadratus Lumborum

First testing method

Movement: Side flexion of the trunk in the horizontal plane without twisting, lowering, or lifting.

Normal range: The side flexion of the trunk should be symmetrical. If there is muscle shortening, the spinal column does not show a smooth arched curve during side flexion, the lumbar spine stays very stiff and there is a compensatory increase of the movement in the ThL segments.

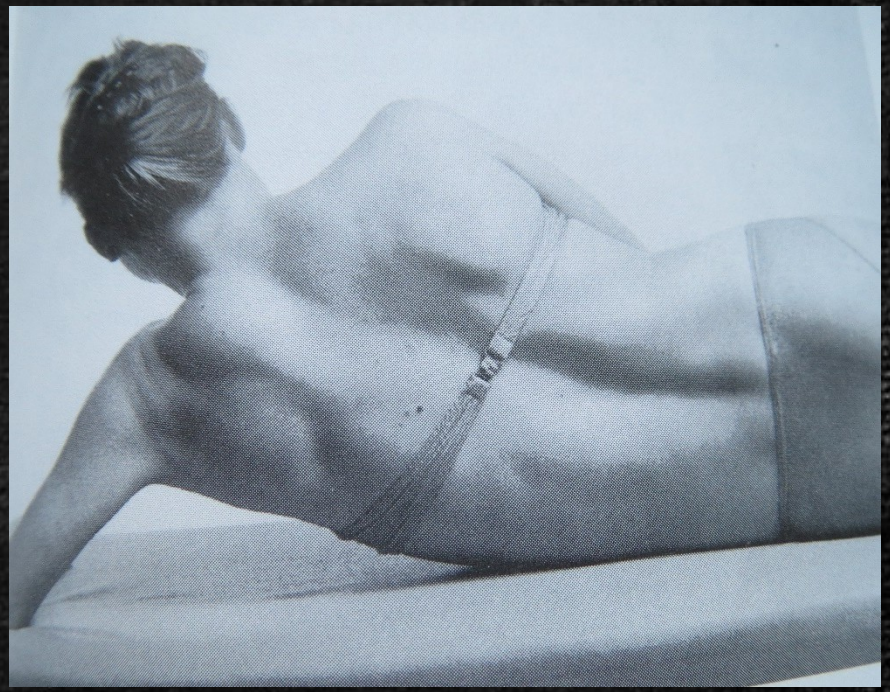


Quadratus Lumborum

Second testing method

Before the own examination we do a brand on the lateral side of the chest of the examined in standing position. The mark is in the level of lower angel of the blade on the examined side.

Starting position: The patient lies on the side to be examined with the leg slightly flexed to stabilize the body. The top arm rests on the body and the bottom one is slightly flexed at the elbow with the hand resting on the table above the head.

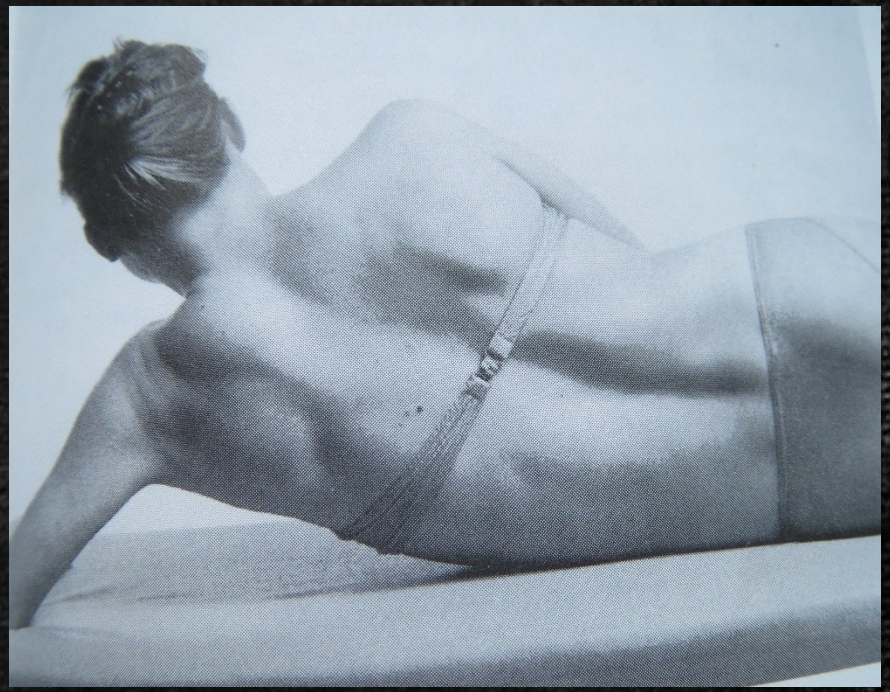


Quadratus Lumborum

Second testing method

Fixation: Not necessary

Movement: The patient pushes on her lower arm and therefore slowly raises her body. Thus side flexion of the trunk takes place without twisting or bending forwards or backwards. When the pelvis starts to move the movement must be stopped. If the quadratus lumborum is shortened, the lumbar spine is kept stiff and the thoracolumbar segments show signs of local compensatory hypermobility. The lower waist crease stays concave.



