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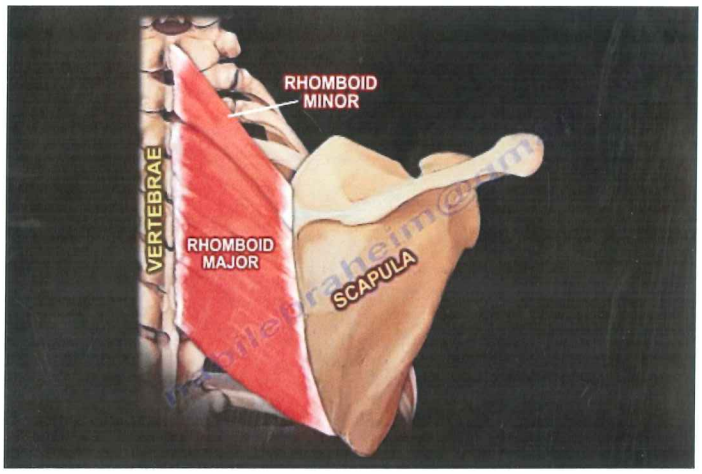
Anatomy, Function, & Dysfunction of the Rhomboid Muscles

The rhomboid muscles lie underneath the trapezius muscle. The rhomboid muscles connect the scapula to the vertebrae so they assist in holding the scapula close to the thoracic wall. The rhomboid muscles get their name from their combined shape (having the shape of a rhombus). The word rhomboid means "diamond" or "kite" shaped object. The rhomboid minor arises from the nuchal ligament and the spinous processes of the C7 and T1 vertebrae. Rhomboid minor inserts into the medial border of the scapula above the insertion of the rhomboid major muscle. The rhomboid major arises from the spinous processes from T2, T3, T4, and T5 vertebrae. The Rhomboid major inserts into the medial border, which is the vertebral border of the scapula from the level of the scapular spine to the inferior angle of the scapula. The rhomboids adduct or retract the scapula by pulling the scapula towards the vertebral column. The rhomboids work with the levator scapulae to elevate the medial border of the scapula. The rhomboids also rotate the scapula downwards with respect to the glenohumeral joint. The rhomboids participate in proper movement and stability of the scapula which is critical for shoulder function. The rhomboid is innervated by the dorsal scapular nerve at C4, C5.

There are a couple clinical entities related to the rhomboid major and minor muscles. If the patient has a brachial plexus injury and the EMG shows evidence of an intact signal in the serratus anterior muscle (supplied by the long thoracic nerve) and also an intact signal in the rhomboid muscles (supplied by the dorsal scapular nerve), this situation indicates that the lesion of the brachial plexus is a postganglionic injury which will have a better prognosis than a preganglionic injury (root avulsion) of the brachial plexus (poor prognosis). The preganglionic injury is associated with Horner's Syndrome (ptosis, miosis, and anhidrosis) due to disruption of the sympathetic chain. There will also be medial winging of the scapula due to loss of the serratus anterior and the rhomboid's muscle function. The inferior border of the scapula will move medially. In the preganglionic injury of the brachial plexus, there will be a loss of the muscle function of the levator scapula and the rhomboids muscles. The physician will examine the muscles proximally that are innervated (root level motor branches, nerves that are coming out of the roots). Determining if the brachial plexus injury is a



preganglionic or postganglionic injury is important! Normal paraspinal muscle activity on an EMG indicates a postganglionic injury which will have a good prognosis.

Another entity that is popular is rhomboid trigger points, muscle pain, and tightness. Usually, the patient will complain about superficial pain between the shoulder blades and the patient describes this pain as an "ache" or that they feel "knots". The pain will be located closer to the scapula than the spine. This pain will occur at rest and movement will not influence the pain. The patient may also experience grinding, snapping, or a crunching noise during movement of the scapula. In these cases, the physician will need to rule out scapulothoracic impingement or a snapping scapula. Other muscle trigger points can be associated with rhomboid muscle trigger points. These trigger points include the pectoralis major, levator scapulae, and the trapezius.

