Exercise & Sports Biomechanics
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Lecture 09

Muscle Origin, Insertion & Action

[Hello, everyone! Welcome back to this course. In this video, we will explore the different muscles of the upper limb and the trunk].

[Next, we will move on to the pronator teres].

Pronator teres:

If we decode it, the pronator means it describes the movement of pronation. Teres describes the shape of the muscle. It originates from the Latin word which means round. It has two heads. One is the humeral head and the ulnar head. The humeral head originates from the medial epicondyle of the humerus and the distal supracondylar ridge, and the ulnar head originates from the medial side of the coronoid process of the ulna, and it inserts at the middle of the lateral surface of the radius.

If we go into the muscle a little bit deeper, you can see there are two heads. One is the humeral head, and the ulnar head is the deep muscle. So, now I will hide the humeral head so you can see the ulnar head of the pronator teres. The humeral head originates from the medial epicondyle.

[So, you know this is the medial side. This is the condyle. So, it is originating above the condyle.] That is why it is known as the epicondyle of the humerus.

The ulnar head is also from the medial side, but it is in the coronoid process of the ulna. [We will move into the insertion].

It inserts at the lateral surface of the radius. When it comes to action, the pronator teres is responsible for the pronation movement, which is facing down.

[Next, we move on to the supinator]

Supinator:

Supinator describes the supination movement. In addition, the supinator is the spiral muscle. It originates from the lateral epicondyle of the humerus, and it inserts at the lateral, posterior, and anterior surfaces of the proximal one-third of the radius. As we discussed before, if the segment is closer to the midline, it is known as medial, and if it is away from the midline, it is known as lateral. If you notice in the image, there is a kind of round line

structure, which is known as the knuckle, which we have discussed before, and it is known as the condyle of the humerus, and this muscle originates above the condyle, which is known as the epicondyle of the humerus. This is the origin, and the supinator inserts at three different surfaces. One is the lateral surface, and the second one is the posterior surface, which we can see in the image. And the other one is the anterior surface of the radius. [So, you know, this side, the medial side, is the ulna, and the lateral side is the radius. Where exactly does it insert? In the radius, if we take the entire range of the bone, this is the proximal end, and this is the distal end of the radius].

It inserts at the proximal one-third of the radius. When it comes to action, the supinator muscle is responsible for supination. This means that from the downward direction, it is moving towards the upward, which is facing the sky.

[Next, we move on to the deltoid muscle].

Deltoid muscle:

The word deltoid comes from the Greek letter delta, which is triangular in shape. Since the deltoid muscle resembles this triangular shape, that is why it is known as the deltoid muscle. It originates from three different surfaces. One is anterior, middle, and posterior. The anterior deltoid originates from the lateral third of the clavicle. And the middle deltoid originates from the acromion process.

The posterior deltoid originates from the spine of the scapula. All three muscles insert at the deltoid tuberosity of the humerus. Let us dive into the details of the deltoid muscle. [So, I will right-click it. I will remove the muscle so that you can see the origin and insertion of it].

The first one is the **anterior deltoid**, which originates from the lateral part of the clavicle. [So, I hope you remember in the anatomical line we have learned the clavicle line, which divides the clavicle into the lateral part and the median part]. Now, the anterior deltoid originates from the lateral one-third of the clavicle. The middle deltoid originates from the acromion process, and the posterior deltoid originates from the spine of the scapula. All three muscles insert at the deltoid tuberosity of the humerus. When it comes to action, the anterior deltoid supports the flexion movement. The middle deltoid helps in the abduction movement. When it comes to rotation, the internal rotation is supported by the anterior deltoid, and the external rotation is supported by the posterior deltoid.

When we combine all these movements, we are able to perform circumduction with the help of the deltoid muscle.

[Next, we move on to the pectoralis major].

Pectoralis major:

It originates from the Latin word meaning chest. It is the chest muscle. It is pretty straightforward. It originates from the clavicular head, from the medial half of the clavicle. The next one is the sternal head, which originates from the upper costal cartilages and the

aponeurosis of the external obliques. It inserts at the lateral lip of the intertubercular bicipital groove and the crest of the greater tubercle of the humerus.

[Let us explore the pectoralis major muscle. A little bit in depth].

The pectoralis major originates from the clavicular head. In the clavicle, it is the medial half of the clavicle. In the sternal head, the first six costal cartilages, four, five, and then six, and the last one is the aponeurosis of the external obliques. Clavicular head, sternal head, and aponeurosis. It inserts at the lateral lip of the intertubercular groove. So, first, we need to understand the humerus a little bit: the lesser tubercle. This is the greater tubercle, and in between there is a space which is known as the intertubercular groove. If you notice, there is a kind of small elevation in the humerus which is known as the crest of the greater tubercle. When it comes to action in the pectoralis major, the clavicular head helps in shoulder flexion, and the sternal head performs both adduction and internal and external rotation of the shoulder.

[Next, we move on to the pectoralis minor].

Pectoralis minor:

The pectoralis means chest muscle flexion. It originates from the anterior surface of the sternum, from ribs 3 to 5, and inserts at the coracoid process of the scapula. [Let us understand the origin and insertion a bit deeper].