Quadratus Lumborum

Second testing method

Ratings:

We measure the vertical distance of the marked point on the lateral side of the chest and table. Furthermore, we observe the lateral edge of the examined side, which, if shortening, is concave. We observe the movement of the lumbar and thoracic spine. Always compare both sides.

0 - not a reduction – measured distance is more than 5 centimeters.

1 - small shortening – measured the distance is 3-5 centimeters.

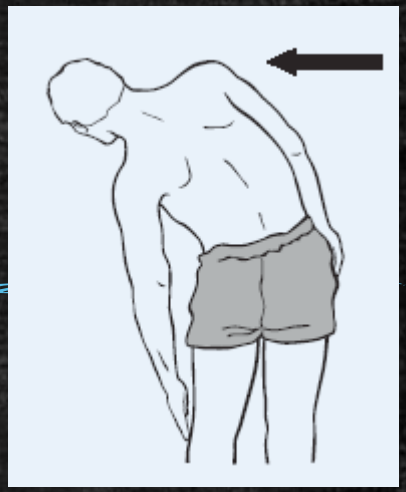
2 - large shortening – measured the distance is less than 3 centimeters.

Quadratus Lumborum

Possible errors

1. While lying prone the neck is under pressure when the upper trunk is steadied.
2. During the movement there is twisting of the trunk and/or forwards or backwards bending.
3. The pelvis and the legs are not adequately fixed.
4. Palpation of the muscle to be tested is not deep enough and therefore the test is not valid.
5. In the orientation test in the standing position a sideways movement of the pelvis is allowed and also an increased upward movement of the shoulders.

