# **Back To Chiropractic CE Seminars Chest & Thoracic Conditions ~ 6 Hours**

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I'm always a phone call away... 707.972.0047 or email: marcusstrutzdc@gmail.com

Marcus Strutz, DC Back To Chiropractic CE Seminars



Presented by Jamie He, D.C.

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# Learning Objectives 6 Hours on Common Head & Neck Conditions

- Section 1: Review anatomy and physiology of the chest and thoracic regions; review orthopedic tests and examination of the regions. Discuss thoracic spine disorders.
- Section 2: Recognize and differentiate cardiac vs non-cardiac chest pain.
  Identity conditions include visceral referred pain.
- Section 3: More on the suggested therapies, maneuvers, exercises and nutrition

### Overview

- 1. Provide an easy-to-read "manual" for common conditions in found in the chest and thoracic spine
- 2. Recognize the red flags of the conditions for proper referral
- 3. Differentiate common thoracic and chest conditions seen in a chiropractic office
- 4. Review anatomy and physiology
- 5. Provide lists of key questions in history taking, demographics, and classic presentation of each condition
- 6. Review lists of positive physical exam findings and suggested management on each condition

# Always remind ourselves that...

- Common people have common things BUT it is very important for us to recognize what is UNCOMMON. The goal of this course is to refresh our knowledge on the common conditions and the red flags of the rare ones.
- While patient history is important, the most reliable information that leads to our final clinical decision or diagnosis is signs and symptoms and findings from the examinations.



**Anatomy Review** 

# 3 Layers of Muscles to the Thoracic Spine

- > Superficial latissimus dorsi, trapezius, levator scapulae, and rhomboids
- Intermediate serratus posterior superior and the serratus posterior inferior
- > **Deep** erector spinae and transversospinales muscles

## Latissimus Dorsi

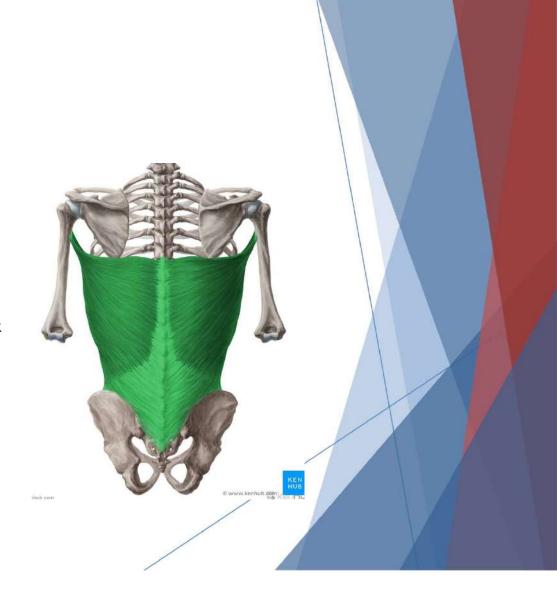
### Attachment:

 Spinous processes of T7-12 and thoracolumbar fascia, lower 3-4 ribs, iliac crest, and inferior angle of the scapula; bicipital groove of the humerus

### Action:

- Extends, adducts and internally rotates the upper arm
- Influences movements of the shoulder blade and trunk
- Assists in respiration

- Shoulder pain and dysfunction
- Low back pain



# **Trapezius**

### Attachment:

 Medial third of superior nuchal line, external occipital protuberance, nuchal ligament, and spinous processes of C7 - T12; lateral third of clavicle, acromion, and spine of scapula

#### Action:

- · Side bending and turning the head
- Elevates and depresses the shoulders, and internally rotates the arm
- Supports the arm and assist in upper limb movement by controlling shoulder blade movements

- Shoulder pain and dysfunction
- Headache
- Upper-crossed syndrome



## Levator Scapulae

### Attachment:

 Transverse processes of vertebrae C1-4; medial border of scapula

### Action:

- Ipsilateral flexion and extension of the neck
- Elevates scapula and tilts glenoid cavity inferiorly by rotating the scapula downward

- Poor posture
- Possibly cervicogenic headaches



## Rhomboids

### Attachment:

 Rhomboid minor: Nuchal ligament, Spinous processes of C7-T1; root of spine of scapula Rhomboid major: Spinous process of vertebrae T2-T5; medial border of scapula

### Action:

- Draws scapula superomedially and rotates glenoid cavity inferiorly
- Supports position of scapula

- Poor posture
- Upper-crossed syndrome
- Shoulder dysfunction



## Serratus Posterior Superior

### **Attachment:**

 Nuchal ligament, spinous processes of C7-T3; Superior borders of ribs 2-5

### Action:

- Elevates ribs
- Assists in respiration

### Clinical relation:

Scapulocostal syndrome





## **Serratus Posterior Inferior**

### **Attachment:**

 Spinous processes of T11-L2; Inferior borders of ribs 9-12

### Action:

- Depresses ribs
- Assists in respiration

### Clinical relation:

Myofascial pain



# Erector Spinae "I Like Standing"(lateral to medial)

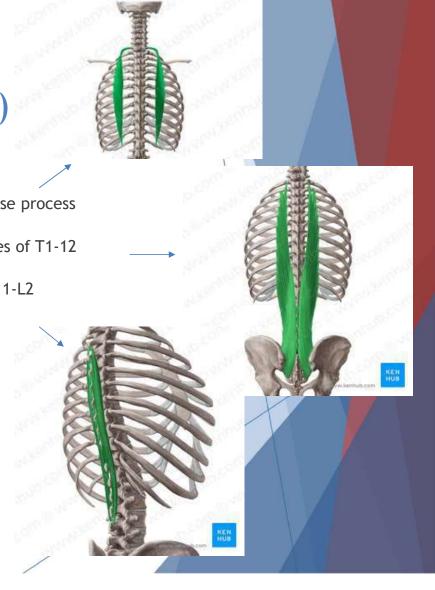
### Attachment:

- Iliocostalis thoracis: angles of ribs 7-12, angles of ribs 1-6 and transverse process of C7
- Longissimus thoracis: transverse processes of L1-5; transverse processes of T1-12 and rib 9 and 10
- Spinalis thoracis: spinous processes of T2-T8 to spinous processes of T11-L2

### Action:

· Extension and ipsilateral flexion of the spine

- Back pain
- Strains
- Spasms



## Transversospinales Muscles

### Attachment:

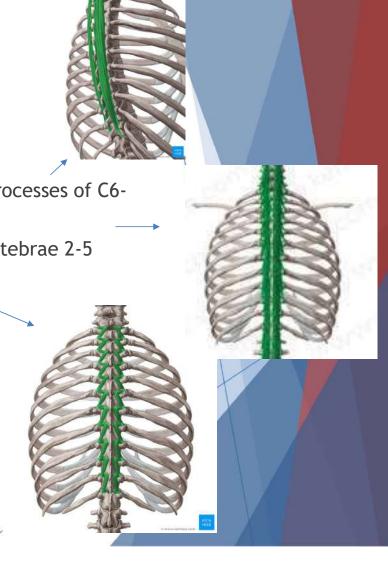
- Semispinales thoracis: transverse processes of T6-10; Spinous processes of C6-T4
- Multifidus: transverse process to spinous process of thoracic vertebrae 2-5 levels above origin
- Rotatores thoracis: transverse process to spinous process

### **Action:**

Stabilize the spine

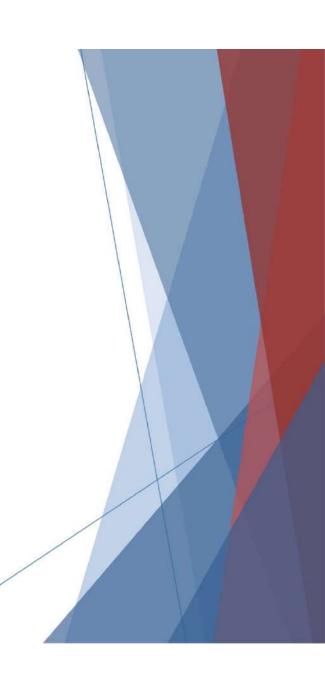
### Clinical relation:

Degenerative changes associated with facet joint osteoarthritis



# Muscles of the Thoracic Cage

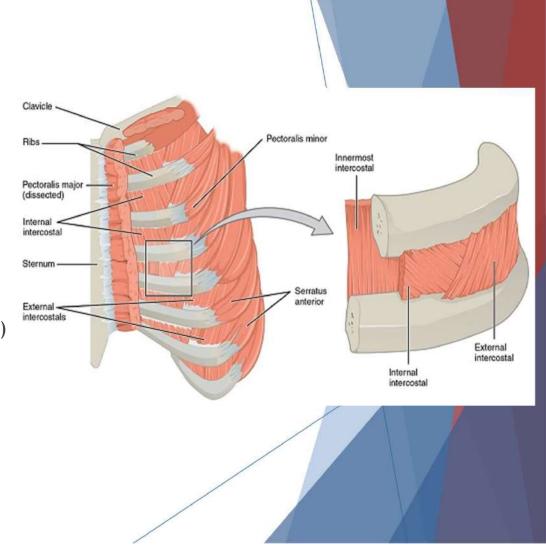
- Intercostals
- Subcostals
- ► Transversus thoracis
- Ones DO NOT comprise the thoracic wall but DO ATTACH to it
  - Pectoralis
  - Serratus anterior
  - Scalenes



## **Intercostals**

### Attachment:

- External intercostal: inferior border of rib above; superior border of rib below
- Innermost intercostal: costal groove of the rib above; superior border of rib below
- Internal intercostal: costal groove (lower part of inner surface of rib near the inferior border) of the rib above; upper border of rib below



