

# Connecting the dots in Ehlers Danlos Syndrome

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# Disclosure

- Director, Center for Complex Conditions
- Trained at the Harvard Medical School
- Assistant Professor (Medicine), Brown Medical School, Rhode Island, USA
- Medical Advisory Board of multiple non profit organizations
- No financial disclosure



# Disclaimer

- I have no actual or potential conflict of interest in relation to this presentation or program
- This presentation will discuss “off-label” uses of medications
- Discussions in this presentation are for a general information purposes only.

# EDS

- The human body is made up of a skeleton
- The different parts of the human body are connected by muscles, ligaments, and skin.
- Because they connect everything together they are known as connective tissue.
- Connective tissue in EDS is soft, breaks down easily and takes longer to heal

# EDS

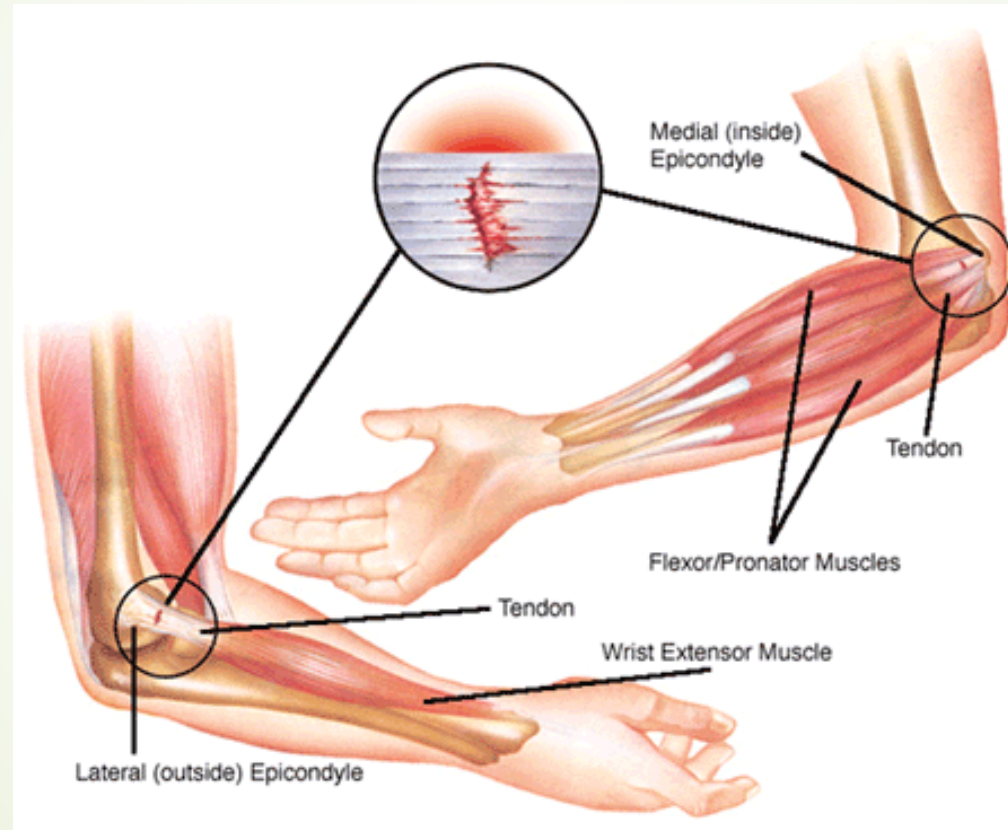
- ▶ Connective tissue in EDS is soft, breaks down easily and takes longer to heal



# Tissue damage in EDS

- ▶ In EDS, tissue is soft and breaks down easily.
- ▶ It takes longer to repair itself.
- ▶ Tissue damage happens on a daily basis from micro trauma.

People with EDS are more prone to wear and tear





Treat the cause of the  
pain

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# To manage pain first find out what is the cause of the pain

- Find out what is the cause of the pain
  
- For example, pain in the shoulder joint can be from:
  - Dislocated shoulder joint,
  - Muscle spasms
  - Nerve or blood vessel impingement or damage
  - All the above
  
- The treatment of each of these is different

# Principles of managing pain in EDS

- Use a mix of treatments. There is no one simple solution
- For example - Knee pain due to instability
  - Stabilize knee with braces
  - Medications – NSAID's, topical etc.
  - Is there an instability of the ankle that is causing the knee pain
- Follow the 10% rule



# Head pain and headaches

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# Common causes of headaches in EDS

Migraines

Chiari malformation

Cervicogenic Headaches – from muscles

Temporo Mandibular joint dysfunction (Craniofacial pain)

Postural Orthostatic Tachycardia Syndrome (PoTS)


Tethered Cord syndrome (TCF)

Spontaneous CSF (Cerebrospinal) leak – low pressure headache

Cranio Cervical Instability (Instability of the neck and head)

Idiopathic Intracranial Hypertension

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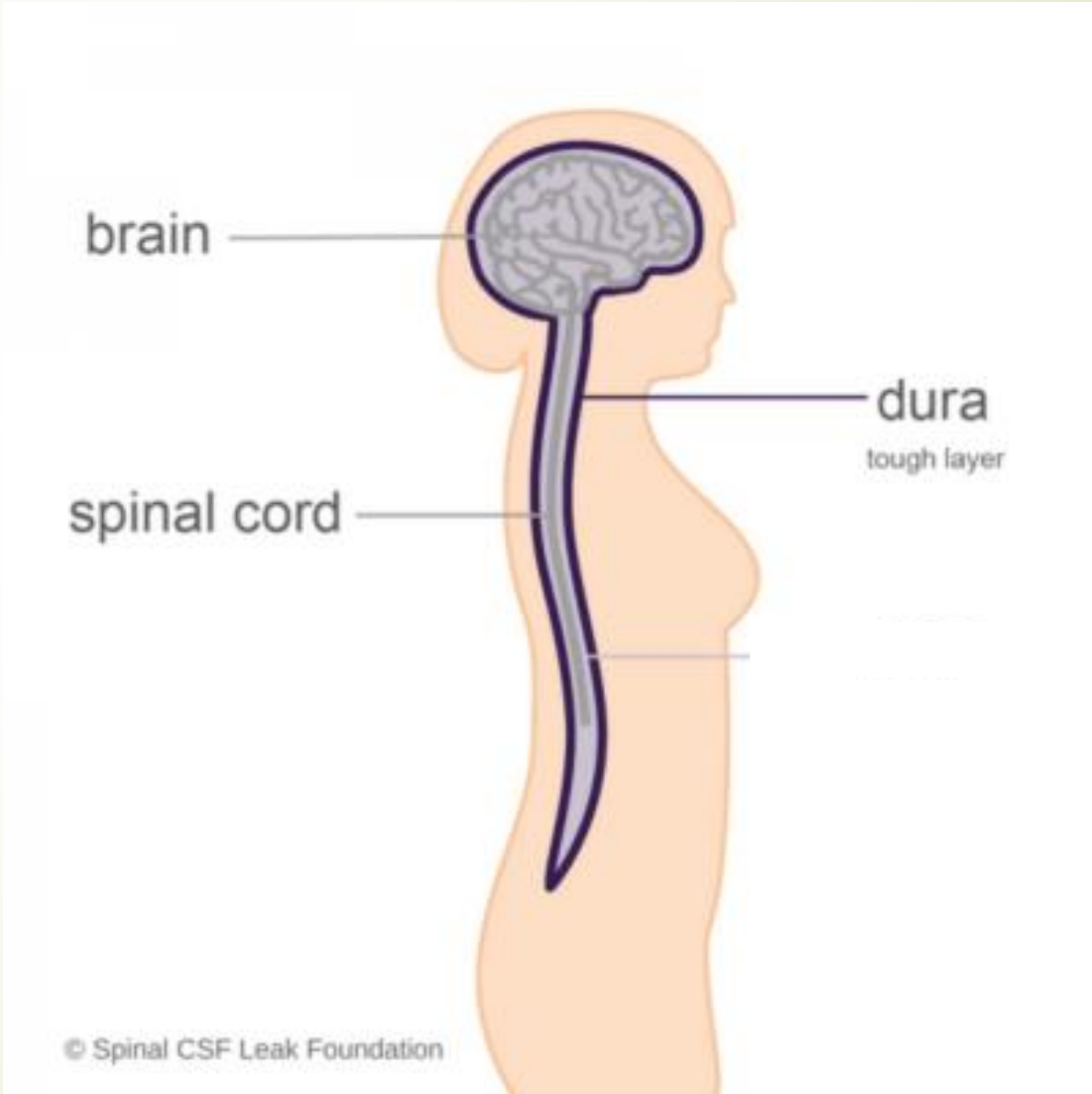


“My whole head hurts, I see double, I can feel throbbing in my ears, it increases when I laugh or cough ”

# Increased Intracranial Hypertension (IIH) – increased pressure inside the head

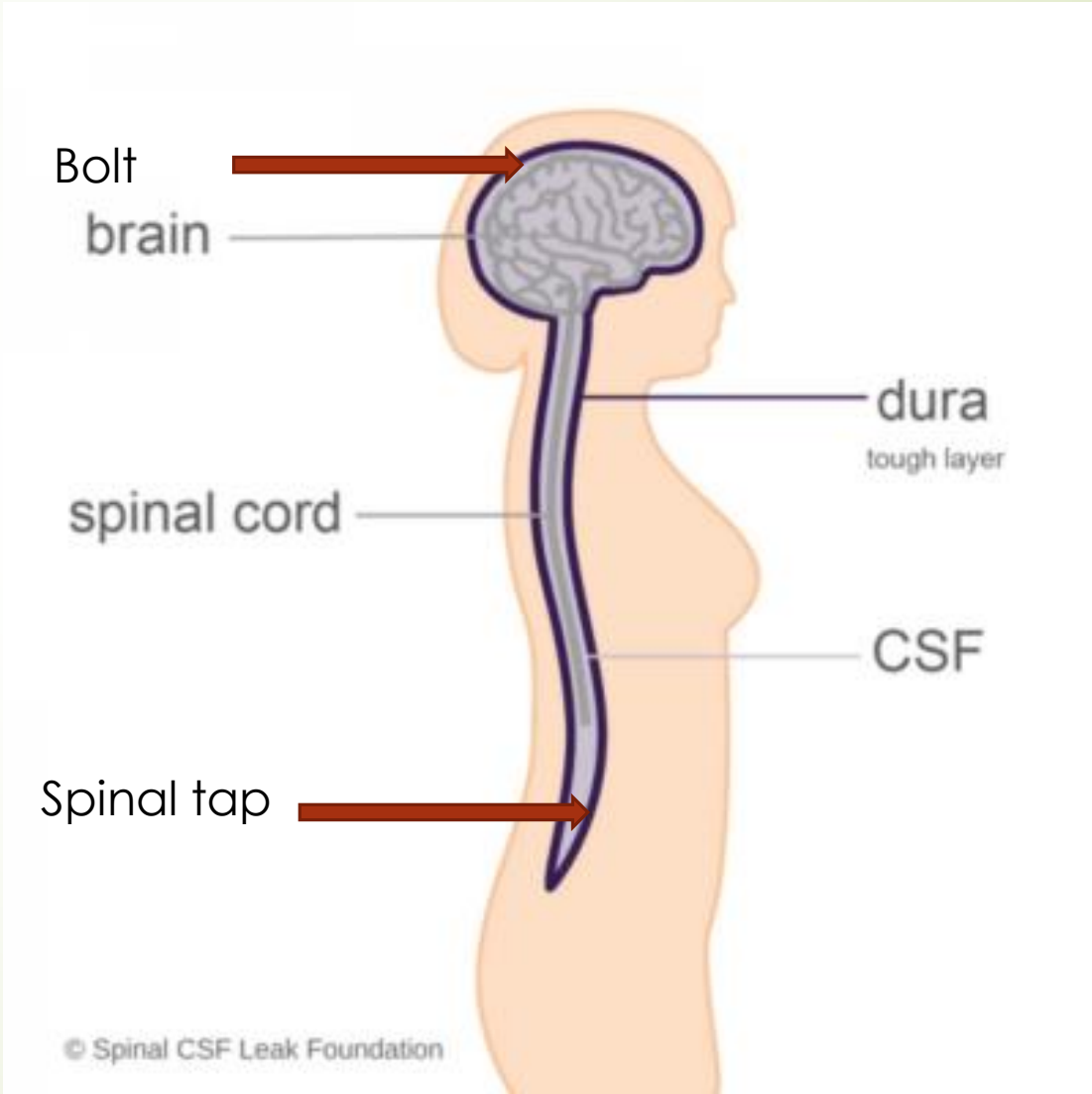
- Raised pressure inside the head from different reasons
- Headache increase with coughing or sneezing
- Ringing in the ears which pulses (pulsatile tinnitus)
- Maybe because of narrowing of blood flow (venous sinus stenosis) or Chiari Malformation
- Diagnosis: ~~spinal tap~~, MR venography, Upright MRI of neck for Chiari, Subarachnoid Bolt, eye exam,
- Treatment: medicines to decrease fluid pressure in the head, VP shunt to drain excess fluid, stent, surgery for Chiari

# CSF Flow around brain and spinal cord

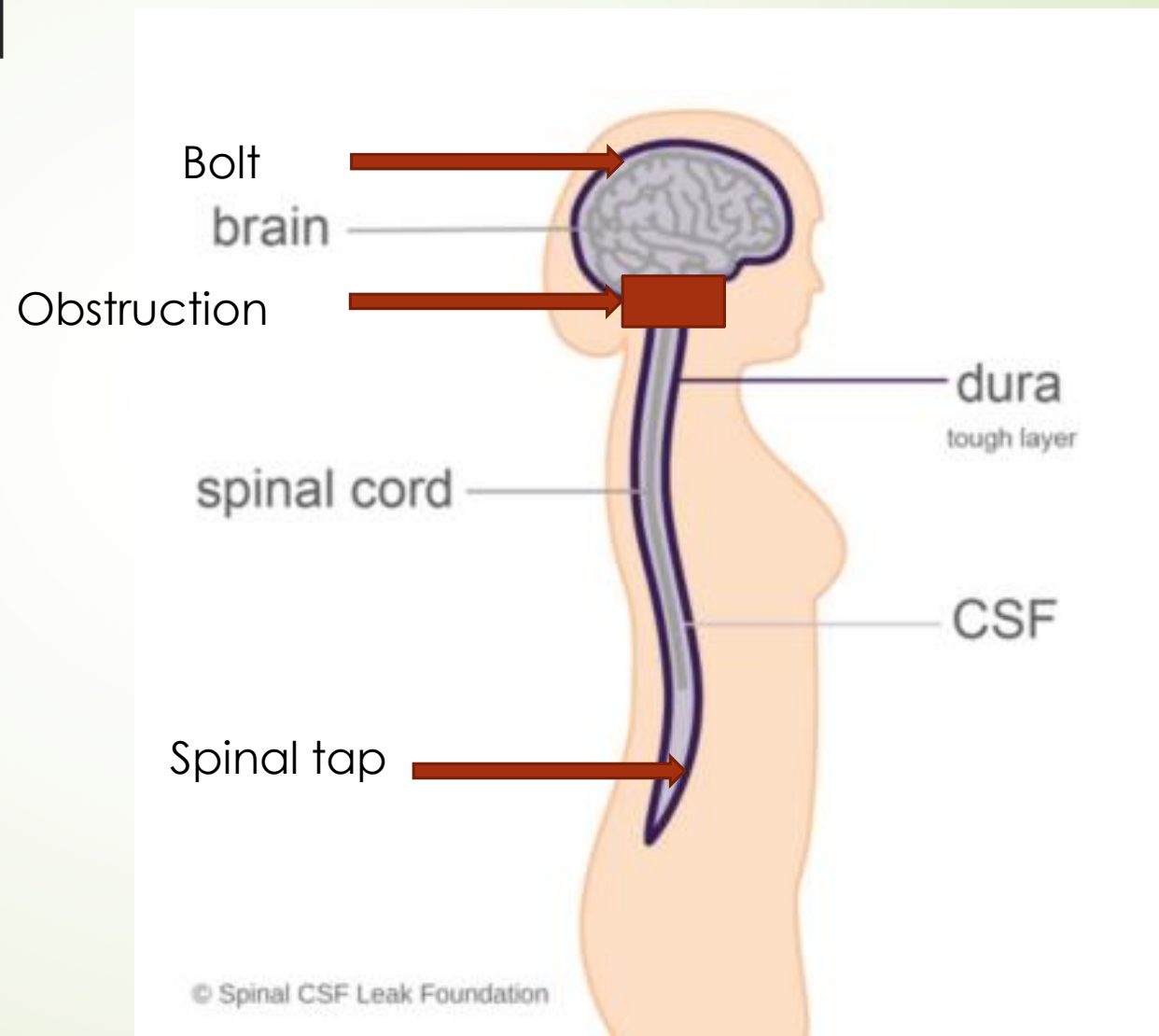





# Areas where CSF pressure can be measured



# Areas where CSF pressure can be measured





“My headache gets worse when I stand, and it almost goes away when I lie down”

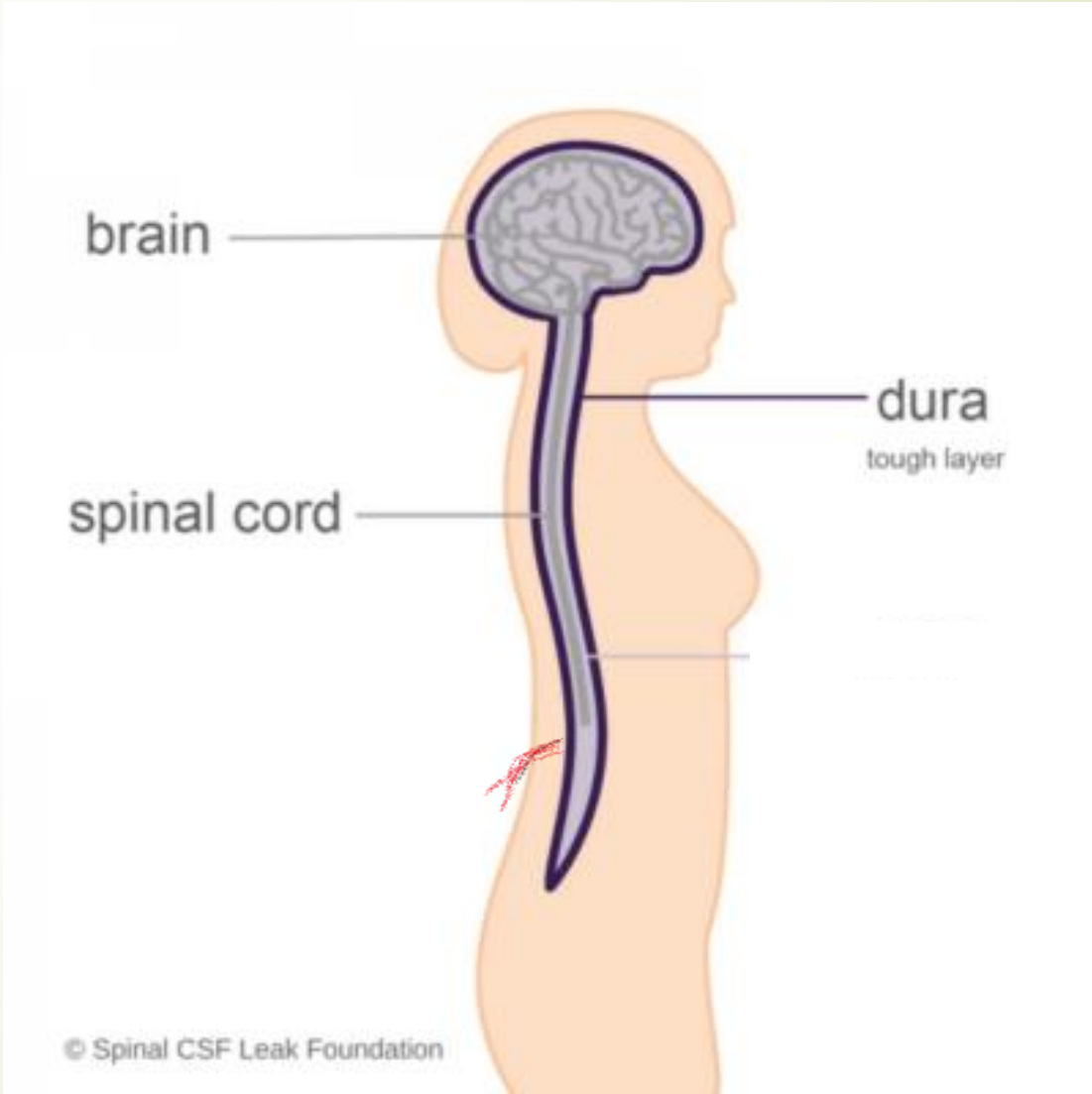
# CSF leak Headaches

- The headache is very intense and starts as soon as the person stands up.
- It resolves fully with lying flat.