Quadratus Lumborum

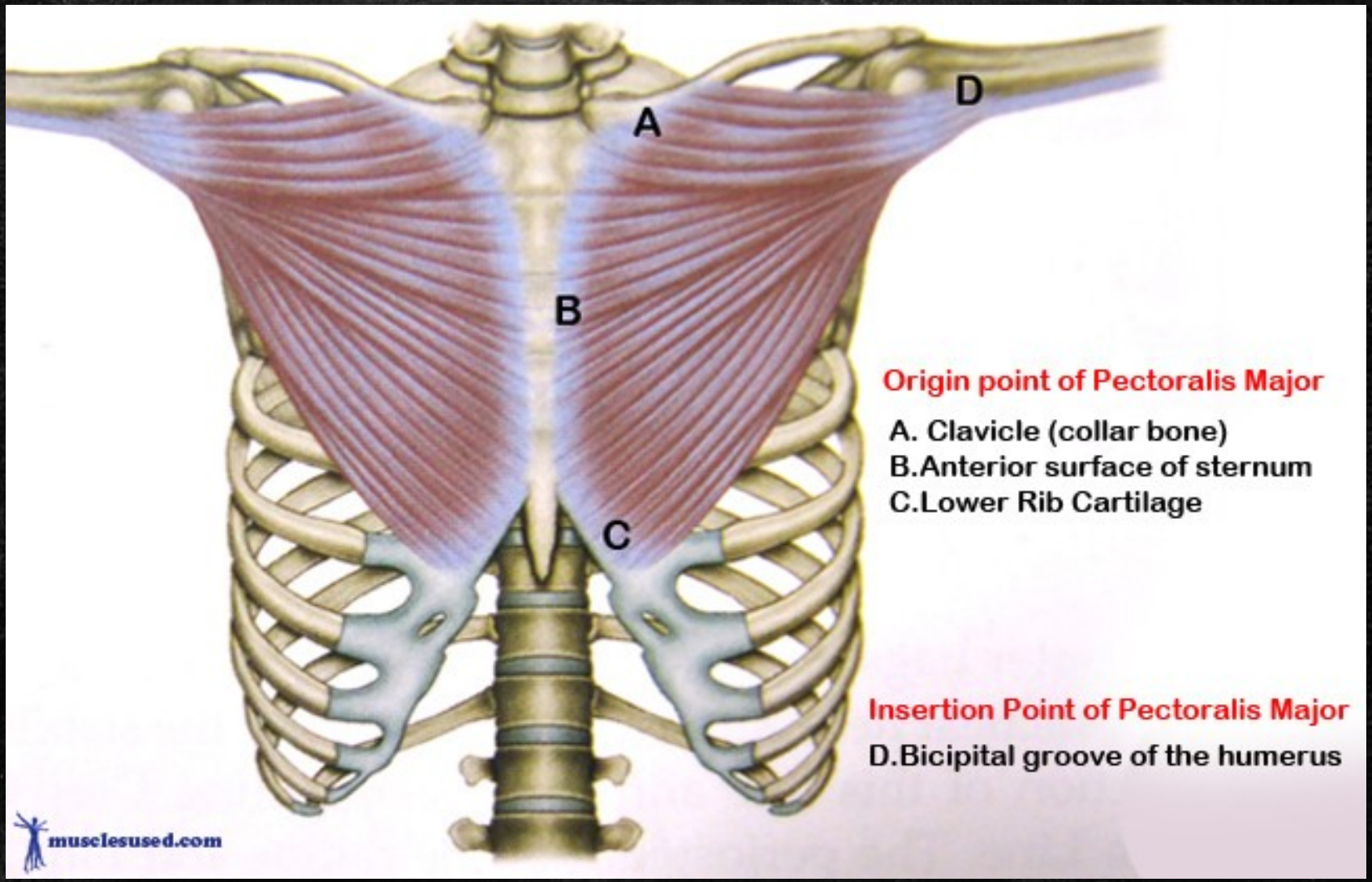


Orientation test in standing

The patient is standing in side flexion without twisting the trunk forwards or backwards or lifting the shoulders. A sideways movement of the pelvis towards the opposite side must be avoided. The range of movement of the two sides is compared.

At the end position, normally the line from the axilla of the opposite shoulder coincides with the intergluteal line. This test is not reliable in standing because the patient cannot be fully relaxed and the tested quadratus lumborum muscle contracts eccentrically during the movement.

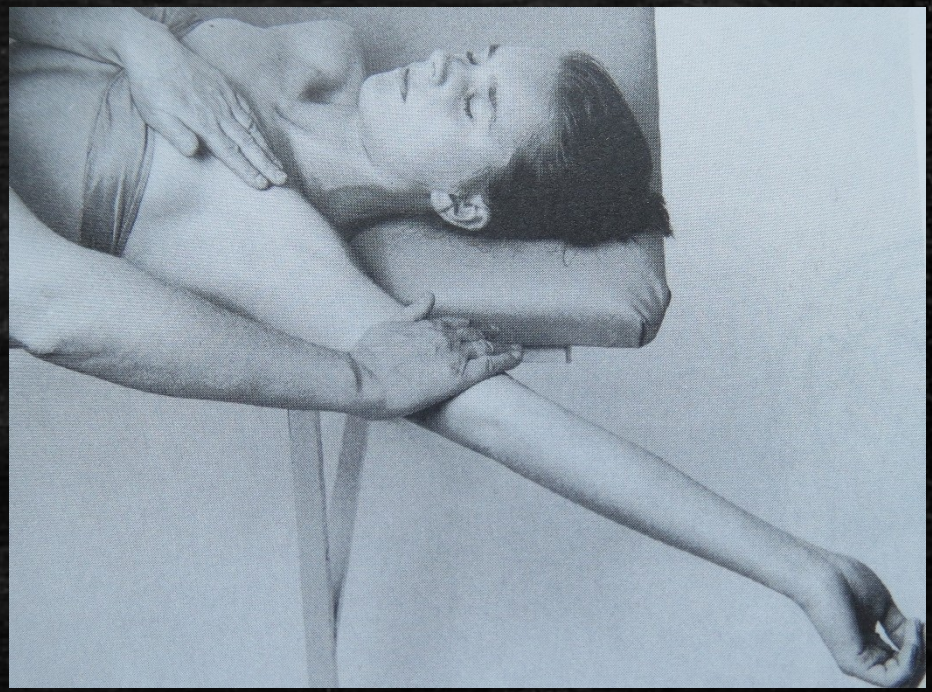
Pectoralis Major



Pectoralis Major

Starting position: Supine lying, with the side to be examined near the edge of the table and the arms alongside the body. Legs are flexed on the table.

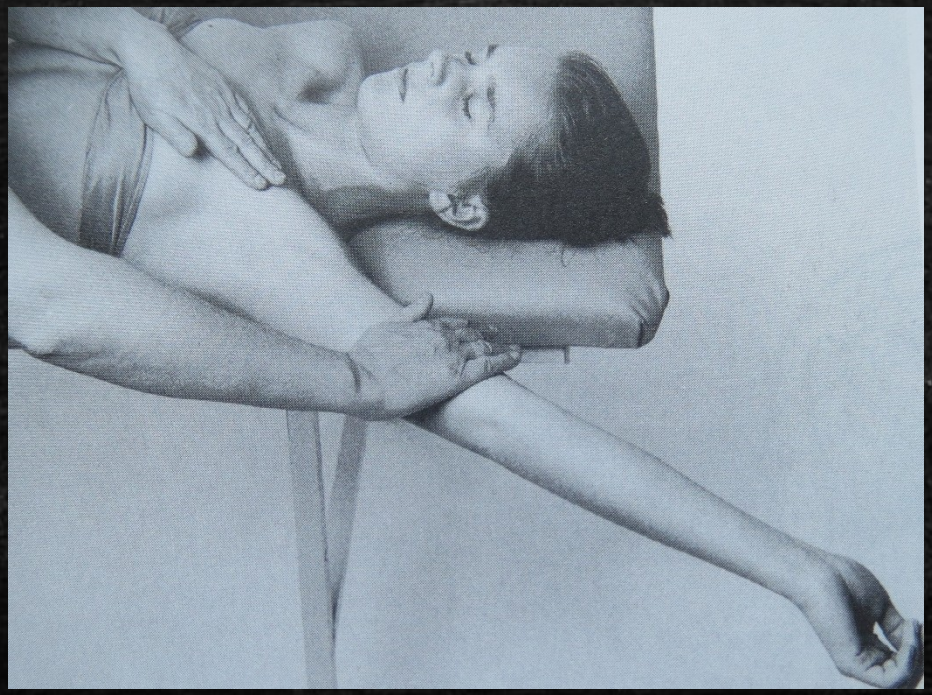
Fixation: Before the movement has started there should be a light rotation of the thorax against its expected diagonal direction. The fixation must be applied before elevation of the arm.



