DPT 2ND SEMESTER (SECTION A)

COURSE TITLE: BIOMECHANICS-I INSTRUCTOR: AHMED HAYAT

FINAL TERM ASSIGNMENT MARKS: 50

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Class: DPT Section A

1- Enlist functions of the following muscles

Deltoid, Trapezius. Latissmus dorsi, Rhomboids, Levator scapulae, Serratus anterior

Pectoralis major minor, Tere major.

2- Name all the ligaments of Shoulder joint and their functions

3- Write Individual and combine action of Rotater Cuff muscles

4- Define Lateral epicondilitis and explain its physiotherapy treatment

5- Differentiate between type 1 and type 2 muscle fibers

ANSWER

1)

Deltoid

Function:

Anterior fibers:

Flexion and medial rotation of arm.

Clavicular part (Anterior) : flexion and internal rotation of the arm,

Middle fibers:

Abduction of arm from 15 to 90.

Acromial part(Middle) : abduction of the arm beyond the initial 15°

Posterior fibers :

Extension and lateral rotation of the arm.

Spinal part(posterior) : extension and external rotation of the arm.

Trapezius

Function

1. Upper fibers

The upper fibers can elevate and upwardly rotate the scapula and extend the neck.

2. Middle fibers

The middle or horizontal fibers of trapezius withdraw/retract the scapula as in bracing back the shoulder together with rhomboids

3. Lower fibers.

The lower fibers of trapezius pulls the medial end of scapula downwards depress the medial part of the spine of the scapula.

Latissimus dorsi

Function

Shoulder joint: Arm internal rotation, Arm adduction, Arm extension; Assists in respiration

Rhomboids

Function

• The main action of the rhomboid muscles is scapular retraction around the scapulothoracic joint. Scapular retraction is a simultaneous sliding of the scapula superiorly and medially along the trunk. This superomedial movement of the scapula rotates the glenoid cavity inferiorly, dropping the shoulder girdle. By opposing excessive scapular protraction, the rhomboids help to maintain a correct posture when sitting, standing and walking.

• The contraction of the rhomboids fixes and stabilizes the scapula into position. This provides an anchor point in space from which various muscles of the upper limb can act and a fulcrum around which the upper limb can move.

Serratus anterior

Function

The contraction of the entire serratus anterior leads to a anterolateral movement of the scapula along the ribs. Due to the pull of the inferior part at the lower scapula, the shoulder jointis shifted superiorly. This shifting now enables to lift the arm above 90° (elevation).

In contrast, the superior part depresses the scapula and thus acts antagonistically. Another function of the serratus anterior is the active stabilization of the scapula within the shoulder. Finally in a fixed scapula the muscle lifts the ribs and acts as an accessory inspiratory muscle.

Levator scapula

Function

The main function of the levator scapulae is the elevation of the scapula.

Movement is helpful when bringing the elevated arm back to the neutral position the muscle also moves

the inferior angle away from the back causing a small upward tilt of the scapula. If the scapula is fixed, a

contraction of the levatorscapulae leads to the bending of the cervical vertebral column to the side

(lateral flexion) and stabilizes the vertebral column during rotation.

Pectoralis minor

Function

The pectoralis minor depresses the point of the shoulder, drawing the scapula superior,

Teres Minor

Function

In concert with the other rotator cuff muscles, Teres Minor is instrumental in providing stability to the shoulder

joint, and helps to hold the humeral head in the glenoid cavity of the scapula.

Teres Minor, along with Infraspinatus, primarily produces external rotation of the shoulder joint.

It assists in adduction and extension of the shoulder.

When the humerus is stabilized, abducts the inferior angle of the scapula

Pectoralis major

Function.

When the arm is the anatomical position, the pectoralis major acts as a strong adductor and internal rotator

of the humerus at the shoulder joint.

Answe 2)

Ligaments of shoulder joints and their functions

Ligaments are soft tissue structure that connects bones to bones.

1 Glenohumeral joint:

Functions:

These ligaments are the main source of stability for the shoulder. They are the superior , middle, and inferior glenohumeral ligaments. They help hold the shoulder in place and keep it from dislocating.

2 coraco-acromial ligaments:

Functions:

These ligaments can thicken and cause impingment syndrome.

3 coraco-clavicular ligaments:

Function:

These two ligaments attach the clavicle coracoid process of the scapula. These tiny ligaments play an important role in keeping the scapula attached to the clavicle. A fall on the point of the shoulder can rupture these ligaments with dislocation of the ac joint.

Answer 3)

Individual and combine action of rotater cuff muscles:

Individual actions of rotater cuff muscles:

1 supraspinatus muscle:

Function:

Abducts the humerus

2 infraspinatus muscle:

Functions:

Externally rotates the humerus.

3 teres minor muscle:

Function:

Externally rotates the humerus.

4 subscapularis muscle:

Function:

Internally rotates the humerus.

Combine function of rotator cuff muscles:

The rotater cuff is a group of muscle and their tendons located around the shoulder joint. The combine action of the rotater cuff muscle are to stabilize the arm bone within the shoulder joint during movments. The function of rotater cuff muscle allow the shoulder complex to reach overhead and move the arm quickly in multiple directions.

Answer 4)

Lateral epicondilitis:

Lateral epicondylitis, also known as "Tennis Elbow", is the most common overuse syndrome in the elbow. It is a tendinopathy injury involving the extensor muscles of the forearm. These muscles originate on the lateral epicondylar region of the distal humerus. In a lot of cases, the insertion of the extensor carpi radialis brevis is involved.

It should be remembered that only 5% of people suffering from tennis lbow relate the injury to tennis! Contractile overloads that chronically stress the tendon near the attachment on the humerus are the primary cause of epicondylitis. It occurs often in repetitive upper extremity activities such as computer use, heavy lifting, forceful forearm pronation and supination, and repetitive vibration. Despite the name you will also commonly see this chronic condition in other sports such as squash, badminton, baseball, swimming and field throwing events.

Physiotherapy management:

There are different types of therapies to treat lateral epicondylitis, all with the same aim: reduce pain and improve function. General physiotherapy management includes:

* Education/Advice- on pain control and/or modification of activities
* Manual therapy- Mulligan - Mobilisation with movement
* Exercises- Strengthening and Stretching
* Modalities- Ultrasound, Transcutaneous electrical nerve stimulation (TENS)
* Braces/Splints/Straps- No clear evidence
* Medications- NSAIDs offer a short term benefit (3-4 weeks pain relief)
* Corticosteroids injection- Short term effect (6 weeks)
* Sport/Occupation Specific Rehabilitation

Answer 5)

TYPE 1:

Slow-twitch muscle fibers have high concentrations of mitochondria and myoglobin. Although they are smaller than the fast-twitch fibers, they are surrounded by more capillaries (1,2). This combination supports aerobic metabolism and fatigue resistance, particularly important for prolonged submaximal (aerobic) exercise activities.

TYPE2:

Fast-twitch type II muscle fibers are further divided into Type IIx and Type IIa. Typically, these have lower concentrations of mitochondria, myoglobin, and capillaries compared to our slow-twitch fibers, which means they are quicker to fatigue.These larger-sized fibers are also produce a greater and quicker force, an important consideration for power activities (1,2).

END