# CSF leak Headaches

- Epidural Blood patch
- Epidural Fibrin
- Surgical repair

# CSF Flow around brain and spinal cord



“My headache gets worse when I cough, I have tingling in my hands and feet, I have difficulty swallowing”



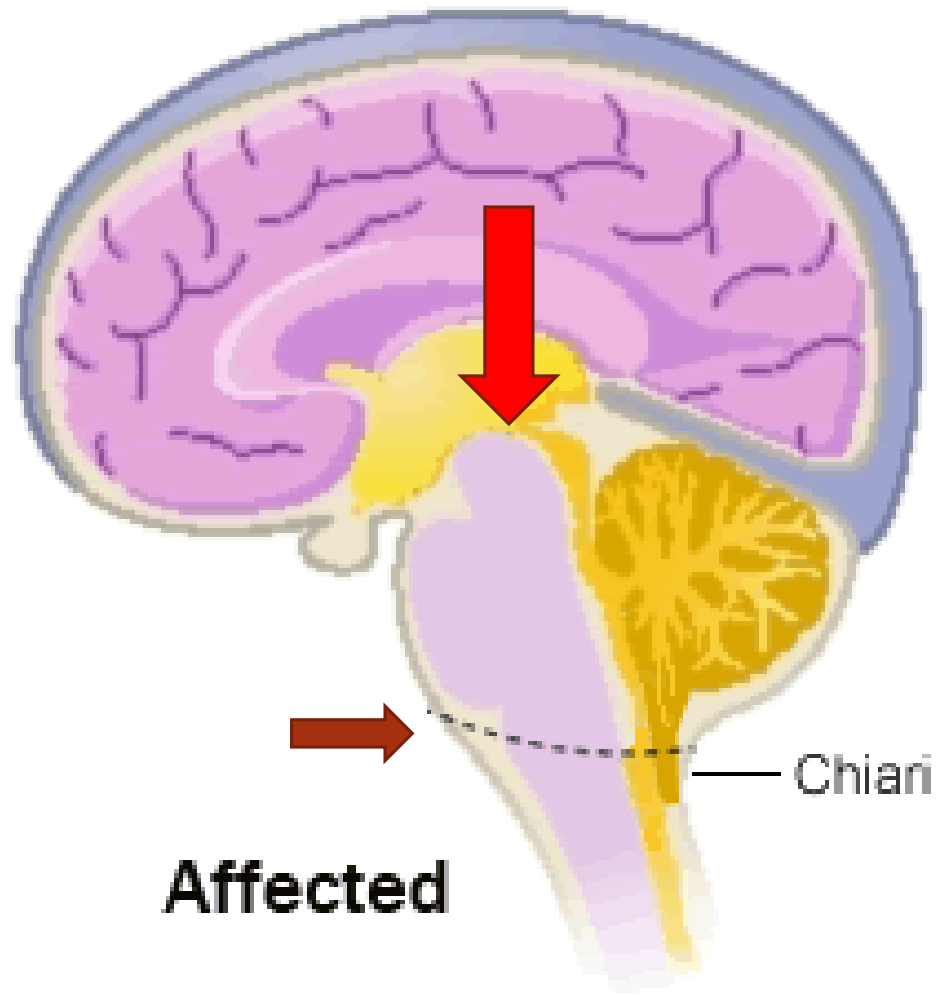
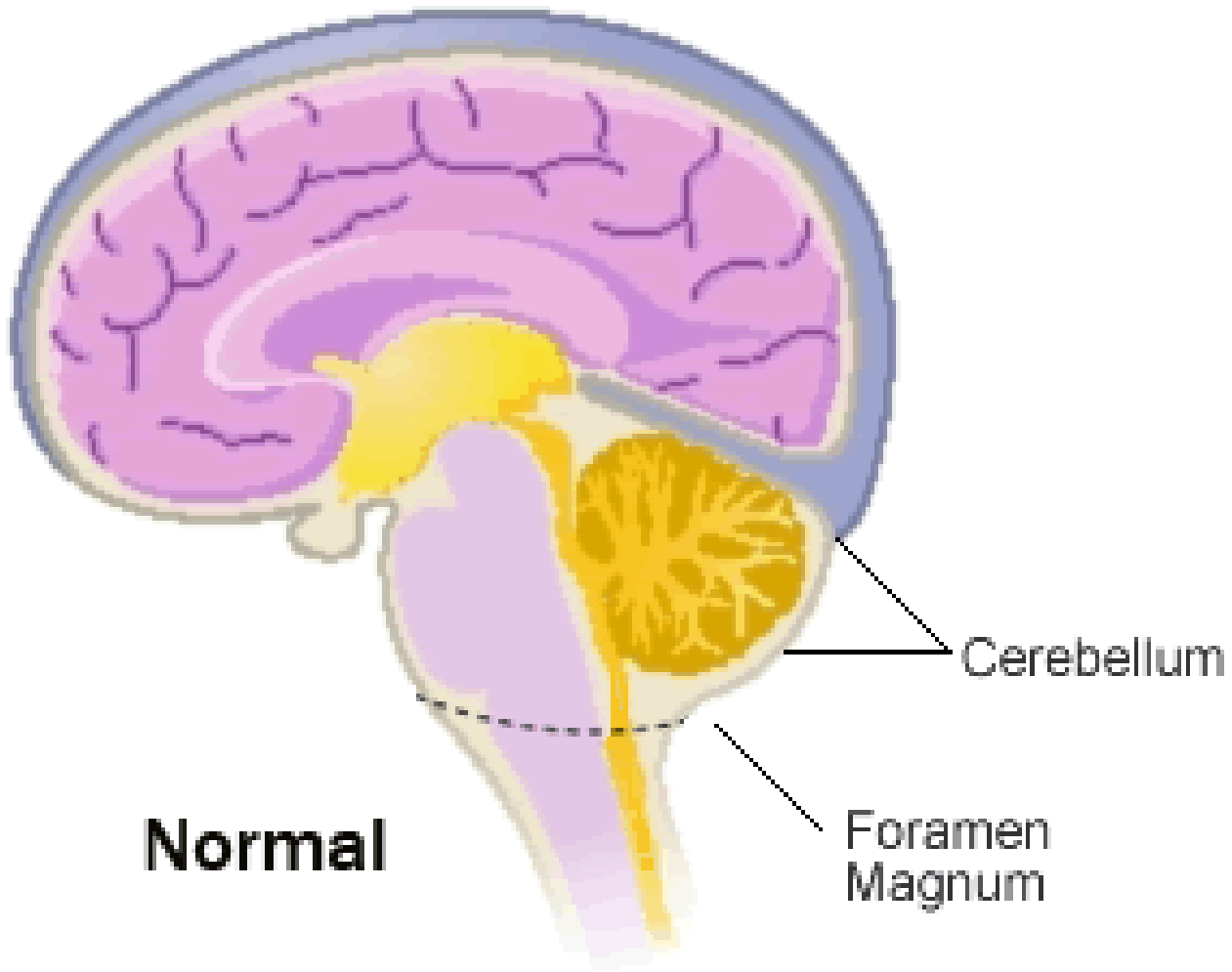
# Chiari Malformation

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# Chiari malformation



# Symptoms of Chiari Malformation

- **COMMON FEATURES**
- Headaches made worse by coughing or straining
- Neck pain
- Balance problems
- Pressure headaches in the back of the head (suboccipital)
- Dizziness
- Difficulty swallowing
- Poor Hand co-ordination

# Treatment of Chiari Malformation

- ▶ Surgical decompression

# Cranio cervical instability

Instability of the head and neck

# Cranio Cervical instability and Cranial Settling

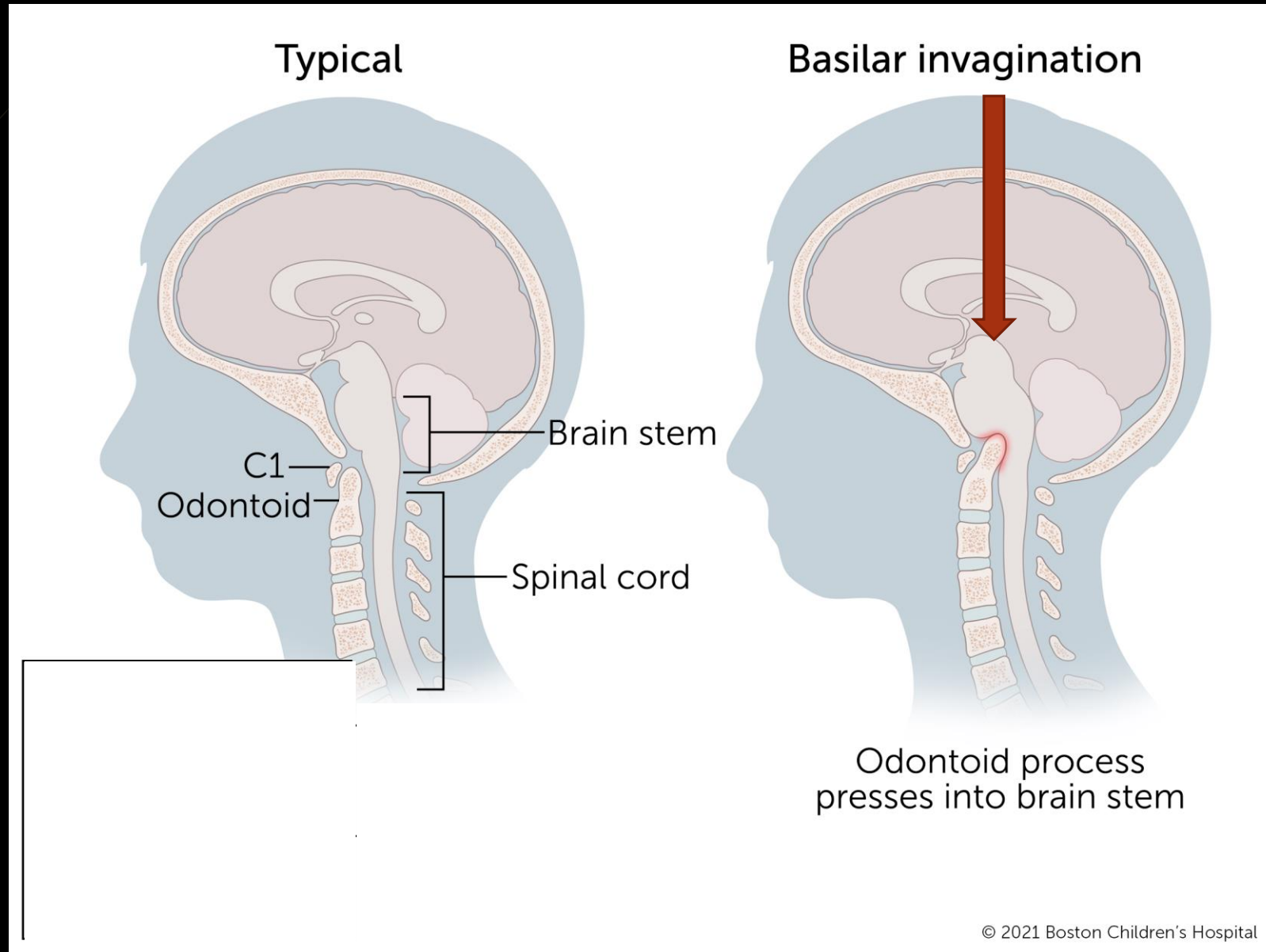
- ▶ The weight of the head is the same as a bowling ball
- ▶ This is delicately balanced on the spine.

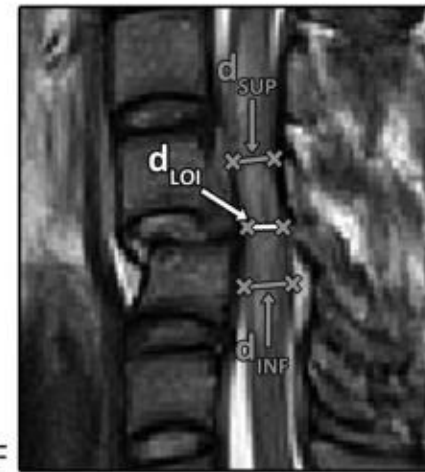
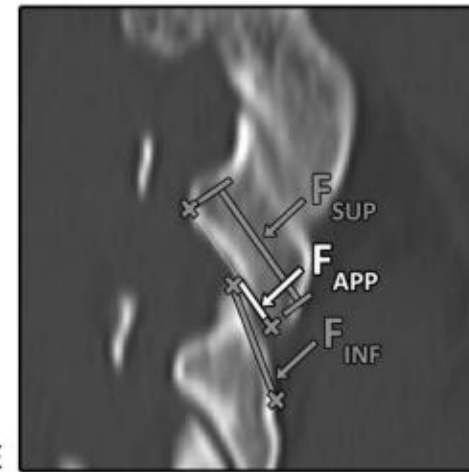
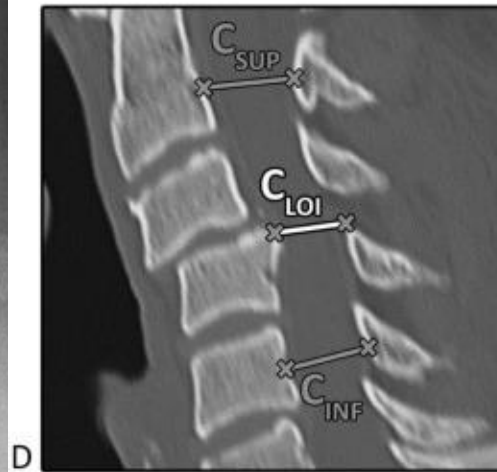
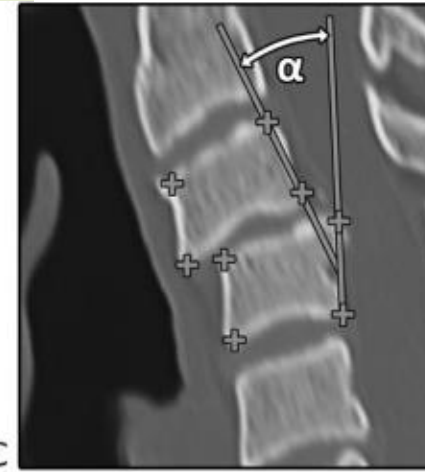
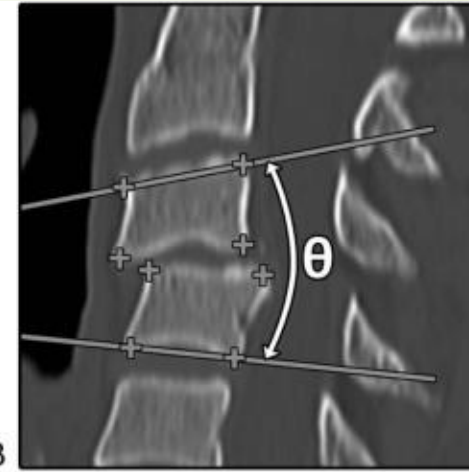
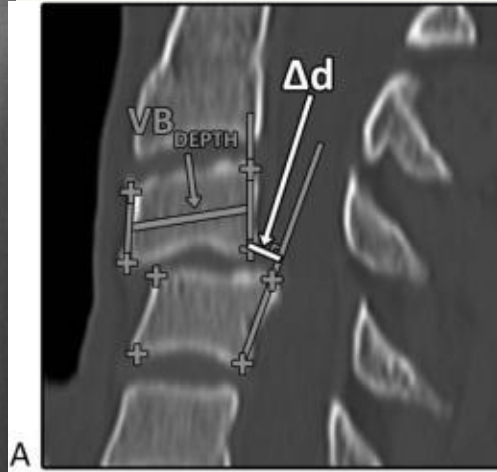
# Cranio Cervical instability and Cranial Settling

- ▶ In EDS the ligaments holding the spine are lax.
- ▶ This causes the skull to descend down on the spine when they are upright – called Cranial settling
- ▶ The loose ligaments holding the vertebra together make the neck unstable

# Cranial settling (basilar invagination)

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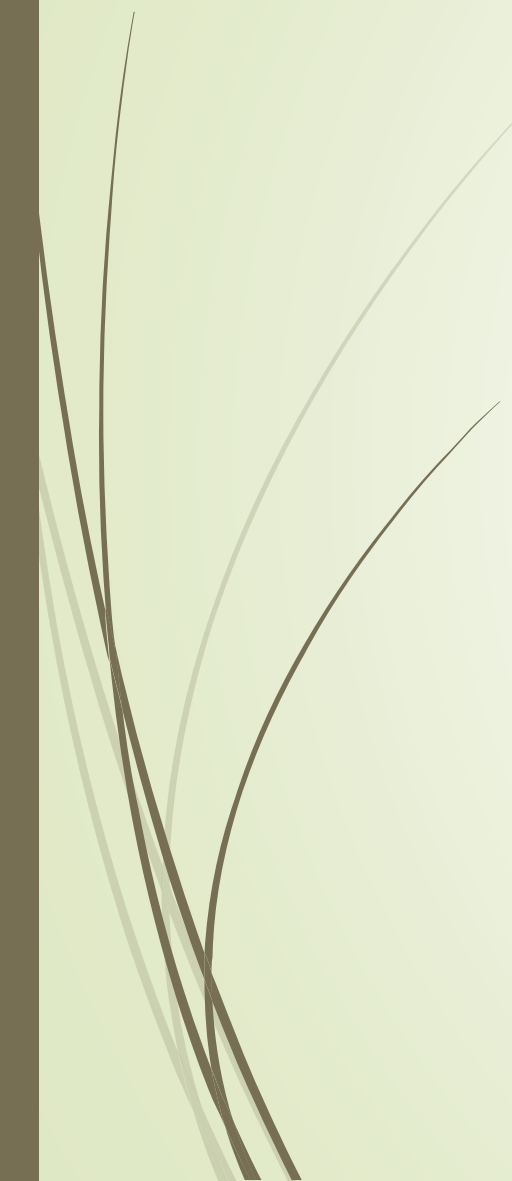






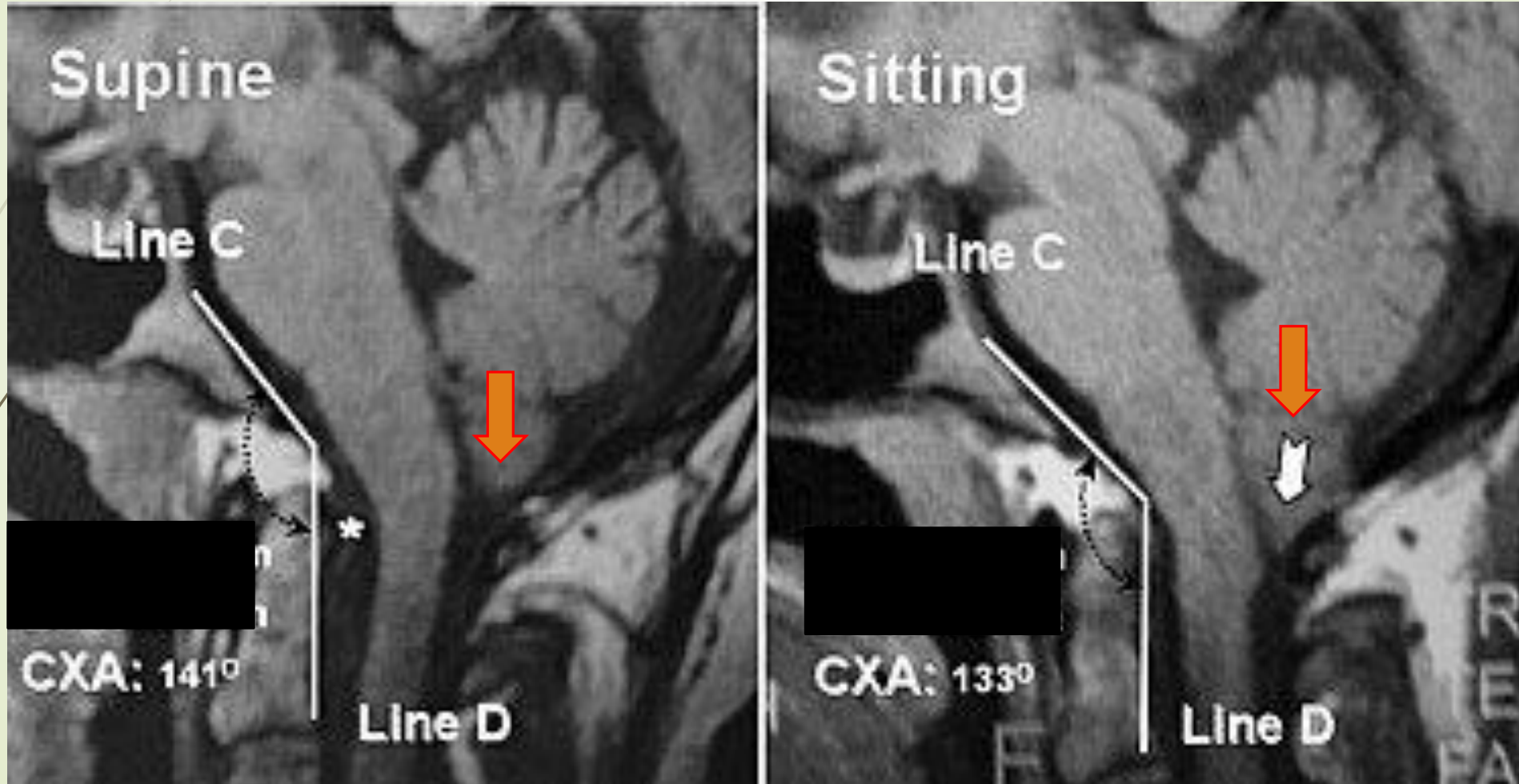
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# Chiari Malformation and EDS

Several thin, dark grey, curved lines that originate from the left side of the slide and sweep upwards and to the right, creating a decorative background element.