Pectoralis Major

Movement:

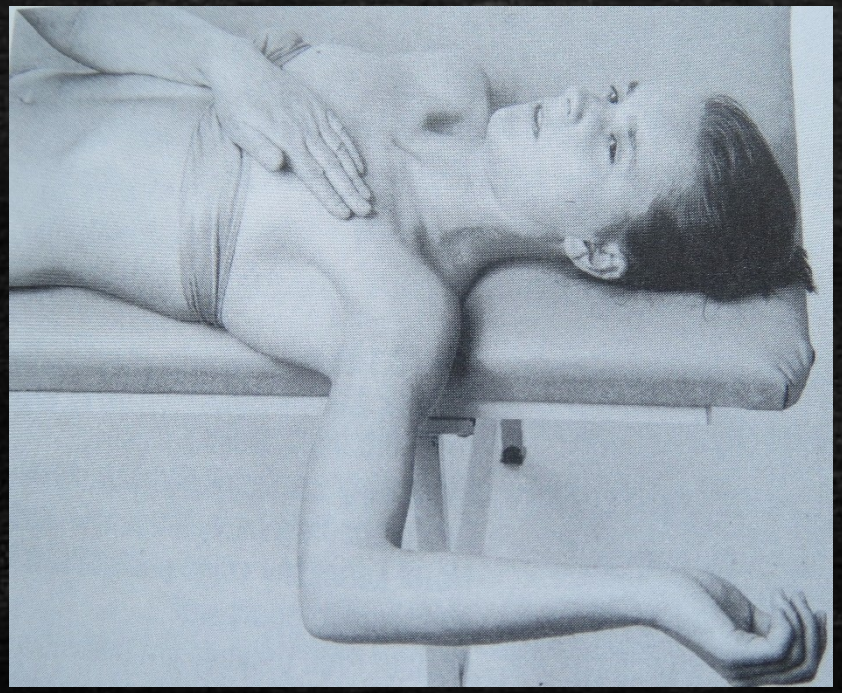
a) lower sternal part – passive elevation of extended upper limb, the arm is moved passively from the starting position outwards, across and upwards, so that the palm is directed towards the ceiling.



Pectoralis Major

Movement:

a) middle and upper sternal part – 90 degrees abduction and external rotation in shoulder, 90 degrres in elbow.



Pectoralis Major

Movement:

a) clavicular part and m. pectoralis minor – we let free fall upper limb extended in elbow and with external rotation in shoulder off the table.

Pectoralis Major

Normal findings: The upper arm should reach the horizontal plane and with pressure in a vertical and posterior direction it should be possible to increase the range of movement. At the same time the muscle fibres are palpated in the sternal and clavicular parts of the muscle. If there is shortening the upper arm does not reach the horizontal plane and on palpation the tight muscle fibres are detected.

https://www.youtube.com/watch?v=78-zzdJ4tvA

Pectoralis Major

Ratings of the lower sternal and middle and upper sternal part

0 - not a reduction – the arm drops to the horizontal, range of motion still increases with a pressure on a distal portion of the humerus downwards, the arm gets below the horizontal.

1 - small shortening – the arm does not drop into the horizontal, but the arm can reach the horizontal when there is the pressure on the distal portion of the humerus downwards.

2 - large shortening – the arm remains in a position above the horizontal, the pressure on distal portion of the humerus can not compress the arm into the horizontal.

Pectoralis Major

Ratings of the clavicular part and m. pectoralis minor

We evaluate according to the possibility of pressing the arm to the retraction and by palpation detected tension of clavicular fibers of m. pectoralis.

0 - not a reduction – compression of the arm can be performed easily, examiner does not find any increased tension of clavicular portion of m. pectoralis major by palpation.

1 - small shortening – compression of the arm can be performed, but with little resistance. Examiner simultaneously detects by palpation increased tension of the palpated part of m. pectoralis major.

