

## LECTURE 03 NECK AND TRUNK

### HYPAXIAL MUSCULATURE OF NECK

<u>NECK</u>	<u>VENTRAL</u> infrahyoids	<u>LATERAL</u> scalenes	DORSOMEDIAL prevertebral
<u>THORAX</u>	-----	ext.intercost. int.intercost. quadratus lumb	-----
<u>ABDOMEN</u>	rect.abdom.	ext.oblique int.oblique	psoas

cf Romer, p.261: Arey 6 p434

Thus in the neck the hypaxial musculature is represented by the prevertebral muscles, the scalenes, and the infrahyoids.

### PREVERTEBRAL MUSCLES OF NECK

<u>Muscle</u>	<u>Innervation</u>
1. longus colli	C2-C6
2. longus capitis	C1-C3
3. rectus capitis anterior	C1-C2
4. rectus capitis lateralis	C1-C2

SLIDE

GM 10 Fig 43.4

1. Longus colli extends from the bodies of T1-T3 to the bodies of C2-C4, sending slips to the anterior tubercles of C3-C6:

sketch

insertions of

longus colli and capitis

(Williams and Warwick, 1980) fig.5.36

2. Longus capitis extends from the anterior tubercles of C3-C6, to the base of the skull on the occipital bone. The longus mm. fill the hollow between the bodies and the transverse processes:

sketch

TS neck or vertebra

showing long. cap.

cf e.g. (Grant and Basmajian, 1980) 36.3

3. Rectus capitis anterior extends from the front of the lateral mass of C1 to the occipital, just anterior to the occipital condyle, and covers the atlanto-occipital joint.

4. Rectus capitis lateralis extends from the transverse process of C1 to the jugular process of the occipital bone, just lateral to the occipital condyle:

sketch

rect.cap. lat. &

rect.cap. ant.

cf (Williams and Warwick, 1980) fig. 5.36

All of these muscles are to some extent flexors of the head and neck.

## **LATERAL VERTEBRAL MUSCLES OF THE NECK**

Scalene muscles extend obliquely from the upper two ribs to the cervical transverse processes. They act to bend the neck forwards, and to the same side---i.e. flexion + lateral flexion.

Remember that the roots of the brachial plexus emerge between the scalene muscles - in fact between the anterior scalene and the medial and posterior scalene.

Anterior scalene: anterior tubercles of C3-C6 to scalene tubercle on the first rib:

sketch

anterior and

medial scalene

from Grey 35 fig. 5.36

Medial scalene: posterior tubercles of C2-C6 to 1st rib

Posterior scalene: posterior tubercles of C4-C6 to 2nd rib

## **VENTRAL MUSCLES OF NECK**

These are the infrahyoid muscles, dealt with in FA1.

Attachments of muscles to cervical vertebrae:

SLIDE

(Grant and Basmajian, 1980) Fig. 26.11

A longus colli

H iliocostalis cervicis

B longus capitis

I longissimus cervicis

C scalenus anterior

J longissimus capitis

D scalenus medius

K semispinalis capitis

E scalenus posterior

L semispinalis cervicis

F levator scapulae

M multifidus

G splenius cervicis

## **MUSCULOSKELETAL ANATOMY OF BACK**

- 1) Thoracic and lumbar vertebrae
- 2) Muscles of back
- 3) Muscles of abdomen

### **THORACIC VERTEBRAE**

#### **Facets for ribs**

In the thoracic region the transverse processes have an articular process on the ventral surface of the tip for articulation with the tubercle of the rib (T1-T10); this is known as the costotransverse joint. There is another just ventral to the vertebral canal for articulation with the head of the rib. In T2-T9 thoracic vertebrae, this facet is shared between two adjoining vertebrae.

SLIDE (GM)

#### **Spinous processes**

The spinous processes of the middle four vertebrae (T5-T8) point downwards, while the upper and lower spinous processes are more horizontal.

SLIDE (GM)

#### **Articular processes**

The superior articular processes face backwards and laterally (cf Table). In fact they are set more or less on the arc of a circle, so that the movements in the thoracic region are mainly rotations about the vertical axis (GM10 p70a, Grey 35 p44a):

SLIDE

GM10 Fig. 5.4

In flexion, side bending and rotation occur to the same side (Gray 36 446a), as in the cervical spine, while in neutral and extension, they occur to opposite sides (Grieve, 1981) p48b. This is relevant to Gracovetsky's hypothesis of the spine as the driving force behind walking.

## LUMBAR VERTEBRAE

The lumbar vertebrae have no costal facets (obviously). They have large bodies (weight bearing) and large quadrangular spinous processes. There is also an *accessory process* at the postero-inferior aspect of the root of the TP. The superior articular facets face medially and backwards, and on the posterior border of each is a rough elevation, the mammillary process.