It is important to have an upright MRI in patients with EDS to diagnose Chiari Malformation and cranio cervical instability

# Cranial Settling in EDS- Deformative stresses on the brain stem, lower cranial nerves, spinal cord



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Clivo-axial angle normal 140°

# Treatment of Craniocervical instability

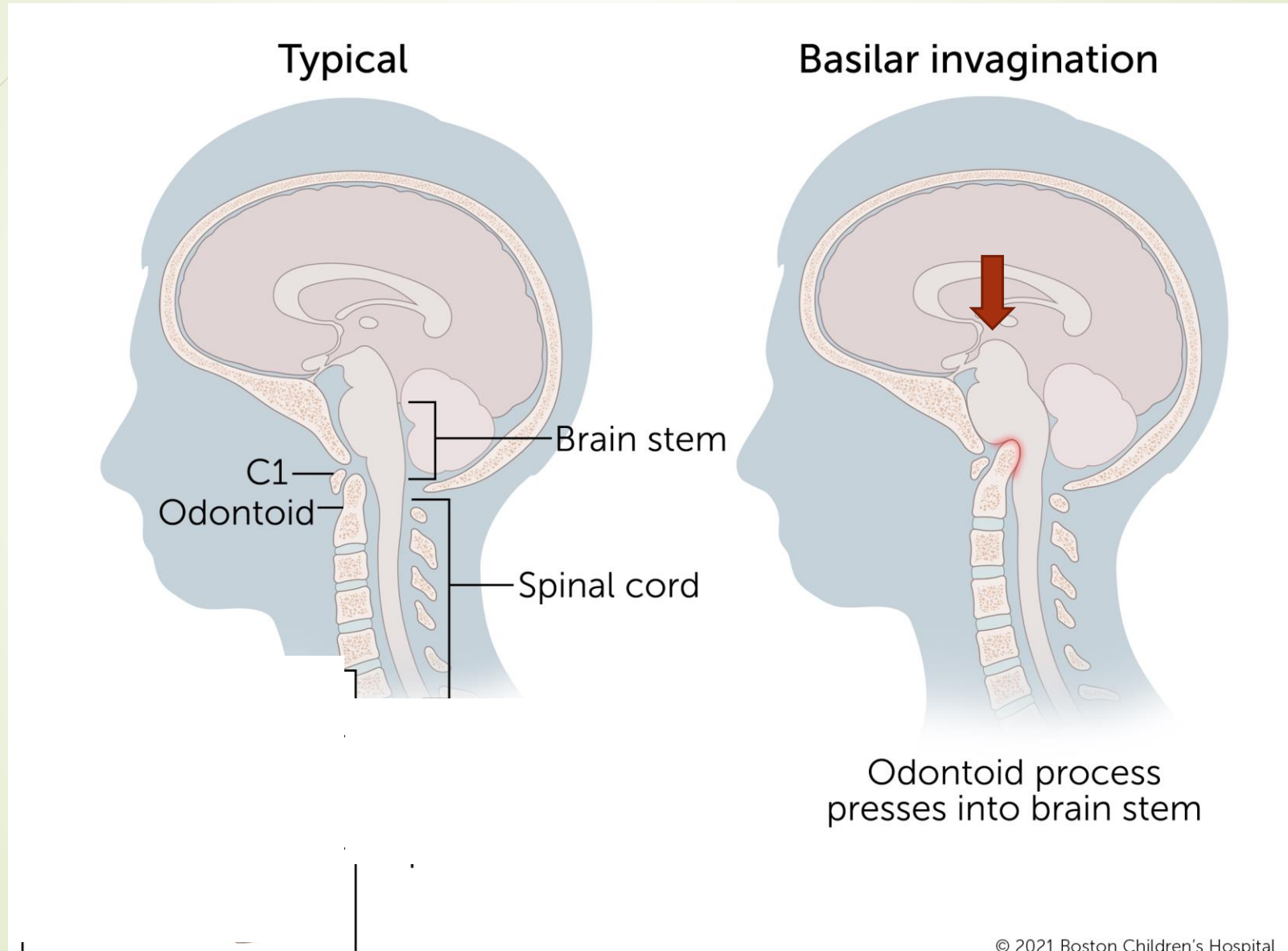
- ▶ For best results, the surgeon should perform an Invasive Cranial traction (ICT).
- ▶ If the patient has an excellent response to the ICT with no side effects

# Treatment of Craniocervical instability

- Cervical fusion is performed with the same weights as used in the ICT.
- Invasive cervical traction takes the load of the head off the spine and corrects cranial settling.
- Performing a cervical fusion without doing an ICT has poor results

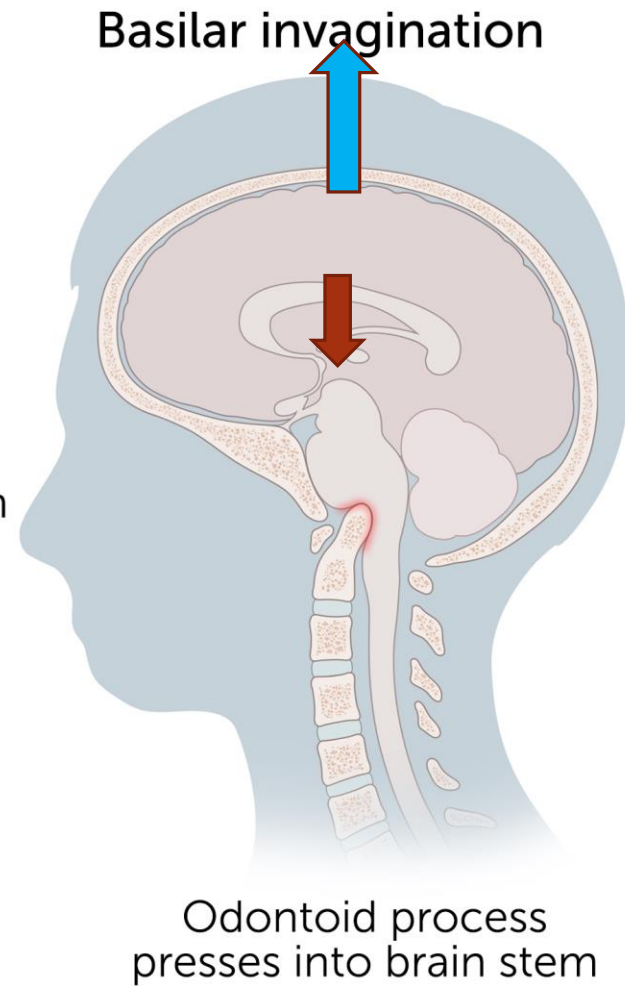
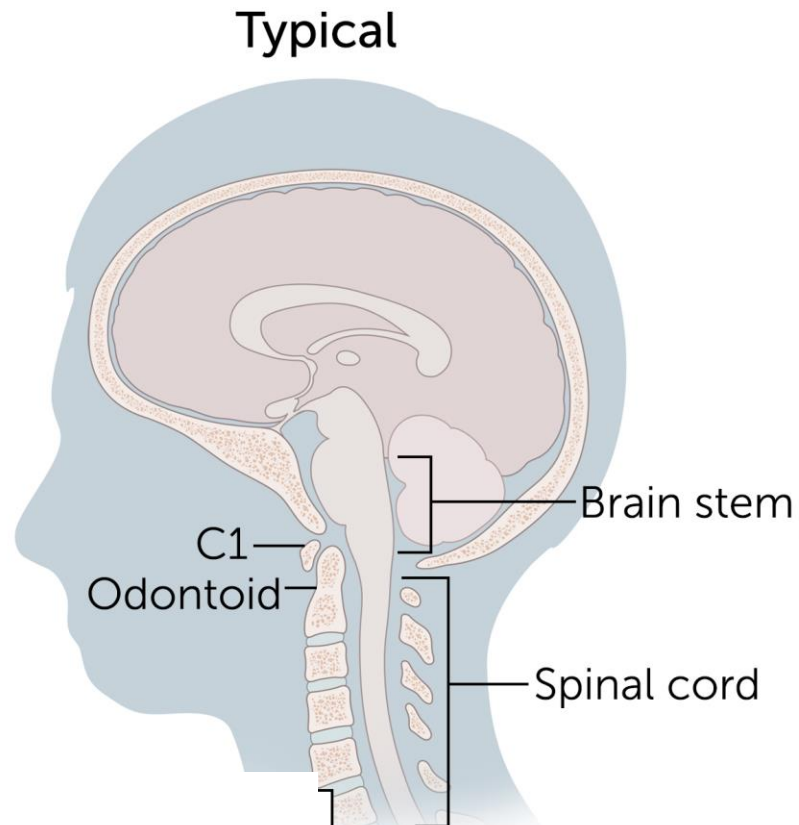
# Cranial settling (basilar invagination)

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# Invasive Cranial Traction

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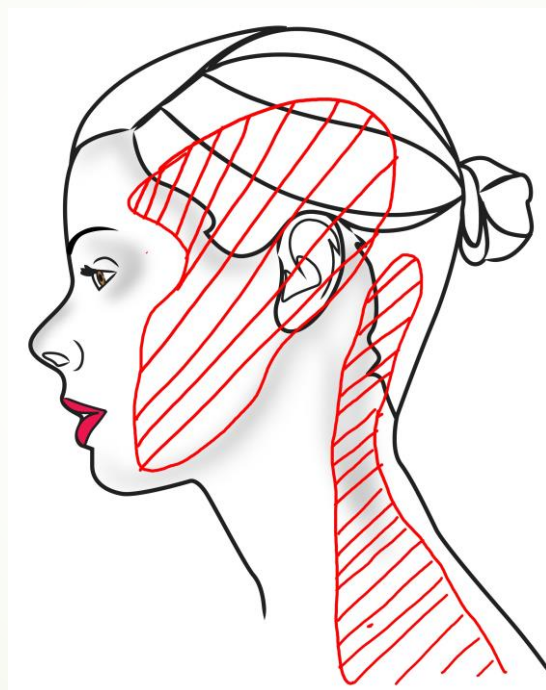
# Temporo Mandibular Joint Dysfunction



## TMJ Pain

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# Temporo-Mandibular joint pain



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# Eagle Syndrome

Facial pain in EDS

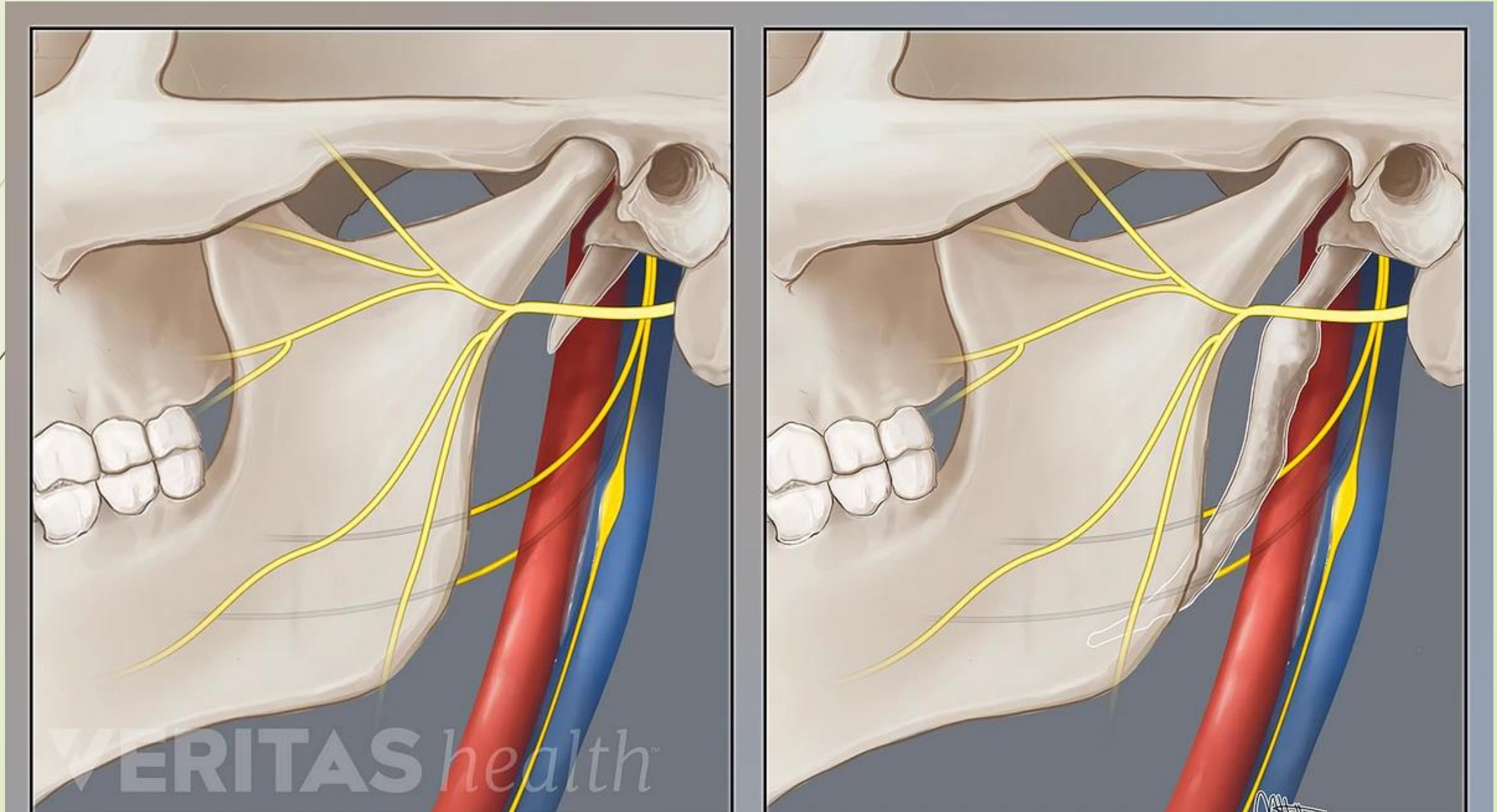
# Eagle Syndrome - symptoms

- ▶ Sharp shooting pain in jaw, back of throat, base of tongue, ears, neck or face
- ▶ Difficulty swallowing

# Eagle Syndrome - symptoms

- Sensation of foreign object in throat
- Pain from chewing, swallowing, turning the neck or touching the back of the throat.

# Eagle syndrome



# Eagle Syndrome

- ▶ Elongated (or misshapen) styloid process – at least 30 mm long
- ▶ Suspect Eagle syndrome in patients with idiopathic unilateral or bilateral facial pain not responsive to pain killers.

# Eagle Syndrome -diagnosis

- Physical examination: the elongated styloid process can be palpated with intraoral examination and provokes the pain.
- 3D-CT scan is considered the gold standard
- Surgery has a cure rate of 80%

# EDS and abdomen



# Abdominal pain

- Very common in EDS
- Gastroparesis (slowing down of the stomach)
- Slowing down of the intestines
- Alternating diarrhea and constipation
- PoTS –causes nausea, acid reflux, bloating and constipation
- Diverticulosis, prolapse



# Abdominal pain in EDS

- ▶ Abdominal pain can increase in the presence of Mast Cell Activation syndrome
- ▶ Mast Cells cause an inflammation and pain of the lining of the gastrointestinal tract

# Vascular compression in EDS

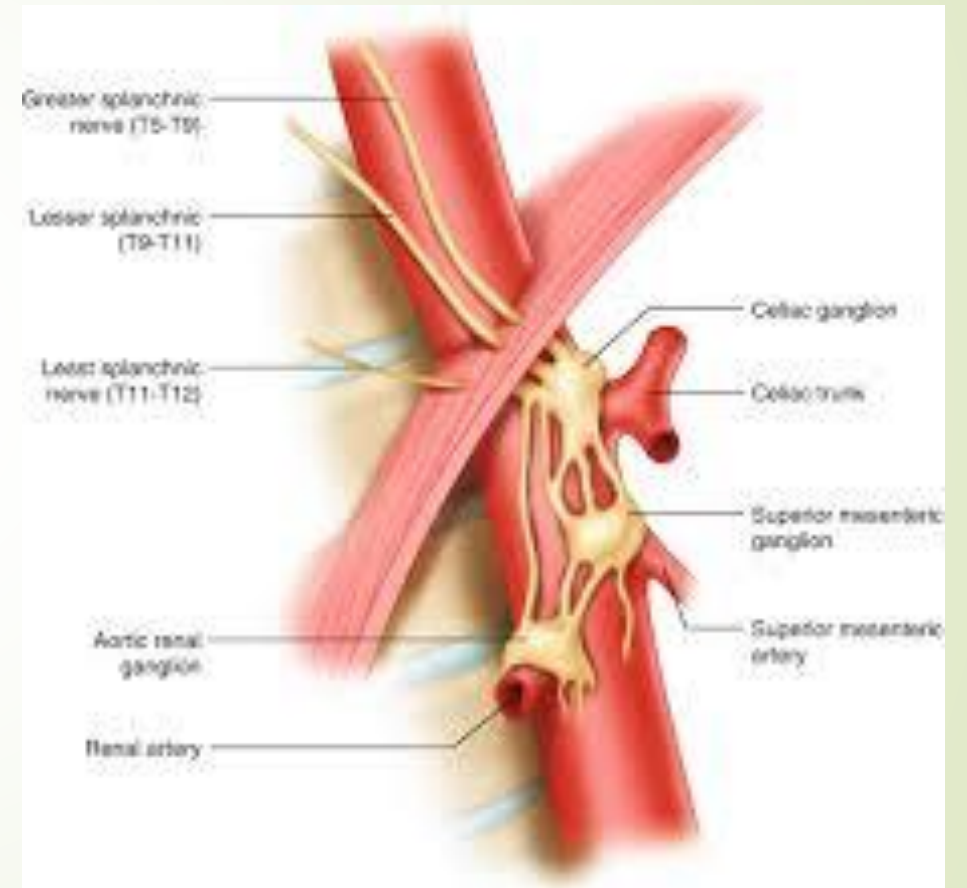
- Normally, when we stand upright, tissue in our body is firm, our organs, ligaments, blood vessels are held in place
- They are held in place because of the rigidity of the connective tissue
- In EDS, the connective tissue is lax
- When a person with EDS stands upright the tissue is unable to support the ligaments, organs, blood vessels

# Median Arcuate Ligament Syndrome (MALS)

# Median Arcuate Ligament Syndrome (MALS)

- ▶ Compression of the celiac artery and celiac ganglia by the Median Arcuate Ligament.

# Median Arcuate Ligament Syndrome (MALS)

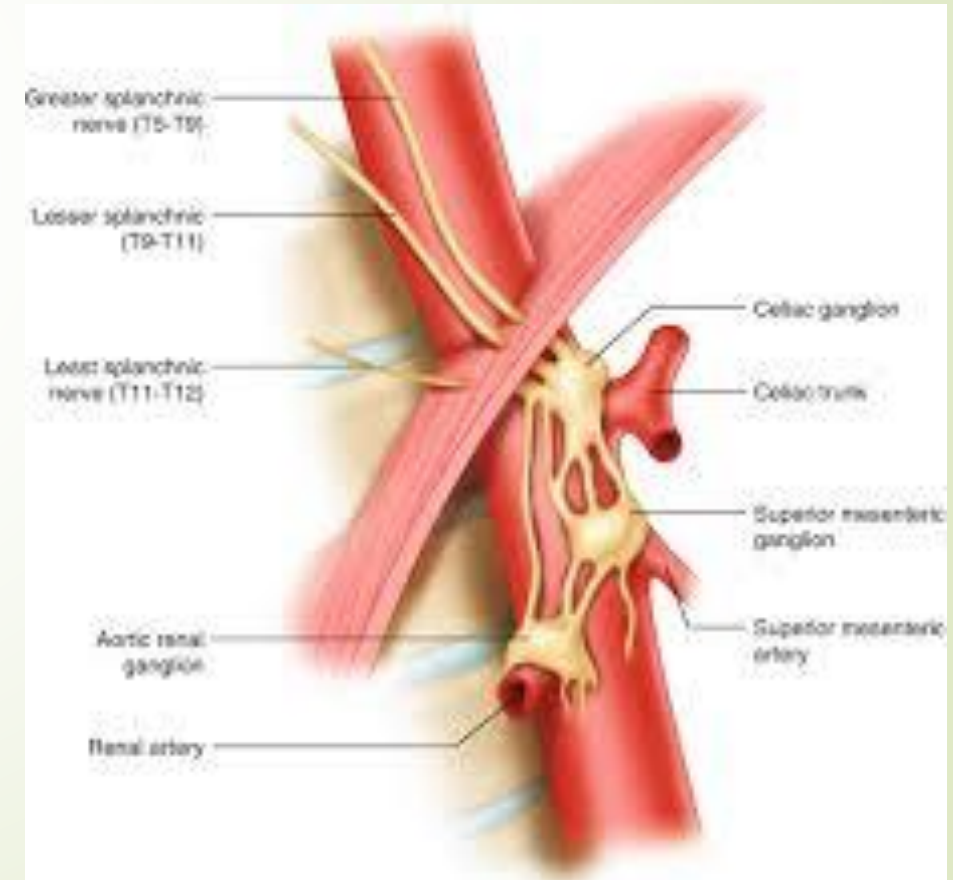


# Symptoms of MALS

- ▶ Pain in the upper abdomen
- ▶ Increased with
  - ▶ Eating, exercise, standing
- ▶ Relieved with:
  - ▶ Prone position, lateral position

# Management of MALS

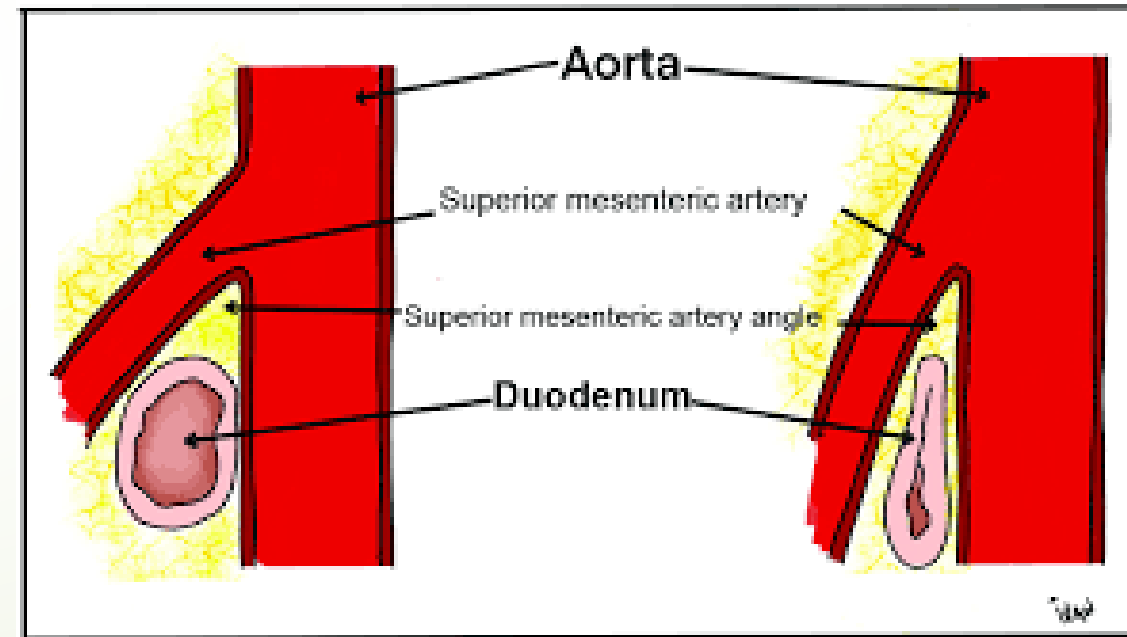
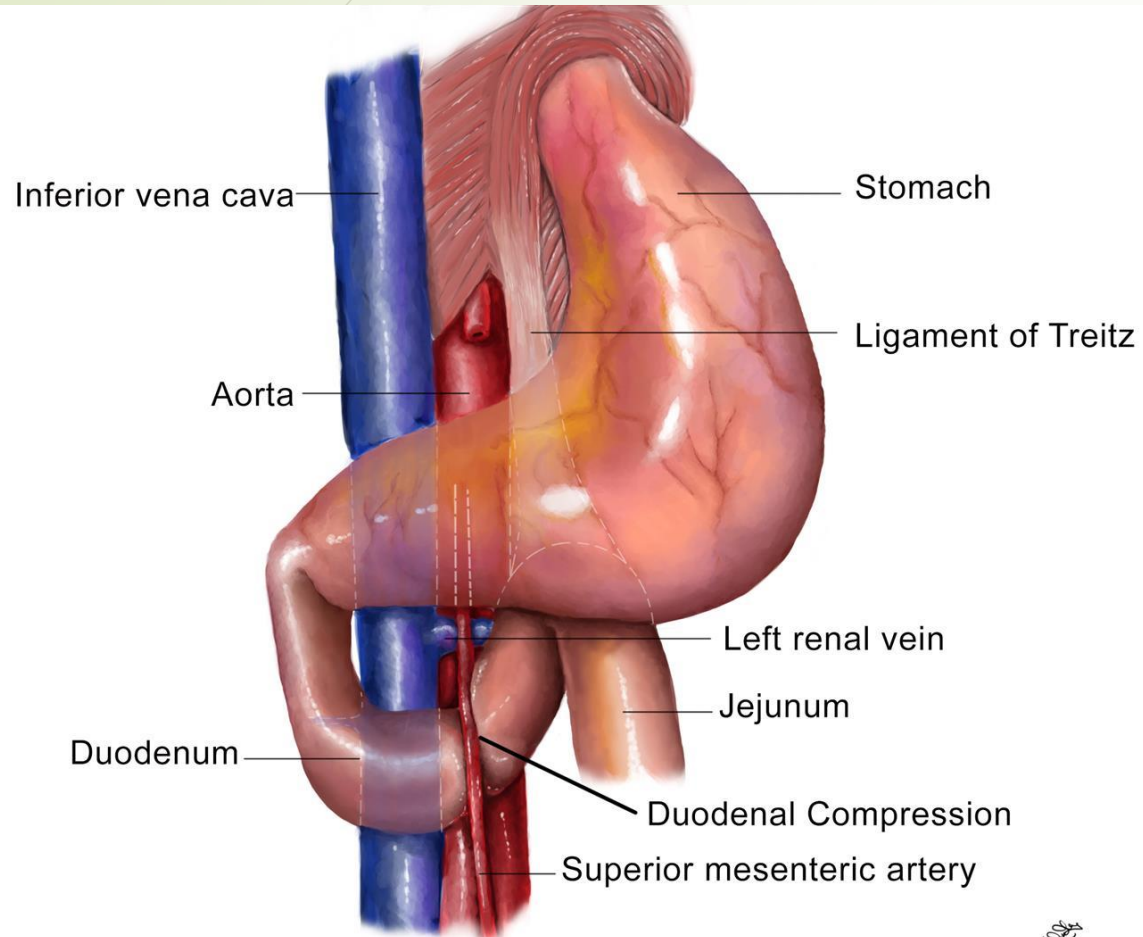
- Surgical release of the Median arcuate ligament
- Excision of celiac plexus



