Scalenes

Overview

Scalenes are 3 (sometimes 4) muscles on either side of the neck. The 3 common bellies are name for their position; scalenus anterior, scalenus medius, scalenus posterior. The anomaly is called scalenus minimus.

They are lateral cervical muscles that connect the cervical vertebrae to the upper thoracic cage. They are long muscles with fibers of uneven length.

Scalenus anterior lies almost completely under the clavicular head of sternocleidomastoid in the pedicle groove. It passes anterior to the cervical nerves and subclavian artery but behind the subclavian vein.

Scalenus posterior lies mostly under the anterior border of the trapezius. It passes posterior to the cervical nerves and subclavian artery.

Scalenus medius lies in the posterior cervical triangle between the two.

Innervation

Scalenes are innervated by the spinal roots of C2-C7. Generally, the level of the spinal nerve is directly related to the attachment of the section of muscle being innervated.

Attachments

It is common that the scalene muscles have variances in their attachments.

Scalenus anterior

Scalenus anterior originates from a flat tendon on the first rib just under the clavicular SCM, medial to the thoracic bundle. It inserts along the anterior tubercles on the transverse process of C3-C6. The upper attachment on C3 is usually a more prominent tubercle than the other cervical vertebrae and easily distinguished with palpation.

Scalenus medius

Scalenus medius originates from a flat tendon on the 1st rib just lateral to the thoracic neurovascular bundle. It inserts on the posterior tubercles of the transverse processes of C2-C7.

Scalenus posterior

Scalenus posterior originates from a flat tendon on lateral aspect of the 2nd rib. It inserts on the posterior tubercles of the C4-C6 or C7.

Scalenus minimus

Scalenus minimus is the most variable of the scalene muscles. It originates from the fascia of the thoracic pleura and sometimes the first rib. It inserts on the posterior tubercle of C7, sometimes C6. It passes posterior to the subclavian artery.

Function

Scalenes draw the cervical vertebrae toward the upper ribs. This can result in lateral flexion of the neck when the ribs are fixed. This results in lifting of the thoracic cage when the neck is fixed. The implications of this can be complicated and argued at length.

During inhalation, especially when the trunk is flexed, scalenes lift the upper ribs from a fixed vertebral column to create volume in the chest cavity. Depending on position and trigger point activity, they synergize with sternocleidomastoid iliocostalis cervicis and serratus posterior superior. Trapezius and levator scapula support the pectoral girdle so that serratus anterior and pectoralis minor can also assist.

When the ribs are stabilized and the vertebrae are allowed to move, they laterally flex the neck. They synergize with the sternocleidomastoid, lower sections of the levator scapula and upper trapezius.

Anatomy books are confusing and contradictory about the role that scalenes play in rotation of the vertebrae. No electro-myographical studies were found to support these claims. That being said, scalene referral patterns can be more easily elicited when the head is rotated ipisilaterally while laterally flexing toward the opposite shoulder.

Neuromuscular considerations

Palpation difficulties

Structural anomalies are common in the scalenes. Developed palpation skills are needed to reach the proper belly for assessment and treatment. Be aware that the lateral tip of the cervical transverse process is blunt and puts significant space between the attachments of the anterior scalene on anterior tubercle and the attachment of the scalenes on the posterior tubercles.

The superior end of scalenus anterior can be found at the anterior tubercle of C3. It is usually prominent. Then, reaching under the SCM from the side, follow the belly down to its attachment on the first rib. Feeling the lateral edge of the tendon attachment on the first rib is important. Caution is needed to avoid the brachial plexus.

Often, the inferior attachment of scalenus medius is blends across the rib toward the attachment of the anterior scalene. Many times the two lower attachments will weave with one another supporting thoracic outlet syndrome. Finding the first rib is often confusing for the new student as it is a smaller loop than expected. Follow the blunt edge of the transverse processes down the lateral neck until the first rib stops your decent. Have the subject laterally flex the head while palpating the upper edge of the rib. The medial scalene will pop out and can be followed to its attachment on the posterior tubercles.

Scalenus posterior can be palpated by following the lamina groove, under the trapezius, down the back of the neck until a thick section is felt inserting at C4. The most posterior part of this clump of muscle is the attachment of serratus posterior superior on the nuchal ligament. The deepest portion is scalenus posterior and in between is iliocostalis lumborum. Scalenus posterior may blend anteriorly with scalenus medius but continues onto the second rib. Scalenus posterior will attach more medially where iliocostalis lumborum and serratus posterior superior will continue out to the lateral angle of the ribs.

Similar patterns of pain and referral

Scalenes are often suspected when pain occurs in the arm and hand. This is both useful and confusing. Many referral patterns overlap the scalene referral patterns. It leads the novice therapist to treat scalenes too often.

