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Understanding the equine back

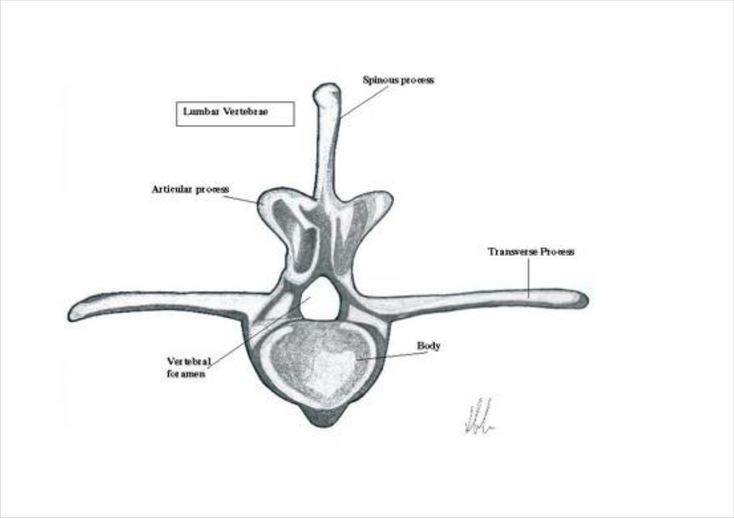
Presented by Equestricare

Unlike the head and neck, the horse's back is a highly inflexible structure, capable of only minor movements up and down and laterally.

This is because the back has evolved to carry weight. Not the weight of the rider but of the organs (especially digestive system).

Smythe and Goody estimate the movement to be less then 15-20cm in a supple horse, and there are not a lot of those around.

When you watch a horse move you get the impression that there is a lot of movement through the spine, but when you really analyse it, most of this movement comes from the neck and pelvis, giving the appearance of bend in the back.



Vertebrae are comprised of:

- Vertebral Body – The solid, main part of the bone
- Vertebral Arch or Foramen – The space where the spinal cord goes
- Vertebral Processes – Attachment sites for muscles and ligaments
  - Dorsal or Spinous – The top process
  - Transverse – The lateral / side process
  - Articular – The small processes closest to the foramen, also called articular facets. Cranial and caudal.

Thoracic Vertebrae

There are 18 thoracic vertebrae give or take 1.
The photo shows the first 12.
These vertebrae provide the attachments for ribs (costae) and are linked by intervertebral fibrocartilages.