# Superior Mesenteric Artery Syndrome

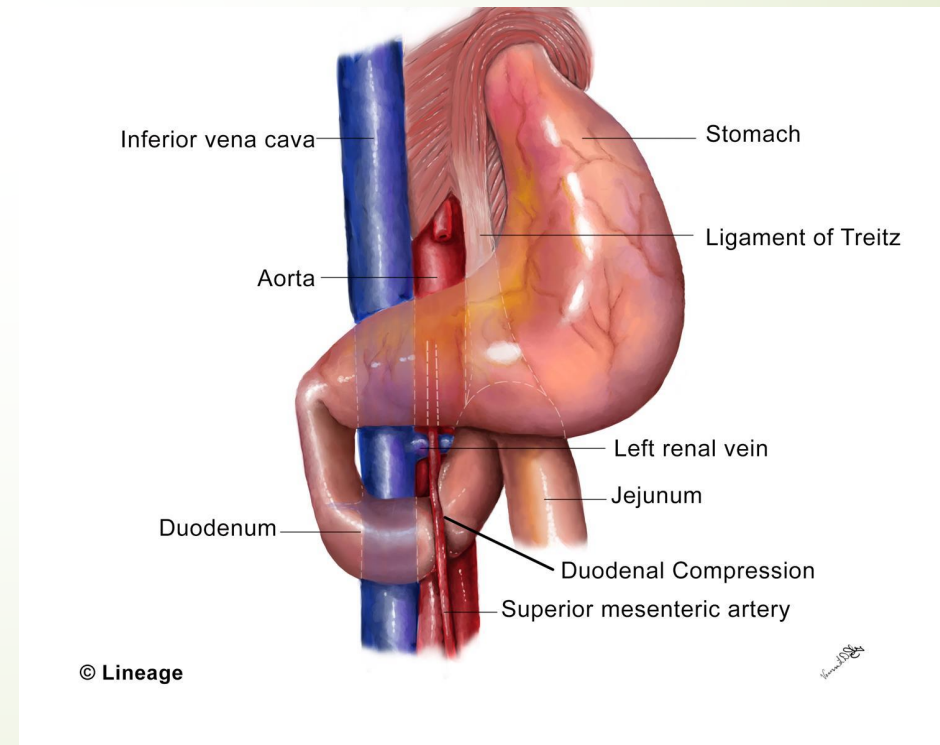
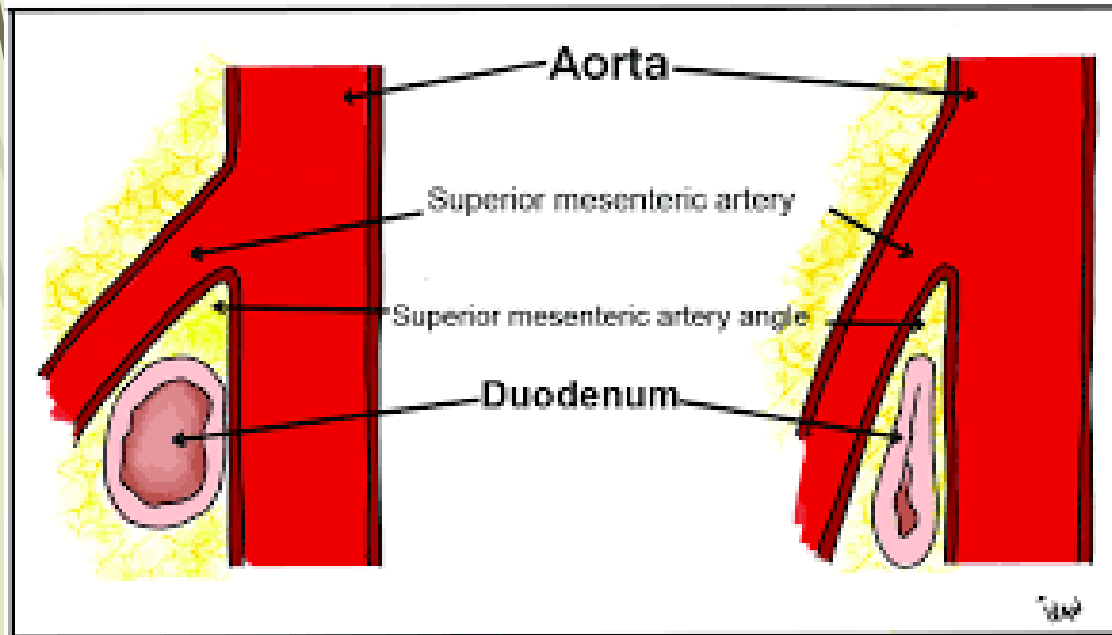


# Superior Mesenteric Artery Syndrome (SMAS)



# Superior Mesenteric Artery Syndrome

- Compression of the 3<sup>rd</sup> part of the duodenum between the aorta and the superior mesenteric artery



# Superior Mesenteric Artery Syndrome - symptoms

- Early satiety
- Nausea, vomiting
- Extreme stabbing abdominal pain after eating
- Abdominal distension, burping
- External hypersensitivity or tenderness of the abdominal area
- Symptoms relieved in left side or knee-to-chest position.

# Superior Mesenteric Artery Syndrome

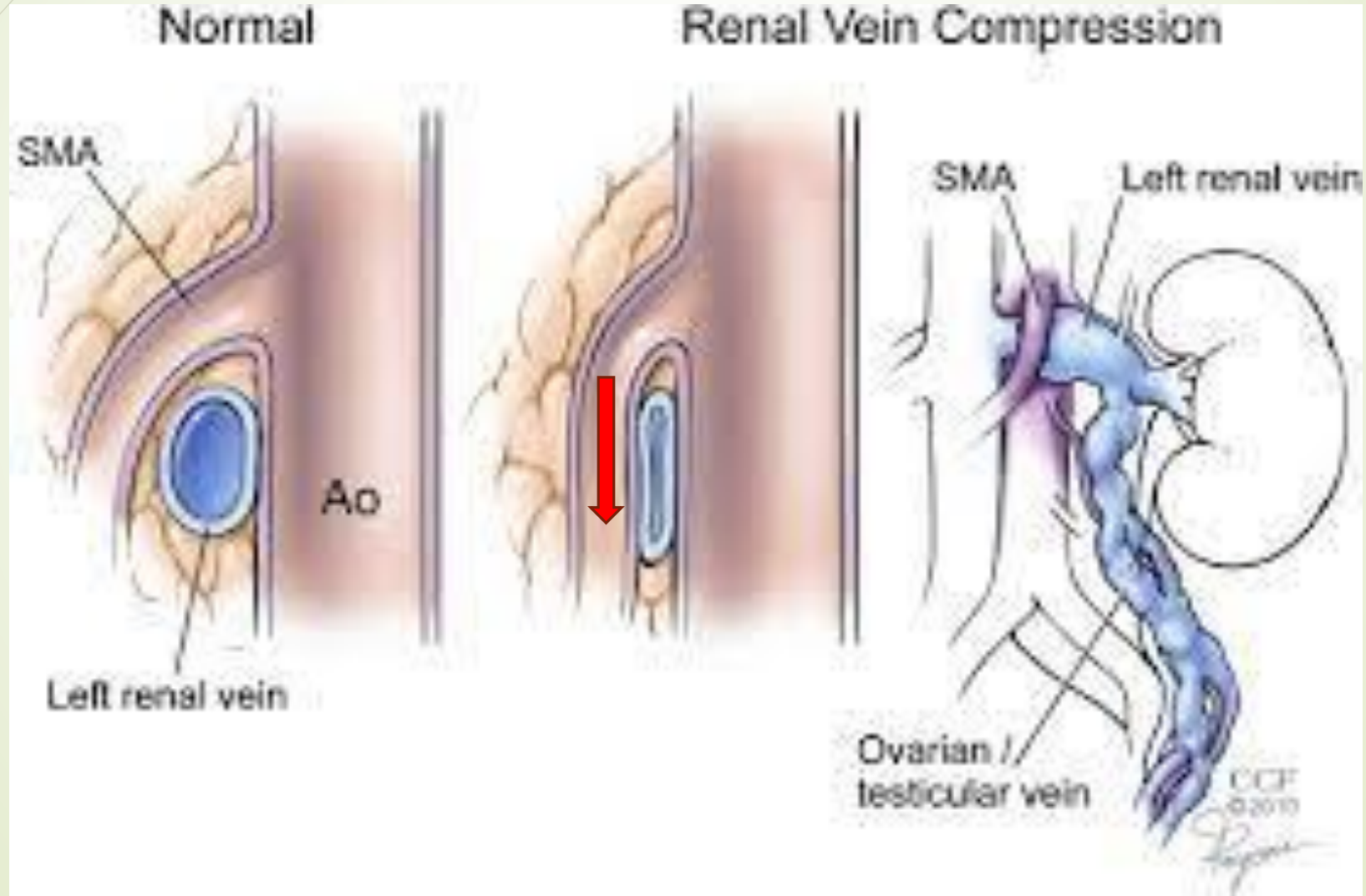
- The treatment of Superior Mesenteric Artery syndrome is surgical
- The most common treatment is called a gastroduodenostomy
- Some centers perform a derotation of the duodenum

# Nutcracker Syndrome

# Nutcracker Syndrome

- ▶ Compression of the left renal vein between the aorta and the superior mesenteric artery.

# Nutcracker Syndrome



# Nutcracker syndrome - symptoms

- ▶ Hematuria – microscopic blood in the urine
- ▶ Pain – abdominal or flank pain on the left
- ▶ Pelvic pain
- ▶ Fatigue



# Nutcracker Syndrome

- ▶ The treatment is surgical
- ▶ Some centers prefer auto transplant of the left kidney to the right side
- ▶ Other centers perform a bypass graft

# Nervous system dysfunction in Gastrointestinal tract - symptoms

- Dysphagia (difficulty swallowing)
- Slow stomach emptying (gastroparesis)
- Slow transit time through small intestine
- Post prandial hypotension
- Postprandial fluctuations in blood glucose
- Anal sphincter dysfunction

# Poor absorption of drugs

- ▶ A common problem in EDS is poor absorption of drugs and nutrients.
- ▶ The most likely cause of this inflammation of the lining of the gastrointestinal tract by Mast Cell Activation Syndrome (MCAS).

# Poor absorption of drugs – other methods

- ▶ IV
- ▶ As lotion on skin
- ▶ Tincture under the tongue
- ▶ Nebulized through lungs

# Rib pain

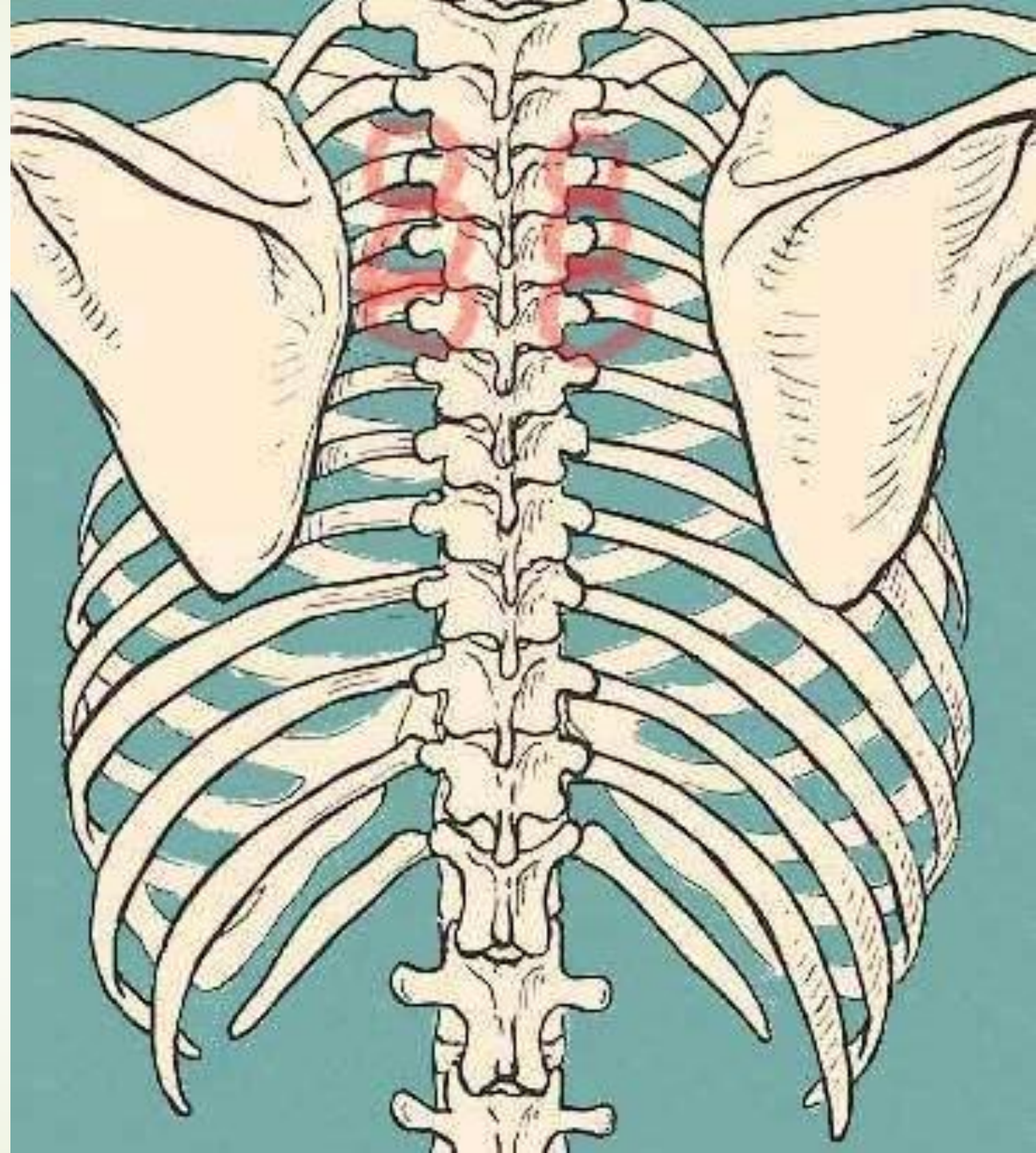
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# Rib subluxation pain

- Severe
- Sharp, stabbing pain
- Radiates around the chest
- Becomes worse with coughing, sneezing

## Ribs and thoracic spine

- ▶ Ribs are connected to the thoracic spine by joints



## Rib subluxations

- With slouched posture the ribs tend to pop out of place
- In EDS having a slouched over posture is easy because of ligament laxity
- Also common in women with heavy breasts





# Using a Roller for rib subluxations



# Compression tops to maintain thoracic spine posture



# How to avoid repeated rib subluxations

- ▶ SpinalQ by Align Med posture corrector maintains the thoracic spine in correct posture which avoids rib subluxations

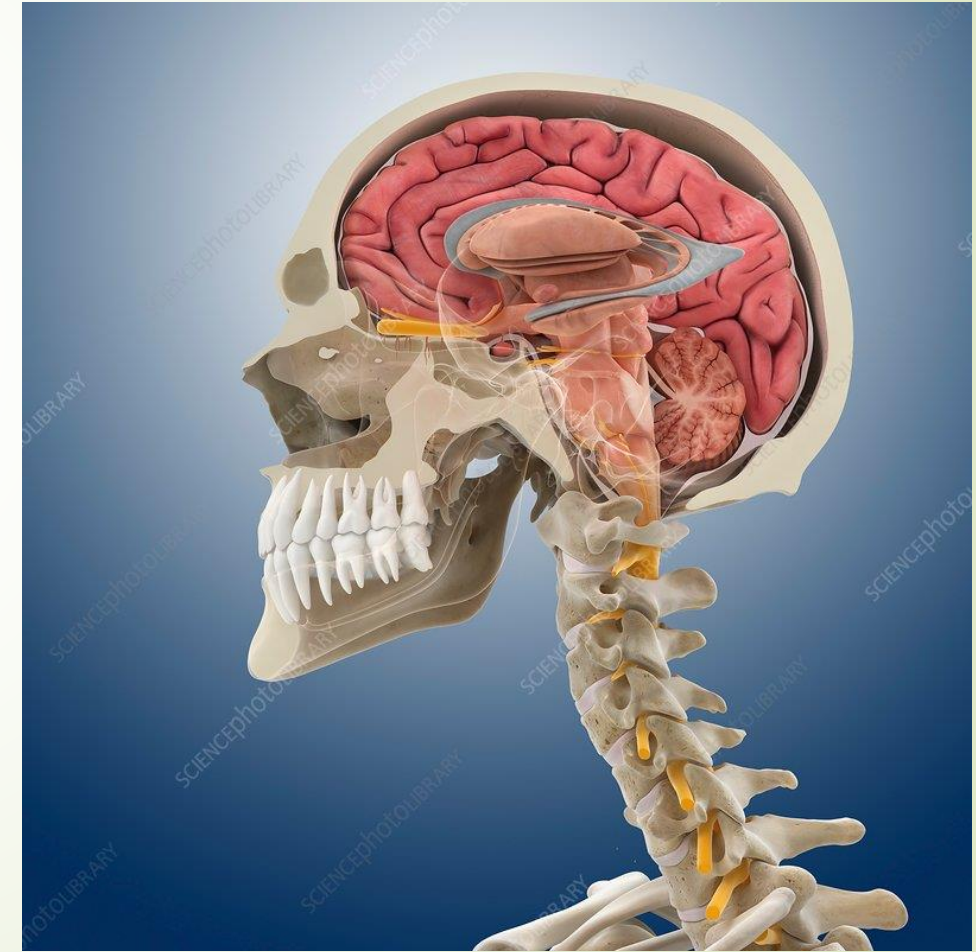
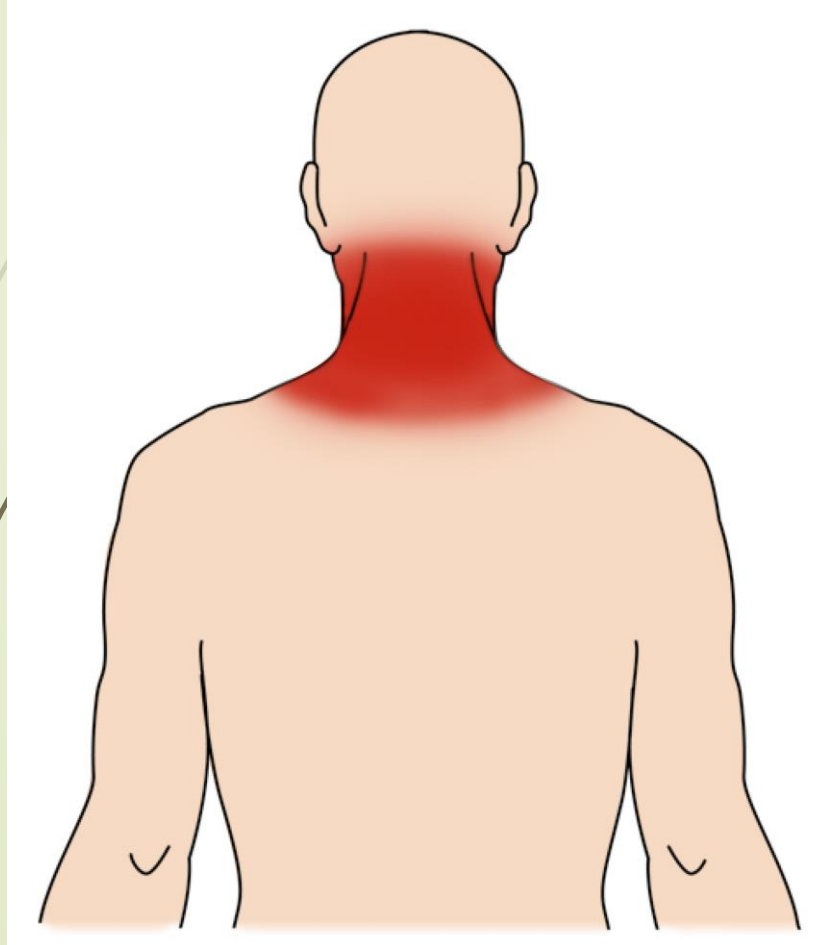




