

## **The Elbow Complex by Tracy Anderson**

This month's article will be on the elbow and radioulnar joints and their surrounding muscles, tendons and ligaments. To start off I will explain the anatomy of the joint and then give some brief examples of injuries and treatments.

The elbow complex is made of three bones, three ligaments, two joints and one capsule. The joining (articulation) of the humerus with the ulna and radius is commonly called the elbow joint. The elbow joint is a uniaxial hinge joint that allows only flexion and extension. There is about 145 degrees of flexion measured from the 0-degree position of extension. The 0-degree of extension is when your arm is completely straight. There is no active hyperextension, as you have in the shoulder joint. This motion is blocked by a little bony knob (olecranon process) on the ulna fitting into a small depression (olecranon fossa) on the humerus. Some people may be able to hyperextend a few degrees, but this is due to a laxity of ligaments rather than bony structures.

### **Basic Anatomy**

The joint (articulation) between the radius and the ulna is known as the radioulnar joint. These two bones connect with each other at both ends, but only the end associated with the elbow complex will be discussed. At this end the top (head) of the radius pivots within a groove in the ulna (radial notch). This joint is a pivot joint, which is uniaxial, and allows only the turning of your forearm clockwise (supination) and counterclockwise (pronation). Measured from the neutral position, there should be about 90 degrees of supination and 80 degrees of pronation. The neutral position is when your hand is straight up and down, like a karate chop. When pronation or supination occur, the radius moves around the ulna. The ulna does not move.

The three ligaments of the elbow are the medial and lateral collateral ligaments and the annular ligament. The medial collateral ligament is triangular shaped and spans the inside (medial) of the elbow. Medial means towards your body, so the medial side of your elbow, would be the side facing your body. It attaches on a bony knob (medial epicondyle) of the humerus and runs obliquely to the medial sides of the coronoid process and the olecranon process of the ulna, which are the bony knobs you can feel on the bottom half of your elbow. The lateral collateral ligament is also triangular shaped and attaches on the lateral side of your humerus (lateral epicondyle) and on the annular ligament and the lateral side of the ulna. Lateral means away from your body, so the lateral side of your elbow would be the side facing away from your body. These two ligaments provide a great deal of medial and lateral stability to the elbow. The annular ligament attaches on the front (anteriorly) and on the back (posteriorly) side of the radial notch of the ulna, encompassing the head of the radius and holding it against the ulna.

The muscles associated with the elbow complex are the Brachialis, Brachioradialis, Biceps, Triceps, Anconeus, and the Pronator Teres muscles. I will briefly explain the location and function of these muscles and then move into exercises and injuries. Remember throughout the rest of the article that flexion means to decrease the angle of the joint, and extension means to increase the angle of the joint.

The Brachialis attaches to the bottom half of the humerus on the front side and spans the elbow joint in front (anteriorly) to attach on the ulna (coronoid process and the

ulnar tuberosity), and lies underneath the biceps muscle. Because the muscle has no attachments to the radius, it plays no role in supination or pronation. Sometimes it is referred to as the work horse of the elbow, this muscle is a very strong elbow flexor.

The Bicep muscle has two heads, a long and a short head. Both heads arise from the scapula. The long head arises from the top of the shoulder joint (supraglenoid tubercle) and runs over the head of the humerus and out of the joint capsule to descend through the bicipital groove to join with the short head that has come from a bony protrusion on the front of the scapula (coracoid process). Because tendons from both heads cross the shoulder in the front, the bicep assists in shoulder flexion. But its main function is flexion of the elbow joint. After the joining of the two heads, they form a common muscle belly covering the front surface of the arm. The bicep muscle tendon then crosses the elbow to attach onto the radius (radial tuberosity). The bicep muscle also turns the forearm clockwise (supinates), because the tendon crosses the front of the elbow joint and attaches onto the radius. Remember that the radius is the bone that moves within the forearm. The bicep muscle is strongest when the elbow is flexed about half way.