There are several scenarios which may aggravate the rhomboids trigger points. For example, painters who hold their arm above their head for long periods of time. Another example, would be bad posture. People who work hard habitually in a slumped forward, round shouldered position (protracted position) such as sitting at a computer related desk job, sewing, or reading.

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In this situation, the pectoralis muscle which is antagonistic to the retraction function of the rhomboid muscles may become shortened and overactive. The rhomboids become stretched from trying to counter act the pull of the pectoralis muscle. To avoid aggravating the problem, some physicians believe it is better to work on stretching out the pectoralis muscle prior to working on the rhomboids because if you stretch the rhomboids with a tight pectoralis muscle, this may increase the weakness and irritation of the rhomboids trigger points.

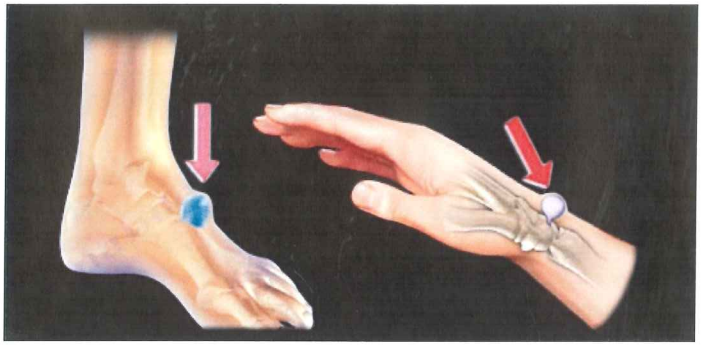
Rhomboids trigger point pain is initially treated with anti-inflammatory medications and stretching of the pectoralis muscle. A rhomboid trigger point release may be performed with a tennis ball. Treatment may also consist of injections to the trigger points. It may be difficult to tell if it is the rhomboids causing pain between the shoulder blades or if it is other muscles that are inserted around the same area.

Ganglion Cyst of the Foot

A ganglion cyst is a mass or lump that forms below the surface of the skin. It is a benign cyst that is filled with a jelly-like substance. It is not a malignant tumor, rather a soft tissue benign mass. Ganglion cysts can occur anywhere, although they usually are found at the wrist area. Occasionally they form at the foot, usually on the top. This mass can: change in size, vary in size, may grow slowly, and are typically asymptomatic.

The patient may feel a burning sensation due to nerve irritation or compression of the nerve. Sometimes, a ganglion cyst forms in the tarsal tunnel area, causing tarsal tunnel syndrome. In this case, if the pain and burning sensation is not resolved with conservative treatment, excision of the mass is probably a good thing to do. The patient may experience skin irritation, difficulty in walking, and it may be painful wearing shoes.

If the ganglion is pushing on a nerve and causing irritation, something surgical needs to be done, such as an aspiration or removal. Usually the patient's symptoms become better after these treatments. It is important to differentiate a ganglion cyst from



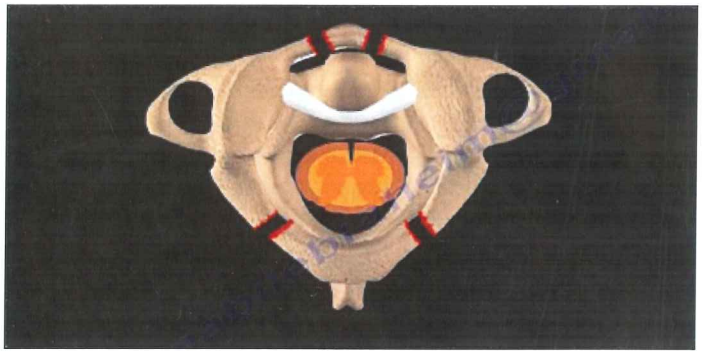
plantar fibromatosis. While ganglion cysts usually occur at the top of the foot, plantar fibromatosis occurs at the bottom of the foot. Another way to determine between the two, is by shining a flashlight at the area in question. A Ganglion cyst will transilluminate whereas plantar fibromatosis does not.