It originates from the ribs, from the 3rd, 4th, and 5th, and it inserts at the coracoid process of the scapula. We have already discussed that the movement will always take place from the insertion towards the origin. Insertion towards the origin. So, what happens exactly if the insertion is moving? There will be scapular protraction. When the muscle is protracted, both scapulae will move away from the spinal line, which is the abduction of the scapula.

[Next, we move on to the coracobrachialis]

Coracobrachialis:

In the name itself, it is very clear that one is the coracoid process and the other is the brachialis, which is known as the arm. Basically, it connects the coracoid process and the brachialis. It is the coracoid process over here, and the brachialis is over here. It just connects them. The origin is the coracoid process of the scapula, and it inserts at the medial surface of the humerus. Exactly in the middle part]. If you look closely, In the scapula, this is the coracoid process from where it originates, and it inserts into the medial surface of the humerus].

So, the entire part is medial, and the other side is lateral, and the most important thing is that it is in the mid part. In the entire humerus, if we divide it by two, exactly in that position, the mid-medial surface of the humerus is the insertion point. When we think about the action, insertion towards the origin, shoulder flexion and shoulder adduction will take place in the coracobrachialis muscle.

[Next, we move on to the levator scapulae].

Levator scapulae:

The word 'levator' originates from Latin and means 'lift,' while 'scapula' means 'shoulder blade.' It originates from the transverse processes of C1 to C4 of the vertebrae. It inserts at the medial border of the scapula. If you look closely, it originates from C1 to C4 in the cervical region and inserts at the medial border of the scapula. As you know, you have learned multiple times that the medial side is closer to the spine. If it is away, it is the lateral border. This is superior, and the bottom is inferior. The levator scapula is inserted at the medial border of the scapula. When it comes to movement, it goes from insertion to origin.

So, what happens is that the entire scapula will be lifted, which aligns with the name of the muscle, 'levator scapula. [In this image, you can clearly see the direction of the elevation of the scapula].

[Next, we move on to the subscapularis]

Subscapularis:

If we divide the word 'sub' and 'scapularis,' 'sub' means 'beneath,' and 'scapula' means 'shoulder blade'. The muscle beneath the shoulder blade is known as the subscapularis. It originates from the subscapular fossa of the scapula and inserts at the lesser tubercle of the humerus. We will look into the muscle of the subscapularis. It originates from the subscapular fossa, which is behind the ribcage and in front of the scapula. This muscle is anterior to the scapula.

What is meant by fossa?

Fossa is a shallow depression where the entire muscle of the subscapularis originates and inserts at the lesser tubercle of the humerus. So, this is the lesser tubercle of the humerus. When it comes to action, the movement takes place from the insertion to the origin, which is from the humerus to the scapula. Here, the internal rotation takes place, or the medial rotation of the shoulder.

[Next, we move on to the infraspinatus].

Infraspinatus:

Infra means below, and spinatus means spine. It refers to some kind of bony ridge. It originates from the infraspinatus fossa of the scapula, and it inserts at the middle part, which is the most important middle part of the greater tubercle of the humerus. [Let us understand the details of the infraspinatus].

In the scapula, there is a ridge-like structure known as the spine of the scapula.

Below the spine of the scapula is known as the infraspinous fossa, and above the spine of the scapula is the supraspinous fossa.

The fossa is a kind of shallow depression which we can clearly see in the posterior view of the scapula. The entire supraspinatus muscle originates from the infraspinous fossa and inserts at the greater tubercle of the humerus. But exactly it is in the middle part of the

humerus. When it comes to action, the muscle inserts at the greater tubercle and moves towards the scapula, which is the posterior side. In this, the external rotation or the lateral rotation of the shoulder takes place.

[The next muscle is the supraspinatus]

Supraspinatus:

You know 'supra' means above, and 'spinatus' means spine. It originates from the supraspinatus fossa of the scapula. It inserts at the greater tubercle, like the infraspinatus.

But the most important thing is where it inserts. The location is the superior aspect of the greater tubercle. As we discussed before, this is the spine of the scapula. Below the spine of the scapula is the infraspinous fossa, and above the spine of the scapula is the supraspinous fossa. The supraspinatus originates from this supraspinous fossa, and it inserts at the superior aspect, which is the top aspect of the greater tubercle of the humerus.

When it comes to action, it moves from the insertion towards the origin, where the abduction movement takes place. [In this image, you can clearly see the abduction movement of the shoulder].

[The next muscle is the teres major. So, what is meant by 'teres'?]

Teres major:

It describes the shape of the muscle, which is cylindrical. It originates from the lower lateral border and inferior angle of the scapula, and it inserts at the intertubercular groove of the humerus, which is anterior inside, and it inserts at the medial lip of the intertubercular groove. Let us understand the attachments of the teres major. It originates from the lower lateral border and the inferior angle.

So, we know that in the scapula, the side towards the spine is the medial side, and the other side is the lateral side of the scapula. At the bottom, there is an edge known as the inferior angle of the scapula. So, this teres major originates from the lateral border of the scapula and the inferior angle of the scapula. The beauty of this muscle is that it originates from the posterior side and inserts at the anterior side of the muscle.