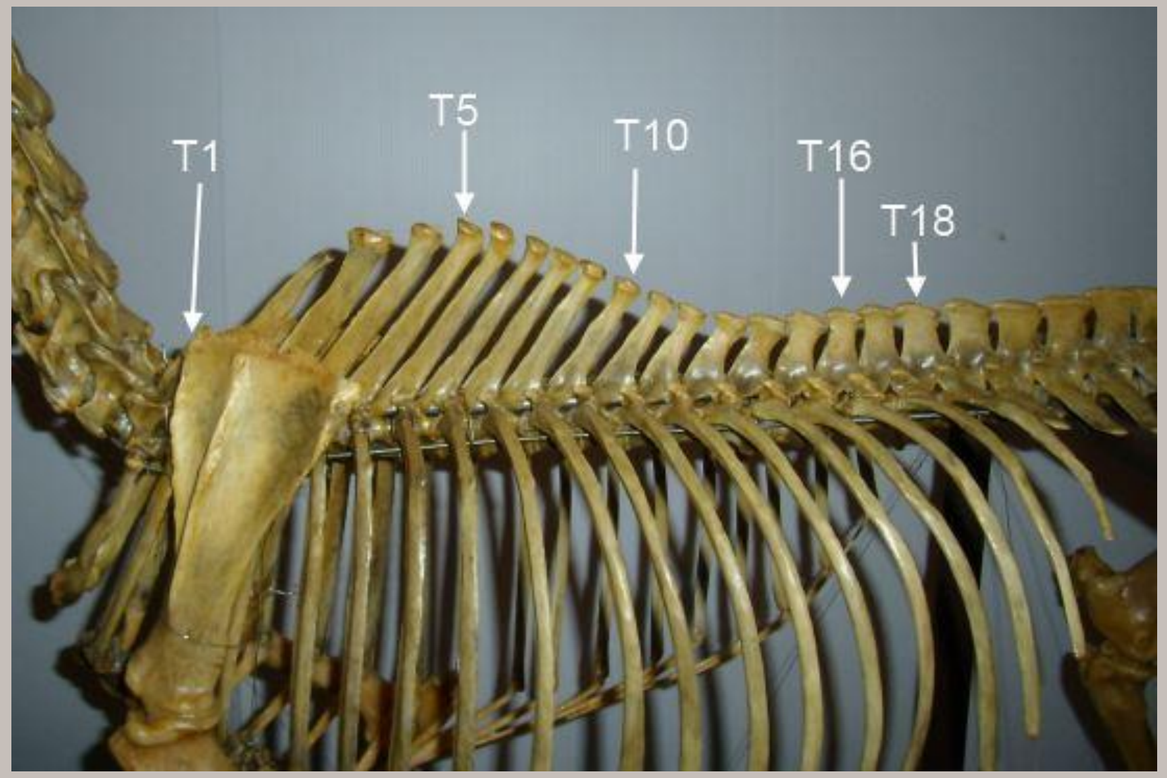
Thoracic Vertebrae

Photo courtesy of Horses Inside Out

The spinous processes of the thoracic vertebrae are much higher then other vertebrae, reaching their peak at T4 where the highest point of the wither would be, and becoming smallest towards the back around T16 which is called the “anticlinal” vertebrae and is the vertebrae in which the direction changes from caudal to ventral.

The fibrocartilages between the thoracic vertebrae aid weight bearing, shock absorption and the maintenance of the small amount of flexibility.

Thoracic Vertebrae



The middle of the back! This is approximately T13-T15

- They are the closest together vertebrae
- They are furthest away from the support areas of the forelimbs and hindquarters.
- This makes them most susceptible to postural issues
- And guess what. They are where we sit!

Ribs

Horses have 18 pairs of ribs (unless they have one extra or one less thoracic vertebrae, in which case they have one less or one more pair!)
Each rib attaches between each pair of thoracic vertebrae via a synovial joint.
Ribs are curved, elongated and elastic.
They are joined at the bottom by the costal cartilages, and the first 8 ribs articulate with the sternum.
The last rib is much shorter and not attached by cartilage to the one in front an is considered a “floating” rib, even though it is still attached to the thoracic vertebrae.

Lumbar Vertebrae

Lumbar vertebrae are not part of the “true” back, but make up what is considered the lower back region of the horse (which, like in people has numerous issues).
There are most commonly 6 lumbar vertebrae, although a number of horses only have 5. These horses also tend to have one additional thoracic vertebrae.

Lumbar Vertebrae

Lumbar vertebrae have very long (7-10cm) and very wide (2cm) transverse processes. The transverse processes of the last three lumbar vertebrae have synovial articulation, and like with any other synovial joint can develop arthritic changes (ankylosis). Unfortunately this fusion is very common.