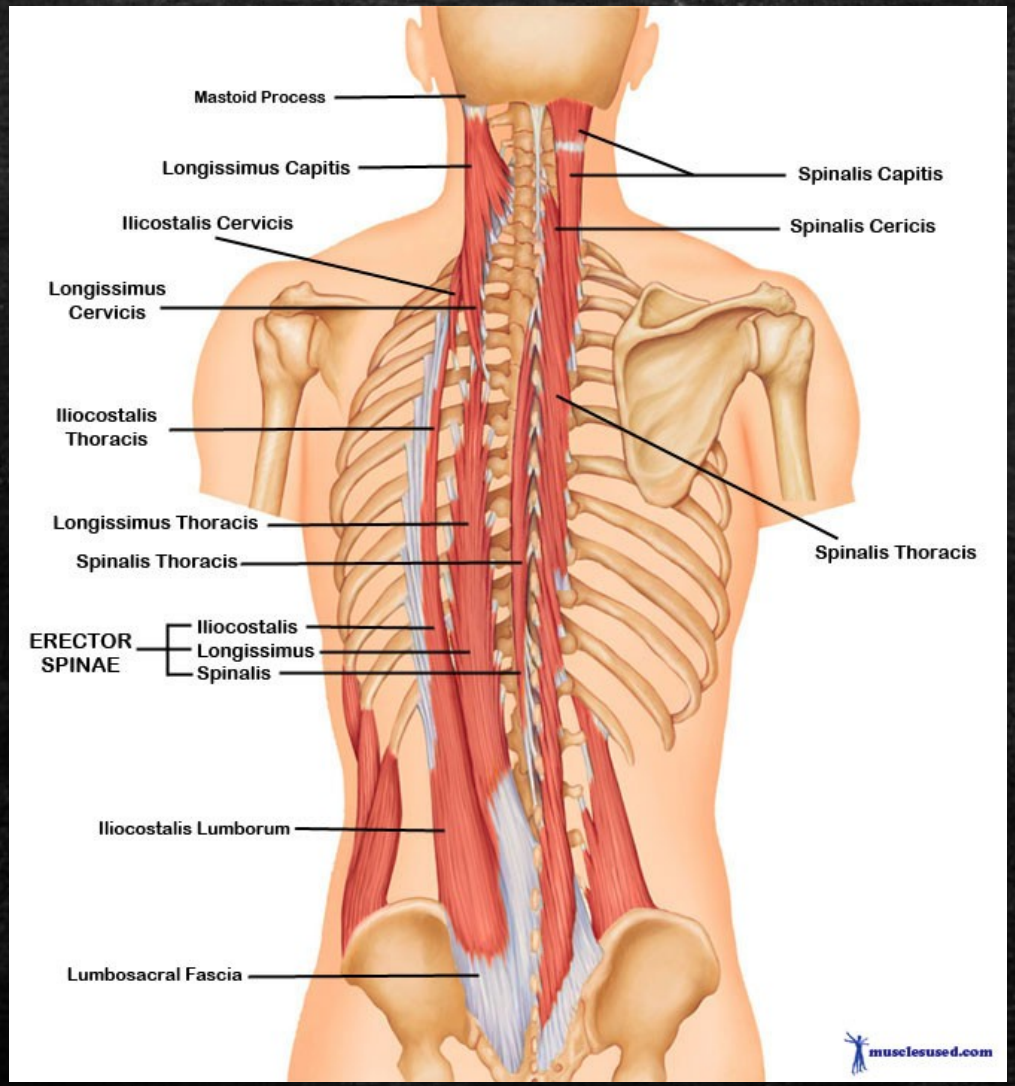
2 - large shortening – compression of the arm is not possible, moreover examiner detects by palpation significant increased tension of clavicular portion m. pectoralis major. The examinee can feell this palpated tension also painfully.

Pectoralis Major

Possible errors

1. The thorax is not adequately fixed before the movement starts and so twisting of the trunk and an increased lumbar lordosis can take place.
2. Instead of fixing the thorax through a diagonal pull there is a vertical push.
3. The pressure during the test is applied not towards the upper but towards the forearm.
4. The direction of the movement is not maintained and so the sternal part of the muscle fibres is not stretched to the necessary extent.

The Paravertebral Back Muscles



The Paravertebral Back Muscles

Starting position: The patient sits with the knees flexed and the lower legs hanging over the edge of the table so that the hamstrings are relaxed. Thighs are on the examination table. Whole feet are supported so as to maintain the right angle in ankle joints.

Fixation: Examiner fixes the pan for iliac bones to prevent pelvic anteversion.

Movement: Forward bending to the maximum range with the forehead moving towards the knees. The pelvis must not move.

https://www.youtube.com/watch?v=78-zzdJ4tvA

The Paravertebral Back Muscles

Ratings:

We measure the vertical distance forehead-thigh.

0 - not a reduction – the measured distance is not greater than 10 cm.

1 - small shortening – measured the distance is 10-15 centimeters.