Typical treatment consists of observation, shoe modification, aspiration/Injection of steroids, and surgery (last resort).

Jefferson Fractures

Fifty percent of patients with Jefferson fractures will have associated spine injuries. The canal is wide with a low risk of spinal cord injuries unless the transverse ligament is disrupted. It is difficult to view Jefferson Fractures on an x-ray (usually seen on the lateral side". This fracture is considered a "Junctional Fracture" and could be missed. The classic Jefferson fracture is a burse fracture that results from an axial load. It could be a four part fracture with bilateral fractures of the anterior and posterior arch. There are variations which include two and three part fractures and incomplete formations of the posterior arch can be mistaken as a fracture.

When speaking of Jefferson fractures, it is important to be familiar with the structures that may be involved. These bony structures include: The Atlas (C1), Axis (C2), and the odontoid process. C1 and C2 are stabilized together by the transverse ligament and C1 and C2 provide a 50% of rotation of the neck. The C1 is a ring. At the upper cervical region, the spinal canal is 2.5 times larger than the cord size. The stability and treatment of Jefferson fractures depends on the integrity of the transverse ligament and the displacement of



the fracture. You need to know about the important ligaments related to the Jefferson fracture. These ligaments include: the transverse ligament, the apical ligament, and the Alar ligament.

In order to determine a ligamentous injury, the physician will want to check the Atlanto-dens interval (A.D.I). Normally, this interval should be less than 3mm in adults and less than 5mm in children.

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If the ADI is between 3-5mm, this indicates an injury to the transverse ligament; the transverse ligament holds the odontoid and C1 together, alar and apical ligaments will be intact. If the A.D.I measures greater than 5mm, then there is an injury to the transverse, alar, and apical ligaments.

A bony injury with the intact transverse ligament and a lateral mass displacement less than 7mm and the A.D.I is less than 3mm is considered a stable fracture. Nondisplaced fractures of this nature should be treated with a rigid orthosis. If the fracture is displaced, a halo will need to be used.

Another type of fracture can occur at C1 with a transverse ligament tear. The Atlanto-dens interval will be more than 3 mm in adults. The treatment will depend on the type of injury to the transverse ligament. With bony avulsions of the transverse ligament, the halo will need to be used cautiously. However, some surgeons prefer to do a fusion of C1 and C2. If there is an intrasubstance tear of the transverse ligament, the surgeon will perform a fusion at C1-C2. The surgeon will need to do early surgery as this is a significant injury with a risk of spinal cord compression.

In regards to "Open Mouth Views", the normal overhang is visible during an "Open Mouth View". If it is just a bony injury Jefferson fracture, the combined overhang will be less than 7mm and the transverse ligament is intact and it is a stable fracture. If a Jefferson fracture has a combined overhang of more than 7mm, then the transverse ligament is probably torn and there is an unstable fracture present.

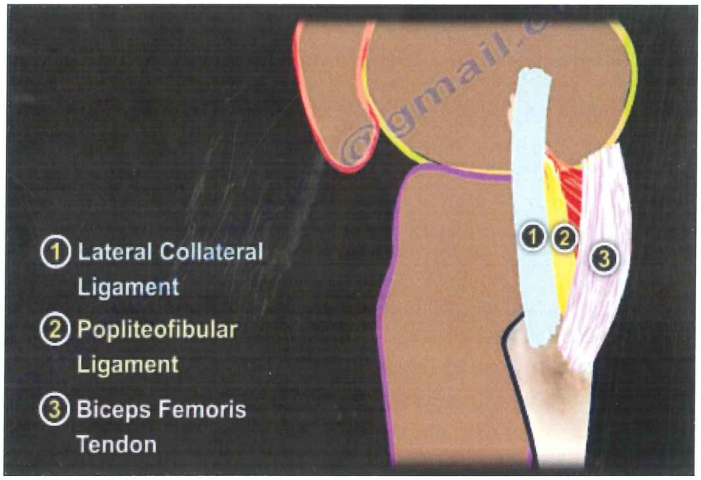
A CT scan is probably the best study in diagnosing the characteristics of the bony injury. An MRI is the best study in diagnosing any associated transverse ligament injuries.