Muscles

EXPAXIAL

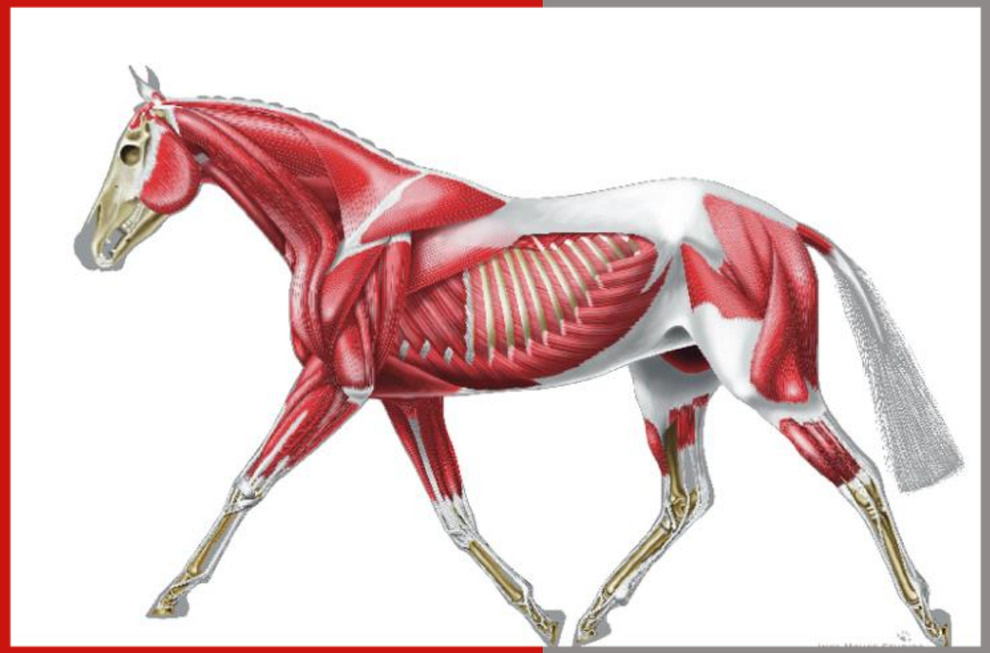
dorsal to the transverse processes

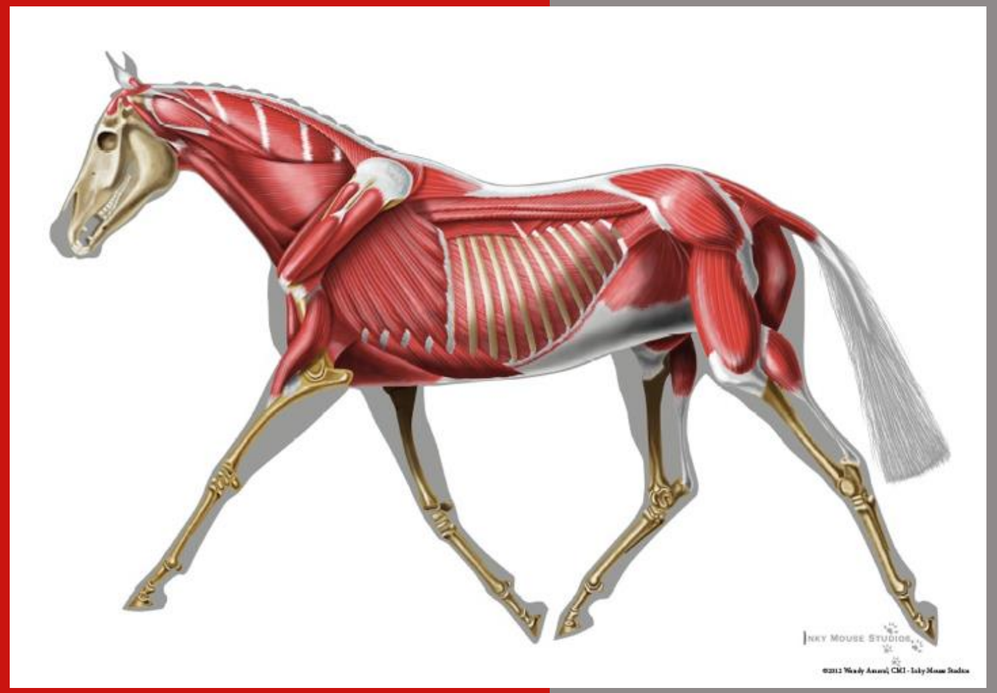
HYPAXIAL

ventral to the transverse processes

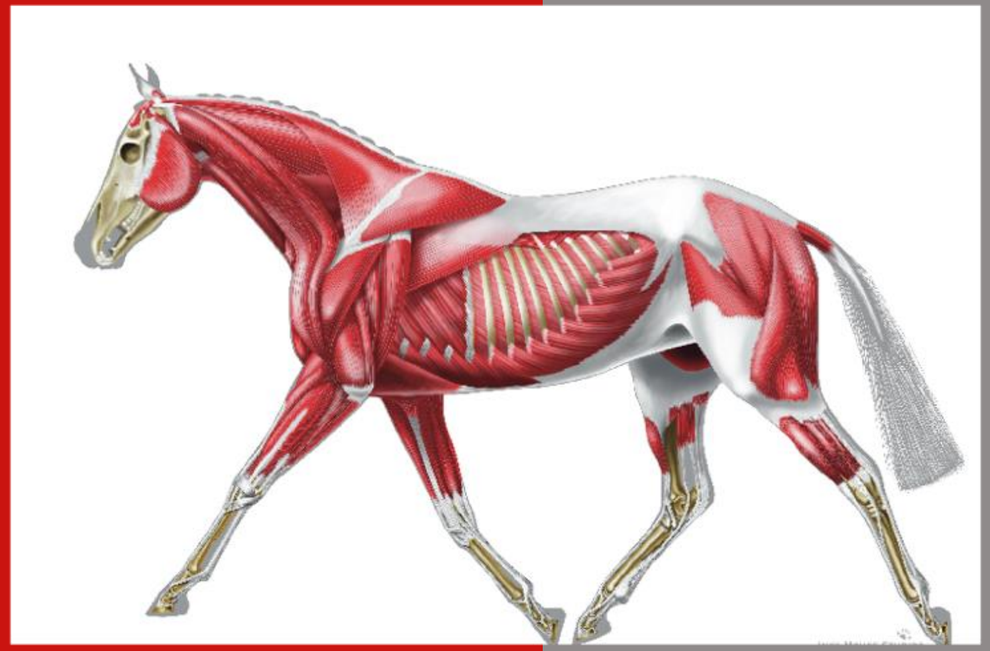
Epaxial Muscles have three layers

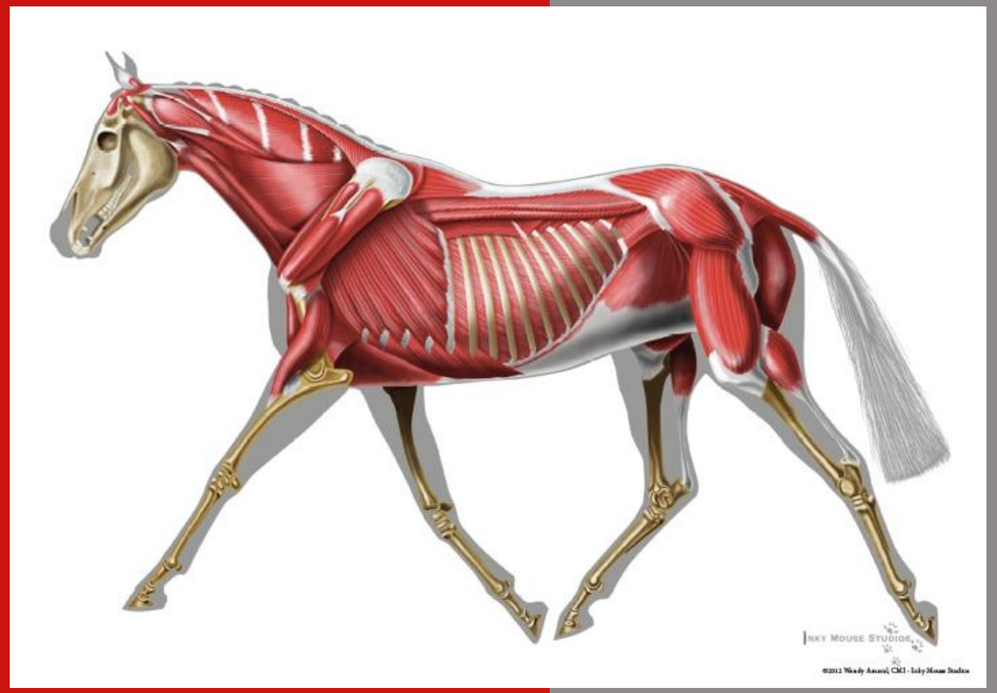
- Primary Layer –
Trapezius Thoracis and Lattissimus Dorsi
- Secondary Layer –
Rhomboideus thoracic, Serratus dorsalis
- Tertiary Layer –
Iliocostalis, Longissimus dorsi, Multifidus dorsi, Intertransversarius lumborum





- Hypaxial muscles are ventral and include the Psoas major and Psoas minor, Iliacus and Quadratus Lumborum





Ligaments

The ligaments of the back can be divided into two main types. Long ligaments and short ligaments.

LONG LIGAMENTS

•Supraspinousligament (continuation of the nuchal ligament) – sits on top of the spinous processes