2 - large shortening – measured the distance is more than 15 centimeters

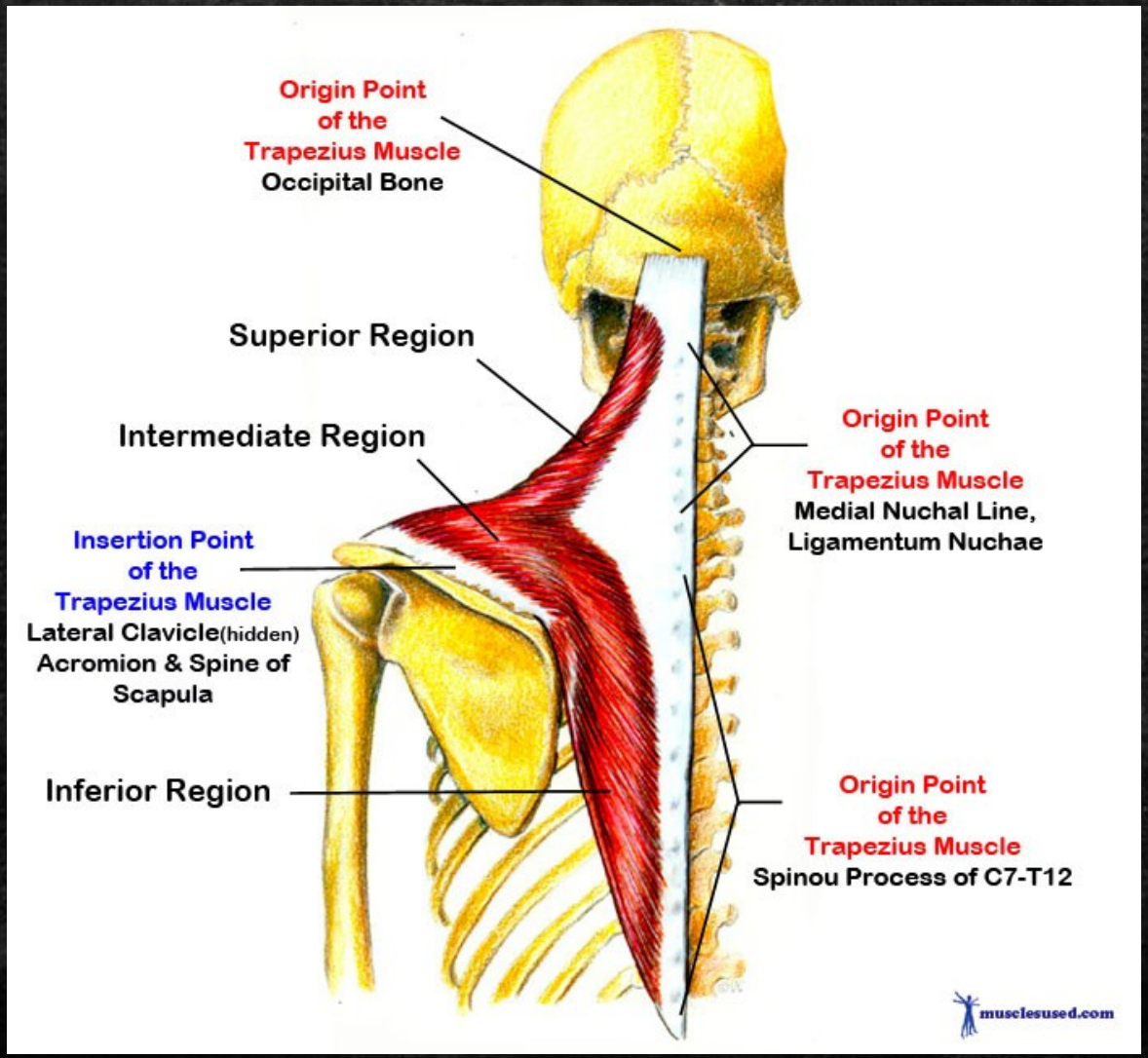
The Paravertebral Back Muscles

Possible errors

1. The forward bending takes place through tilling the pelvis and not through bending the spine.

The test is not very specific!

