

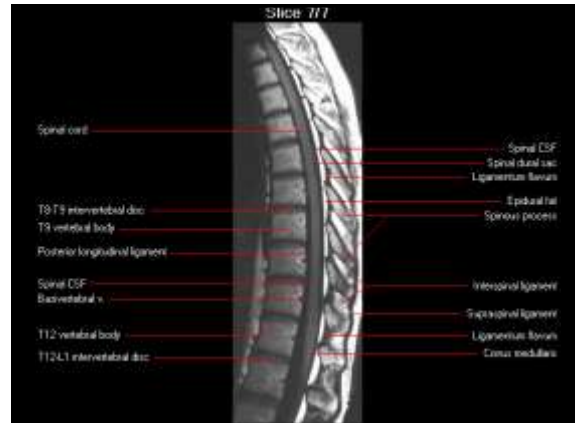
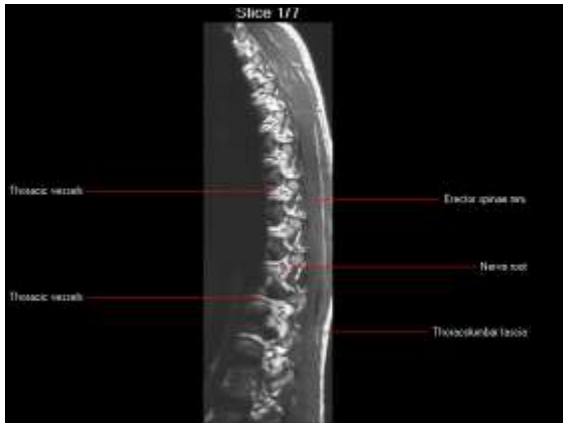
Anatomy and Kinesiology of the Thoracic Spine

Review of the basics before we get down to assessment and diagnosis

Applied Anatomy



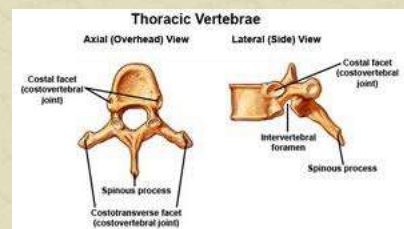
- ❖ 12 vertebrae
- ❖ 12 pairs of ribs
- ❖ Costovertebral joints
- ❖ Costovertebral joints
- ❖ Costosternal joints
- ❖ Intervertebral/intercostal joints
- ❖ Facet joints
- ❖ Intervertebral discs



Thoracic Vertebrae

- ❖ Similar in basic make-up to the lower cervical and lumbar vertebrae
- ❖ Possess longer spinous processes which overlap considerably
- ❖ Design of the vertebrae lead to a natural mild kyphosis
- ❖ Contains less motion than either the lumbar or cervical regions

Thoracic Vertebrae



Facet Joints of the Thoracic Spine

Resting position: Midway between flexion and extension

Close packed position: Extension

Capsular pattern: Side flexion and rotation equally limited, then extension

The Ribs



The Ribs

- ❏ 12 pairs of ribs
- ❏ Lowest pairs (11th and 12th) do not have an anterior attachment – Floating Ribs
- ❏ Middle pairs (8th -10th) attach to sternum via a combined cartilaginous attachment – False Ribs
- ❏ Uppermost pairs (1st-7th) have bony attachments both anteriorly and posteriorly

Intercostal Muscles

- ❏ Muscles run between ribs in pairs
- ❏ Internal intercostals extend from the front of the ribs, and go posteriorly past the rib angle.
- ❏ External intercostals (on the outside of the ribcase) wrap around from the back of the rib almost to the end of the rib anteriorly.
- ❏ Diagonal direction improves elevation of the ribs during respiration.

Costovertebral Joints



- ❏ Synovial joints
- ❏ Head of the rib articulates with the vertebral body below, the intervertebral disc and the vertebral body above.
- ❏ 7th rib articulates with the 7th and 8th vertebral bodies as well as the intervening disc.