# Neck pain

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2

# Neck pain



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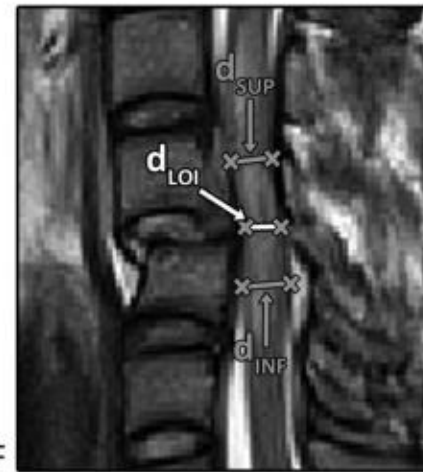
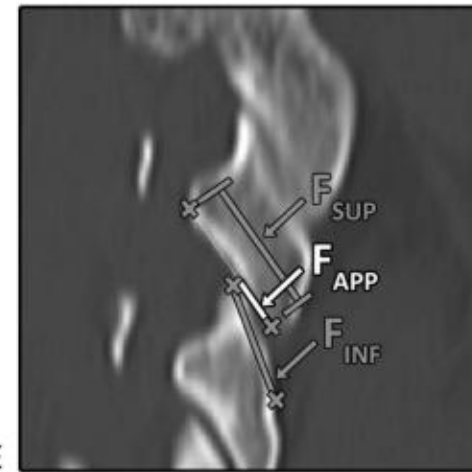
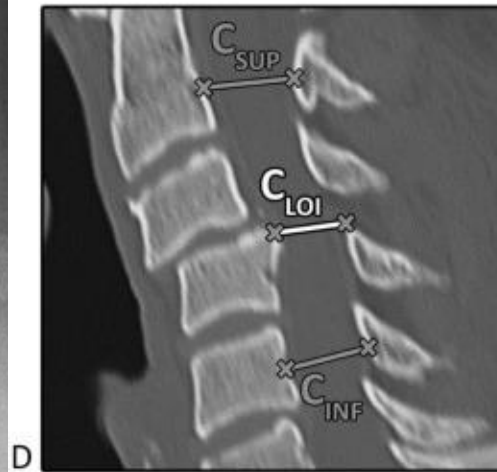
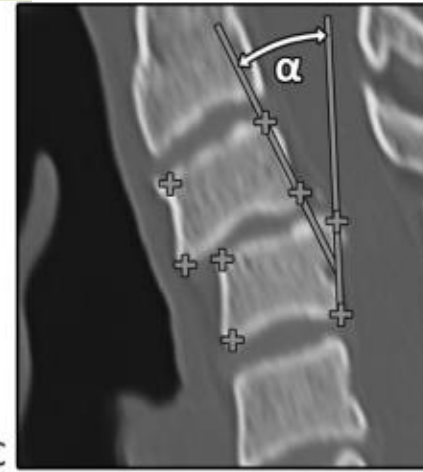
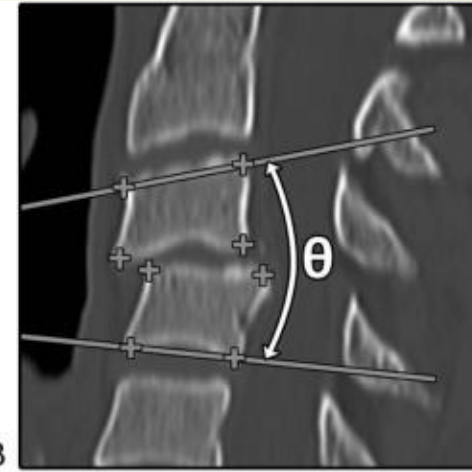
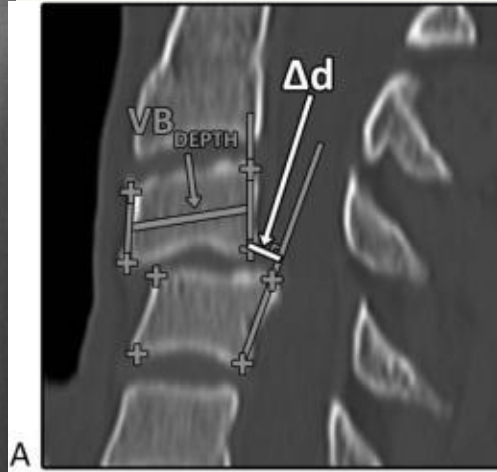
# Neck pain

- The head is supported and held in place on the neck by ligaments and muscles.
- In EDS, the ligaments may be lax or loose.
- As a result, the muscles in the neck must work hard to hold up the head.
- Patients often find themselves sitting with their chin supported in their hands
- A supportive neck collar may help



# Cranio Cervical instability

- In cranio cervical instability there is excessive movement of the vertebrae at the atlanto-occipital joint and the atlanto-axial joint.
- The instability of the cervical spine may cause nerve damage and compression of spinal cord, brain stem, vagus nerve





# Imaging for Cranio Cervical Instability

- Need functional imaging technology
- Static pictures are not helpful
- Digital motion x-ray (DMX)
- Functional computerized tomography (fCT scan)
  - **Flexion**
  - **Extension**
  - **Rotate neck left 90 degrees.**
  - **Rotate neck right 90 degrees.**

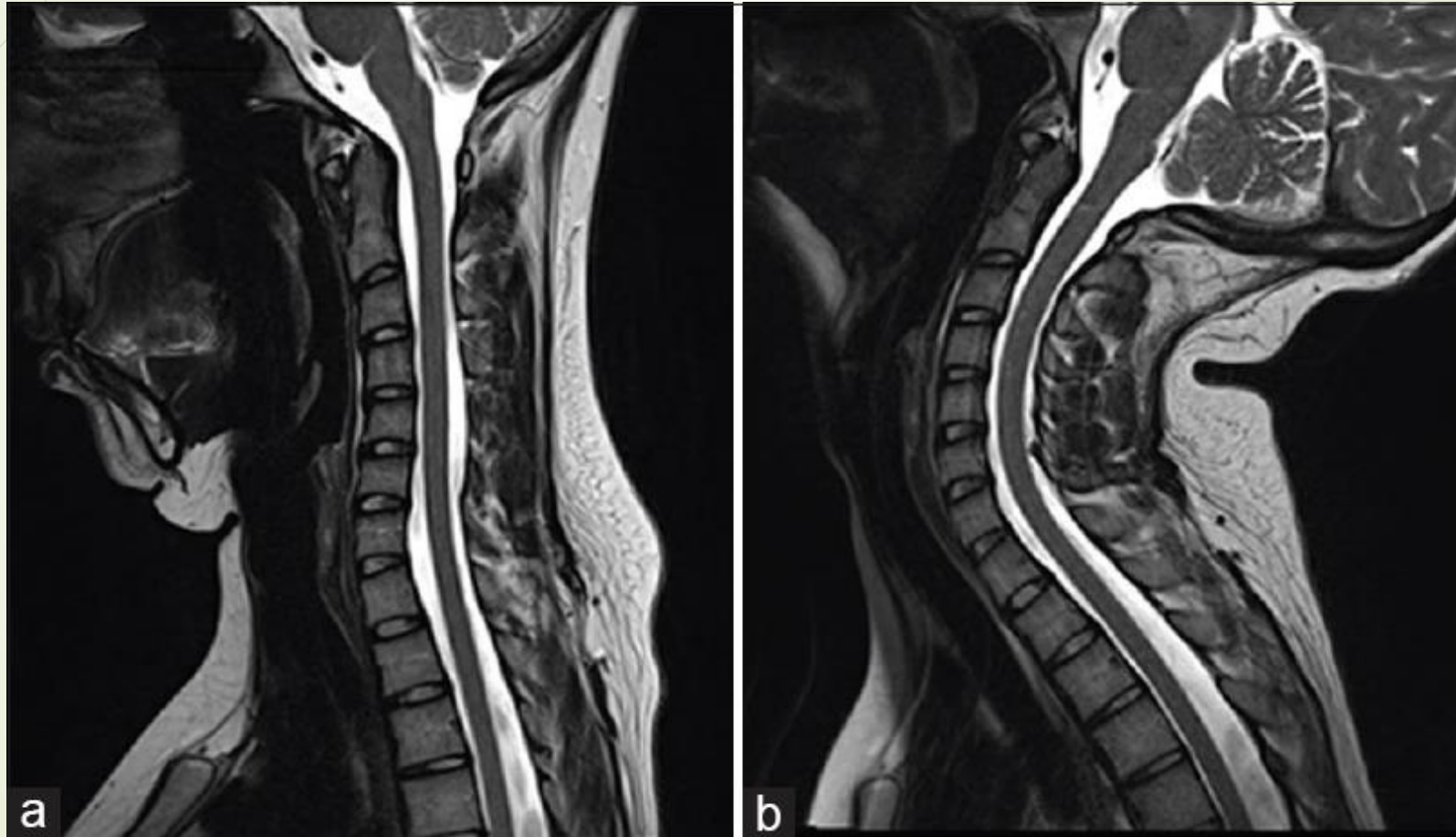
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# Cranio Cervical instability



Spiessberger A, Dietz N, Gruter B, Virojanapa J. Ehlers–Danlos syndrome-associated craniocervical instability with cervicomedullary syndrome: Comparing outcome of craniocervical fusion with occipital bone versus occipital condyle fixation. J Craniovert Jun Spine 2020;11:287-92

# Cranio Cervical instability



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# Cranio Cervical Instability - management

- Mild to moderate:
  - Hard cervical collar
  
- Severe Instability:
  - Surgical fusion

# Miami J collar



# Vista® MultiPost Therapy Collar – a improved design



# Cervical fusion

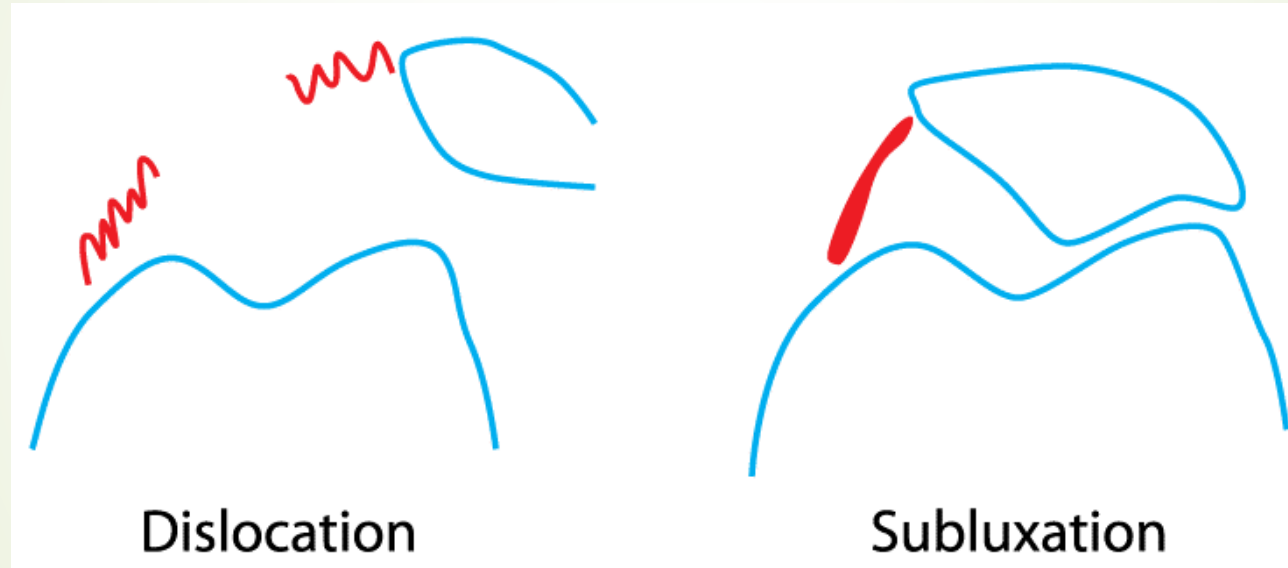
- There are 2 thoughts on how Cervical fusion is done
- The best technique is to place a traction on the head (invasive cranial traction) and find out at what position is the best result
- During the surgery, the same traction weight is applied, and the neck is fused in the best position
- The other method is to look at CT scan and MRI and fuse the spine in whatever position it is – this is a poor method and the results are not good .

# Subluxations and Dislocations

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# Subluxations and Dislocations



# Pain in subluxation and Dislocations

- When a joint subluxes or dislocates, the pain is usually from muscle spasms around the joint.
- Pain from capsular stretch
- Not as much from the bones



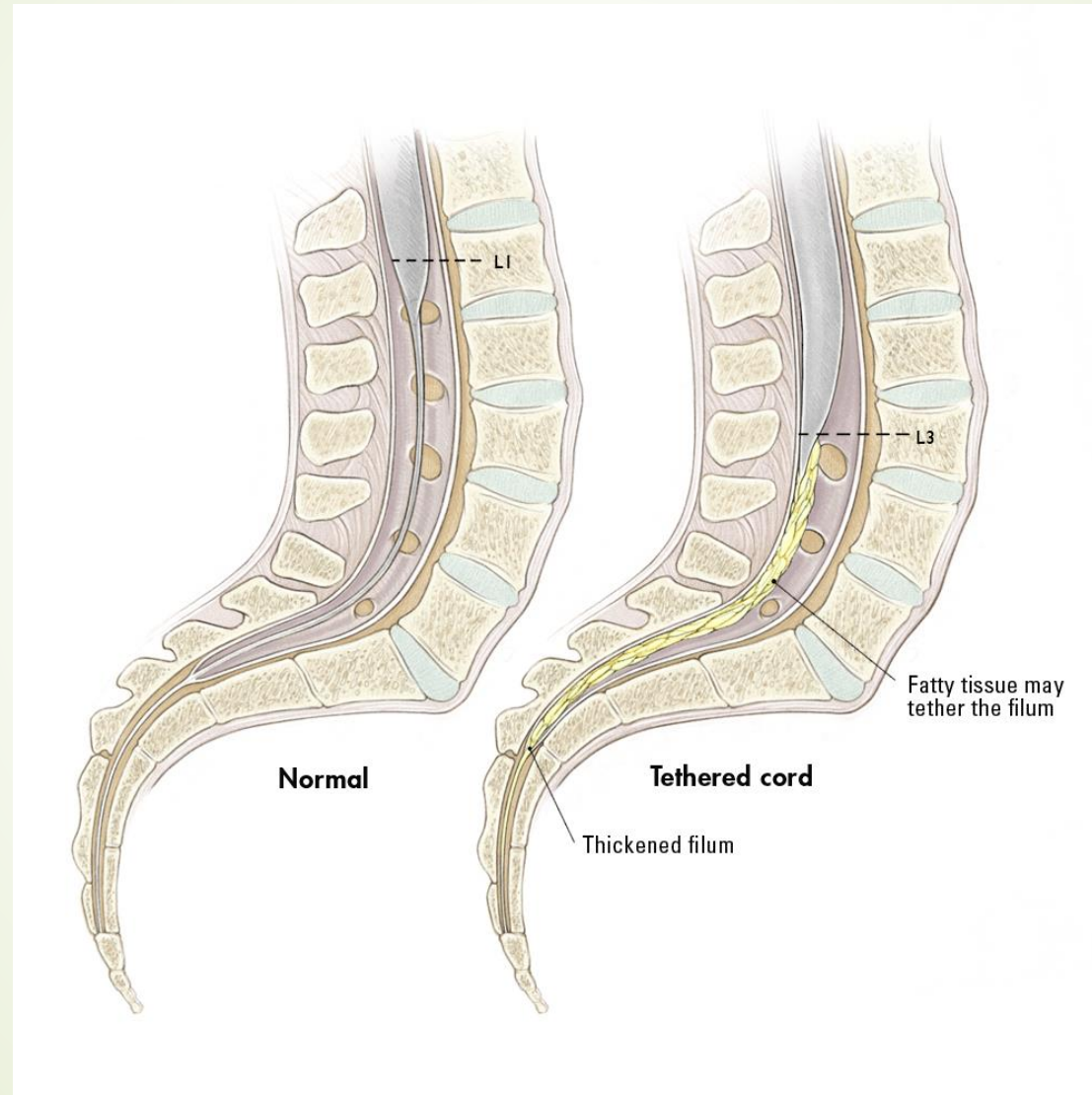
## Numbing medicine injections

- Commonly used numbing medicine injections (Lidocaine) may be ineffective
- Bupivacaine or Carbocaine work well in EDS

# Tethered Cord Syndrome

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# Tethered Cord Syndrome (TCS)





# Clinical symptoms

- Low back pain
- Neurogenic bladder
- Legs get heavier with walking
- Diffuse pain in both legs

# Neurogenic bladder

- **Bladder symptoms (Neurogenic bladder)**
- Urinary hesitancy
- Increased (decreased) frequency,
- Urgency
- Sense of incomplete emptying of the bladder
- Incontinence

# Tethered cord syndrome and Chiari Malformation

- People with EDS who have Chiari Malformation should also be checked for Tethered Cord Syndrome

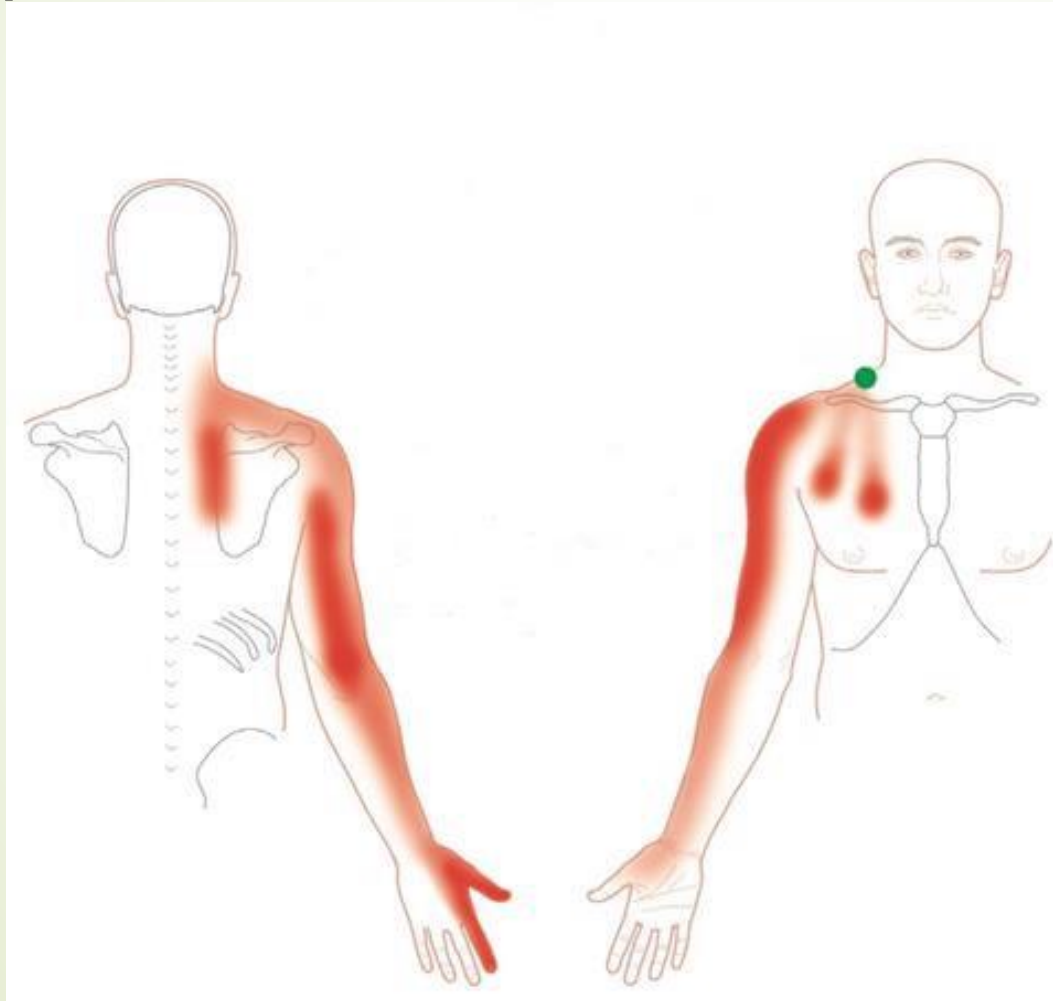


# Tethered Cord Syndrome and EDS

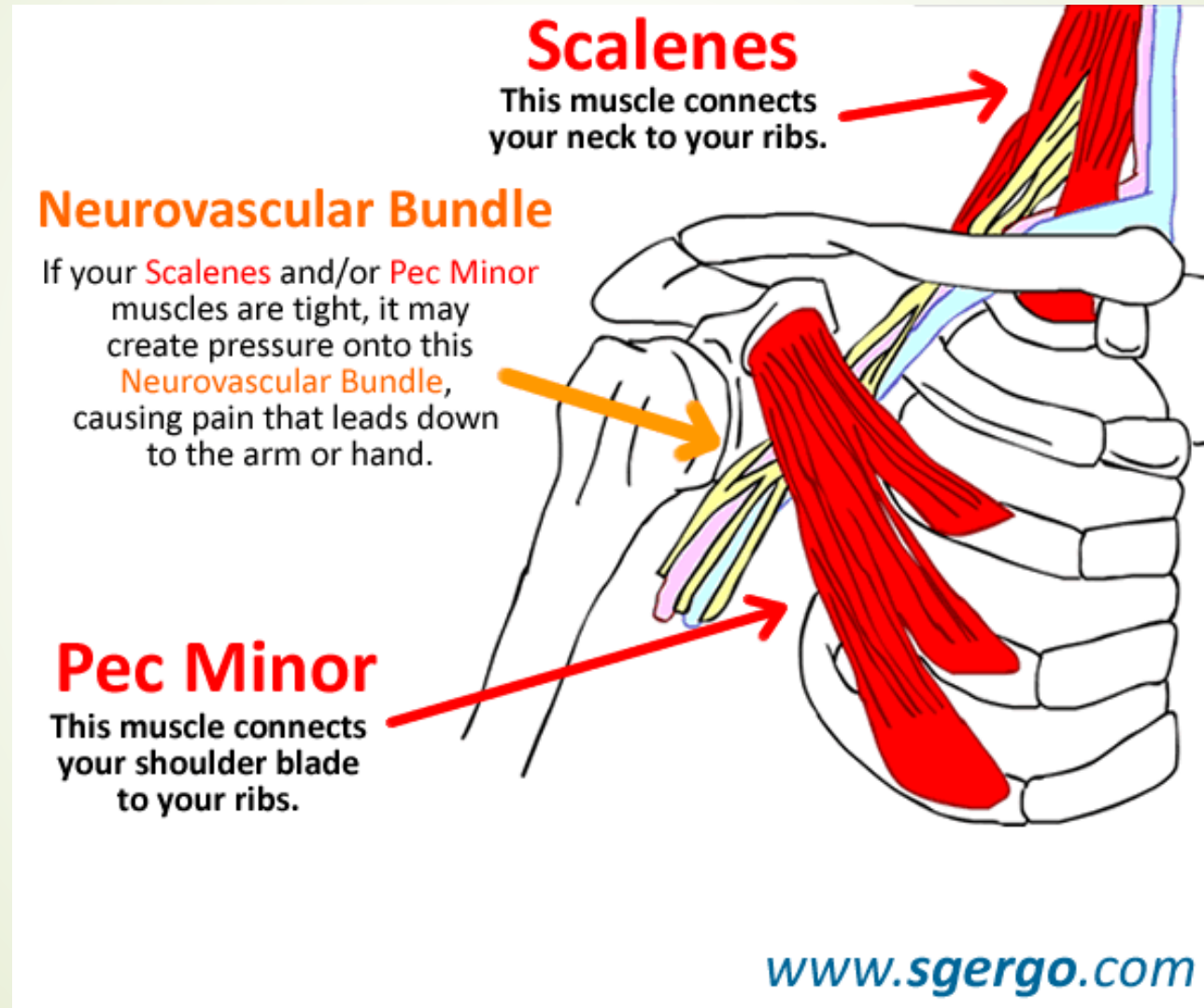
- MRI is NOT a useful tool for diagnosing TCS
- MRI may be done to rule out other problems
- Diagnosis is based on clinical history and examination
- A urodynamic study maybe helpful in case of urinary symptoms / neurogenic bladder

# Arm pain in EDS

# Pain patterns in Thoracic Outlet syndrome



# Thoracic Outlet Syndrome





# Thoracic Outlet Syndrome

- ▶ Kinesio taping
- ▶ Botox injections
- ▶ Surgical correction, may need to consider doing a shoulder stabilization surgery also (Neer Inferior Capsular Shift)