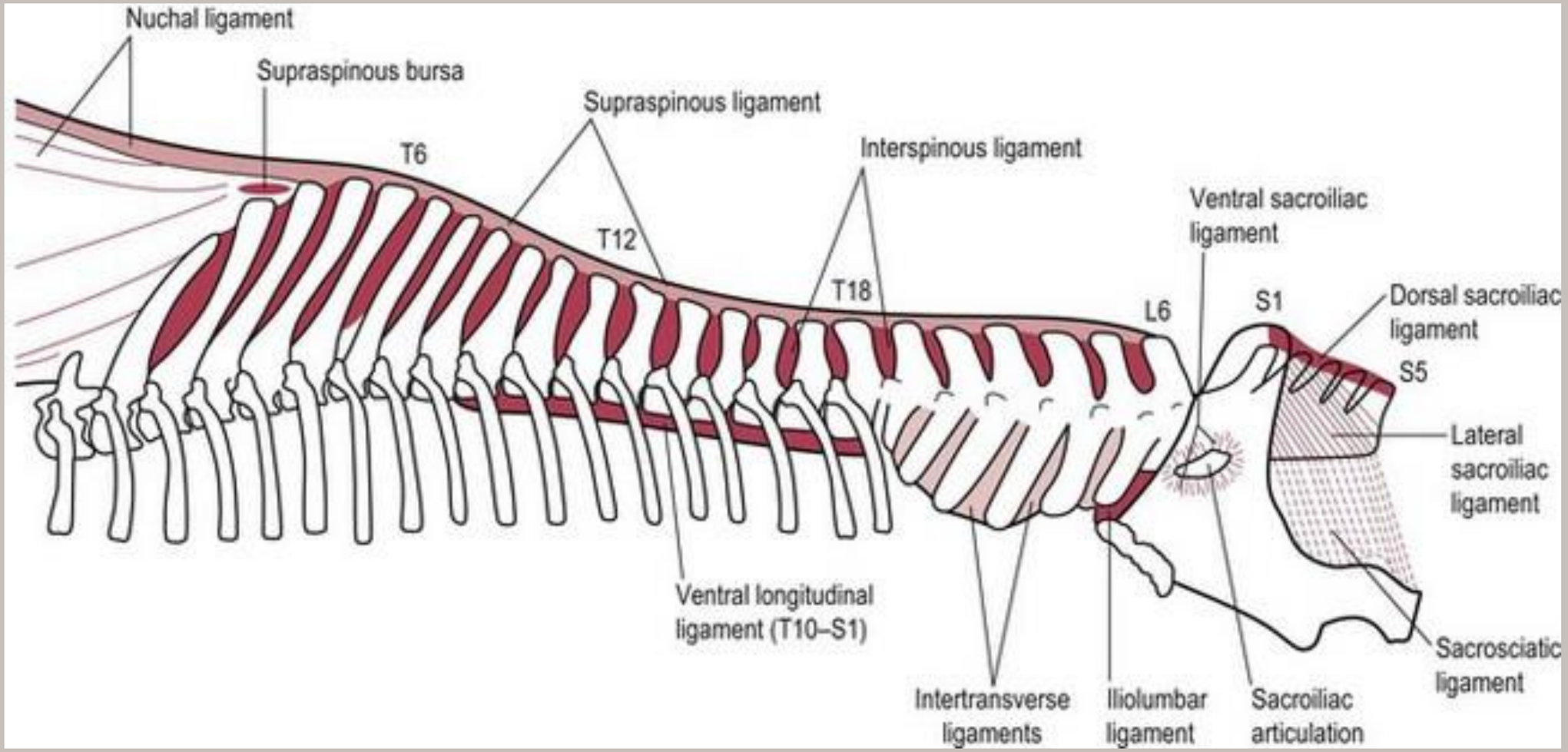
•Dorsal and ventral longitudinal ligaments – dorsal longitudinal ligaments sit under each vertebrae, ventral longitudinal ligaments sit under each vertebral disc.

Ligaments

SHORT LIGAMENTS

- Interspinous ligament – sits between each spinous process
- Ligamentum flavuum – sits between each articular process
- Costovertebral ligament = sit between the vertebrae and the ribs
- Costotransverse ligament – sits between the vertebrae and the ribs

Spinal Ligaments



MOVEMENT OF THE BACK

It's important to take your joints through their full range of movement on occasion.

There are four types of movement within the back.

1. Lateral Flexion
2. Rotation
3. Flexion
4. Extension

LATERAL FLEXION

Side to side
A horse only bends laterally in the back: 1 - 10 degrees
(this is not a lot!)
The feel of lateral flexion for a rider actually comes from the ribs.

ROTATION

Twisting
Very little rotation in the back.
Greatest amount of rotation is in walk (or rolling) especially over poles

FLEXION

Rounding of the back
Less then 4 degrees
Most visible in Canter
Most increased by going backwards

EXTENSION

Hollowing of the back
Less then 4 degrees
Most visible in canter

MOVEMENT OF THE BACK

CERVICOTHORACIC JUNCTION

Lateral flexion - Approx 28 degrees
Flexion/Extension - Approx 33 degrees
Rotation - Approx 1 degree.