Although the entire referral pattern is seldom presented, the trigger points of scalenes are

numerous and usually only elicit part of the pattern. Further assessment of impaired functions, causes and perpetuating factors are needed. Serratus posterior superior, which is similar in attachments and similar in referral pattern, is easily mistaken for scalenes.

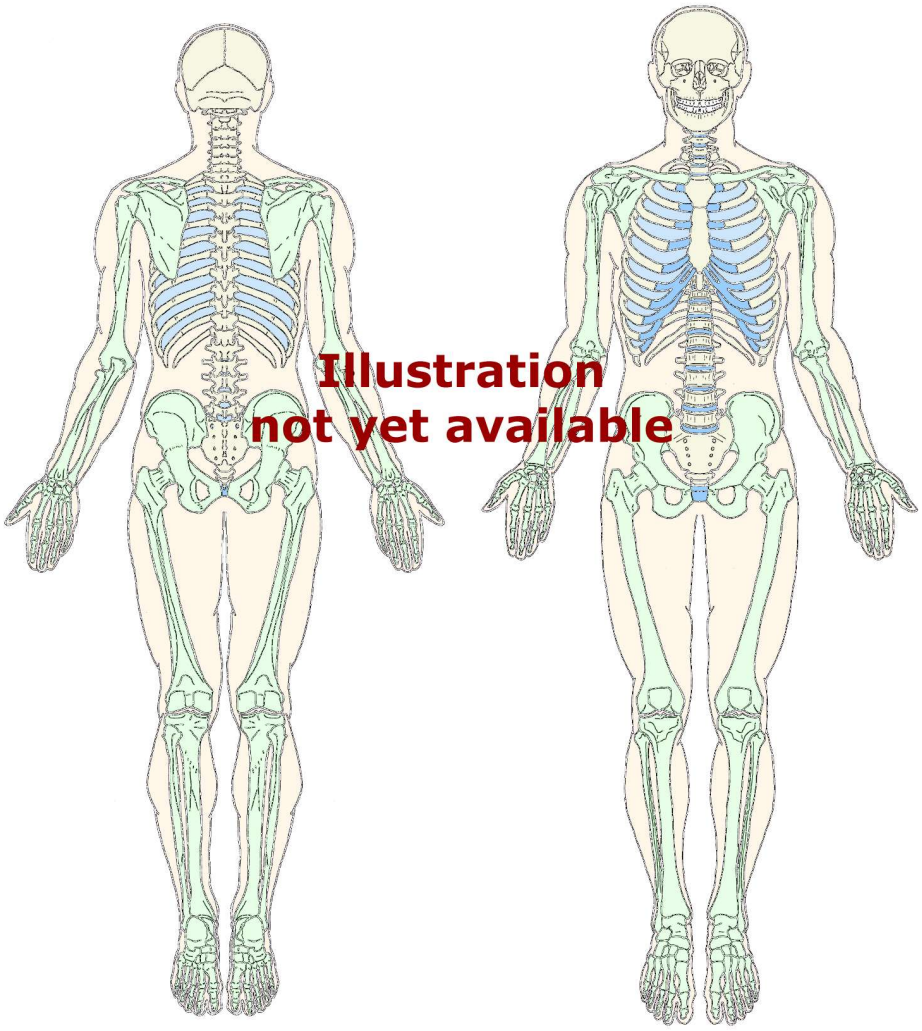
Fortunately, the treatment of scalenes usually restores motion in displaced cervical joints and the joints of the shoulder girdle. The function of many muscles in the arm and hand are restored from this alone. The therapist would be successful more consistently and work more efficiently if they would assess the pattern in more detail and apply more appropriate treatment.

Structural issues

Scalenus anterior is a poor flexor of the neck but does become chronically shortened in forward head posture. This is complemented on the upper posterior neck by the short extensors of the head; sub-occipitals, splenius capitis and semispinalis capitis. After the more superficial phasic muscles are released, the deep tonic muscles must be addressed.

Scalenus posterior has very similar attachments to iliocostalis cervicis and serratus posterior superior. They pull on the same structures and synergize closely. They are an important part of resolving forward head posture and lateral flexion of the lower cervicals.

Breathing from the upper thoracic region is a more common issue as we become more sedentary and spend more time bent forward reading, watching television and driving. Although scalenes are a big contributor, other synergists need to be assessed for longer lasting results. Sternocleidomastoid, serratus posterior superior and iliocostalis cervicis have similar attachments but the therapist must look further for lasting treatment. Electro-myographical studies show that serratus anterior and pectoralis minor are very active in assisted or labored breathing. They open the upper ribs from the pectoral girdle. They need the support of the muscles that lift the pectoral girdle; trapezius, levator scapula and rhomboids.



- muscle

Origin

section

- **attachment**

Insertion

- **attachment**

Function

- **function**
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