### **Action:**

- The interchondral part elevates ribs during forced inspiration
- The interosseous part depresses ribs during forced expiration
- Support intercostal spaces and thoracic cage

### Clinical relation:

Respiratory insufficiency

## Subcostals

### Attachment:

 Interior surface of the lower ribs; superior border of the rib 2-3 levels below origin

### Action:

- Depresses ribs during forced expiration
- Support intercostal spaces and thoracic cage

### Clinical relation:

Respiratory insufficiency



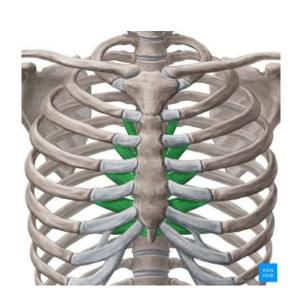
## **Transversus Thoracis**

### Attachment:

 Superior surface of the inferior sternum; internal surface of costal cartilages 2-6

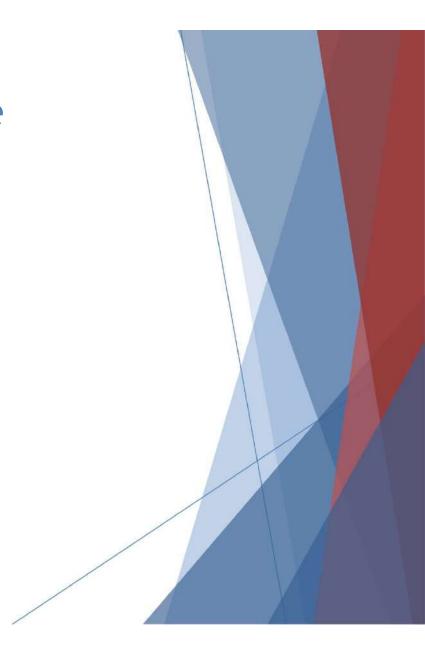
### Action:

- Weakly depresses ribs
- Support intercostal spaces and thoracic cage



# Organs Inside the Thoracic Cage

- Heart
- Lungs
- Thymus
- Mammary gland (female)
- Trachea
- Esophagus
- Stomach
- Pleurae





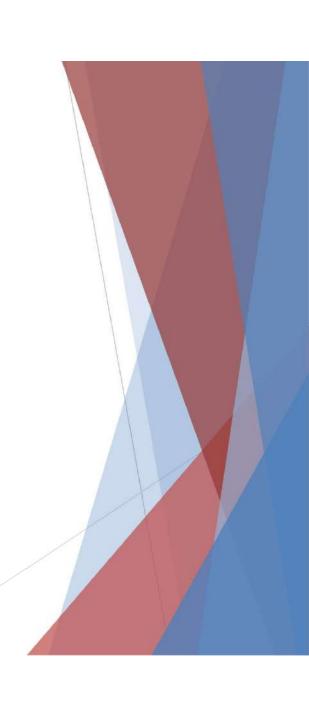
## **Observations**

Look For	What It May Look Like	Possible Indication
Deformity	Buffalo hump in the upper Tsp	Cushing's syndrome
	Acute-angle kyphosis	Compression fracture
	Hyperkyphosis	Scheuermann's disease
	Lateral curvatures, scapular winging	Scoliosis
Skin Lesions	Rash with blisters	Shingles/herpes zoster
	Rough, thick, lesion-like patches, maybe discolored	Skin cancer

Normal thoracic kyphosis: 20-40 degree (measured using the Cobb angle, the gold standard kyphosis measurement method)

# Normal Active Range of Motion

Action	Range of motion
Flexion	20-45
Extension	25-45
Lateral flexion	20-40



# Myotome and Dermatome Testing

Nerve Root Level	Sensory Testing	Motor Testing
T1	Medial elbow and upper arm	Finger abduction
T2	Armpit	
T3-T12	Thorax/abdomen Nipples (T4) Xyphoid (T7) Navel (T10)	Intercostals, back, abdominals

# Orthopedic Tests

Test Name	Positive Findings	Indication
Adam's Test	One side of the rib cage is higher, rib hump	Scoliosis
Prone Extension	Whether the kyphosis improves with extension	Yes - Functional hyperkyphosis No - Structural hyperkyphosis
Passive Neck Flexion Test	Reproduce pain or other neural symptoms in the Tsp	Contribution of neural tension to the symptoms
Thoracic Compression Test	Increase symptoms	Tissue trauma, decrease disc height or foraminal space
Thoracic Distraction Test	Decrease symptoms	Nerve root compression
Thoracic Foraminal Closure Test	Reproduce or increase symptoms	

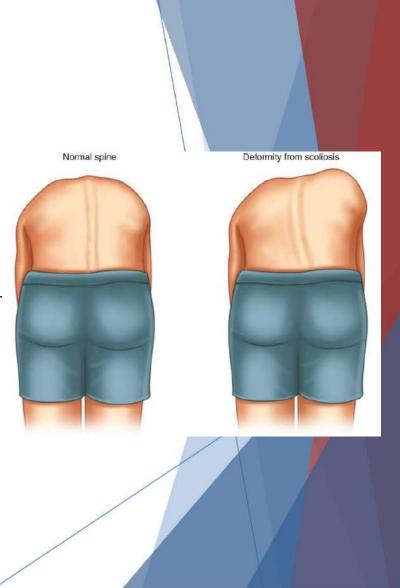
Test Name	Positive Findings	Indication
Adson's Test	Marked decrease/disappearance of the radial pulse	
Roo's Test	Reproduce or increase paresthesia; pain at neck and shoulder, down the arm	Thoracic Outlet Syndrome

## Adam's Test

> To identify individuals with scoliosis

Procedure: Patient stands and bends forward as far as possible.

**Interpretation:** Look for one side of the rib cage to be higher than the other next to the vertebral column. The convex side is the one with the rib hump.



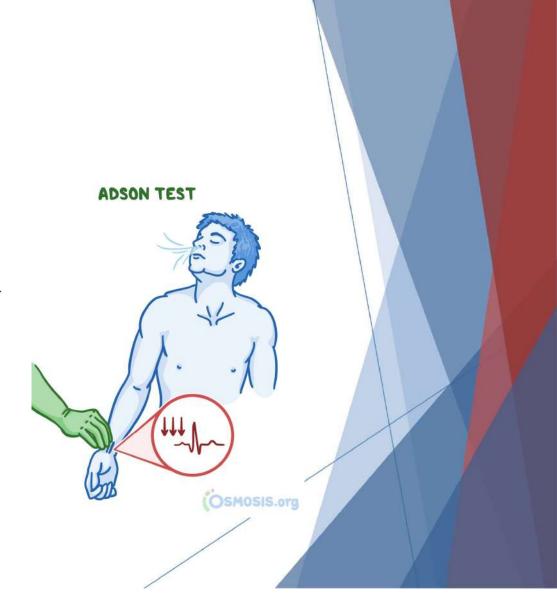
### Adson's Test

> To identify individuals with Thoracic Outlet Syndrome

**Procedure:** The arm of the standing (or seated) patient is abducted 30 degrees at the shoulder and maximally extended. The radial pulse is palpated and the examiner grasps the patient's wrist. The patient then extends the neck and turns the head toward the symptomatic shoulder and is asked to take a deep breath and hold it.

The quality of the radial pulse is evaluated in comparison to the pulse taken while the arm is resting at the patient's side.

**Interpretation:** A marked decrease/disappearance of the radial pulse

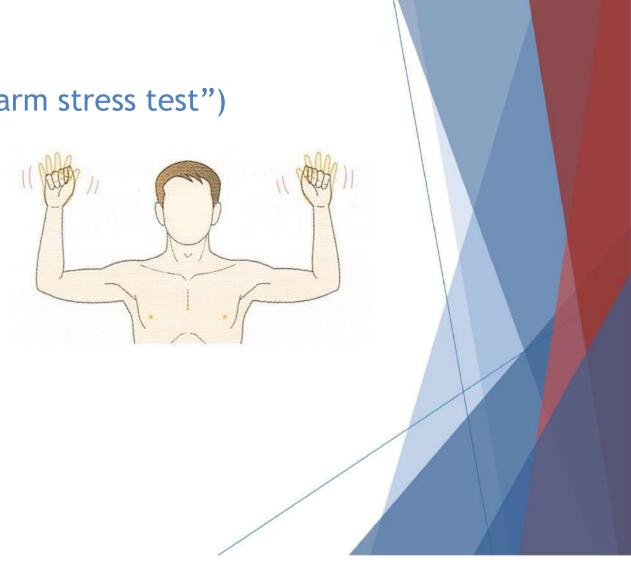


Roo's Test aka EAST test ("elevated arm stress test")

- To identify individuals with Thoracic Outlet Syndrome
- Most reliable provocative test for TOS

**Procedure:** Patient has both arms in the 90 degree abduction-external rotation position, then slowly opens and closes the hands over a 3-minute period

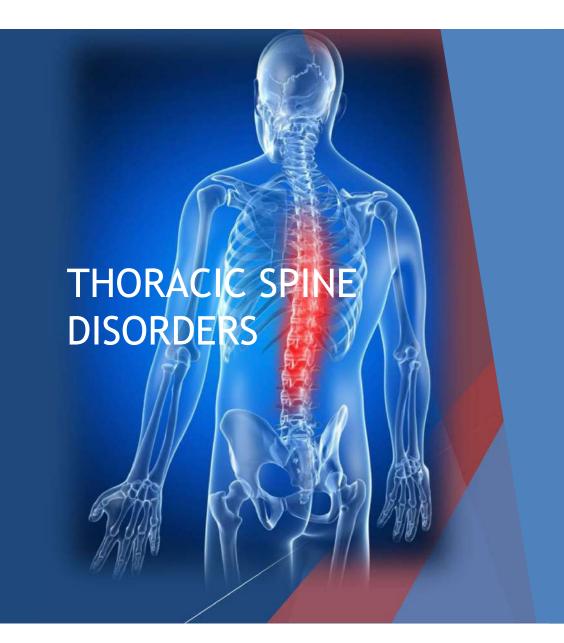
Interpretation: Reproduction of symptoms. Gradual increase in pain at neck and shoulder, progressing down the arm; paresthesia in forearm and fingers (nerve compression). Cyanosis and swelling (venous compression), arm pallor with arm elevated and reactive hyperemia when lowered (arterial compression).





