

## Unit 4:

# Principles of radiological anatomy

### GENERAL OBJECTIVES:

- understand principles of plain and contrast radiography
- understand principles of CT, MRI, ultrasound and endoscopy
- recognize and name skeletal elements of the vertebral column on radiographs
- recognize and name skeletal and articular elements of the shoulder complex on radiographs

### SPECIFIC OBJECTIVES:

The focus of this practical class is on repeating the material from first two teaching units by studying specifics of bony/articular features on radiographs. The focus is on general principles of viewing long, short, flat and irregular and pneumatic bones.

Problems with 'indirect' viewing of articular elements (made of soft tissue) should be recognized.

### **A. Plain Radiographs of Lumbar spine**

(1) The projected images of a typical vertebra:

<b>Elements</b>	<b>Views</b>
Body	A-P or P-A
Pedicles	Lateral
Laminae	(Oblique)
Articular processes	
Transverse processes	
Spinous process	

(2) The transition zones:

Study the changes in the elements as you move from L3 up to T12 and from L3 down to L5. Can you relate these changes to function?

Study the lumbosacral junction, with its astonishing change in angle and regrouping of the elements.

(3) The lumbar spine as a whole:

- Alignment of elements  
Check the alignment of each **set** of vertebral elements from T12 to S1 in each view and the symmetry of pairs of elements.
- Grey spaces  
Discs - alignment and relative size  
Facet joints - integrity and alignment  
Intervertebral foramina - alignment and relative size  
Spinal canal - measurement  
Interlaminar space, Interspinous space

### **B. Plain Radiographs of Thoracic Spine**

#### **A-P and Lateral Views**

(1) Individual Vertebrae:

**Compare** typical thoracic with typical lumbar vertebrae noting:

Direction of pedicles

Direction of transverse processes

Plane of facet joints

Rib articulations

**Build the image** in both views - Body, Pedicles, Laminae, Articular processes, Spinous processes, Transverse processes, Ribs superimposed.

(2) Transition Zones:

Note changes in elements at cervicothoracic and thoracolumbar zones.

(3) Spine as a Whole:

Study the primary curve, the alignment of elements, discs, facet joints, intervertebral foramina and spinal canal.

Consider the role of thoracic spine as a primary anchor for rib movement,

What special problems arise from superimposition of shadows? How might you solve these?

### **C. Sectional Anatomy of Back**

**CT & MRI** Study individual elements demonstrated at each level, articulations, spinal canal and nerve exits, surrounding soft tissues. What provides radiographic contrasts?

## **Radiological anatomy of Neck**

### **Plain Radiographs (A-P, Lateral, Oblique) Of Cervical Spine**

The Pedicle as a signpost. Its direction determines where the other elements will project.

From C3 to C6 the images are almost identical. C7, C1 and C2 will need special attention.

#### **Lateral C3-7**

Build the image:

Body, Pedicles, Laminae, Articular Column, Spinous Process, Transverse Processes

What differences do you note at C7 level? How is it trying to be thoracic?

Alignment of elements:

Anterior body line - follows odontoid of C2

Posterior body line - follows odontoid also

Articular column

Spino-laminar line

Articulations and spaces:

Discs - relative thickness?

Facet joints - how are they projecting?

Intervertebral foramina - Why can't you see them?

Spinal canal - Measure it. Markers?

Prevertebral soft tissue line

#### **A-P, C3-7**

Alignment:

Bodies

Articular columns Where does the articular column project?

Spinous processes - central, equidistant

Articulations and Spaces:

Discs

Facet joints - why can't you see them?

Intervertebral foramina - why can't you see them?

Spinal canal - hard to measure. Why?

#### **Obliques C3-7 (R & L required)**

Pedicles and intervertebral foramina are now seen! Why?

#### **Lateral, C1-2**

Note the end of the articular column at C2-3.

Where is the corresponding joint between the lateral masses of C1 and C2?

Note the slope of the odontoid process (dens) of C2.

Alignment and Spaces:

Anterior body line to dens. Posterior body line to dens

Spino-laminar line to posterior arch to foramen magnum

Spinal canal, widening for brain stem

Median C1-2 joint. Lateral C 1-2 joints

Soft tissue line up to nasopharynx

### **A-P "Open Mouth", C1-2**

Lateral C 1-2 joints - Note slope and symmetry.

Posterior arch of C1 superimposes on dens. Why? Where is anterior arch projected?

## **Shoulder Region**

### **Adult Shoulder**

#### **A-P, A-P Oblique**

Bony landmarks - humeral head and tuberosities, glenoid fossa, coracoid process, acromio-clavicular joint.

Articular margins/surfaces, including both anterior and posterior margins of glenoid.

Congruency?

Lines of force. Note relationship to articular surface.

Angle of humeral head to shaft.

Cartilage space. Note its changing manner of projection in the AP versus oblique.

Epiphyseal line.

Soft tissues and invisible relationships.

#### **Lateral**

Locate glenoid via coracoid and acromion. (Refer to bone).

Study the relationship of large humeral head to small glenoid.

Locate acromio-clavicular joint.

### **Growth Patterns**

Identify and label each epiphysis, with associated epiphyseal plate and metaphysis.

Think about the consequences of damage to the growing elements of bone.

### **Clavicle**

Medial articulation with manubrium. Shaft, with cortex and medulla

Lateral articulation with acromion, arching above shoulder joint