# Joint Position sense

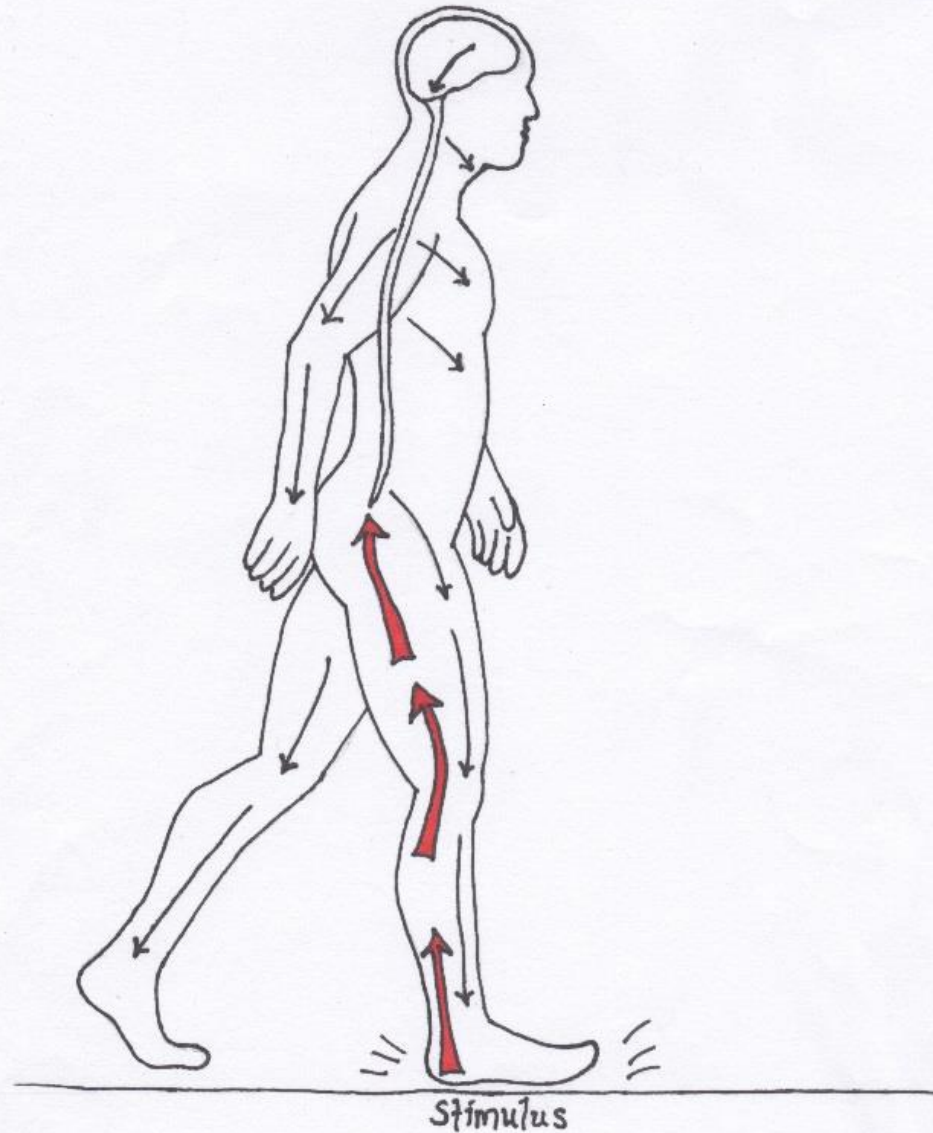
Proprioception

The body's ability to sense movement of the joints and their position

# Proprioception (Joint Position Sense)

- ▶ There are sensors in our joints, tendons, ligaments, muscles and skin that send a message to our brain as to the exact position of the joint
- ▶ The brain in turn sends signals back to manage our balance

# Proprioception – Joint sense





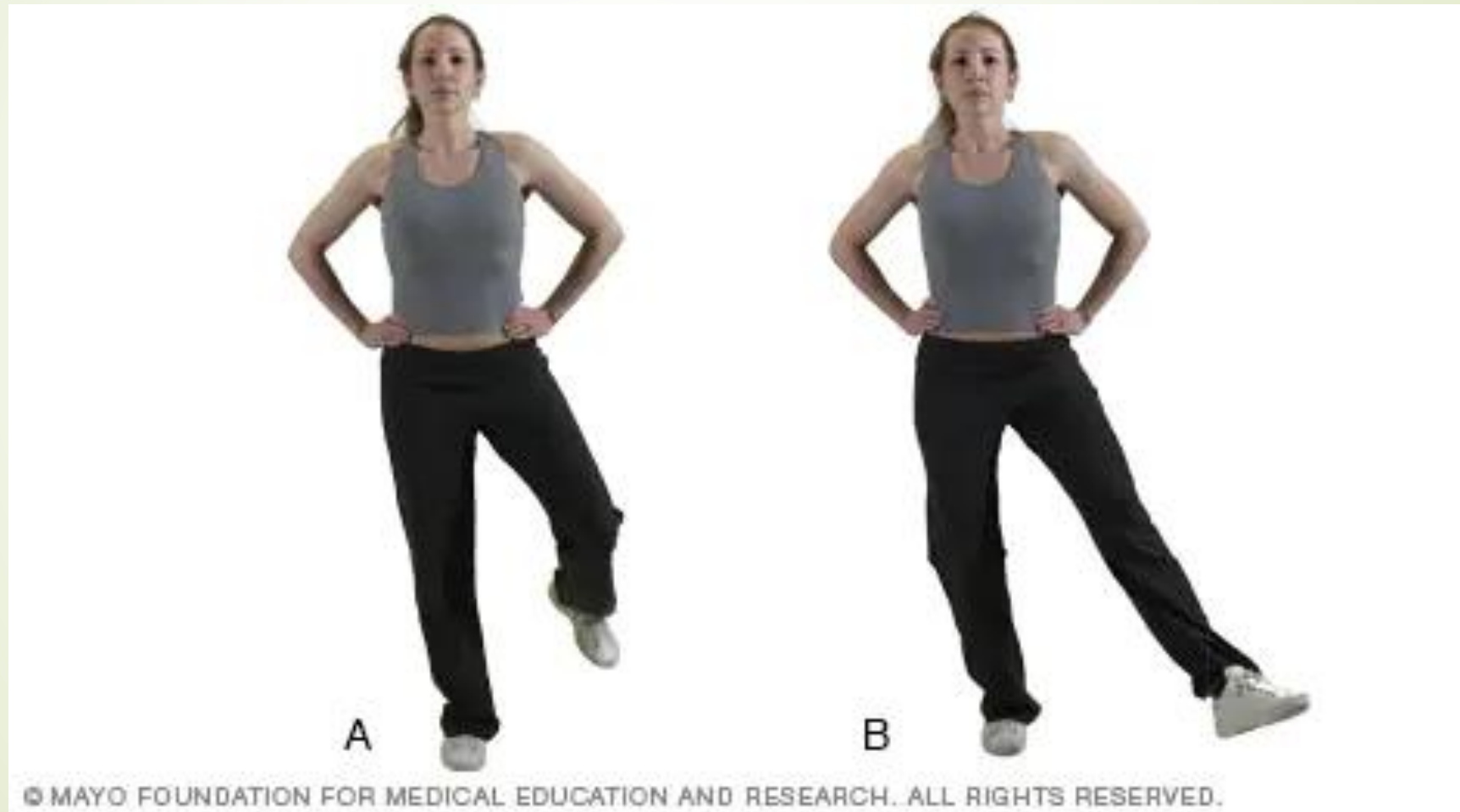
# Proprioception – Joint sense

- The brain constantly gets information from the joints as to the exact position of the limbs in space.
- This information to the brain helps us walk, use our arms, maintain our posture without tipping over.
- EDS – poor proprioception.

# Wobble Board



# Stork (one leg) standing



# Exercise ball



# Body Braid – for proprioception

- ▶ Improves proprioception throughout the body.
- ▶ [Bodybraid.com](http://Bodybraid.com)
- ▶ Yes, it can be worn under your clothes



Made-to-Measure



dm orthotics<sup>®</sup>  
SENSORY



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CW-X



# Hand and wrist pain

- Because of poor proprioception people with EDS, the fingers do not send enough signals to the brain
- As a result, they drop things because the brain does not realize they are holding something



# Hand and wrist pain

- In some cases, they hold things too tightly (pen, cooking).
- Their finger joints are lax so they must use even more muscle strength to hold things
- They press down hard when they write
- All of these cause pain in their hands and wrists

# Fingerless compression gloves



## Ring splints to stabilize the joints



# Thick handles improve proprioception



# Padded steering wheel cover improves proprioception





Do braces make your  
muscles weaker?

1  
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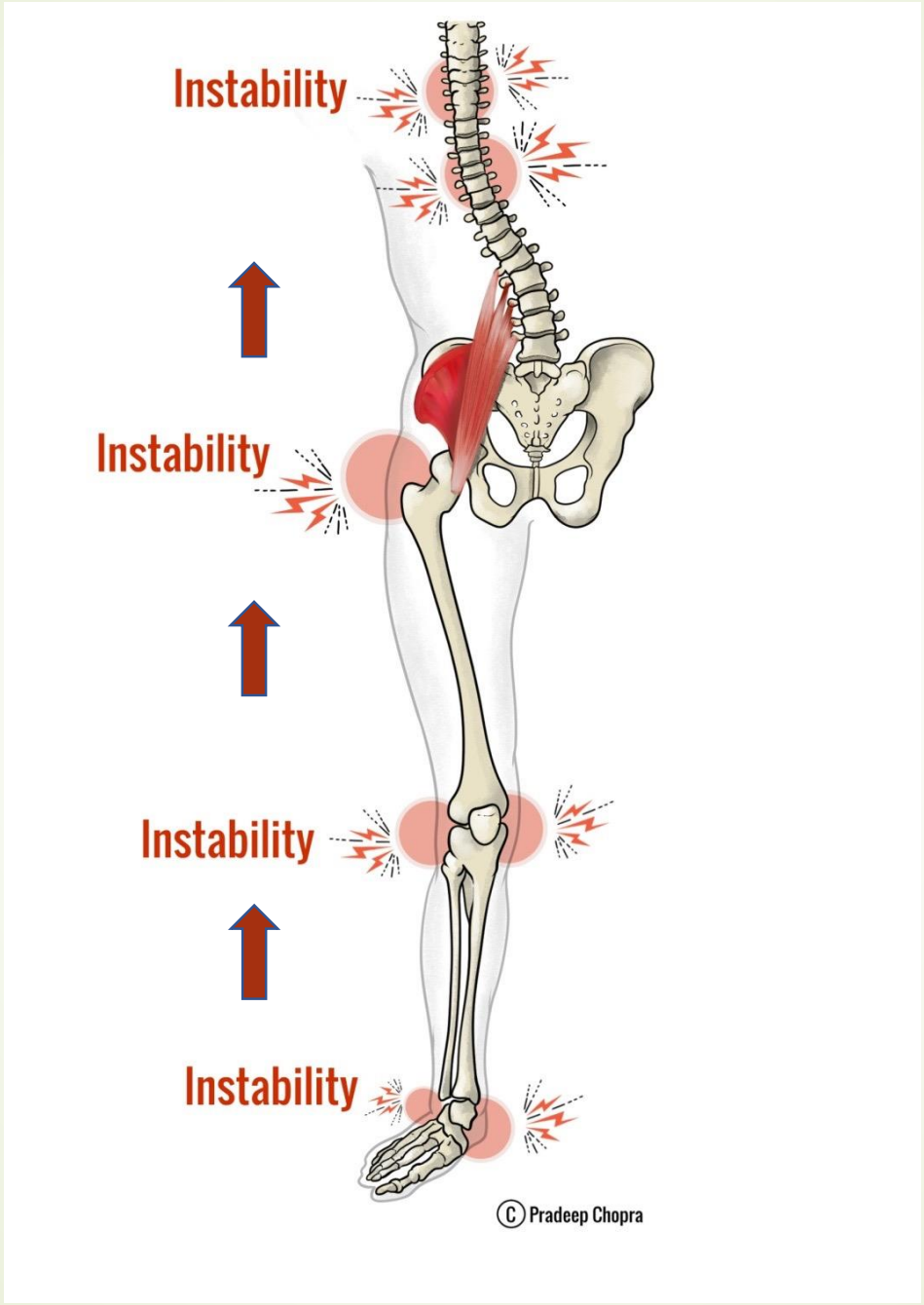
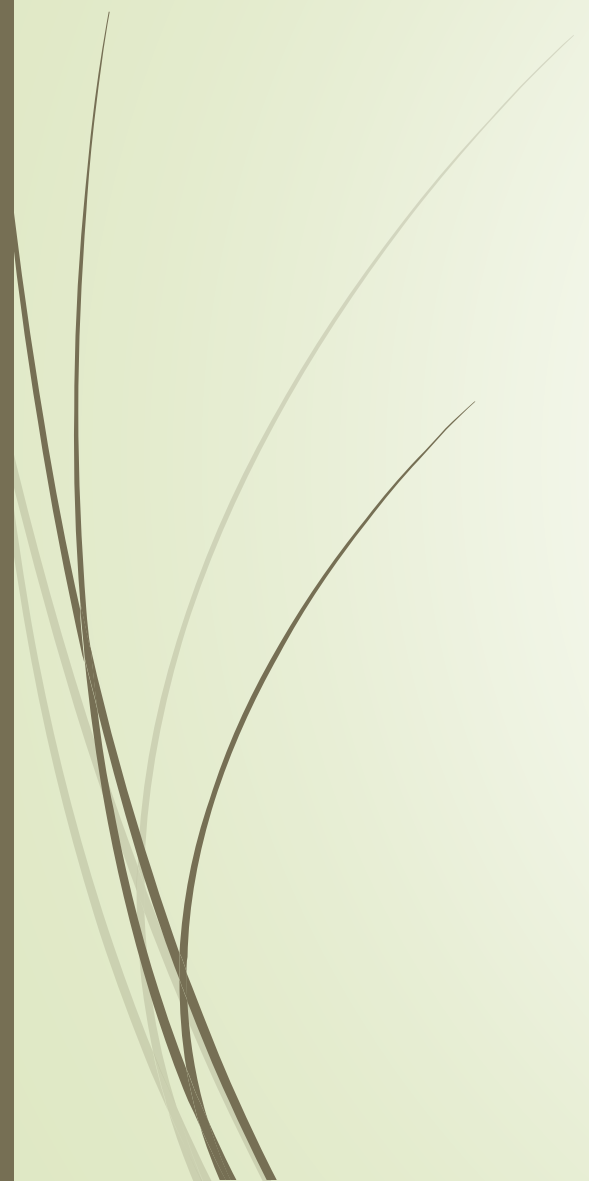


# Do braces make your muscles weaker?

 **NO**

- It's a common misconception
- No brace is tight enough to stop muscles from moving
- In fact, braces stabilize joints so your muscles can move the joints more efficiently.

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2  
6



1  
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7





# Pain in lower half of the body

- ▶ If the feet and ankles are unstable, they make
- ▶ The knees even more unstable, which then
- ▶ Makes the hips unstable, which then
- ▶ Throws the pelvis and spine off

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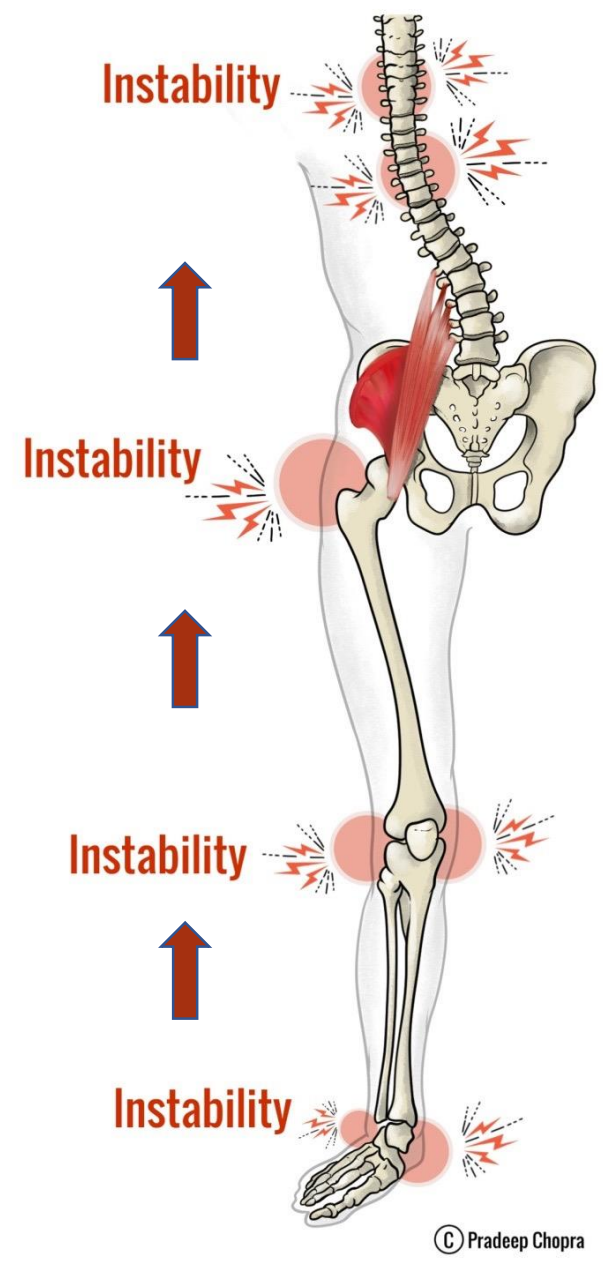
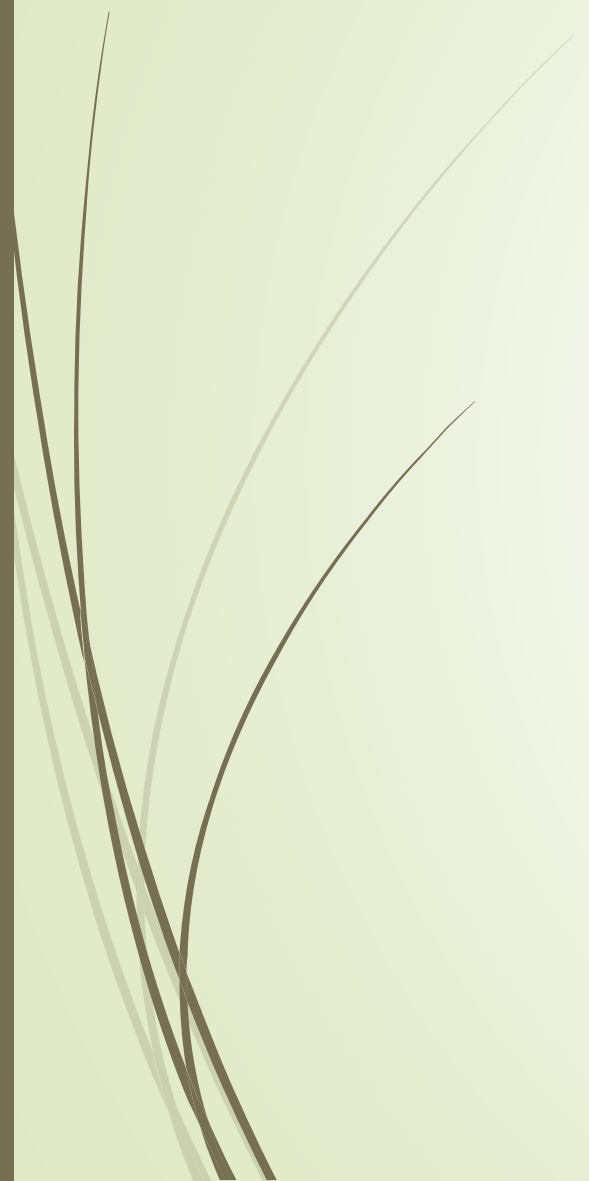
# Feet and ankles

- There are usually 2 problems
- Unstable ankles
- Flat feet

# 130 Unstable ankles

- People with unstable ankles tend to roll their ankles when walking.
- This causes a nerve (peroneal) near the knee to become inflamed.
- This causes pain on the side of the lower leg.
- They tend to trip on their toes





# High top shoes for ankle instability

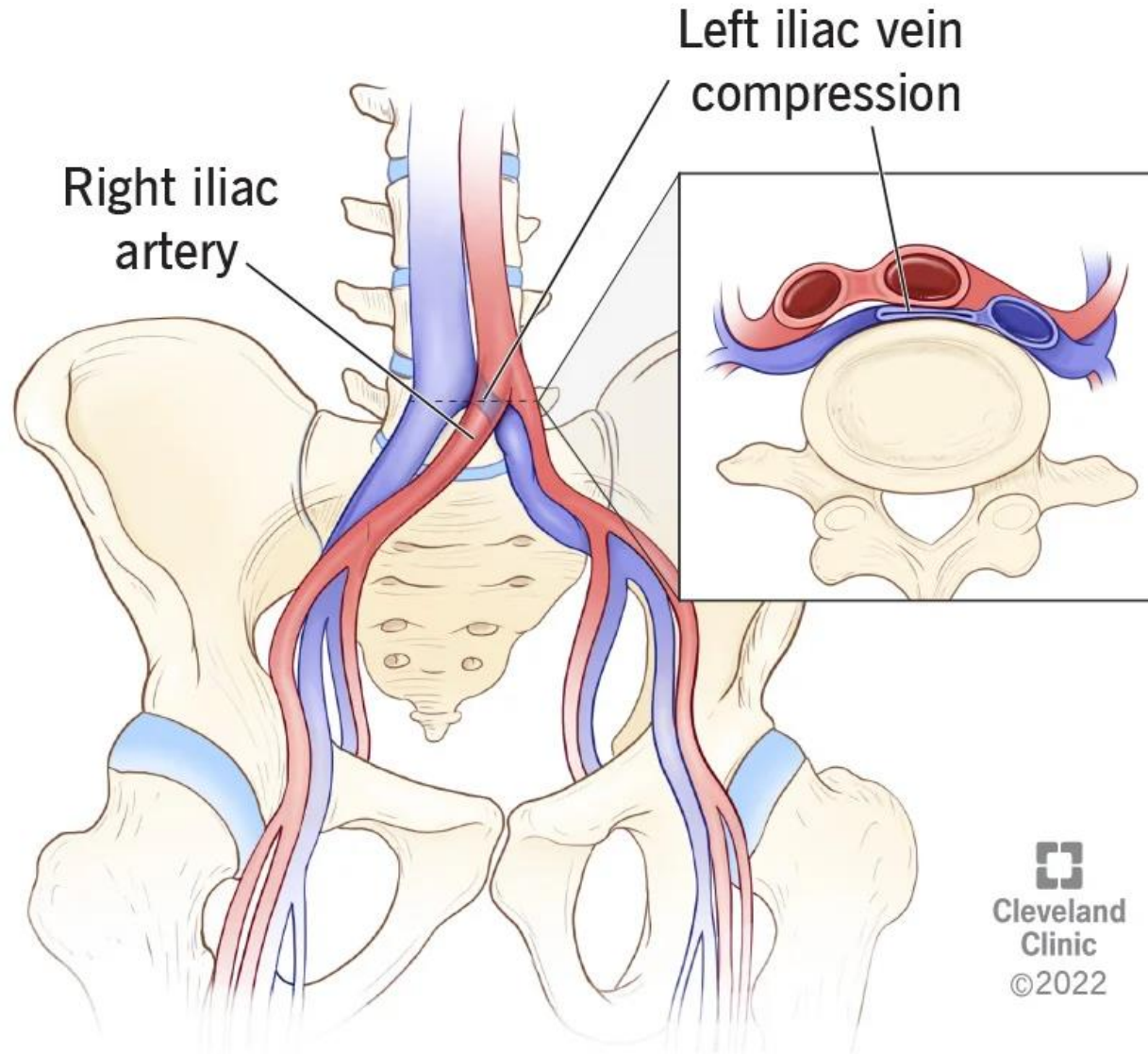
132



# May Thurner Syndrome - symptoms

- The right iliac artery compresses the left iliac vein
- Risk of Deep Vein Thrombosis
- Left leg pain with walking
- Left leg swelling
- Heavy feeling in the left leg
- Left leg varicose veins