Red Flags	Historic Findings
Suspected fracture	<ul><li>Recent trauma</li><li>Osteoporosis</li><li>Corticosteroid therapy</li></ul>
Tumor/Cancer/ Malignancy	<ul> <li>History of cancer</li> <li>Age &lt;20 or &gt;50 with NEW back pain</li> <li>Systemic upset (unexplained weight loss, night sweats, fevers, etc)</li> <li>Nocturnal pain</li> <li>Possible neurologic deficits</li> </ul>
Spinal cord compromise/Myelopathy	<ul> <li>Severe/progressive neurological deficit (motor weakness, sensory abnormality, hyper-reflexia, gait abnormality) in the lower extremities</li> <li>Bowel/bladder dysfunction</li> <li>Sexual dysfunction</li> </ul>

Red Flags	Historic Findings
Infections	<ul> <li>Fever</li> <li>Significant tenderness over vertebral bodies</li> <li>Intravenous drug use</li> <li>Immunocompromise</li> <li>Previous back surgery</li> </ul>
Inflammatory arthritis (ankylosis spondylitis - AS)	<ul> <li>Morning pain and stiffness</li> <li>Swelling in multiple joints</li> <li>For AS: Genetic factor - HLA-B27; worse with rest</li> </ul>
Aneurysm	<ul> <li>Sudden, severe and unrelenting chest pain</li> <li>Radiates to the upper back</li> <li>No relief when lying down</li> </ul>
Viscerosomatic (peptic ulcer, cholecystitis)	<ul> <li>Pain in both front and back with a pattern</li> <li>Fever, nausea, and vomiting</li> <li>Worse after a meal</li> </ul>



Postural syndrome

Scheuermann's disease

**Scoliosis** 

Compression fracture

Thoracic facet syndrome

T4 syndrome

Osteoid osteoma

Ankylosing spondylitis

Diffuse Idiopathic Skeletal Hyperostosis (DISH)

## Prevalence and Associated Risk Factors for Thoracic Spine Pain

Based on a systematic review that was published by BMC Musculoskeletal Disorders in 2009.

- Population with higher prevalence for thoracic spine pain(TSP): child and adolescent, females>males
- ► TSP was significantly associated with:
  - concurrent musculoskeletal pain
  - growth and physical
  - lifestyle and social
  - Backpack
  - Postural
  - Psychological
  - environmental factors
- Risk factors identified for TSP in adolescents included age (being older) and poorer mental health.

# Thoracic spine pain in the general population: Prevalence, incidence and associated factors in children, adolescents and adults. A systematic review

Andrew M Briggs, Anne J Smith, Leon M Straker, and Peter Bragge BMC Musculoskelet Disord. 2009

**Background:** Thoracic spine pain (TSP) is experienced across the lifespan by healthy individuals and is a common presentation in primary healthcare clinical practice. However, the epidemiological characteristics of TSP are not well documented compared to neck and low back pain. A rigorous evaluation of the prevalence, incidence, correlates and risk factors needs to be undertaken in order for epidemiologic data to be meaningfully used to develop evidence-based prevention and treatment recommendations for TSP.

Methods: A systematic review method was followed to report the evidence describing prevalence, incidence, associated factors and risk factors for TSP among the general population. Nine electronic databases were systematically searched to identify studies that reported either prevalence, incidence, associated factors (cross-sectional study) or risk factors (prospective study) for TSP in healthy children, adolescents or adults. Studies were evaluated for level of evidence and method quality.

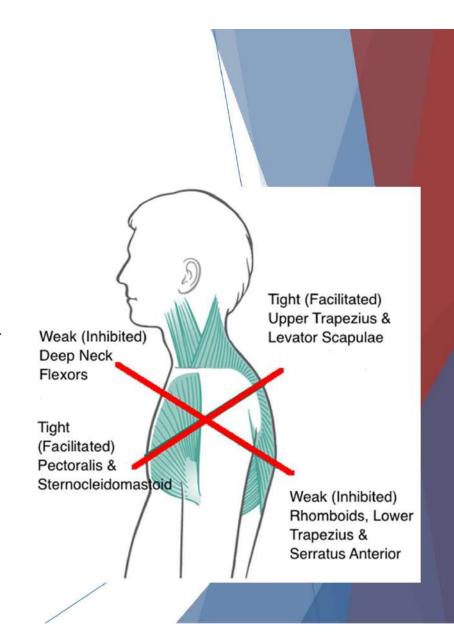
Results: Of the 1389 studies identified in the literature, 33 met the inclusion criteria for this systematic review. The mean (SD) quality score (out of 15) for the included studies was 10.5 (2.0). TSP prevalence data ranged from 4.0-72.0% (point), 0.5-51.4% (7-day), 1.4-34.8% (1-month), 4.8-7.0% (3-month), 3.5-34.8% (1-year) and 15.6-19.5% (lifetime). TSP prevalence varied according to the operational definition of TSP. Prevalence for any TSP ranged from 0.5-23.0%, 15.8-34.8%, 15.0-27.5% and 12.0-31.2% for 7-day, 1-month, 1-year and lifetime periods, respectively. TSP associated with backpack use varied from 6.0-72.0% and 22.9-51.4% for point and 7-day periods, respectively. TSP interfering with school or leisure ranged from 3.5-9.7% for 1-year prevalence. Generally, studies reported a higher prevalence for TSP in child and adolescent populations, and particularly for females. The 1 month, 6 month, 1 year and 25 year incidences were 0-0.9%, 10.3%, 3.8-35.3% and 9.8% respectively. TSP was significantly associated with: concurrent musculoskeletal pain; growth and physical; lifestyle and social; backpack; postural; psychological; and environmental factors. Risk factors identified for TSP in adolescents included age (being older) and poorer mental health.

#### Postural Syndrome

- History Findings/Risk Factors
  - Prolonged sitting in faulty posture
- Classic Presentation
  - ► Constant aching pain the middle and upper Tsp regions
  - ▶ Neck pain or strain in the back of the neck
  - Chest pain and tightness
  - Difficulty sitting, reading, watching television, or driving for long periods of time
  - ▶ Possible headache, numbness, tingling, and pain in the upper arms

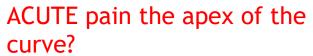


- Anterior head carriage
- Hyperkyphotic posture
- ► Tight pectoralis major and minor, SCM, levator scapulae, upper trapezius
- Weak rhomboids, erector spinae, serratus anterior, lower and middle trapezius, and deep neck flexors
- Suggested Management
  - Chiropractic treatment
  - Myofascial release
  - Workstation ergonomics
  - Postural exercise



#### **Scoliosis**

- Functional
  - ► Compensatory leg length inequality, pelvic subluxation, anatomical asymmetry
  - ▶ Postural muscular imbalance, habitual
- Structural
  - ► Adolescent Idiopathic (most common)
  - ► Congenital hemivertebra, Klippel-Feil syndrome, rib synostosis, Sprengel's deformity
  - ▶ Other
    - ▶ Trauma
    - ▶ Metabolic disorders rickets, osteomalacia, osteogenesis imperfecta
    - Mesenchymal disorders Marfan's syndrome, Ehler-Danlos, dwarfism
    - ▶ Vertebral neoplasm osteoid osteoma, osteoblastoma, giant cell tumor



Reflex muscle spasm due to a local process such as a

tumor, fracture, or disc disease.



#### Adam's forward bend test

A reliable test to identify individuals with scoliosis and differentiate functional from structural scoliosis.

According to "A Study of the Diagnostic Accuracy and Reliability of the Scoliometer and Adam's Forward Bend Test," the diagnostic accuracy is: Sensitivity: .92; Specificity: .60).

#### Modified Adam's forward bend test

A simple and reliable test for the clinical assessment of rotational flexibility in Adolescent Idiopathic Scoliosis patients.

Patient is asked to bend to the convex side of the curve in the forward bending position. This addresses the coupling phenomenon of axial rotation with reference to the side-bending movement.

# A simple method for assessing rotational flexibility in adolescent idiopathic scoliosis: modified Adam's forward bending test

Alpaslan Senkoylu 1, Mustafa N Ilhan 2, Necdet Altun 3, Dino Samartzis 4, Keith D K Luk Spine Deformity. Mar 2021

Purpose: This study aimed to evaluate the diagnostic aptitude of a modified Adams forward bending test (MAFBT), which addresses the coupling phenomenon of axial rotation with reference to the side-bending movement. Also, this evaluation was facilitated by the introduction of our rotational flexibility index (RFI).

Methods: Thirty-two female and eight male AIS patients were included in this study from a single institution. In the MAFBT, subjects were asked to bend to the convex side of the curve in the forward bending position. Scoliometric measurements were done during the AFBT and MAFBT. Utilizing anteroposterior standing plain radiographs curve flexibility indices were calculated. The diagnostic aptitude of the MAFBT was evaluated based on the receiver operating characteristic (ROC) curves and area under the curve (AUC). The RFI was also assessed, which considered AFBT and MAFBT parameters as a specified function.

