Chapter 10
Muscular System
Lecture 17

Lecture Overview

• Review of how muscles are named

• Skeletal muscle actions

• What you should know for the exam about skeletal muscle actions

• Compartments and compartment syndrome

• Hernias

How Skeletal Muscles Are Named

• Characteristics used to name skeletal muscles
  – Direction
    • Orientation relative to body midline
    • Rectus, transverse, oblique
  – Size
    • Relative size of muscle
    • Maximus, minimus, longus, brevis, lattissimus, vastus
  – Shape
    • Relative shape of muscle
    • Deltoïd, trapezius, serratus, rhomboid
How Skeletal Muscles Are Named

- Characteristics used to name skeletal muscles
  - **Action**
    - Principle action
    - Flexor, extensor, abductor, adductor, rotator
  - **Number of origins**
    - Number of tendons of origin
    - Biceps, triceps, quadriceps
  - **Location**
    - Temporalis, femoris
  - **Origin and insertion**
    - Sternocleidomastoid, stylohyoid

Skeletal Muscle Actions

- **origin** – immovable* end
- **insertion** – movable end
- **agonist** (prime mover) – primarily responsible for movement
- **synergists** – assist prime mover; stabilize joint
- **antagonist** – resist prime mover's action and cause movement in the opposite direction

Understand these terms

What You Should Know About Muscle Actions

- The muscles you will need to know for the lecture exam (name, general location, action) are in the Muscle Action Table on next slide.
- Given the name of an UNKNOWN muscle
  - Based on the naming conventions discussed previously,
  - And using your previous knowledge about the anatomy of the body,
  - And using the starred items on the chart handed out in class (from Martini – see two slides ahead),
  - You should be able to tell me what the name of a muscle implies, e.g., where it is, what it’s attached to, is it long or short, etc.
### Muscle Action Table

<table>
<thead>
<tr>
<th>Muscle Name</th>
<th>General Location</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masseter</td>
<td>Cheek in front of ear</td>
<td>Elevates mandible (raises lower jaw)</td>
</tr>
<tr>
<td>Trapezius</td>
<td>Upper shoulder</td>
<td>Elevates clavicle; Extends neck</td>
</tr>
<tr>
<td>Sternocleidomastoid</td>
<td>Side of neck</td>
<td>Rotates head; Flexes head toward shoulder</td>
</tr>
<tr>
<td>Deltoid</td>
<td>Shoulder</td>
<td>Abduction at shoulder</td>
</tr>
<tr>
<td>Biceps brachii</td>
<td>Front of upper arm</td>
<td>Flexion at elbow and shoulder</td>
</tr>
<tr>
<td>Triceps brachii</td>
<td>Back of upper arm</td>
<td>Extension at elbow</td>
</tr>
<tr>
<td>Abdominal muscles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External oblique</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal oblique</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectus abdominis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pectoralis major</td>
<td>Front of upper chest</td>
<td>Flexion, adduction, and medial rotation of shoulder</td>
</tr>
<tr>
<td>Latissimus dorsi</td>
<td>Upper back</td>
<td>Extension, adduction, and rotation of shoulder</td>
</tr>
<tr>
<td>Orbicularis Oris</td>
<td>Around mouth</td>
<td>Compresses, purses lips</td>
</tr>
<tr>
<td>Orbicularis Oculi</td>
<td>Around eye</td>
<td>Closes eye</td>
</tr>
<tr>
<td>Temporalis</td>
<td>Side of head (skull)</td>
<td>Elevates mandible</td>
</tr>
<tr>
<td>Gluteus maximus</td>
<td>Buttocks</td>
<td>Extension and lateral rotation at hip</td>
</tr>
<tr>
<td>Hamstring group</td>
<td>Back of thigh</td>
<td>Flexes, adducts, and rotates shoulder</td>
</tr>
<tr>
<td>Biceps femoris</td>
<td>Lateral part of thigh</td>
<td>Flexes, adducts, and rotates shoulder</td>
</tr>
<tr>
<td>Semitendinosus</td>
<td>Medial part of thigh</td>
<td>Flexes, adducts, and rotates shoulder</td>
</tr>
<tr>
<td>Semimembranosus</td>
<td>Medial part of thigh</td>
<td>Flexes, adducts, and rotates shoulder</td>
</tr>
<tr>
<td>Quadriceps group</td>
<td>Front of thigh</td>
<td>Extends knee</td>
</tr>
<tr>
<td>Rectus femoris</td>
<td>Deep</td>
<td></td>
</tr>
<tr>
<td>Vastus lateralis</td>
<td>Medial</td>
<td></td>
</tr>
<tr>
<td>Vastus medialis</td>
<td>Medial</td>
<td></td>
</tr>
<tr>
<td>Vastus intermedius</td>
<td>Deep</td>
<td></td>
</tr>
</tbody>
</table>

Table from: Martini & Ober, Visual A&P, 2011

### Examples of Naming Muscles

What would the levator scapulae do?

- Levator scapulae
- Supraspinatus
- Spine of scapula
- Deltoid
- Infraspinatus
- Teres minor
- Teres major
- Long head of triceps brachii
- Lateral head of triceps brachii

Examples of Naming Muscles

Near what landmark do you think the fibularis longus would be located? Would it be a short or long muscle?

What can you tell about the orbicularis oculi muscle?

Levers

• Levers can give a “mechanical advantage” in two ways:
  – To exert more force against a resisting object than the force actually applied
  – To move the resisting object farther or faster than the effort arm is moved.

Mechanical Advantage (MA) can be stated as the ratio of the output force to the input force.
**Levers**

Four Basic Components

1. **rigid bar (bones)**
2. **Fulcrum** – point on which bar moves (joints)
3. **Object moved against Resistance** (weight, Load)
4. **Effort (Force)** – supplies energy for movement (muscles)

*Whatever is in the middle tells you what type of lever system it is*

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**Hernias**

A **hernia** develops whenever an organ protrudes through an abnormal opening.

If organs become twisted or strangulated, ischemia (blood starvation) may result and surgical intervention is necessary to prevent further damage.

1. Incisional hernia
2. Umbilical hernia
3. Direct inguinal hernia
4. Femoral hernia
5. Indirect inguinal hernia

Figure from: http://drgeiss.com/p_hernia.html
A compartment is an area in which muscles, blood vessels, and nerves of a limb are isolated by dense collagenous sheets (fascia!)

Because of the strength of the connective tissue, accumulated fluid (from damage or inflammation) cannot escape

Pressure may cause ischemia and muscle damage

This is called “compartment syndrome”

Review

• Muscles are named according to
  – Direction
  – Size
  – Shape
  – Action
  – Number of origins
  – Location
  – Origin and insertion

Review

• An origin of a muscle is the fixed end of a muscle, i.e. the end that moves the least
• An insertion of a muscle is the movable end of a muscle, i.e., the end that moves the most
• A prime mover (agonist) is a muscle whose contraction is chiefly responsible for a movement
• A synergist helps a larger agonist work efficiently
• An antagonist opposes the action of an prime mover (agonist)
• Regarding muscle actions, you should know...
  – Names and actions of muscles reviewed in lab
  – Naming convention for muscles on Tortora handout chart

• Levers
  – Be able to identify the type of lever that is represented by a muscle/bone/joint diagram

• Compartments of the limbs
  – Group of muscles, blood vessels and nerves isolated by thick CT sheets
  – Inflammation or damage can cause fluid accumulation and swelling with danger of ischemia

• Hernia
  – Is a protrusion of organs through an abnormal opening
  – Is dangerous, especially if the protruding organs become strangulated or twisted