The trunk and spinal column

Chapter 10

Functions of Spine

- Consider the complexity of functions
  - provides stability to a cylinder
  - permits movement in all directions
  - supports structures of considerable weight (e.g. head)
  - provides sites for attachment of muscles & ligaments
  - acts as a shock absorber
  - protect vital organ (spinal cord)

Bones

- 33 bones of the spine
  - 7 cervical
  - 12 thoracic
  - 5 lumber
  - sacrum (5 fused vertebrae)
  - coccyx (4 fused vertebrae)
Bones

- The bones in each region have slightly different sizes and shapes
- The width of the vertebral bones increases from cervical to lumbar regions
- The vertebral foramen decreases in diameter from cervical to lumbar regions

Spine Structure

- Atlas - 1st cervical vertebrae
- Axis - 2nd cervical vertebrae
- Curvature of spine
  - cervical
  - thoracic
  - lumbar
  - sacral

Deviations from normal curvature

- Lordosis
  - increased lumbar curvature
- Kyphosis
  - increased thoracic curvature
- Scoliosis
  - lateral curvatures (in frontal plane)
Bones in the Thorax region

- 12 pairs of Ribs
  - 7 pairs are ‘true’ ribs and attach to the sternum
  - 5 pairs are ‘false’ ribs
    - 3 pairs attach indirectly to sternum
    - 2 pairs are ‘floating’ ribs and do not attach to sternum
  - ALL ribs attach to the thoracic vertebrae

Joints

- Atlantooccipital
  - skull and first cervical vertebrae
  - Allows for flexion and extension
- Atlantoaxial
  - 1st and 2nd cervical vertebrae
  - trochoid joint
- Intervertebral articulations
  - arthrodial joints

Movements of Trunk and Spine

- Spinal flexion
- Spinal extension
- Lateral flexion (left or right)
  - left lateral flexion: tilting head to left
- Reduction
  - returning from lateral flexion to neutral
- Spinal rotation (left or right)
  - left spinal rotation: left side backwards
### Muscles of Trunk and Spine

- **Movers of the head**
  - Splenius capitus (extensor)
  - Sternocleidomastoid (flexor)
- **Movers of the vertebral column**
  - erector spinae
  - Splenius cervicus
- **Muscles of the thorax**
  - inspiration: sternocleidomastoid, scalenes, ext. intercostals, diaphragm
  - expiration: int intercostals, ext & int obliques, transverse and rectus abdomini
- **Muscles of the abdominal wall**
  - rectus abdominus
  - external and internal obliques
  - transverse abdominus
  - quadratus lumborum

### Splenius (cervicis, captitis)

- **Origin**
  - cervicis: 3rd-6th thoracic vertebrae, spinous process
  - capitis: 7th cervical & 1st to 3rd or 4th thoracic vertebrae
- **Insertion**
  - cervicis: 1st three cervical vertebrae, transverse process
  - capitis: mastoid process & occipital bone
- **Action**
  - extension of head and neck
  - lateral flexion (one side contracting only)

### Sternocleidomastoid

- **Origin**
  - manubrim, medial clavicle
- **Insertion**
  - Mastoid process
- **Action**
  - flexion of head (both sides contracting)
  - lateral flexion
**Erector Spinae**

- Group of muscles that run from the occipital bone to the sacrum.
- Multiple sites for origin and insertion.
- Action: Extension of spine

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**Rectus abdominis**

- Origin
  - crest of the pubis
- Insertion
  - 5th, 6th, 7th ribs and xiphoid process
- Action
  - lumbar flexion
  - lateral flexion
- Note: does NOT cross hip joint

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**External Oblique Abdominal Muscle**

- Origin
  - borders of lower 8 ribs, lateral aspect of trunk
- Insertion
  - iliac crest, anterior half
  - inguinal ligament
  - crest of pubis
- Action
  - lumbar flexion
  - lateral flexion
Internal Oblique Abdominal Muscle

- **Origin**
  - inguinal ligament
  - iliac crest, anterior 2/3
- **Insertion**
  - 8th, 9th, 10th ribs and linea alba
- **Action**
  - lumbar flexion
  - lateral flexion

Transverse abdominis muscle

- **Origin**
  - outer third of inguinal ligament
  - iliac crest, inner rim
  - lower 6 ribs
  - lumbar fascia
- **Insertion**
  - crest of pubis, linea alba
- **Action**
  - expiration (forced)

Quadratus Lumborum

- **Origin**
  - Posterior inner lip of iliac crest
- **Insertion**
  - 12th rib and upper 4 lumbar vertebrae
- **Action**
  - lateral flexion
Summary: Trunk and Spine Muscles

- Movers of the head
  - Splenius capitus (extensor)
  - Sternocecidomastoid (flexor)
- Movers of the vertebral column
  - Erector spinae
  - Splenius cervicus
- Muscles of the thorax
  - Inspiration: sternocleidomastoid, scalenes, ext. intercostals, diaphragm
  -Expiration: int intercostals, ext & int obliques, transverse and rectus abdomini
- Muscles of the abdominal wall
  - Rectus abdominus
  - External and internal obliques
  - Transverse abdominus
  - Quadratus lumborum

The ‘Sit-up’ Exercise
Curl technique

- Joint actions:
  - Hip flexion
  - Lumbar flexion
- Muscles
  - Iliopsoas, rectus femoris
  - Abdominal muscles

Rigid Trunk Technique

- Joint actions
  - Hip flexion
- Muscles
  - Iliopsoas, rectus femoris
  - Note: The abdominal muscles DO NOT cross the hip joint.