Results: Significant correlations were noted between the Cobb angle and AFBT (p = 0.005), fulcrum bending and the MAFBT (p = 0.0001), side-bending and MAFBT (p = 0.0001). There were significant positive correlations between rotational flexibility as based on fulcrum bending radiograph to that of the RFI (r = 0.4, p = 0.036) and side-bending technique (r = 0.4, p = 0.008). Based on ROC analyses (AUC range 0.7-0.8), the MAFBT demonstrated high specificity and sensitivity rates for flexible and rigid curves, respectively.

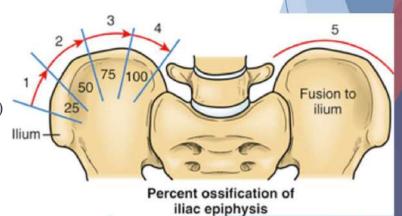
Conclusions: This is the first study to report that the MAFBT is a simple and reliable test for the clinical assessment of rotational flexibility in AIS patients. The study further noted that the novel RFI has clinical utility in the assessment of AIS.

## Adolescent Idiopathic Scoliosis (AIS)

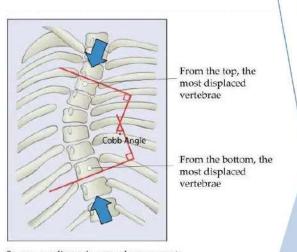
- Demographic
  - ▶ Females>males, age 10 to skeletal maturity
  - ► Curve frequency right thoracic (most common), left lumbar (2<sup>nd</sup> common)
- History Findings/Risk Factors
  - Progressive onset
  - ▶ Before menarche (50% of progression) vs after menarche (<20%)
  - ► Incomplete skeletal maturity (Risser sign <2)
  - Genetic
    - ▶ 1 affected parent ~30% chance child affected
    - ▶ 2 affected parents ~40% chance
- Classic Presentation
  - ► Chronic pain
  - Visible lateral curves

#### Physical Exam Findings

- ► Standing posture check compensatory head tilt, uneven shoulders, lateral spinal curve(s), pelvic tilt, leg length inequality
- Adam's bend forward test
- Lying prone if rib hump is reduced may suggest a functional component
- ▶ Increased muscle tightness on convex side of curve
- Reduced ROM
- X-ray findings visible curves
  - > 10 degrees of Cobb's angle (measure curvature of the spine)
  - ► Risser sign (measure skeletal maturity)



- Suggested Management
  - > <20 degrees monitor and conservative treatment
    - ► Chiropractic adjustment (CBP Mirror Image)
    - ► CBP Mirror Image posture exercise
    - Schroth exercises
    - ▶ Daily stretching and proprioceptive rehab exercises
  - ▶ 20-45 degrees monitor, treat, brace
    - ► Evaluate risk factors for progression
    - ► Manage like above
    - Refer for bracing if >5 degrees progression in one year (Milwaukee brace, Boston brace, Copes brace, etc.)
  - >45 degrees
    - ► Refer for surgery



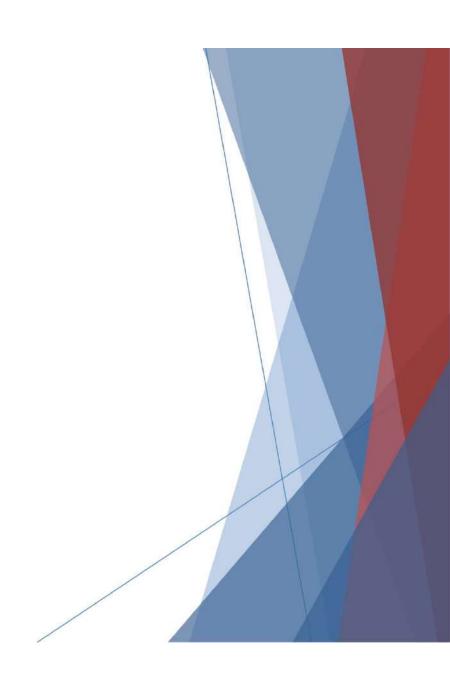
Source: e-radiography.net and core concepts

#### Scheuermann's Disease

- Demographic
  - ► Young adolescents (13-17 years old)
- History Findings/Risk Factors
  - Vertebral growth plate trauma
- Classic Presentation
  - ► Midback pain and fatigue
- Physical Exam Findings
  - ▶ Structural hyperkyphotic curve, >45 degree
  - ▶ No improvement with Prone Extension test
  - ➤ X-ray findings: vertebral bodies and discs of the spine identified by anterior wedging of greater than or equal to 5 degrees in 3 or more contiguous vertebrae



- Postural exercises
- ► Taping for proprioceptive awareness
- Brace
- Surgery for severe cases



## Successful brace treatment of Scheuermann's kyphosis with different angles

Mohammad Reza Etemadifar, Mohammad Hossein Jamalaldini, and Rasoul Layeghi J Craniovertebr Junction Spine. 2017 Apr-Jun; 8(2): 136-143

Background: Scheuermann's disease is regarded as the most common cause of structural hyperkyphosis within adolescents without any proper treatment. It may lead to progressive deformity and back pain which influences patient's quality of life during adolescence and adulthood. Treatment approach to Scheuermann's kyphosis has not been clearly defined due to its different definitions and obscure natural history. The goal of treatment is not only to prevent progression but also to obtain permanent correction. Bracing, especially Milwaukee brace and physiotherapy are two of the common nonoperative treatment modalities. Hence, the present study intended to evaluate the effectiveness of Milwaukee brace on progression control as well as correction of Scheuermann's kyphosis.

Materials and Methods: In a retrospective, observational study, all the patients diagnosed with Scheuermann's kyphosis were reviewed in 2003-2013, who were treated by Milwaukee brace at a single center. There was a minimum of 2-year follow-up after completion of bracing, during which clinical and radiological parameters were identified and recorded.

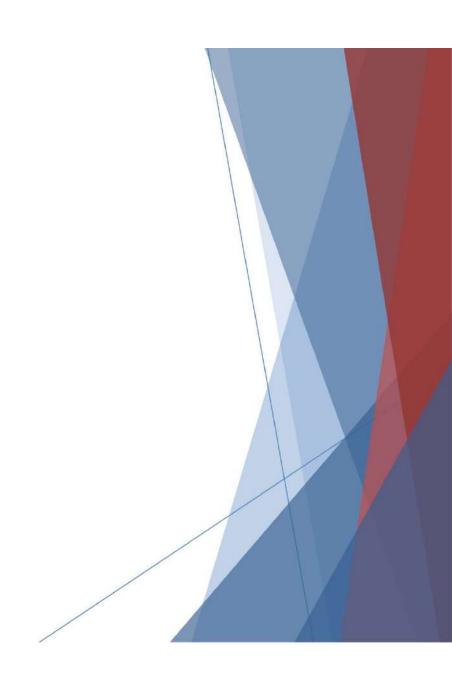
Conclusion: Milwaukee brace has been proved to be effective in treatment of Scheuermann's kyphosis as well as decrease of the surgery need. In more severe cases (up to 90), brace treatment could be considered, provided there is enough growth remaining. The most common brace used in Scheuermann's kyphosis is Milwaukee brace yet. Furthermore, the earlier an individual starts the brace wearing, the better outcomes will be reached, which highlights the importance of early diagnosis.

### **Compression Fracture**

- History Findings/Risk Factors
  - Older age
  - Osteoporosis or cancer
  - ▶ Trauma
  - ▶ Long-term corticosteroid use
- Classic Presentation
  - ▶ Older patients sudden onset of pain after a minor event such as sneezing or stepping off a curb
  - ► An increase of pain intensity while standing or walking
  - ► A decrease in pain intensity while lying on the back
  - Limited spinal mobility

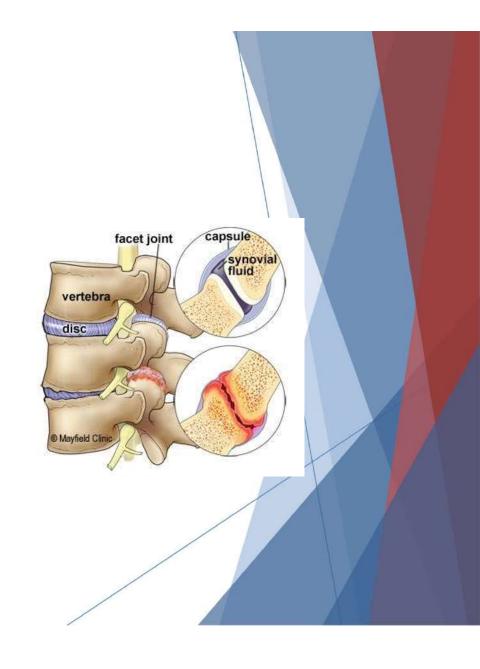


- ► Positive radiographic findings
- ▶ Positive Thoracic compression test
- Suggested Management
  - Medical referral
  - Rest



## Thoracic Facet Syndrome

- Causes
  - ▶ Trauma
  - Osteoarthrosis or rheumatoid arthritis
  - ▶ Repetitive stress such as postural stress
- Classic presentation
  - ► Localized dull, achy, sharp pain
  - ► May have referred pain along rib
  - Worse with extension

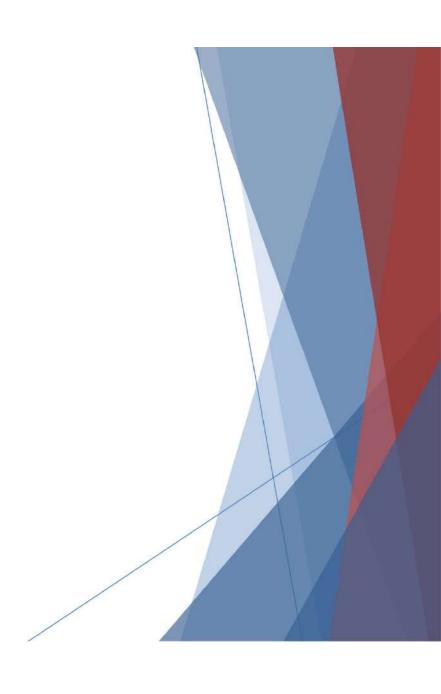




- Limited range of motion with increased pain on extension
- Positive Kemps test
- Possible muscle hypertonicity and spasm
- ▶ Reduced pain with thoracic distraction test
- Increased pain with thoracic compression test
- NO neurological deficits even with referred pain

#### Suggested management

- Manipulation
- Traction
- Myofascial treatment trigger point therapy, myofascial release
- Stretching
- Avoid hyperextension



## T4 Syndrome

A musculoskeletal related dysfunction in which neurological structures are affected in the upper extremity.

