بسم الله الرحمن الرحيم





FINAL | Lecture 2

CLINICAL



Written by: Muthanna Khalil





﴿ وَإِن تَتَوَلَّوْا يَسْتَبْدِلْ قَوْمًا غَيْرَكُمْ ثُمَّ لَا يَكُونُوَا أَمْنَ لَكُمْ ﴾

اللهم استعملنا ولا تستبدلنا

Clinical anatomy of Back

Dr.Fadi Hadidi, MD, AFRCSI Asso.Prof of Orthopaedics and Spine Surgery

Outline

- Alignment of spine.
- Disease related to alignment of spine.
- Clinical applications of anatomy of spine.

Learning outcome

- To understand the importance of the anatomy of the vertebral column.
- To realize the impact of alignment of vertebral column on function of humans.
- To apply the basic knowledge in clinical practice





The vertebral column consists of:

- 1. Vertebrae
- 2. Intervertebral discs

Vertebrae are divided into:

1. Typical (has body + arch)

2. Atypical

- The sacrum is composed of fused vertebral bodies without arches, so it is considered atypical.
- The coccyx is like the sacrum.
- C1 (the atlas) has 2 arches and no body, so it is also atypical.

Vertebral Segment (the functional unit) Composed of 2 vertebrae and the disc in between

The importance of vertebral discs is that they help the vertebrae withstand the force of gravity exerted by the body.

These discs are composed of fibrocartilaginous material.

In absence (or wear down) of these discs, the bones are prone to multiple fractures, especially in elderly people with osteoporosis.



ROM: Range of Motion

- collectively LARGE ROM
- flex/ext
- L-R rotation
- L-R lateral flexion

The vertebral column is very flexible; it is capable of aiding in many movements, and even the combination of these movements simultaneously is possible due to the presence of multiple joints.

Nevertheless, this wide ROM makes the spine one of the most prone structures to different injuries. Stability is inversely proportional to mobility.





Sagittally, the spine is curved In a unique manner.

Terminology:

Parts that are concave anteriorly are referred to as **Kyphosis.**

Parts that are concave posteriorly are referred to as **Lordosis.**

So: Cervical lordosis Thoracic kyphosis Lumbar lordosis Sacral kyphosis



The spine is straight when viewed from a coronal (ant-post) view. The primary function of the spine is to keep the head vertically above the pelvis. This is why the spine is straight (form a coronal view).

Any deviation of the head to the side should signal the body to correct the state and return the head above the pelvis, otherwise abnormalities occur.



Contracture in the sternocleidomastoid muscle caused the head of this baby to shift towards the left side, disrupting the line of gravity and making left structures suffer more gravity compared to their right counterparts.

This will with time cause **facial asymmetry** since the <u>structures that suffer more gravity will grow slower</u>.

This effect is not exclusive to the face; any structure similarly affected will have the same consequences.

Surgical and/or physiotherapeutic interventions should be made to correct this abnormality before it can cause permanent changes which occurs after about 9 months of uncorrected gravity line deviation.





This is a case of scoliosis, which is increased lateral deviation of the spine to one side.

Left structures (suffering more gravity) will grow slower, so the left ribs and left lung will be relatively small.

Aside from the aesthetics, serious complications can occur if left untreated such as respiratory insufficiency and with time leading to heart failure.

Surgical intervention to fix the deviation is needed,





The sagittal profile is uniquely curved as seen.

Humans are the only species of vertebrates (الفقاريات) that has lordosis components in their spine. Other species have only kyphosis and thus cannot stand on 2 limbs; they need 4 limbs.

Kyphosis is the natural posture that is assumed even by humans during sleep or in stressed situations to protect internal organs.

So, lordosis is against the norm. We suffer pain from spinal segments that have lordosis \rightarrow . Inductive like the segments that have lordosis the segment of the segment segment of the s

We stand and walk on 2 limbs, and this gives humans 2 advantages:

- Preserves energy (2 < 4); we need to eat relatively less compared with most animals given the body mass sustained by this food.
- 2. This shape makes 50% of the spine pass anterior and 50% posterior to the gravity line, minimizing the points that lie on the line itself, decreasing compression on the vertebrae.



Also in fetal life, kyphosis is seen.



6.3 The newborn has a C-shaped spine. The first lordotic cu ppear is the cervical lordosis with crawling (to maintain ho





Conventionally, spine configurations are of 3 types:

- Positive sagittal balance, where the gravity line is anterior to the spine.
- Negative sagittal balance, where the gravity line is posterior to the spine.
- Neutral.

Clinically, this has important effects (see next slides).

People are normally under one of the 3 categories. Patients usually seek medical advice when they feel problems.

Sagittal balance



Patients with (+) balance will have the following symptoms.

Positive balance

- Headche
- Migraine
- Decrease cervical motion

The patient keeps his neck flexed with limited extension.

- Chronic neck and back tension
- Increase risk of CVD
- Pulmonary problems

Calcification of the spine, making the kyphosis more severe with time. This leads to exaggerated clinical outcomes.

Ankylosing spondylitis

Clinical features

Kyphotic posture





Always flexed neck. Chin may touch chest. Difficulty eating, especially solid food. Respiratory and cardiac problems.



Surgical 'fixing' of the spine is typically done to reduce the positivity of the sagittal balance.

Things may not return perfect, but at least severe consequences may be overcome.



Surgical outcomes in elderly are usually less reliable.

Preventive measures are vital.





Negative sagittal balance

Usually has physiologic etiology, such as obesity or pregnancy.

Effects:

- Facet joint arthropathy
- Overload sacroiliac joint
- Overload hips and knees
- Muscles strains

- Fracture of pars interarticularis
- spondylolisthesis

To compensate for the (-) balance.



CEABILITY



Important!!



Obese patients acquire (-) sagittal balance, due to the increased mass in the belly anteriorly.

Obese patients must lose weight to improve.



Pregnant ladies (especially in the 3rd trimester) will have their balance negative to accommodate the growing fetus anteriorly.

Things are not worrisome in a normal case because after pregnancy ends, everything returns normal.



In patients with severe back pain that they cannot withstand, symptomatic treatment by steroid injection is offered.

Pregnant ladies will sooner or later return normal.

Obese patients have to lose weight.









Pars interarticularis fracture



Spondylolisthesis.

Occurs after untreated fractures in pars interarticularis.

Things must be fixed fast, otherwise the intervertebral disc will degenerate will continuous movement, worsening the case.





Most of the weight of the body (about 70%) is carried by the bodies of vertebrae.

Only about 30% is carried by the arches.



If the load increases, the bodies of the vertebrae will be affected, possibly causing their fracture.

The vertebrae lying on the gravity line are most prone to this. (C1, T1, L1, S1).

AXIAL LOAD/ COMPRESSIVE FORCES



In case of vertebral body fracture, more weight is directed towards the arches, causing chronic low back pain, and possibly injury to the spinal cord in left without treatment.



Artificial bone is injected inside the body of the fractured vertebra, restoring the integrity of the body and its weightbearing capacity (70%).



In severe cases, the whole vertebra is replaced.



Take home message

• Normal alignment of spine is critical for optimal function

• Sagittal balance is major predictor of disability related to chronic back pain especially in elderly patient like osteoporosis

Doctor's advice:

- Take care of your spines.
- Exercise to strengthen the muscles.
- Don't overload.

Thank you



For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			

رسالة من الفريق العلمي:

أسأل الله لكم التوفيق أكمله وأجمله والمعذرة فالملف كتب على عجالة دعواتكم