Costotransverse Joint



- ❏ Synovial joints
- ❏ The tubercle of the rib articulates with the transverse process of the thoracic vertebra
- ❏ The 11th and 12th ribs do not articulate in this way
- ❏ They are free floating ribs
- ❏ Pain on respiration may mean either costotransverse and/or costovertebral joints could be affected

Costosternal Joints

- ❏ The 1st rib articulates with the manubrium as a cartilaginous joint
- ❏ All the other articulations are synovial joints
- ❏ Ribs 2-7 articulate with the sternum
- ❏ Ribs 8-10 are united to the 7th rib by cartilage as an interchondral joint



Intervertebral Discs

- ❏ Thin
- ❏ There are usually very few disc problems in thoracic spine
- ❏ Those that do present tend to clear quickly and have an easily identifiable cause



Facet Joints

- ❏ The shape and orientation of the facets determines the movement
- ❏ Superior facets face posteriorly, superiorly and slightly laterally
- ❏ Inferior facets face anteriorly, inferiorly and slightly medially
- ❏ Rotation is greatest movement



Movements of The Thoracic Spine

Limited By

- ❏ The rib cage
- ❏ The costotransverse and costovertebral joints
- ❏ The facet joints
- ❏ The thin IV discs
- ❏ The shape and proximity of spinous processes



Thoracic Movement

- ❏ Very few studies have been done on thoracic spine movements
- ❏ Main movement of the thoracic spine is rotation
- ❏ Rotation and side flexion are coupled in the thoracic region.



Thoracic Movement

- ❏ Amount of flex and ext, and lateral flexion increases from T1-2 to T11-12
- ❏ The amount of rotation decreases
- ❏ T1 is the least mobile vertebrae
- ❏ T12-L1 is a very mobile transitional point



Movements

- ❏ FLEXION- anterior sagittal rotation and translation, ribs stretch at CT and CV joints
- ❏ EXTENSION - occurs with backward bending or elevation of the arms. Posterior sagittal rotation and translation with compression of CT and CV joints



Movements

- ❏ ROTATION - Superior vertebrae will rotate to the right and pull the rib with it.
- ❏ SIDE FLEXION - elevation of ribs on the opposite side to the movement



Movements of the Ribs

- ❏ The ribs are relatively horizontal at the top of the rib cage
- ❏ As they descend they run more obliquely
- ❏ The 12th rib is more vertical than horizontal
- ❏ Inspiration draws the ribs upwards and outwards, thus increasing the antero-posterior diameter of the rib cage



Movements of the Rib Cage T1-6

- ❏ During inspiration the first 6 ribs rotate about their long axis
- ❏ Downward rotation of the rib neck is associated with depression
- ❏ Upward rotation of the same portion is associated with elevation
- ❏ This gives rise to the Pump Handle Action



Movements of the Rib Cage T7-10

- ❏ Ribs 7-10 mainly increase in lateral direction
- ❏ The ribs move upwards, backwards and medially
- ❏ This is known as the Bucket Handle Action



Movements of the Rib Cage T11-12

- ❏ The lower ribs move mainly laterally in what is referred to as the Caliper Action
- ❏ This increases lateral diameter
- ❏ The ribs are quite elastic in children but they eventually become hard and brittle



Possible Sources Of Pain

- ❏ Vertebrae
- ❏ Dura
- ❏ IV discs
- ❏ Posterior longitudinal ligament
- ❏ Posterior thoracic muscles
- ❏ CT and CV joints
- ❏ Facet joints
- ❏ Nerve root compression



Patterns of Referred Pain

- ❏ Need to diagnose difference between visceral and spinal referred pain
- ❏ Chest pain - cardiac, pulmonary, pleural disease, oesophagus
- ❏ Angina- may affect face, jaw, and neck
- ❏ Hiatus hernia
- ❏ Abdominal
- ❏ Gynaecological



Pain Referral

- ❏ Thoracic pain “shooting through” - disc
- ❏ Pain referred horizontally around chest - Synovial joint
- ❏ Pain referred down and around chest wall - root involvement (Grieve 1981)



Kyphosis

- ❏ Most common condition in the thoracic region
- ❏ Slight posterior curvature of the thoracic spine is normal
- ❏ PT must ensure an excessive curvature or kyphosis is present



Kyphosis

- ❏ Very often reducible and easily managed
- ❏ Occasionally may require surgical intervention
- ❏ Will be discussed next week



Any Questions?