An EXCLUSION diagnosis (when all other diagnoses do not fit the clinical pattern), rare occurrence

- Demographic
  - ► Females>males, 30-50 years old
- History Findings/Risk Factors
  - Prolonged sitting
  - Sustained reaching and pulling activities (shoveling, overhead reaching)

- Classic Presentation
  - Upper back stiffness and achiness
  - ▶ Diffused upper extremity numbness and/or paresthesia, in "glove" distribution
- Physical Exam Findings
  - ▶ Tenderness on palpation of T4 vertebra
  - ▶ Negative finding in neurological assessment (dermatomes, myotomes, reflexes) to determine whether nerve root or peripheral nerve lesions were present
- Suggested Management
  - ► Chiropractic treatment
  - Postural exercise

#### Osteoid Osteoma

A common benign tumor that usually develops in the long bones of the leg — the femur (thigh bone) and tibia (shin bone) - but can occur in any bone. In 7-20% of cases, osteoid osteoma occurs in the posterior elements of the spine.

- Demographics
  - Young male
- Causes
  - Unknown
- Classic Presentation
  - Localized dull midback pain during the day
  - Worse at night with sharp pain
  - Relieved by aspirin



- ▶ Positive imaging findings (X-ray and CT) small lucent spot (smaller than 2cm)
- ► Acute-angle scoliosis at the site of the tumor (lesion on the concave side)
- Suggested Management
  - ► Refer for surgical excision

# Diffuse Idiopathic Skeletal Hyperostosis VS Ankylosing Spondylitis

	DISH	AS
Cause	Idiopathic	Autoimmune
Incidence	2.9-25.0%	0.05-1.4%
Age of onset	>50 years	<30 years
Sex ratio {M/F}	2:1	3:1
Clinical features	Pain, radiculopathy, dysphagia, risk of spinal and peripheral fractures	Spinal pain and stiffness, especially in the morning; characteristic postural abnormalities, involvement of large peripheral joints
Radiological features	Affects anterior longitudinal ligaments of the spine, spares intervertebral discs and SI joints	Intervertebral joint fusion, especially the SI joints

	DISH	AS
Physical exam findings	Global ROM restriction	Global restriction with mild end-range discomfort
Laboratory investigations	Non-specific and inconclusive	High ESR and CRP Presence of HLA-B27 (in most cases)
Associated diseases	Obesity, diabetes mellitus, Hypervitaminosis A	Autoimmune conditions like iritis, uveitis, ulcerative colitis
Treatment	Strengthen spinal muscles (abdominal and extensors), stretching, and an anti-inflammatory diet.	Myofascial therapy, physiotherapy, stretching, and an anti-inflammatory diet. Disease modifying drugs, non-steroidal anti-inflammatory drugs, surgery (occasionally)

## OTHER THORACIC CONDITIONS

Thoracic outlet syndrome
Scapulocostal syndrome
Herpes zoster
Myofascial pain syndrome
Viscerosomatic pain

## Thoracic Outlet Syndrome(TOS)

A group of disorders resulting in compression of neurovascular structures at the thoracic outlet, causing symptoms in the upper extremities, neck and chest.

This is often over diagnosed.

Most commonly involved nerve root levels: C8-T1

Demographic

Neurologic type (90-97%): females>males

Venous type (3-10%): males>females

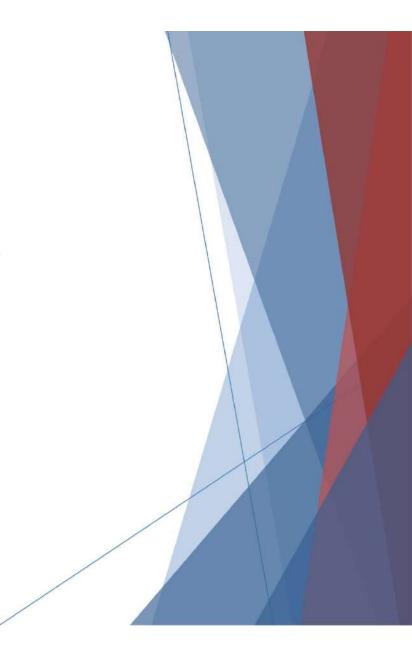
Arterial type (rare): young adults

- History Findings/Risk Factors
  - Physical trauma (repetitive injuries, car accidents)
  - ▶ Postural or anatomical abnormalities (scoliosis, rounded shoulders, cervical rib)
  - Pregnancy
  - Excess callus after fracture or exostosis of clavicle or first rib

#### Classic Presentation

Unilateral numbness, tingling, or paresthesia of upper limb and shoulder

- ► Neurologic type (most common)
  - ▶ Pain on medial aspect of the arm, forearm, and the 4<sup>th</sup> and 5<sup>th</sup> digits
  - ► Paresthesia, often nocturnal
  - ▶ Loss of dexterity, cold intolerance, occipital headache
  - Raynaud phenomenon
- Venous type
  - ► Pain in the arm
  - Swelling of the arm, cyanosis
  - Paresthesia in the fingers and hand
- Arterial Type
  - Pain, pallor, coldness, paresthesia



#### Physical Exam Findings

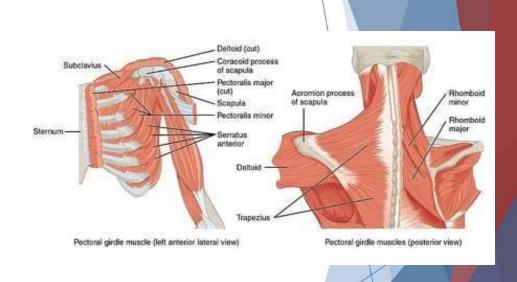
- Anterior head carriage
- ▶ Positive Roo's test, Adson's test, Wright's test, Eden's test
- ▶ Relief with Shoulder Girdle Passive Elevation test
- ► Tenderness over scalenes, brachial plexus and lower cervical spine or above clavicle
- ► Hyperesthesia or hypoesthesia over C8-T1 dermatomes
- ► Muscle weakness (shoulder abduction, grip strength)

#### Suggested Management

- Chiropractic treatment
- Stretch scalenes and pectoralis
- Strengthen trapezius and rhomboid
- Postural exercise (cervical extension)

#### Scapulocostal Syndrome

- History Findings/Risk Factors
  - Disproportionate use of the serratus posterior superior and other back muscles (e.g. cradling the phone between ear and shoulder)
  - Prolonged sitting in poor posture
- Classic Presentation
  - Pain and paresthesia along the medial border of scapula, radiating to the neck, chest, and upper extremities





- Anterior head carriage
- Increased pain by lifting objects with outstretched hands
- ▶ Pain in the little finger when apply pressure on the serratus posterior superior muscle
- ▶ Hypertonic muscles in the scapular region
- Suggested Management
  - Myofascial release therapy
  - ▶ Electric stimulation
  - Stretching
  - ► Ergonomic suggestions

## Herpes Zoster (Shingles)

A viral infection due to a latent varicella virus that resides in the dorsal root ganglion.