It inserts at the medial lip of the intertubercular groove. So, this is the lesser tubercle, the greater tubercle, and in between is the intertubercular groove of the humerus, and the teres major inserts at the medial lip of the intertubercular groove. So, this is medially attached to the intertubercular groove. When it comes to action, it inserts at the intertubercular groove and moves towards the scapula. If the muscle moves from the insertion to the origin, it facilitates the adduction movement in the shoulder. Medial rotation of the shoulder and extension of the shoulder.

[Next, we move on to the teres minor]

Teres minor:

It originates from the lateral border of the scapula, from the middle part, and it inserts at the greater tubercle of the humerus in the inferior aspect of it. If you look closely, this is the medial border, lateral border, superior, and inferior. So, the origin is on the lateral side of the scapula and in the middle part of it.

The insertion is at the greater tubercle of the humerus. Which is the anterior side of the humerus and it is the inferior aspect of the greater tubercle. When it comes to action, if it moves from the insertion to the origin, it will take the lateral rotation of the shoulder, and imagine that. The arm is abducted. From the abducted position, it will come back to the adduction movement.

If you look into this image, it is very clear that the teres minor performs external rotation and adduction of the shoulder.

[Next, we move on to the latissimus dorsi. What is meant by that?]

Latissimus dorsi:

If we divide the word latissimus and dorsi, latissimus means broad, and dorsi means back, which is the broad muscle of the back. It originates from the spinous process from T7 to L5.

The second origin is at the iliac crest of the pelvis. The third one is from the thoracolumbar fascia. The fourth one is the inferior angle of the scapula and the lower three or four ribs. It inserts at the intertubercular groove of the humerus. When we look into the muscle, it originates from T7 to L5.

In addition, it also originates from the fascia of the entire thoracic to lumbar region. The third part originates from the iliac crest of the pelvis. The fourth part originates from the inferior angle of the scapula. And the last part originates from the last three or four ribs. It inserts at the floor of the intertubercular groove of the humerus. When it comes to action, the insertion towards the origin from the humerus to the back part of the body facilitates the internal rotation of the shoulder, adduction, which is moving towards the midline and extension of the shoulder.

[Next, we move on to the subclavius].

Subclavius:

Sub means below, and clavius means clavicular bone. It originates from the superior surface of the first rib and inserts at the clavicle bone. When we look into the muscle, looking a little bit deeper, it originates from the first rib, which is the superior surface of the bone, and it inserts at the clavicle, specifically at the inferior surface of the clavicle. When it comes to action, from the insertion, if it is moving towards the origin, the movement of the muscle is downward, which means it will cause depression of the clavicle, and the movement will be in a downward direction.

[Next, we move on to the rhomboid major].

Rhomboid major:

The term rhomboid refers to its shape. It exactly resembles a diamond shape. That is why it is known as rhomboid. It originates from the spinous processes of the vertebrae from T2 to T5 and inserts at the medial border of the scapula, inferior to the spine of the scapula.

When we look into the muscle, it originates from T2 to T5 and inserts at the medial border of the scapula. So, you know this is the medial border. This is lateral, superior, and inferior. In addition, it is clearly mentioned that it is inferior to the spine of the scapula.

This ridge is known as the spine of the scapula. When it comes to action, from insertion towards the origin, the movement is upward. So, this means it will elevate the scapula from the protracted position. The rhomboid major will help us to retract back to the normal position.

[Next, we move on to the rhomboid minor].

Rhomboid minor:

It originates from the spinous processes of C7 and T1 and inserts at the medial border of the scapula, superior to the spine of the scapula. If you look into the muscle, you can clearly see that it originates from C7 and T1 and inserts at the medial border of the scapula, similar to the rhomboid major. But the difference is it inserts above the spine of the scapula. When it comes to action, if we move from insertion to origin, again the same movement occurs, which is elevation of the scapula and retraction of the scapula.

[Next, we move on to the trapezius].

Trapezius:

When we look from the back view, it looks like a trapezoid, which means a four-sided figure. It is a large and flat-shaped muscle. The muscle fibers are in different directions. One is the descending part. The second one is the transverse part, and the third one is the ascending part. The descending part originates from the nuchal line. It inserts at the lateral third of the clavicle.

The transverse part originates from the spinous process of the vertebrae from T1 to T4 and inserts at the acromion process and the spine of the scapula. Lastly, the ascending part originates from the spinous process from T4 to T12 and inserts at the middle part of the spine of the scapula. From the model, you can clearly see the arrangement of the fibers.

As we discussed before, there are three different parts of the trapezius. One is the descending part, the second one is the transverse part, and lastly, the ascending part. The descending part originates from the nuchal line and inserts at the lateral third of the clavicle. The transverse part originates from the spinous process of T1 to T4 and inserts at the acromion process.

An ascending part originates from T4 to T12 and inserts at the spine of the scapula. So, this trapezius muscle helps to retract the scapula and performs neck flexion and extension. Lastly, it performs both elevation and depression of the scapula.

[So, thank you, and see you in the next video.]