THOROCOLUMBAR JOINTS

Rotation - Approx 1 degrees
Lateral flexion - between 1 - 10 degrees
Flexion & Extension - Less then 4 degrees

ATLANTO-OCCIPITAL JUNCTION

Flexion & Extension - Approx 85 degrees
Lateral Flexion - Approx 44 degrees
Rotation - Approximately 20 degrees.

CERVICAL JOINTS

C1/C2 - Rotation 108 degrees, lateral flexion 3.9 degrees, dorso flexion & extension 15 degrees.
C2 - C7 - Rotation 1 - 2 degrees, lateral flexion - 25 - 45 degrees, Dorso flexion and extension - 20 - 30 degrees

Most lateral flexion of the back occurs between T9/T10 and T14/T15

Most flexion of the back occurs between T17/T18 and T18/L1
Least Flexion between T3 - T9

Most extension (Dorso Flexion) of the back is between T14 - T18.
Least extension (dorso-flexion) T2 - T9

The Spine

FLEXION
(VENTROFLEXION)

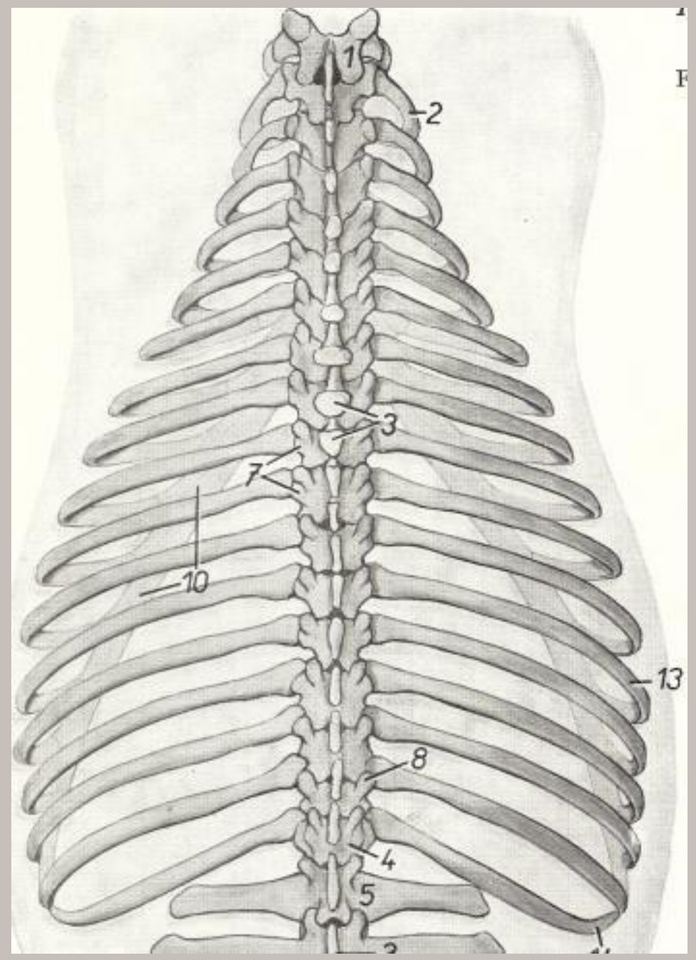
1.1 - 6 mm

EXTENSION
(DORSOFLEXION)