- History Findings/Risk Factors
  - Older age
  - ▶ History of chickenpox
  - ▶ Mechanical, emotional, or chemical stress
- Classic Presentation
  - Isolated burning and pain, itching
  - ▶ A stripe-like red rash with small patches of vesicles across chest and/or back
  - ► Fluid-filled vesicles that break open and crust over, and cleared over at the end (varies with degree of progression)



- ▶ Visible skin lesion
- Suggested Management
  - ► Avoid contacts on the affected regions
  - ▶ Refer for antiviral medicines acyclovir, valacyclovir, and famciclovir
  - ▶ Wet compresses, calamine lotion, and colloidal oatmeal baths for itching relief

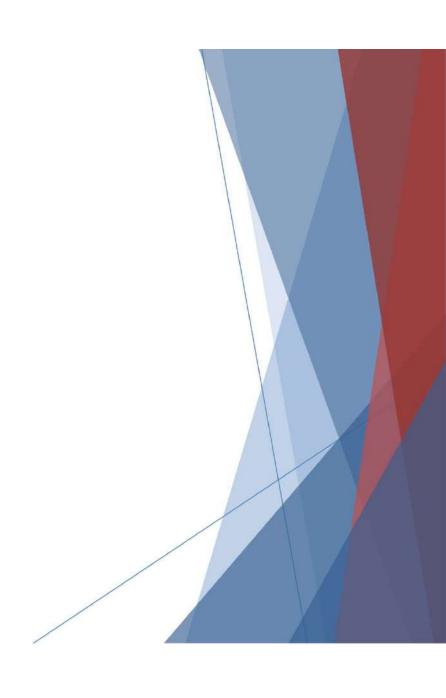
### Myofascial Pain Syndrome

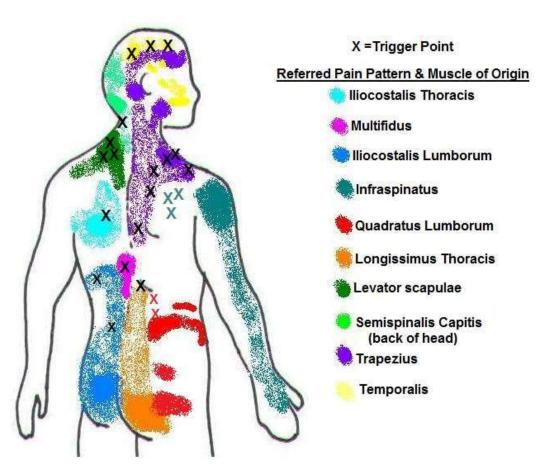
Pain associated with inflammation or irritation of muscle or of the fascia surrounding the muscle, trigger points.

- History Findings/Risk Factors
  - Scoliosis
  - Muscle overused
  - ▶ Systemic or metabolic disorder (hypothyroidism, deficiency in iron, Vit D,C,B12)
- Classic Presentation
  - ▶ Local or radiating pain in a pattern that can be overlapped with other muscles
  - Weak but NO atrophy
  - Muscle tightness
  - Patients with trigger points may have associated localized autonomic phenomena, including vasoconstriction, pilomotor response and hypersecretion.



- ▶ Taut and tender when palpated
- ▶ Painful limit to full stretch ROM
- ▶ Visual local twitch response with snapping palpation
- Suggested Management
  - Myofascial release therapy
  - ► Electric stimulation
  - Stretching





Referred pattern for serratus posterior superior: back of shoulder runs to elbow and ulnar side of wrist, it may refer also to the chest and inner arm.

As the muscles lie deeper, the pattern may be overlapped with other muscles.

#### Viscerosomatic Pain

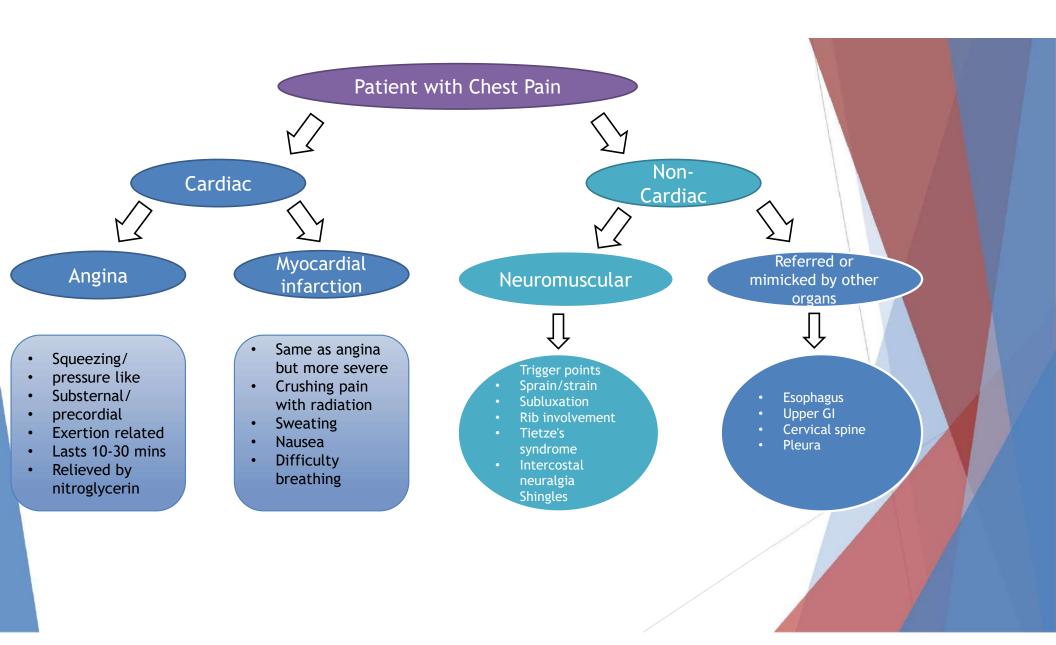
The segmental levels specified maybe painful with the organ is involved

Viscera	Spinal Reflex Site (approximate)
Heart	T1-T5
Lungs	T3-T5
Stomach	T5-T8
Pancreas	T7-T9
Gallbladder, liver, spleen, caecum, and duodenum	T6-T10
Appendix	T9-T11
Kidneys	T9-L2

- History Findings/Risk Factors
  - ► History of gastrointestinal, liver and lung disorders/infections
  - ▶ Hard to pinpoint, generalized pain
  - ► Change in skin texture (sweaty, dry, red or blanched), hypersensitivity and paresthesia (numbness, change in sensation)
  - Muscle rigidity and spasm
  - ▶ Deep, dull, aching pain which is hard to reproduce
- Physical Exam Findings
  - ▶ Involved segments are tender to palpate
  - Unable to reproduce pain
- Suggested Management
  - Proceed with chiropractic treatment once red flags are ruled out
  - Myofascial release therapy



Cardiac Vs. Non-cardiac



#### CARDIAC CHEST PAIN

- Angina
- Myocardial infarction
- Pericarditis
- Hypertrophic cardiomyopathy

According to the CDC, "[h]eart disease is the leading cause of death for men, women, and people of most racial and ethnic groups in the United States... About 659,000 people in the United States die from heart disease each year—that's 1 in every 4 deaths."

# Angina aka angina pectoris

Ischemic pain due to atherosclerosis and vasospasm in the coronary artery

Types of Angina	Cause	Characteristics	Relief	Notes
Stable	Coronary artery diseases (atherosclerosis)	predictable, occurs with exertion, short duration (<5 mins)	Rest and angina medication (nitroglycerin)	Most common type
Unstable	Coronary artery diseases	unpredictable and occurs at rest, longer duration (>20 mins)	NONE	Medical emergency, can evolve to a heart attack
Variant/ Prinzmetal	Vasospasm	Occurs at night and at rest	Angina medication	
Refractory	Episodes are frequent despite a combination of medications and lifestyle changes.			

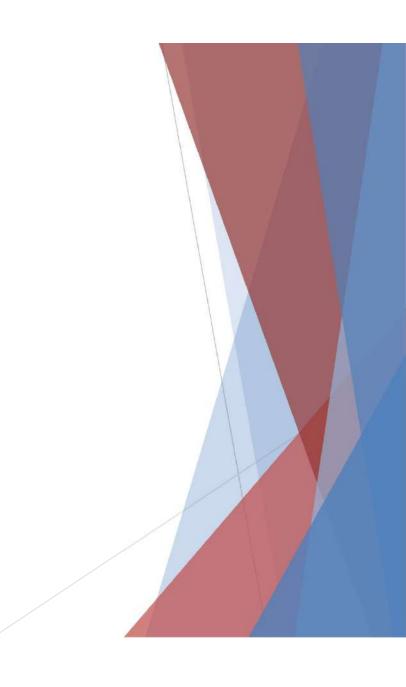
- Demographic
  - ► Females>males
- History Findings/Risk Factors
  - ▶ Previous episodes of angina
  - Pre-existing conditions (diabetes, heart disease, hypertension, hyperlipidemia, obesity)
  - Sedentary lifestyle
  - Stress
  - Unhealthy eating patterns

#### Classic Presentation

▶ Squeezing or pressure sensation in the chest

#### Symptoms in female patients may also include

- ▶ Discomfort in the neck, jaw, teeth or back
- Nausea
- Shortness of breath
- ▶ Stabbing pain instead of chest pressure
- ► Stomach (abdominal) pain
- Suggested Management
  - ► Lifestyle change (diet and exercise)
  - ► Co-manage with MDs



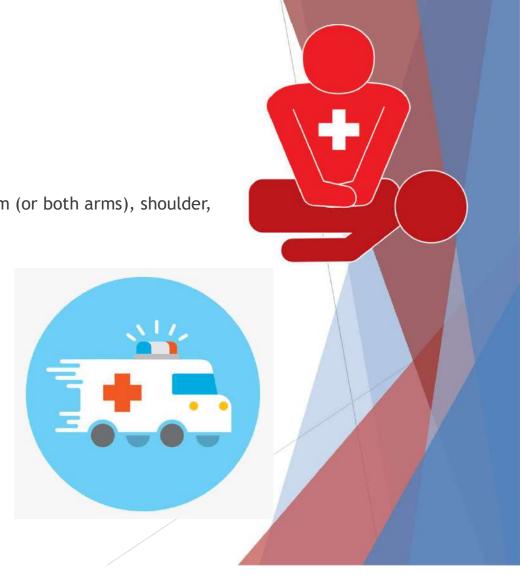
## **Myocardial Infarction**

- History Findings/Risk Factors
  - ▶ Age and gender: males over 45, females over 50 or after menopause
  - ► Family history of heart disease
  - Pre-existing conditions (diabetes, heart disease, hypertension, hyperlipidemia, obesity)
  - Sedentary lifestyle
  - Substance use
  - Unhealthy eating patterns

#### Classic Presentation

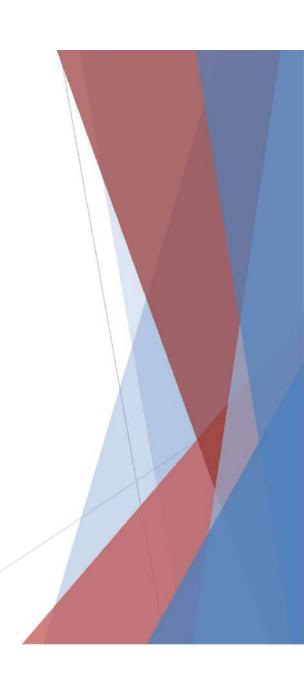
► Severe, crushing chest pain, may radiate to left arm (or both arms), shoulder, neck, jaw, and back

- Shortness of breath or trouble breathing
- ▶ Nausea or stomach discomfort
- Heart palpitations
- Anxiety or a feeling of "impending doom."
- Sweating
- ▶ Feeling lightheaded, dizzy or passing out
- Suggested Management
  - ▶ Call 911 and perform CPR if possible



#### **Pericarditis**

- History Findings/Risk Factors
  - ▶ History of a preceding respiratory infection, renal failure, or cancer
- Classic Presentation
  - ▶ Chest pain, substernal and often radiates to neck or shoulder
  - Difficulty breathing
  - ▶ Worse lying down, better seated
- Suggested Management
  - ► Refer!