# May-Thurner Syndrome





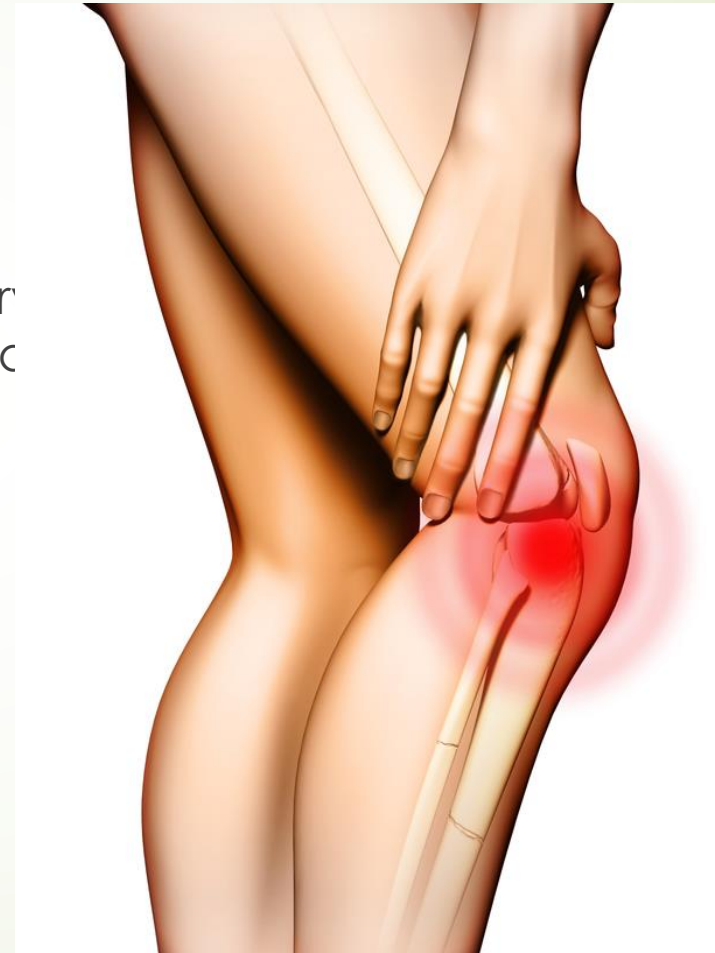
135

# Proximal Tibio fibular joint



# Knee pain – often missed cause

- Site of pain from the proximal Tibiofibular joint
- It can inflame the peroneal nerve which causes pain down the side of the leg and even foot drop



# 137 Unstable ankles

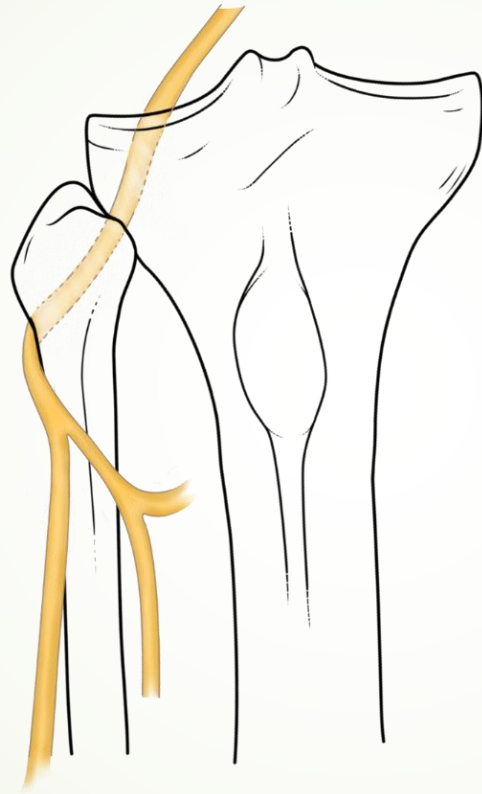
- People with unstable ankles tend to roll their ankles when walking.
- This causes a nerve (peroneal) near the knee to become inflamed.
- This causes pain on the side of the lower leg.
- They tend to trip on their toes



# The Tibio-Fibular joint – proximal and distal

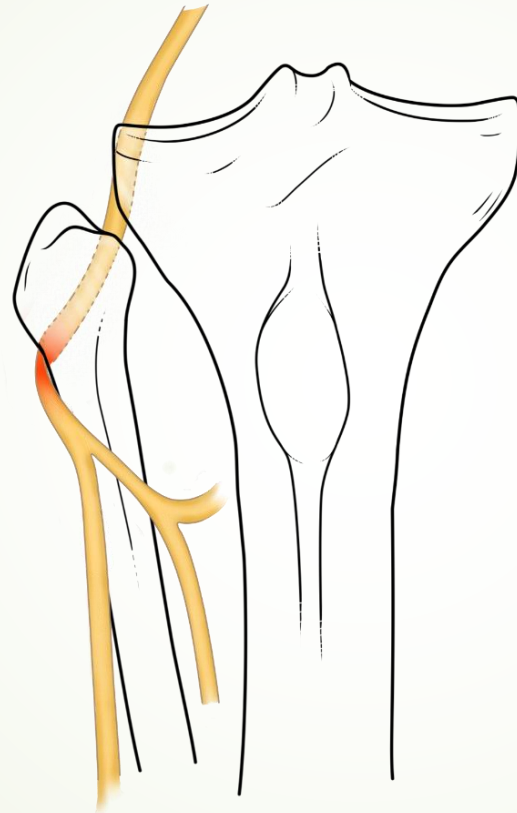
- Pain along the lateral aspect of the leg below the knee
- Knee pain, especially with squatting
- Foot drop – may be present

# Proximal Tibio-Fibular joint



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# Proximal Tibio-Fibular joint



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# Complex Regional Pain Syndrome (CRPS)

141

Pradeep Chopra, MD

3-1

# Signs and Symptoms of CRPS 1

- Pain starts in one limb but can present in the trunk (spine, abdomen, pelvis)
- Constant pain, even at rest with intermittent exacerbations.
- Temperature differential
- Color differential – comes and goes
- Swelling – comes and goes
- Area of pain larger than the primary injury

# Signs and Symptoms of CRPS

- Pain or uncomfortable sensation to touch
- Nail growth changes (faster, distorted),
- hair growth changes (coarser, darker, rapid growth, hair falling),
- skin changes – thin and shiny
- skin lesions – pin point lesions to blisters
- Increased sweating





Swelling

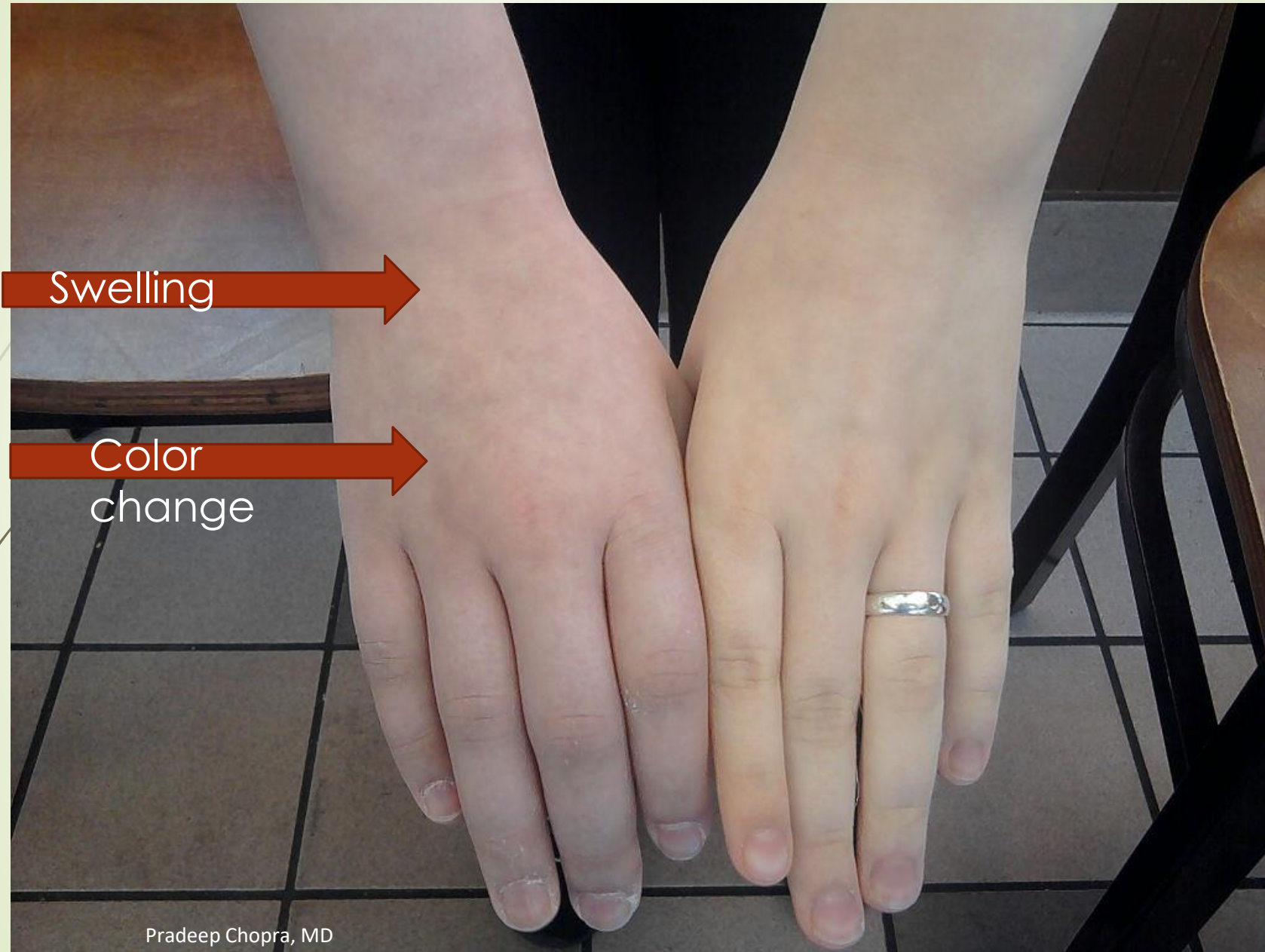
Color change



Swelling

Shiny skin

Nails growth faster,  
brittle, ridged

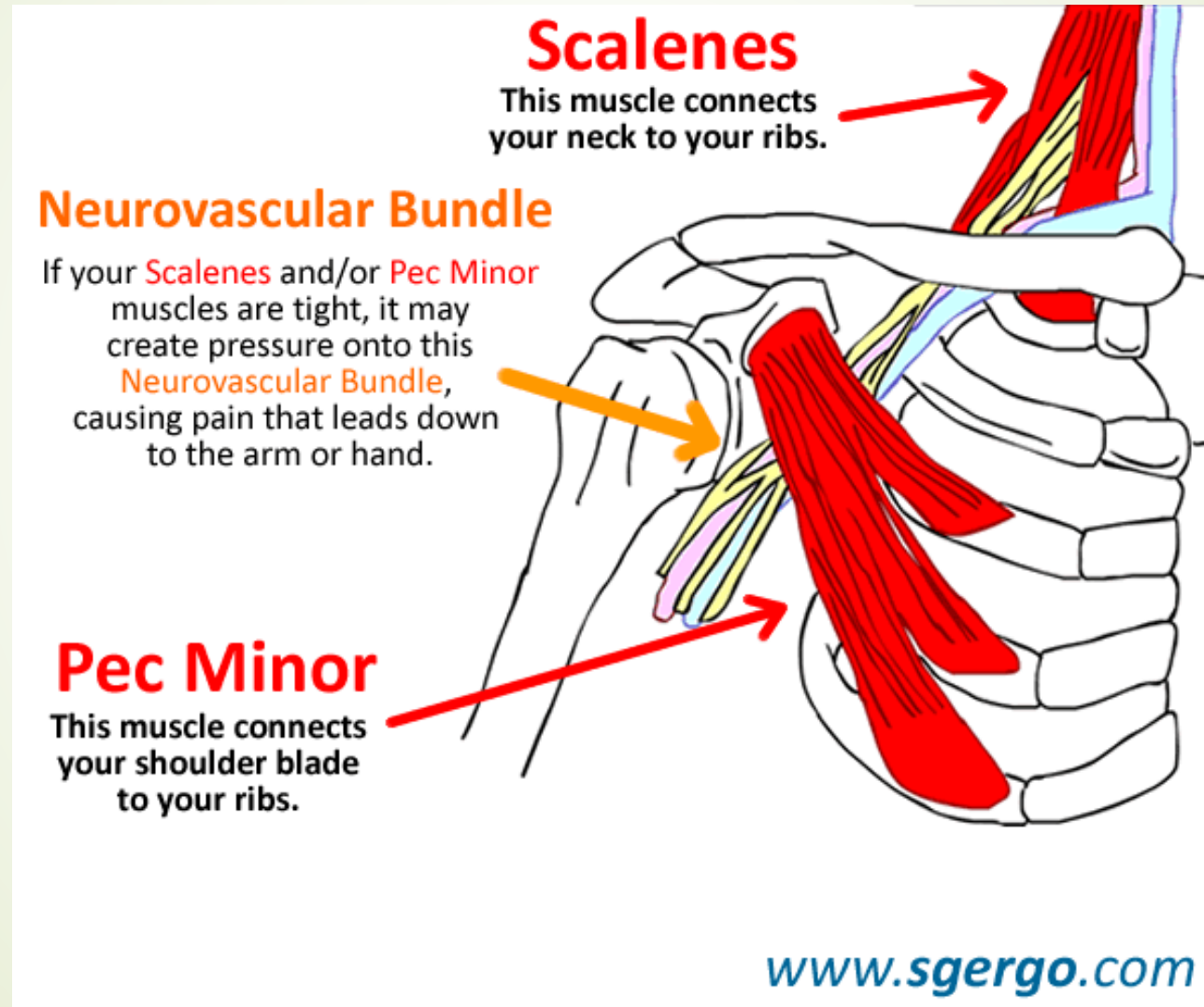


Pradeep Chopra, MD

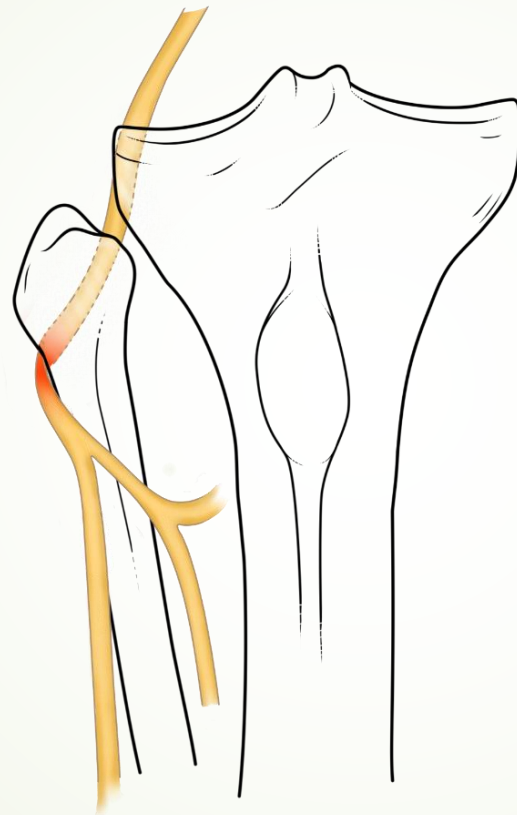
# What can cause CRPS in EDS

- ▶ Thoracic outlet syndrome
- ▶ Tethered Cord syndrome
- ▶ CRPS of the leg caused by unstable ankles

# Thoracic Outlet Syndrome



# Proximal Tibio-Fibular joint



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# Psychological aspects in EDS

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# Psychiatry

- ▶ For a person to be diagnosed with a mental condition, one must rule out any other medical condition.
- ▶ For example, to someone has an eating disorder, the patient must be ruled out for any disease that is interfering with his/her eating.



# Psychiatry

- ▶ Patients with EDS have nausea and bloating because of gastroparesis.
- ▶ They avoid eating
- ▶ This does not mean that they have an eating disorder.
- ▶ Unfortunately, most psychiatrists do not take the time to understand EDS and misdiagnose them

# Psychological aspects in EDS

- ▶ The psychological and psychiatric issues in EDS are no more than in the general population
- ▶ Psychiatrists who misdiagnose these patients do not understand EDS

# Psychological aspects in EDS

- ▶ I reviewed multiple studies. In all those studies patients with EDS were diagnosed with psychological disorders (obviously)
- ▶ None of the authors took into consideration that people with EDS have real somatic medical conditions

# Psychological aspects in EDS

- Agoraphobia (fear of going into crowded places): the authors did not take into consideration the recurrent joint subluxations, light headedness, loss of proprioception
- Eating disorders: the authors did not take into consideration the gastroparesis, intestinal dysmotility, inflammation of the gut from MCAS

# Psychological aspects in EDS

- Brain fog: from Postural Orthostatic Tachycardia Syndrome, MCAS was misdiagnosed as ADHD
- Fatigue: from EDS, PoTS, MCAS was misdiagnosed as failure to thrive

# EDS and disability

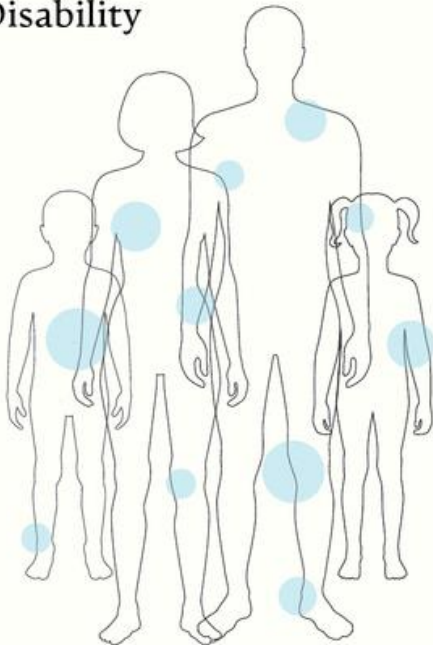
- The Social Security Administration in USA asked the National Academy of Sciences, Engineering and Medicine to convene an expert committee that would provide current disabilities in EDS and other connective tissues.
- The report is freely available on the internet
- Other than anxiety and depression in EDS, no other mental health was found in EDS

# Consensus study report on EDS and Marfans

The National Academies of  
SCIENCES • ENGINEERING • MEDICINE

## CONSENSUS STUDY REPORT

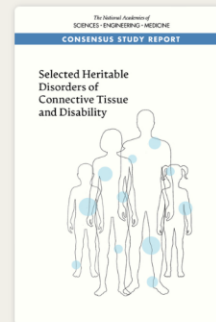
### Selected Heritable Disorders of Connective Tissue and Disability



NATIONAL ACADEMIES  
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Consensus Study Report



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## Selected Heritable Disorders of Connective Tissue and Disability

(2022)

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Epub, Kindle, MobiPocket  
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Heritable disorders of connective tissue (HDCTs) are a diverse group of inherited genetic disorders and subtypes. Because connective tissue is found throughout the body, the impairments associated with HDCTs manifest in multiple body systems and may change or vary in severity throughout an affected individual's lifetime. In some cases, these impairments may be severe enough to qualify an eligible child or adult for monetary benefits through the U.S. Social Security Administration's (SSA's) Social Security Disability Insurance or Supplemental Security Income program. SSA asked the National Academies of Sciences, Engineering, and Medicine to convene an expert committee that would provide current information regarding the diagnosis, treatment, and prognosis of selected HDCTs, including Marfan syndrome and the Ehlers-Danlos syndromes, and the effect of the disorders and their treatment on functioning. The resulting report, Selected Heritable Disorders of Connective Tissue and Disability, presents the committee's findings and conclusions.

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#### RESOURCES AT A GLANCE

[Report Highlights](#)

[Report Conclusions](#)

# In Summary

- ▶ People with EDS do NOT have more psychological issues than others.





# EDS and children

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# EDS in children

- ▶ Detecting and managing hypermobility early in life is the best option
- ▶ Avoid hypertension of joints
- ▶ Growth spurts are associated with increased pain
- ▶ Look for early complications such as Chiari Malformation, Tethered cord syndrome, Postural Orthostatic Tachycardia syndrome



# Dangers of EDS and children

- ▶ The biggest risk is from ignorant hospitals and doctors
- ▶ Unexplained bruises,
- ▶ dislocated joints,
- ▶ chronic body wide pain
- ▶ to the ignorant health care provider it may look suspicious.



# Misdiagnosis in EDS

- Things people with EDS have to hear when they look for help: “EDS does not hurt” “EDS is very rare, you can’t have it”, “EDS what?” “your skin is not very stretchy”
- The diagnosis of Conversion Disorder or Munchausen by Proxy are often made by providers with no training in Psychiatry and vice versa psychiatrists have no training in pain conditions.