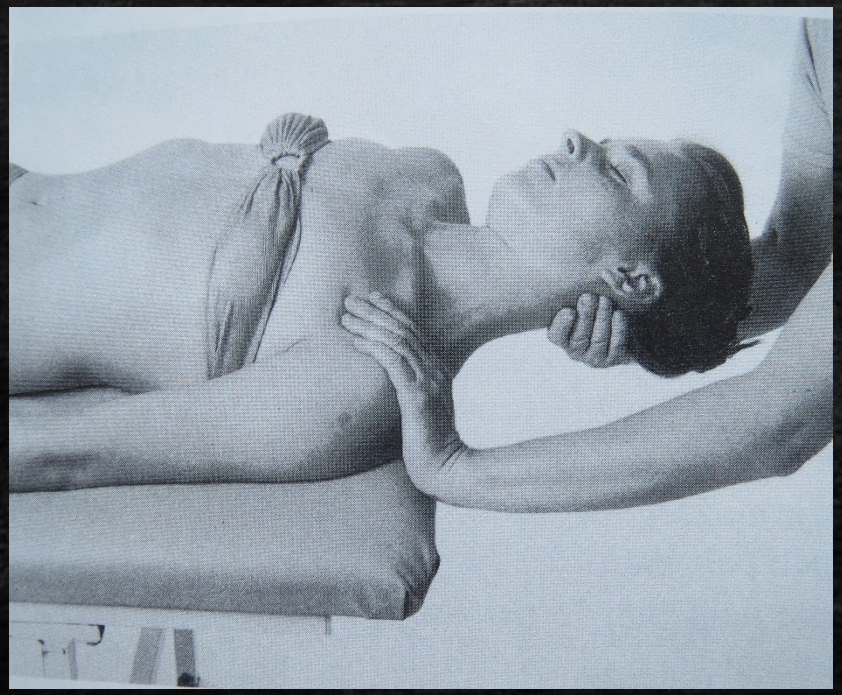
The Trapezius – Upper Part



The Trapezius – Upper Part

Starting position: Supine, lower limbs slightly supported, upper limps loosely at your sides. Head off the table in the middle position supported by a physiotherapist in occiput.

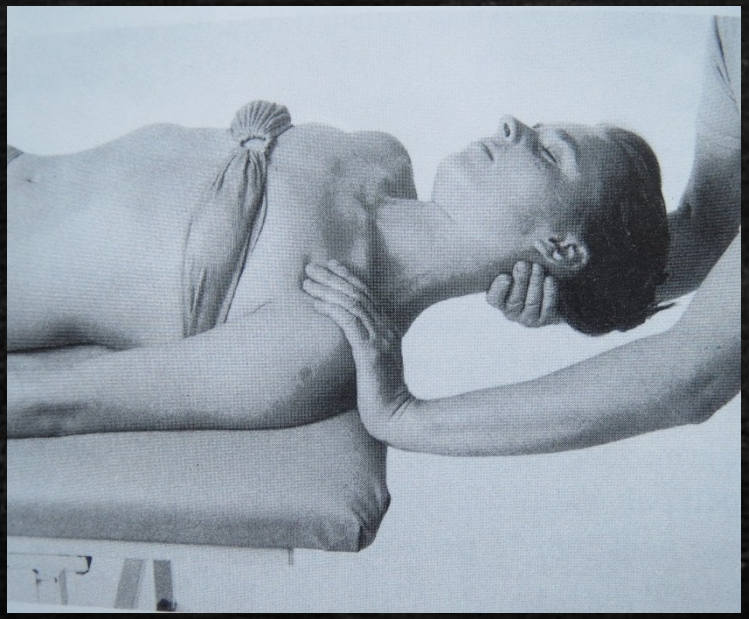
Fixation: The shoulder on the side to be tested is fixed from above.



The Trapezius – Upper Part

Movement: Passive side flexion of the neck without flexion, extension or rotation. The head is moved with the ear to the opposite shoulder. Then continue with depresion of the shoulder.

Normal findings: The range of movement is compared on both sides and the fibres of the trapezius are palpated.



https://www.youtube.com/watch?v=78-zzdJ4tvA

The Trapezius – Upper Part

Ratings:

We evaluate the degree of the shoulder girdle compression (if inclination is limited, it is most likely a joint affair)

0 - not a reduction – compression of the arm can be performed easily

1 - small shortening – compression of the arm can be performed but with light resistance