## Hypertrophic Cardiomyopathy

- History Findings/Risk Factors
  - ► Genetic (1 parent with the condition 50% chance)
- Classic Presentation
  - ► Chest pain, especially during exercise
  - ► Fainting, especially during or just after exercise or exertion
  - Heart murmur
  - Heart palpitations
  - Shortness of breath, especially during exercise
- Suggested Management
  - Refer!

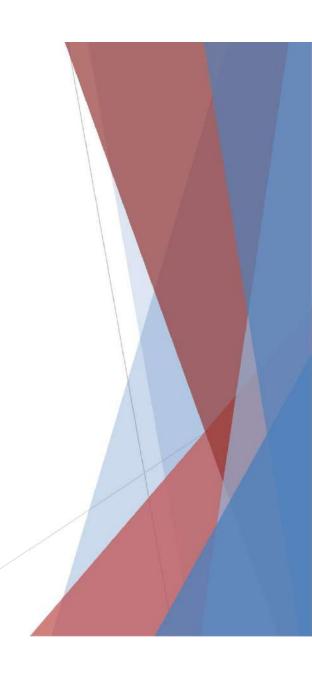


## NON-CARDIAC CHEST PAIN musculoskeletal

- Muscle strain
- ▶ Fibromyalgia
- Rib (slipped or fracture)
- Intercostal neuralgia
- ▶ Tietze's syndrome
- Costochondritis

## Intercostal Neuralgia

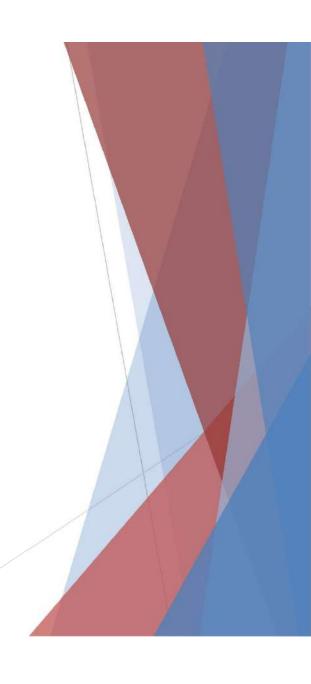
- History Findings/Risk Factors
  - Shingles
  - ► Trauma or history of chest surgery
  - ► Rib subluxation
- Classic Presentation
  - Unilateral
  - ▶ Band like pattern around the chest or upper back
  - ► Squeezing pain, tingling, or numbness
- Suggested Management
  - ► Chiropractic treatment with low force
  - Refer for nerve block



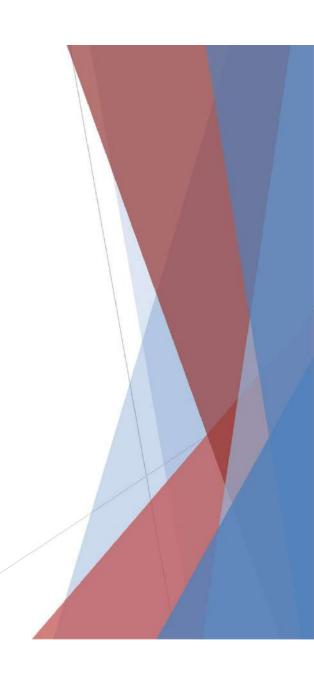
## Tietze's Syndrome

An inflammatory reaction at the costochondral area.

- Demographic
  - Rare
  - ▶ Females>males, <40 years old
- ► History Findings/Risk Factors
  - ▶ History of prolonged coughing or exertion
  - ► History of previous episodes
- Classic Presentation
  - Unilateral
  - Sudden onset
  - ▶ Moderate to severe pain in the upper chest



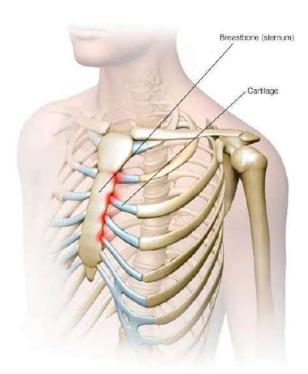
- Physical Exam Findings
  - ▶ Tender to palpate over the upper chondrocostal junction
  - ► Chest swelling
  - ► NO radiographic findings
- Suggested Management
  - ► Self-resolved in about 6 months
  - Refer for a corticosteroid injection



### Costochondritis

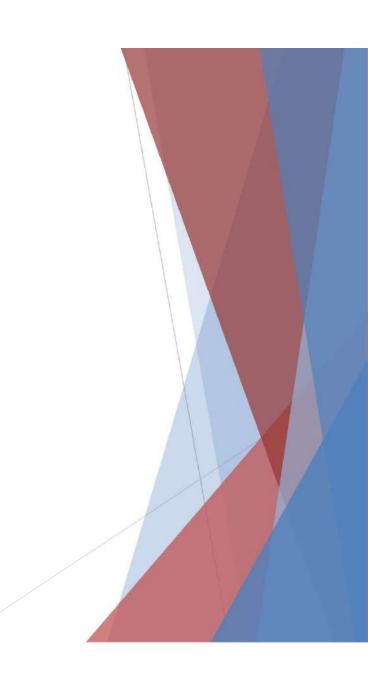
It accounts for 10% to 30% of all chest pain in children.

- Demographic
  - ► Females>males
  - ► Adults, >40 years old
  - ▶ Children and adolescents, ages 10-21 (peak age for the condition is 12-14)
- History Findings/Risk Factors
  - Arthritis
  - Infections
  - Overuse of the arms
  - Repetitive minor trauma to the chest wall
- Classic Presentation
  - Bilateral, middle ribs
  - ▶ Sharp pain in the chest
  - Increased pain when taking a deep breath or coughing



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- Physical Exam Findings
  - ▶ Tender to palpate over the sternocostal joints
  - ► NO radiographic findings
- Suggested Management
  - Self-resolving
  - Moist heat
  - NSAIDs
  - Avoid contact sports



## What's the Difference?

Feature	Tietze Syndrome	Costcochondritis
Prevalence	Rare	More common
Age	Young adult <40 years old	All ages
Number of sites affected	1	>1
Region affected	Unilateral, upper chest Rib 2, 3	Bilateral, mid-chest Rib 2-5
Local swelling	Present	Absent

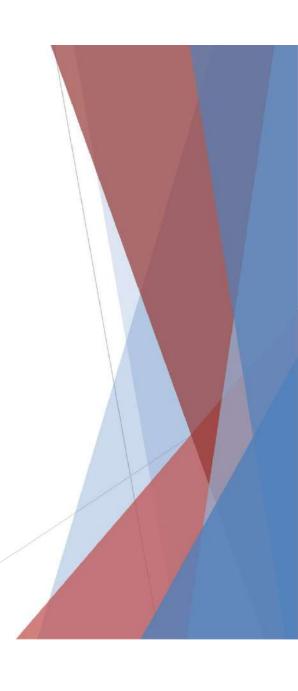
## NON-CARDIAC CHEST PAIN visceral

- Pleurisy
- Pulmonary embolism
- Gastroesophageal reflux disease

### Pleurisy

Inflammation of the tissues that line the lungs and chest cavity.

- History Findings/Risk Factors
  - ▶ Recent history of a respiratory infection
- Classic Presentation
  - ▶ Sharp chest pain, may spread to shoulders or back
  - ▶ Worse with coughing, sneezing, and bending to/lying on the involved side
- Physical Exam Findings
  - ► Radiographic findings may find pleural effusions
- Suggested Management
  - Rest
  - NSAIDs
  - ► Refer is the effusion is larger



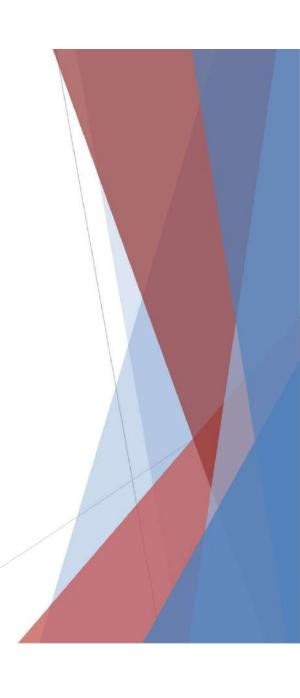
### Pulmonary Embolism

A blood clot that develops in a blood vessel in the body (often in the leg = deep vein thrombosis/DVT). It then travels to a lung artery where it suddenly blocks blood flow.