0.8 - 3.8 mm

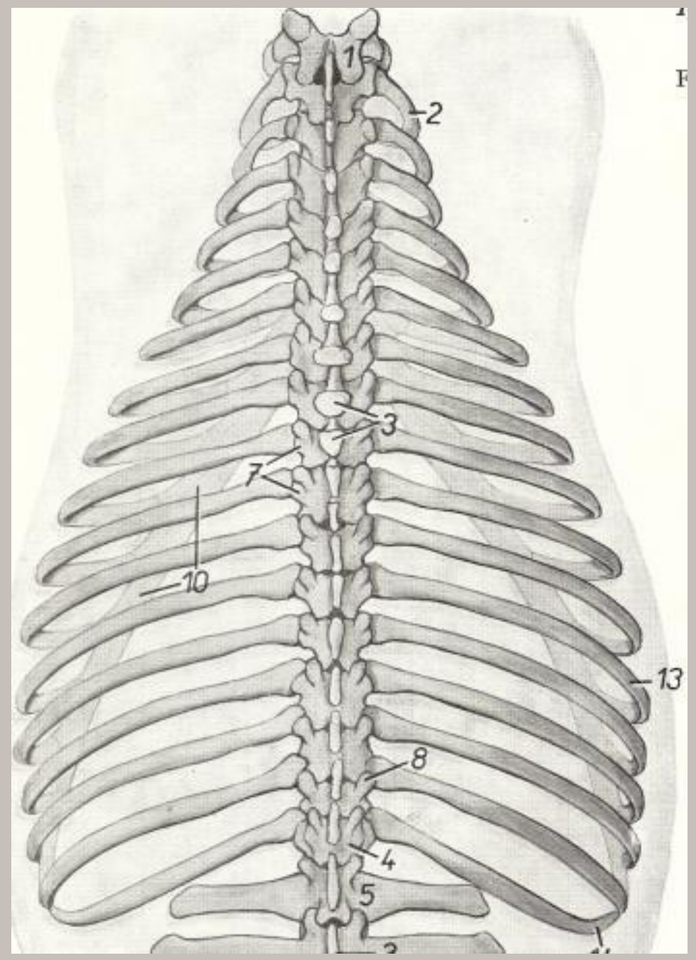
The Ribs

THERE ARE ONLY 8 TRUE RIBS THAT CONNECT TO THE STERNUM, THE OTHER TEN ARE "FALSE" RIBS AND ARE CONNECTED BY CARTILAGE.



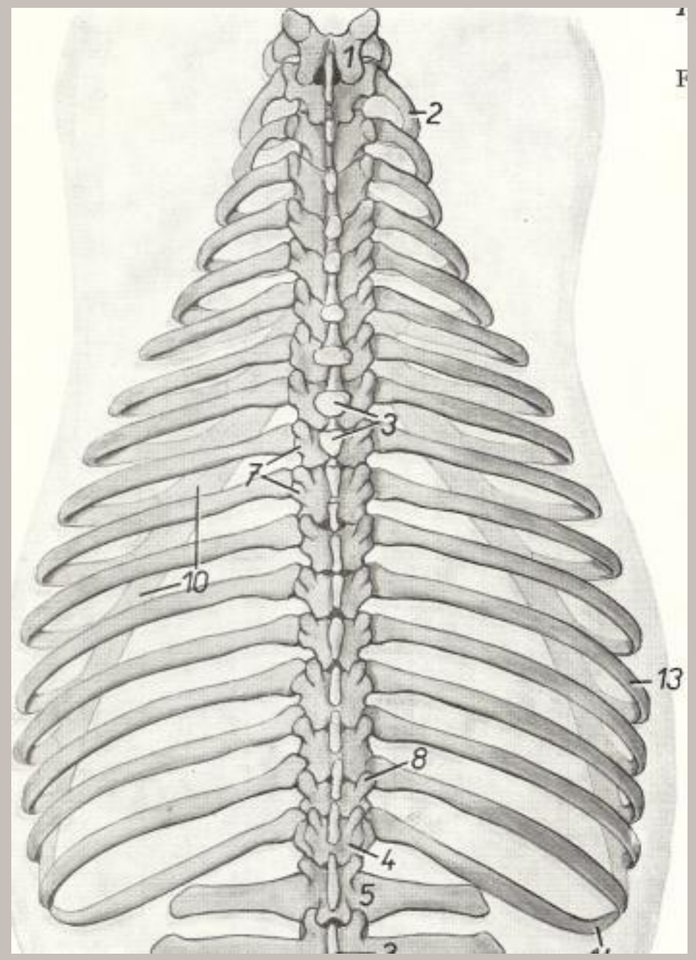
The Ribs

EACH RIB HAS TWO FACETS WHICH ARTICULATE WITH THE TWO ADJACENT VERTEBRAE AND 1 TUBERCLE WHICH ARTICULATES WITH THE TRASVERSE PROCESS OF THE VERTEBRAE BEHIND IT



The Ribs

RIB MOVEMENT IS THEREFORE ONLY THE ROTATION AROUND THE AXIS THAT CONNECTS THE HEAD AND TUBERCLE



Locking the lumbar spine

Putting the head down does not raise the back, instead it pulls on the tops of the tall spinous processes. The strain on the nuchal ligament also increase strain on the supraspinous ligament of the back. This causes constant traction and locking of the lumbar spine.