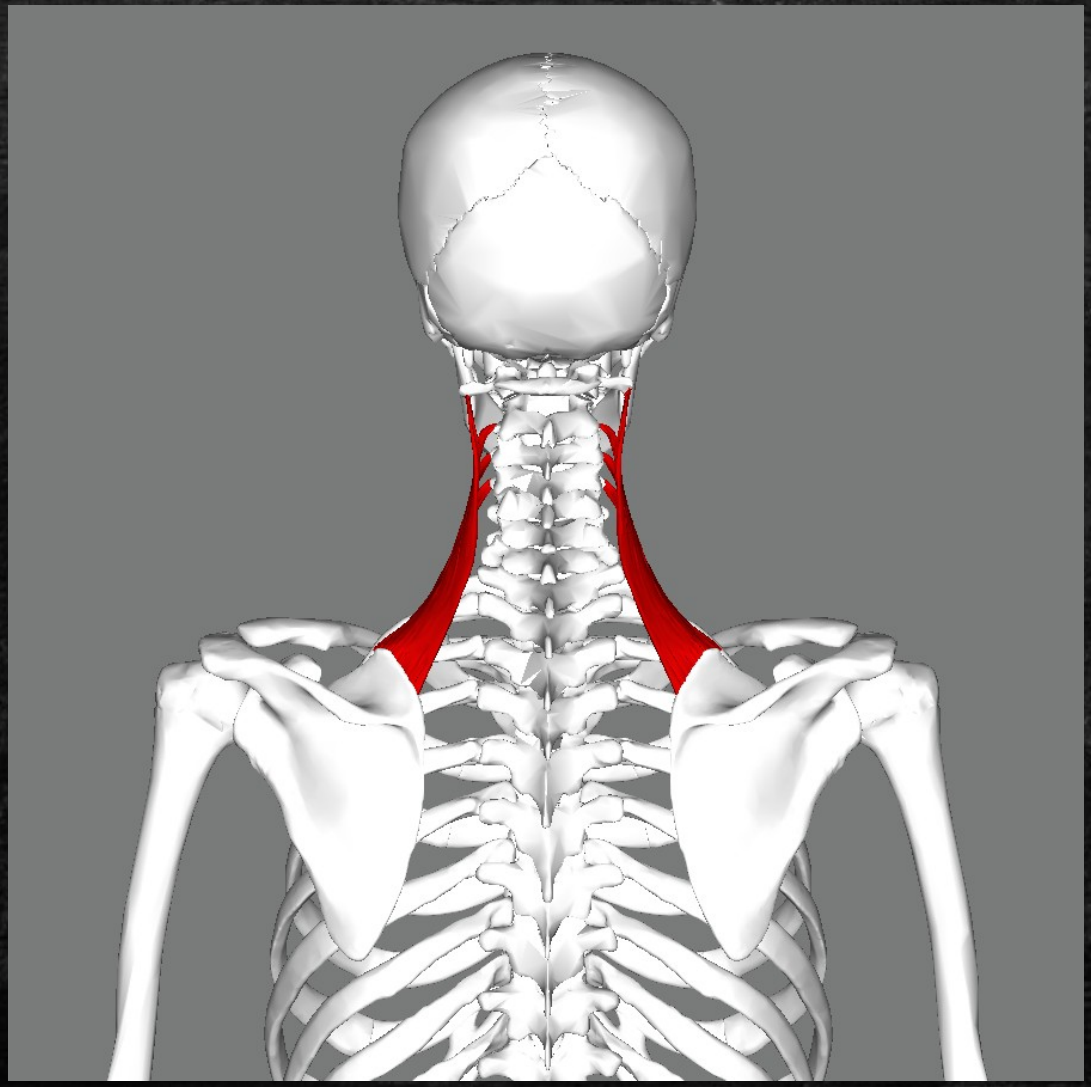
2 - large shortening – compression of the arm can not be done, when we try to compress the shoulder we encounter stiff resistance to stop. Moreover, it can also be restricted inclination.

The Trapezius – Upper Part

Possible errors

1. Exact starting position of the head is not held.
2. We forget support of the knees.
3. The shoulder of the side to be tested is not fixed.
4. The movement takes place with rotation, flexion and extension of the spine.

Levator Scapulae



Levator Scapulae

Starting position: Supine lying with the arms along the body. Lower limbs slightly bended. Head in the middle position on the table.

Fixation: The examiner steadies the head with one hand and stabilizes the shoulder with the other to depresion on the examined side. Simultaneously palpates with thumb of the fixating hand m. levator scapulae at its insertion on angulus superior scapulae.

Levator Scapulae

Movement: Maximal flexion in the cervical spine with rotation and side flexion towards the opposite side. If there is shortening of the levator scapulae, the range of movement is decreased and the muscle insertion painful on palpation.

Levator Scapulae

Ratings:

We evaluate the extent of the shoulder girdle depression (if limited inclination, rotation or flexion, it is most likely a joint affair)

0 - not a reduction – depression of the arm can be performed easily

1 - small shortening – depression of the arm can be performed but with light resistance

2 - large shortening – depression of the arm can not be done, when we try to depress the shoulder we encounter stiff resistance to stop. Moreover, there can also be restricted inclination.

Levator Scapulae

Possible errors

1. The shoulder is not adequately fixed.

Sternocleidomastoideus

Starting position: Supine lying with the arms along the body. Lower limbs slightly bended. Head out of the table. Examiner behind the head of examinee.

Fixation: Sternum, if possible clavicula as well.

Sternocleidomastoideus

Movement: The examiner supports the head on occiput, makes further simultaneous extension, inclination and rotation of the head to the side which is not assessed

Sternocleidomastoideus

Ratings:

The degree of shortening is evaluated by the range of extension and we palpate muscle belly and especially tendon of SCM on clavicle and sternum.

CAVE! Extension of cervical spine can impair blood circulation of a. vertebralis…be careful at elderly!

This assessment is often unreliable because of restrictions on movement in the cervical spine!!!

e-sources, literature

- http://www.musclesused.com/
- https://quizlet.com/24689791/muscles-adductors-of-thigh-4-flash-cards/
- Janda V. et al.: Muscle function testing
- https://www.youtube.com/watch?v=78-zzdJ4tvA

Thank you for your attention ☺