In the lumbar region, the IVF is bordered posteriorly in part by the ligamentum flavum (Moore 1, p588). The vertebral canal is normally triangular in cross section, but in some cases may be narrowed or stenotic. There is then a narrowed lateral recess, in which the nerve roots may be compressed (Grieve, 1981) p28.

sketch

Movements. In the lumbar region, flexion/extension is the movement which predominates. In fact the first 50 - 60 degrees of spinal flexion occurs in the lumbar spine, mainly in the lower motion segments (Frankel and Nordin, 1980) p.262. This is probably due more to the massive thickness of the discs than to the orientation of the articular facets. These face back and medially, so that rotation would require the bodies to move with respect to one another, which is not possible (F&N fig. 10-5)

**MUSCLES OF BACK** (Williams and Warwick, 1980; Oliver and Middleditch, 1991)

Remember that in the trunk, as in the neck, we have epaxial and hypaxial musculature:

EPAXIAL: erector spinae + transversospinalis

HYPAXIAL: dorsomedial, lateral and ventral groups

**EPAXIAL muscles:**

- INTERSPINALES and INTERTRANSVERSARI

These are present in the cervical and lumbar regions, but mostly absent from the thoracic region (Grant and Basmajian, 1980).

Interspinales are paired, one on either side of the interspinous ligament.

Intertransversarii are also paired.

In the **cervical** region, they have anterior and posterior slips, which join adjacent anterior and posterior tubercles, and are separated by the anterior primary rami (which lie in the gutter formed by the intertubercular lamella). They have a particularly high density of muscle spindles (Oliver and Middleditch, 1991), p132, Abrahams, 1977) and may have a more important sensory function than motor function.

In the **lumbar** region, there is a medial and lateral - the medial runs from the mammillary process and accessory process above to the mammillary process below, while the lateral runs between transverse processes (

sketch

- TRANSVERSOSPINALIS

- |                         |           |
|-------------------------|-----------|
| 1. Semispinalis (super) | 5-6 segs. |
| 2. Multifidus           | 3-4 segs. |
| 3. Rotatores (deep)     | 1-2 seg.  |

- ERECTOR SPINAE

1. Iliocostalis (lat)
2. Longissimus
3. Spinalis (med)

These are all covered by the thoracolumbar fascia. The thoracolumbar fascia is the dorsal aponeurosis of transversus abdominis, and splits so that the

superficial layer attaches to the lumbar spines, while the deep layer attaches to the tips of the lumbar transverse processes.

Transversospinalis lies in the groove between the spinous process and the transverse process: remember that the transverse process separates the epaxial from the hypaxial musculature:

sketch

T.S. of vertebra

showing erector spinae

transversospinalis

+ aponeurosis & fascia

cf Grey 36 fig 5.38

GM10 26.10

## TRANSVERSOSPINALIS

The deeper group is the transversospinalis. The muscles originate from transverse processes below, to insert on spines above.

sketch

T.S. showing

rotatores, multifidus,

semispinalis

**Rotatores** are the deepest and span 1- 2 segments. They run from the transverse process to the lower border and lateral surface of the lamina (rather than the spinous process). (Hollinshead 315b). Since these muscles have the most oblique fibres of the group, they probably play a role in rotation of one vertebra with respect to its neighbour. They are best developed in the thoracic region.

**Multifidus** overlies these, spanning 3-4 segments. It forms the middle layer of transversospinalis. It arises as a thick, fleshy mass from the dorsal aspect of the sacrum, and from the transverse processes up to C4, to insert on the lower border of each spinous process. It is best developed in the lumbar region, where it also attaches to the mammillary processes.

sketch

spans of

rotatores

multifidus

semispinalis

**Semispinalis** is the most superficial and spans 5-6 segments. Clearly any other arrangement would result in the deepest muscle having to penetrate other, shorter muscles to reach its attachments. Semispinalis is divided into three parts as follows:

<u>Semispinalis</u>	<u>ORIGIN: TPs</u>	<u>INSERTION</u>
capitis	C4-T5	skull
cervicis	T1-T6	spines C2-C5
thoracis	T6-T10	spines C6-T4

Semispinalis capitis and cervicis we referred to before when dealing with the neck.

Actions: the semispinalis muscles acting bilaterally extend the vertebral column. Acting unilaterally, they produce lateral flexion- but this will be linked with rotation to the same side, especially in the cervical region.

## ERECTOR SPINAE

This muscle overlies the transversospinalis group, and extends from the pelvis to the skull. It arises from the lumbar spines and sacral crest and from the iliac crest of the pelvis, as a single mass.

### SLIDE

GM10 Fig. 26.9

showing parts of erector spinae

On reaching the thoracic vertebrae, it splits into three columns, each with three parts:

	<u>PART</u>	<u>SUPERIOR ATTACHMENT</u>
1.	Iliocostalis lumborum thoracis cervicis	angles of lower 6 ribs angles of upper 6 ribs transverse processes
2.	Longissimus thoracis cervicis capitis	lumbar and thoracic T.P.s
3.	Spinalis thoracis cervicis capitis	upper lumbar to lower cervical spines

1) Spinalis is inconstant or blended with semispinalis; difficult or impossible to identify

2) Muscles of erector spinae group are basically more lateral than the transversospinalis group.

Longissimus capitis inserts onto the mastoid process, while semispinalis capitis inserts medially, on either side of the ligamentum nuchae.

Longissimus cervicis inserts onto transverse processes (via tendons) while semispinalis cervicis is a transversospinal muscle and therefore attaches to spinous processes.

Actions: Act bilaterally as extensors and unilaterally as lateral flexors.

**References**

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