The Short Head of the Biceps Femoris Muscle

The short head of the biceps femoris is an interesting and important muscle. The short head of the biceps femoris is innervated by the common peroneal nerve, which is a branch of the sciatic nerve. The long head of the biceps femoris arises from the upper and medial part of the back of the ischial tuberosity. The short head of the biceps femoris is not a part of the hamstrings since it does not originate from the ischial tuberosity. It functions only on the knee.

The short head of the biceps femoris arises from the femoral shaft from the middle third of the linea aspera lateral to the supracondylar ridge of the femur. It joins with the long head of the biceps femoris in the distal thigh and it inserts at the fibular head. It is the most posterior structure inserted into the fibular head. Both heads of the biceps femoris muscle are inserted into the head of the fibula along with the lateral collateral ligament and the popliteal fibular ligament. The arrangement of the structures attached to the fibular head from anterior to posterior are as follows: the lateral collateral ligament, the popliteofibular ligament, the biceps femoris tendon. It is important to note that posterior to the biceps femoris, you will find the common peroneal nerve.

The short head of the biceps femoris is important because a high sciatic nerve lesion can mimic a common peroneal nerve injury at the fibular head. In both conditions, the patient will have foot drop but, the EMG will show abnormalities in the short head of the biceps femoris muscle if the lesion is a high sciatic nerve palsy. The



lesion is not from injury to the common peroneal nerve at the fibular head, the lesion is from injury to the sciatic nerve because of EMG changes in the short head of the biceps. The short head of the biceps changes in the EMG will differentiate between a high lesion that will affect this muscle and low lesion that will not affect this muscle. The short head of the biceps femoris flexes the knee joint and laterally rotates the knee (external rotation). The nerve supply is the common peroneal nerve (L5, S1).

Anatomy of the Plantaris Muscle

The plantaris muscle arises from the lateral supracondylar ridge of the femur above the lateral head of the gastrocnemius muscle. The plantaris muscle inserts into the medial side of the calcaneus. The plantaris muscle passes between the soleus and gastrocnemius muscles down to its insertion into the calcaneus. It lies within the superficial posterior compartment of the lower leg and is absent in about 10% of the population. It allows for plantar flexion of the foot and flexes the knee.

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Anatomy of the Plantaris Muscle continued

The plantaris is innervated by the tibial nerve. The muscle contains a high density of proprioceptive receptor end organs. This allows the plantaris muscle to provide proprioceptive feedback to the central nervous system regarding the position of the foot. This muscle is commonly used by surgeons for tendon grafts, especially for Achilles tendon ruptures in order to augment the repair. The plantaris muscle could be injured in association with an Achilles tendon rupture. Occasionally, when performing the Thompson Test to check for an Achilles tendon rupture, it may show an inaccurate result if the plantaris is intact.

When rupture of the plantaris muscle occurs, the patient may feel a sharp stabbing pain at the back of the calf. The patient may also feel a "Pop" similar to being struck from behind. The calf muscle will become swollen with significant bruising. This condition is often referred to as "tennis leg". This injury occurs due to eccentric loading on the ankle with the knee extended. Treatment of this injury includes elevation, crutches, and pain control.

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Dr. Ebraheim, Amanda Critton and Lauren Corba do not have any relationships with industry to disclose.

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