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3



# Misdiagnosis

- ▶ Please check with other patients to get feedback before you go to a hospital.
- ▶ If you sense that the doctors are skeptical of your complaints, consider going somewhere else.
- ▶ Avoid large academic hospitals

The treatment of pain depends on treating the cause of the pain



# POTS (Postural Orthostatic Tachycardia Syndrome)

Pradeep Chopra, MD

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6



# Postural Orthostatic Tachycardia syndrome (PoTS) - Symptoms

- ▶ Lightheaded
- ▶ Heart racing (Palpitations)
- ▶ Fatigue





# Postural Orthostatic Tachycardia syndrome (PoTS) - Symptoms

- Headaches
- Cold hands and feet
- Poor concentration “brain fog”
- Feeling of constant anxiety

# Diagnosis of Postural Orthostatic Tachycardia Syndrome (PoTS)

- Measure blood pressure and heart rate:
  - after lying flat for 5 minutes
  - standing up - immediately
  - Standing for 10 minutes
  
- Q-sweat test
  
- Tilt Table Test

# Diagnosis of POTS

Increase in heart rate by 30 beats/minute with very little change in blood pressure

5 mins



120/80

**70**

Standing Immediately



118/78

**110**

Standing for 10 minutes



122/80

**105**



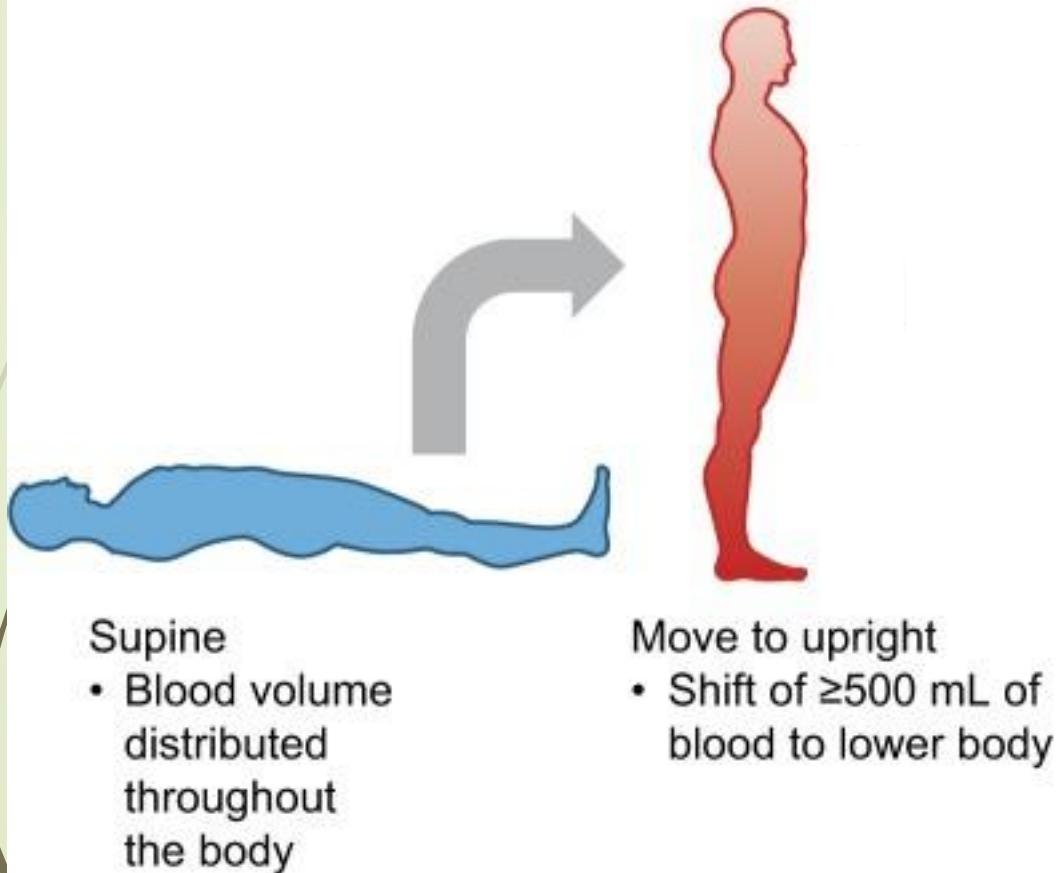
## Diagnosis of Postural Orthostatic Tachycardia Syndrome (PoTS)

- Increase in heart rate by 30 beats/min within 10 minutes of standing
- heart rate of 120 beats / min within the first 10 minutes of standing
- No significant change in blood pressure
- Lightheaded
- In children an increase of 40 beats/minute

# Causes of Dysautonomia / PoTS

- ▶ Blood pooling
  - ▶ legs,
  - ▶ mesentery (intestines),
  - ▶ Pelvis
- ▶ Cranio Cervical instability
- ▶ Autoimmune Dysfunction

Most of the blood pools in the abdomen, buttocks and thighs (80%)



# Autonomic Nervous system

- We have two kinds of nervous systems that control automatic functions
- Sympathetic nervous system –
  - increases heart rate,
  - maintains blood pressure and
  - movement of intestines.
- Parasympathetic nervous system – does the opposite of the sympathetic nervous system.

## Blood pooling in the splanchnic blood vessels

- ▶ Patients with EDS have excessive pooling of blood in the abdomen and pelvis.
- ▶ Symptoms: Bloating, lightheaded, tachycardia



# EDS – low GI perfusion. Position while eating

- ▶ Consider using a zero-gravity chair
  - ▶ for 30 minutes before eating,
  - ▶ while eating and
  - ▶ for 30 minutes after eating.
- Compression garment may help



## Anxiety in EDS – it not from the brain. It's an overactivity of the autonomic nerves

- ▶ Patients with EDS and POTS (Dysautonomia) are often misdiagnosed to have anxiety
- ▶ Symptoms of undiagnosed palpitations, fatigue, dizziness, chronic pain are attributed to 'anxiety'.

## Anxiety in EDS – it not from the brain. It's an overactivity of the autonomic nerves

- In most cases its simply PoTS – malfunction of the autonomic nervous system.
- The symptoms of 'anxiety' are more from dysfunction of the flight and fight nervous system
- Treating PoTS help treat this “anxiety”

# Management of PoTS

- Increase salt by mouth. Try a salty diet first, then try salt pills.
- Increase Potassium by mouth
- Electrolyte fluids – at least 500ml (16 oz) per day.

# Management of PoTS

- Increase water intake – at least 2 liters / day
- Compression tights up to thighs and buttocks
- Medications to try: Ivabradine
- Medicines not very helpful: Beta blockers, Midodrine.

# Managing PoTS

- Almost 80% of the blood in the lower limb is contained in the upper leg (thighs and buttocks)
- The veins located in calf and ankles have very little sympathetic nerves.
- Hence, vasoconstrictor drugs have very little effect on venous tone in the legs

Ludbrook, J. (1966). The musculo-venous pumps of the human lower limb. *American Heart Journal* 71, 635—641.

Self, D. A., White, C. D., Shaffstall, R. M., Mtinangi, B. L., Jennifer, M., Croft, B. & Hainsworth, R. (1996). Differences between syncope resulting from rapid onset acceleration and orthostatic stress. *Aviation, Space, and Environmental Medicine* 67, 547—554.

Samueloff, S. L., Browse, N. L. & Shepherd, J. T. (1966). Response of capacity vessels in human limbs to head-up tilt and suction on lower body. *Journal of Applied Physiology* 21, 47—54.

Epstein, S. E., Beiser, G. D., Stampfer, M. & Braunwald, E. (1968). Role of the venous system in baroreceptor-mediated reflexes in man. *Journal of Clinical Investigation* 47, 139—152.

# Managing PoTS

- ▶ Because of the poor nerve supply in the lower legs, pumping muscles is the best way to move pooled blood.

# Exercise in PoTS

- ▶ Exercise while lying flat or reclining
- ▶ Water exercises
- ▶ Do not push yourself.
- ▶ Exercise whatever you can
- ▶ Remember: you just need to pump muscles not strengthen them



# Sequential Compression Device





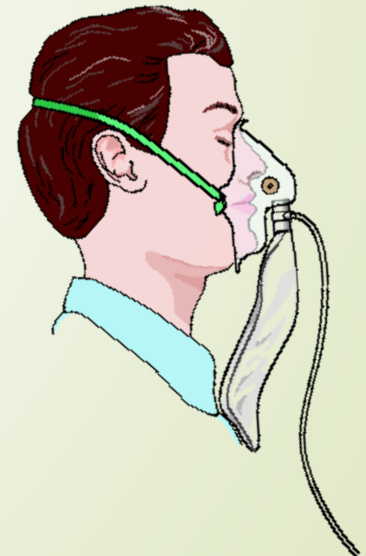
# Oxygen in Postural Orthostatic Tachycardia Syndrome (PoTS)

- ▶ Brain oxygen level drop significantly in PoTS
- ▶ Studies have shown lower cerebral oximetry in PoTS
- ▶ This causes Brain fog, light headedness, blurred vision, fatigue

Kharraziha I, Holm H, Bachus E, Melander O, Sutton R, Fedorowski A, Hamrefors V. Monitoring of cerebral oximetry in patients with postural orthostatic tachycardia syndrome. *Europace*. 2019 Oct 1;21(10):1575-1583. doi: 10.1093/europace/euz204. PMID: 31384930; PMCID: PMC6877984.

# Oxygen in Postural Orthostatic Tachycardia Syndrome (PoTS)

- ▶ There is also a decrease in oxygen delivery to muscles on a microscopic level
- ▶ Oxygen by non-rebreather mask 3 liters to 5 liters, 20 minutes per day up to twice a day.



# Technology

- ▶ Amazon's Echo "Alexa" setup in different rooms of the house.
- ▶ Should you feel lightheaded, use it to call for help
- ▶ Apple Watch 4 and after:
  - ▶ will record heart rate and
  - ▶ has a fall warning. It can detect a fall and call for help



# Exercises for EDS

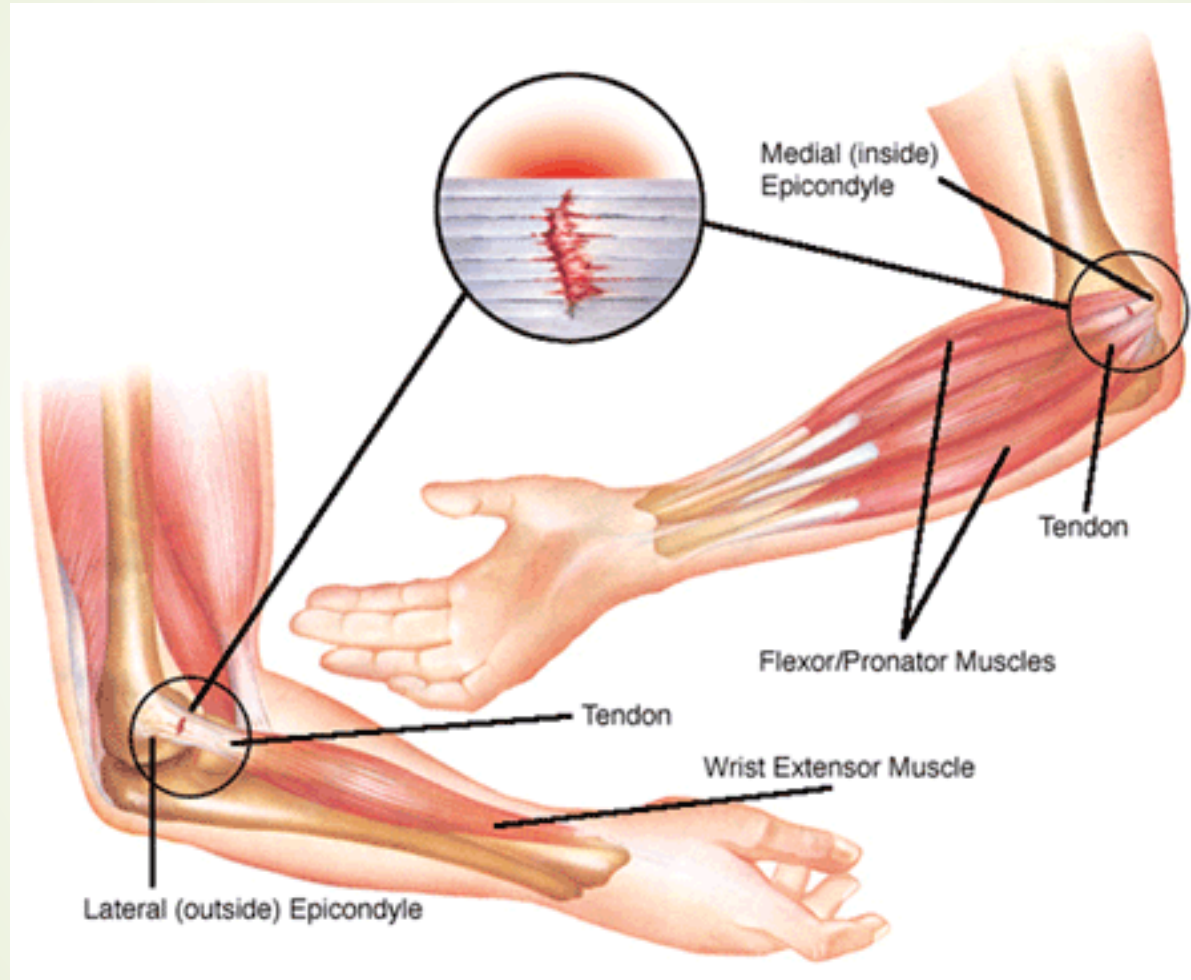
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# Types of tissue injury in EDS

- **Micro trauma** – small repetitive traumas resulting in constant tissue breakdown. Invisible tissue breakdown
- For example – overstretching muscles and ligaments. Vacuuming, chopping food, dusting

# Micro trauma





## Exercising in EDS should be done very carefully

- It is not about 'strengthening' muscles.
- The connective tissue in EDS is soft and strengthening muscles will cause increased wear and tear
- Muscles toning without stressing the joints – for stabilizing joints

## Exercising in EDS should be done very carefully

- ▶ Proprioception exercises.
- ▶ Exercising consistently is more important than the degree of exercise
- ▶ Start low, go slow



# Exercises

- ▶ Aquatic therapy – walk in water, tread in water
- ▶ Balance exercises
- ▶ Supine exercises for PoTS
- ▶ Walk – going for short walks
  
- ▶ As long as you are pumping muscles that should help

# Wobble Board



# Stork (one leg) standing



# Exercise ball






# Mast Cell Activation Syndrome

MCAS



Pradeep Chopra, MD



# Mast Cell Activation Syndrome and EDS

- It feels like having flu – tired, cold, sick and no appetite.
- It causes fatigue
- Causes loss of appetite
- It causes diffuse body wide pain
- Worsens PoTS



# Mast Cell Activation Syndrome (MCAS) and EDS

- Mast cells are normally found everywhere in the body
- They are activated when the body's immune system detects a danger
- In MCAS, mast cells start to misbehave
- They release many chemicals like histamine, cytokines that increase pain and inflammation

# Symptoms of MCAS

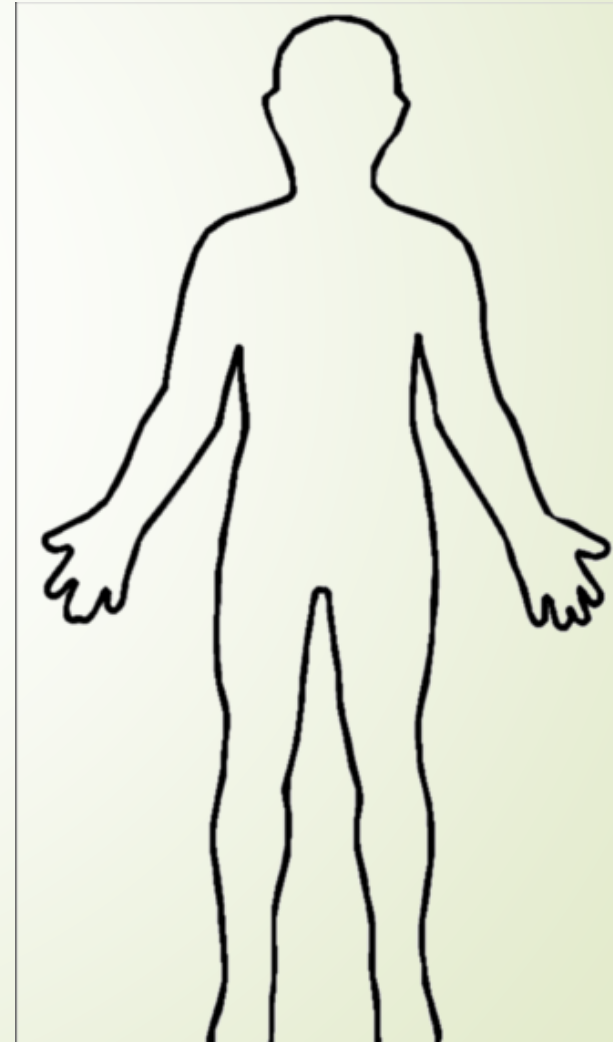
- Skin flushing and itching
- Multiple sensitivities to chemicals
- Headaches
- Sweating (especially at night)
- Skin flushing after a shower
- Brain Fog
- Fatigue
- Abdominal discomfort

# Mast Cell Activation Syndrome (MCAS)

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- Head: Brain fog, headaches
- Heart: Fast heart rate, dizziness
- Lungs: chest tightness
- GI tract: Pain, nausea, diarrhea
- Bladder: pain, frequent or painful urination
- Joint and muscle pain
- Skin: Rashes, itching



Management of MCAS is  
in 3 parts

# Management of MCAS – part 1

- Antihistamines such as
- Famotidine 20mg twice a day
- Benadryl or Cetrizine – twice a day
- Clemastine, Rupatadine – antihistamine also helps pain
- Montelukast 10mg once a day

# Management of MCAS part 2

- Mast cell stabilizers:
- Cromolyn 200 mg by mouth 3-4 times/day
- Ketotifen 2mg by mouth 2 times/day

# Management of MCAS part 3

- Some of the usual suspects for MCAS to avoid are:
  1. Seasonings (except olive oil, salt).
  2. All dairy.
  3. Eggs.
  4. Grains except quinoa and rice.
  5. Avoid beef products but okay to take lamb, venison, and poultry.
- Avoid drugs or food with color dye such as red or blue dye
- HEPA air filter
- Nasal saline wash during flare ups
- Avoid rapid change in room temperature





# Fatigue in EDS

Pradeep Chopra, MD



# Fatigue

- EDS
- Postural Orthostatic Tachycardia / Dysautonomia
- Mast Cell Activation Syndrome
- Medicines
- Pain
- Poor sleep
- secondary mitochondrial dysfunction

# Blood tests in Fatigue

- ▶ Iron and Ferritin levels
- ▶ Cortisol level
- ▶ Thyroid function
- ▶ Testosterone levels

## Poor sleep in EDS

- ▶ If PoTS – take a salty snack and electrolyte fluid before bedtime
- ▶ Lemborexant (Dayvigo) 5mg to 10mg at bedtime
- ▶ Daridorexant (Quviviq) 25mg to 50mg at bedtime
- ▶ Magnesium tablet or lotion at bedtime

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# Low Dose Naltrexone LDN

# Low Dose Naltrexone (LDN)

- Increases endorphin production
- Increased in OGF repairs tissue and healing.
- Naltrexone blocks the effect of TLR4 (Toll Like receptors) which decreases glial cell activation
  
- All the above decrease pain, fatigue and inflammation

J Neuroimmune Pharmacol (2013) 8:470–476  
DOI 10.1007/s11481-013-9451-y

PERSPECTIVE

## Treatment of Complex Regional Pain Syndrome (CRPS) Using Low Dose Naltrexone (LDN)

Pradeep Chopra · Mark S. Cooper

Received: 7 November 2012 / Accepted: 4 March 2013 / Published online: 2 April 2013  
© The Author(s) 2013. This article is published with open access at Springerlink.com

**Abstract** Complex Regional Pain Syndrome (CRPS) is a neuropathic pain syndrome, which involves glial activation and central sensitization in the central nervous system. Here, we describe positive outcomes of two CRPS patients, after they were treated with low-dose naltrexone (a glial attenuator), in combination with other CRPS therapies. Prominent CRPS symptoms remitted in these two patients, including dystonic spasms and fixed dystonia (respectively), following treatment with low-dose naltrexone (LDN). LDN, which is known to antagonize the Toll-like Receptor 4 pathway and attenuate activated microglia, was utilized in these patients after conventional CRPS pharmacotherapy failed to suppress their recalcitrant CRPS symptoms.

**Keywords** Chronic pain · Complex regional pain syndrome · CRPS · Reflex sympathetic dystrophy · RSD · Neuropathic pain · Naltrexone · Fixed dystonia · Allodynia · Vasomotor · Ulceration · Dystonic spasms · Conversion

dysfunctions. One of the characteristic symptoms of this condition is that the pain is out of proportion to the initial injury. Diagnoses of CRPS are often delayed because it is under recognized (Binkley 2012). If effective treatments are given early enough in progression of the disease, there is reduced chance for the spread of regional pain, autonomic dysfunction, motor changes, and negative sensory symptoms, such as hypoalgesia (Marinus et al. 2011). As CRPS progresses, it becomes refractory to sympathetic nerve blocks, conventional analgesics, anticonvulsants and antidepressants.

During neuroimmune activation, TLR4 (Toll-Like Receptor 4) is upregulated in microglia, resident immune cells of the central nervous system (Watkins et al. 2009). After transection of the L5 spinal nerve in the rat, TLR4 expression is increased in spinal microglia. This correlates with the rodent developing neuropathic pain (Tanga et al. 2005). From a post-mortem analysis of a CRPS patient, activated microglia and

# Low Dose Naltrexone (LDN) in Germany

- <http://www.ldn4ms.de>
- This website has more information on LDN



## LDN (low Dose Naltrexone)

- ▶ Normal dose 4.5mg to 9mg per day
- ▶ May start at 0.5mg per day and increase slowly
- ▶ Give it a trial of 6 months at least

TAKE LDN ONLY ONCE A  
DAY ONLY

# Web resource

- ▶ LDN Research Trust
- ▶ <https://www.ldnresearchtrust.org/>

# Managing pain in EDS

Treat the cause of the  
pain

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# Causes of pain in EDS

- ▶ Mast Cell Activation Syndrome
- ▶ Headache – high or low pressure
- ▶ Spine – instability of the neck, lower back and SI joint
- ▶ Chest- rib subluxations

# Causes of pain in EDS

- ▶ Abdomen – MCAS, vascular compression, GI dysmotility
- ▶ Nerve pain – thoracic outlet syndrome, peroneal nerve compression, celiac plexus nerve compression in abdomen
- ▶ EDS – muscle spasms from unstable joints

# Muscle pain

- Bittersalz (EPSOM) salt bath – 2 large cups of Bittersalz salt in a bathtub
- Magnesium Lotion
- IV Magnesium
- Carbidopa+Levodopa (Sinemet) (25/100) ½ to 1 tab as needed



# Menstrual Periods

- ▶ Talk to your Obstetrician about completely stopping menstrual periods
- ▶ Menstrual Periods can worsen symptoms of EDS, MCAS, PoTS, body wide pain, pelvic pain



# Levodopa-carbidopa for muscle pain

- Significant relief for muscle spasms and dystonia
- Low dose
- Sinemet ® (25/100 mg) ½ to 1 tab as needed

# Topical Magnesium

- ▶ Topical magnesium lotion is very helpful for muscle pain
- ▶ Oral Magnesium does not work as well

# Ketamine

- Ketamine is a strong pain killer at low doses.
- It works best when given as IV
- It can be used as a nasal spray or under the tongue.
- Only good for neuropathic (nerve) pain
- Not much value in EDS pain unless there is a component of nerve pain



# Thank you

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