The brachioradialis originates from the lower third of the humerus (lateral supracondylar ridge) and inserts onto the bottom portion radius (styloid process). This muscle is quite prominent on the top portion of your forearm near the elbow. Because of its more lateral attachment, it is most effective as an elbow flexor when the forearm is in neutral position. This is because of its vertical line of pull. This muscle initially takes the work load during elbow flexion, until your elbow is bent about a third of the way. Then your biceps start to take more of the load, and as you continue flexing your elbow, your bicep muscle takes most of the load.

The triceps muscle has three heads and is located on the back side of your arm. The long head comes from the bottom part of your shoulder joint (inferior rim of the glenoid fossa) and descends between the teres minor and teres major muscles to join the other two heads. The lateral head originates on the upper back side of your arm (inferior to the greater tubercle on the posterior humerus). The medial head lies underneath the long and lateral heads and originates below the lateral head on the back (posterior) surface of the humerus. The three heads come together to form a common muscle belly. The triceps tendon crosses the elbow on the back side (posteriorly) to insert onto the ulna (olecranon process). Because it spans the rear of the elbow vertically, it is very effective at elbow extension.

The anconeus muscle is a very small muscle that attaches beside the much larger triceps muscle. It originates from the hind (posterior) surface of your elbow (lateral epicondyle) and spans the back side of the elbow and inserts onto the ulna (laterally and inferior to the olecranon process). This muscle plays no significant role in elbow extension. When the anconeus contracts, it pulls on the annular ligament and keeps it from being pinched in the olecranon fossa during elbow extension.

The last muscle is mostly associated with the radius and ulna. It is the pronator teres muscle. This muscle is only being discussed because of its attachment on the medial side of the humerus (medial epicondyle). This muscle also originates from the ulna (coronoid process). It crosses the elbow joint on the front surface (anterior), and runs diagonally to insert on the lateral surface of the radius at about midpoint. Its

function is to turn your forearm counter clockwise (pronation), and is assistive in elbow flexion.

### **Injuries**

The elbow joint will be used in most all upper body exercises and movements. A common injury is tendonitis felt on the back of the elbow. Most people assume that this is their tricep tendon. However, in most cases, it is the tendon from the wrist flexor muscles. These sets of muscles originate from the rear side of the elbow (medial epicondyle of the humerus) and insert onto the fingers in different arrangements. During lying triceps extensions (skull crushers), some will allow there wrist to be bent backwards. This will cause stress and chronic pain to the back side of the elbow. While most think it is their elbow hurting, it is in reality the tendons from their hands, due to poor grip. This can be fixed by maintaining a strong grip on the bar and keeping your wrist flexed or stiffened. If you have this injury, and feel pain here during lying tricep curl, stay away from exercises for the triceps, when your arm is over your head. If any other exercise causes pain, stay away from it for at least four to six weeks. Use cables or dumbbell kickbacks, while working your triceps. After this period of time your tendon should be healed enough to start back using light weight. Remember to keep a firm and correct grip on the bar.

Tennis elbow is another common malady affecting many people. This is an overuse syndrome or tendonitis involving the outside region of the elbow (lateral humeral epicondyle). In simple terms it hurts on the back and/or outer side of the elbow. Microscopic tears of these tendons are very common for people in their forties, and it may or may not have come from athletics. You can test yourself by noting any tenderness over the elbow. Also you should be able to elicit tension and pain when the elbow is extended, your forearm is turned counter clockwise (pronate) and the wrist is flexed. If you feel pain when doing this, then you should lay off of any activity that causes pain. Such as throwing motions, some triceps exercises, carrying heavy objects with that arm and anything else that may affect the area.

Tendons in general take a long time to heal, because of the lack of blood flow to the area. Tendons naturally have a low blood supply, so the nutrients it needs for healing doesn't get there as fast as it would for a muscle. So using light resistance with high repetitions will force blood into the working muscle, and allow more blood flow to get to the injured tendon. Of course you might not be able to use heavy weight anyway, but use super light weight, your not going to go to failure here.

If you feel you may have injured an area of your elbow complex, you should have it looked at by a physician or therapist, so they can determine the best way for it to heal. Please visit my site at [www.LFNOnline.com](http://www.LFNOnline.com) and let me know if you have any comments or questions about my articles.