- History Findings/Risk Factors
  - ▶ Family history of a blood clotting disorder
  - ▶ History of cancer, stroke or heart failure
  - Obesity
  - Prolonged sitting/Bed resting
- Classic Presentation
  - Sudden onset
  - Severe sharp chest pain, may spread to arm, shoulder, neck or jaw (similar to a heart attack)
  - ▶ Shortness of breath
  - Excessive sweating
- Suggested Management
  - Refer!

## Gastroesophageal Reflux Disease (GERD) aka chronic acid reflux

- History Findings/Risk Factors
  - Pregnant
  - Obesity
  - ▶ Hiatal hernia
  - Smoking
  - ► Eating large, fatty meals
- Classic Presentation
  - ► Substernal chest pain
  - Heartburn
  - ► Trouble swallowing
  - ▶ Sensation of a lump in the throat (or food stuck in the throat feeling)
  - ▶ Worse lying down, especially after meals
  - Better in upright positions



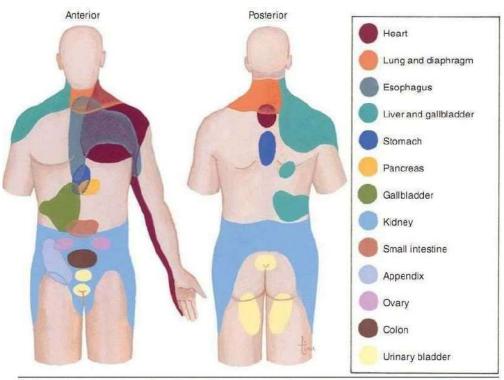
#### Suggested Management

- ► Lifestyle change (stop smoking, eat slowly, maintain a healthy weight)
- ► Avoid triggers (fatty food, tomato sauce, alcohol, chocolate, mint, garlic, onion, and caffeine)
- Avoid lying down after a meal (wait at least 3 hours)
- ▶ Elevate the head of the bed by 6-9 in
- OTC (Pepcid, Omeprazole)

### Visceral Referred Pain Pattern

Organs with referral pattern in the thoracic region

Viscera	Referred Pattern	
Heart	Chest, midback, left arm	
Esophagus	Neck, chest, upper arm	
Stomach	Epigastric area to midback	
Liver and gall bladder	Right upper quadrant, right shoulder	
Pancreas	Left shoulder, lower thoracic	



Referred pain. The sites for referred pain from various organs are shown.

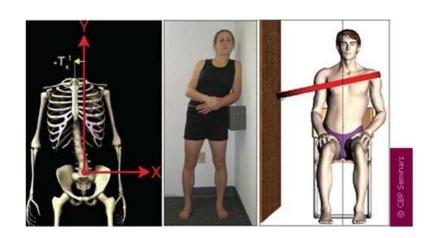


# Chiropractic Biophysics (CBP) Mirror Image® Posture Exercise

- Developed by Donald Harrison, D.C. in 1980
- ► Focuses on structural correction of the spine the underlying foundation of the spine



Mirror Image exercise example for the abnormal forward head posture. The patient has an abnormal forward head (translation) posture and the skeletal animation shows what happens to the spine with this posture. On the right is two different CBP® Mirror Image exercises: one with just the patient's muscles and body as resistance and the other with an elastic band for increased contraction effort. The patient actively maneuvers their posture into the opposite or Mirror Image position.

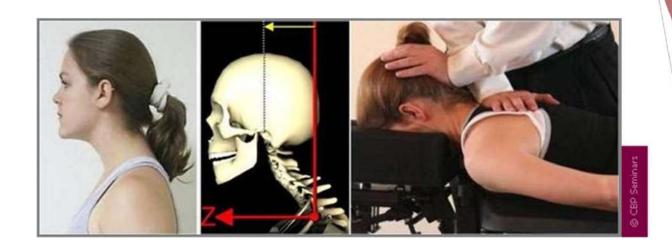


Mirror Image exercise example for an abnormal lateral shifted (translated) ribcage posture. The patient has right lateral ribcage posture (translation) and the skeletal animation shows what happens to the spine with this posture. On the right is two different CBP® Mirror Image exercises one with just the patient s muscles and body as resistance and the other with an elastic band for increased contraction effort. The patient actively maneuvers their posture into the opposite or Mirror Image position.

# Chiropractic Biophysics (CBP) Mirror Image® Posture Adjustments

In theory, these adjustments re-balance the bodies' sense of proper balance or alignment by way of triggering improved muscle and nerve reflexes. Thus, postural adjustments as performed with drop table, hand-held instrument, or even mirror image manipulation procedures, are performed for resetting the nervous system regulation of postural muscle balance.

Clinically, these adjusting set-ups were found to result in postural and spinal alignment improvements verified with follow up x-ray.



Mirror Image adjustment example for the head posture. The patient has forward head posture (translation) and the skeletal animation shows what happens to the spine with this posture. On the right is the CBP Mirror Image adjustment. The posture is placed in its opposite position and then a Chiropractic adjustment is performed.



Mirror Image adjustment example for the ribcage posture. The patient has right lateral ribcage posture (translation) and the skeletal animation shows what happens to the spine with this posture. On the right is the CBP® Mirror Image adjustment. The posture is placed in its opposite position and then a Chiropractic adjustment is performed.

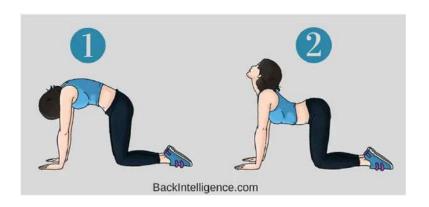
#### Other Postural Correction Exercises

#### 1. Decompression

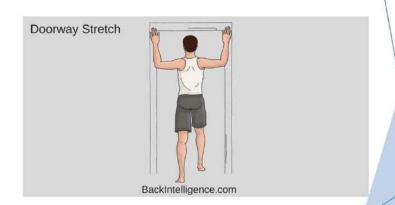




#### 2. Cat & Cow



#### 3. Doorway stretch



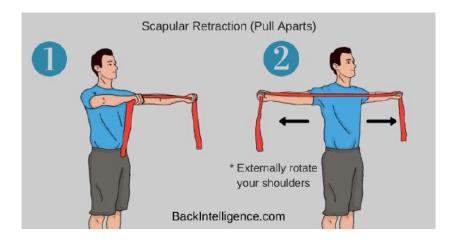
#### 4. Upper trapezius stretch



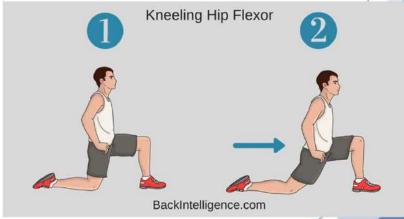
#### 5. Chin tucks



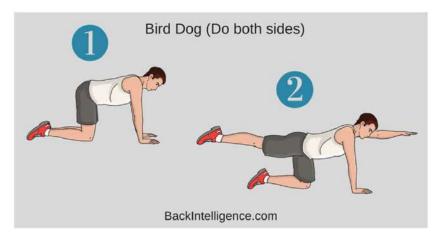
#### 6. Standing pull apart

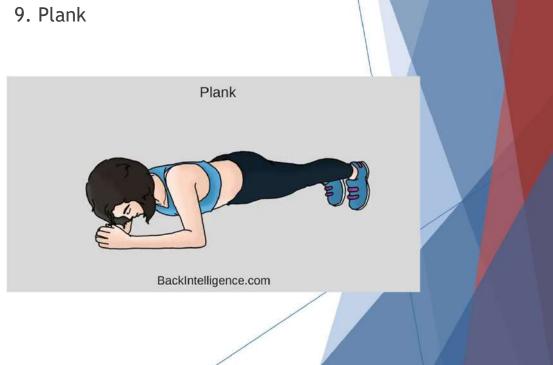


#### 7. Hip flexor stretch

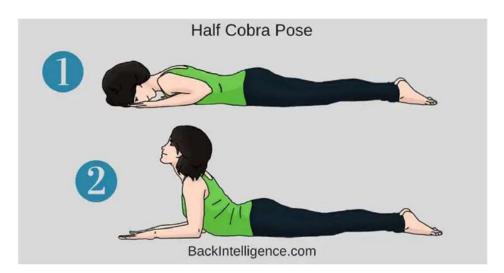


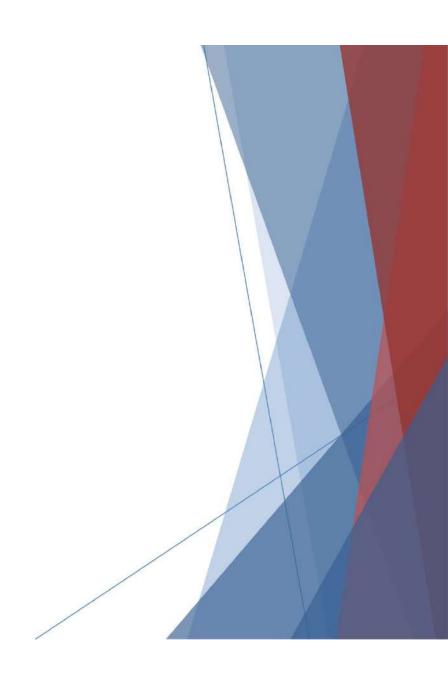
### 8. Bird dog





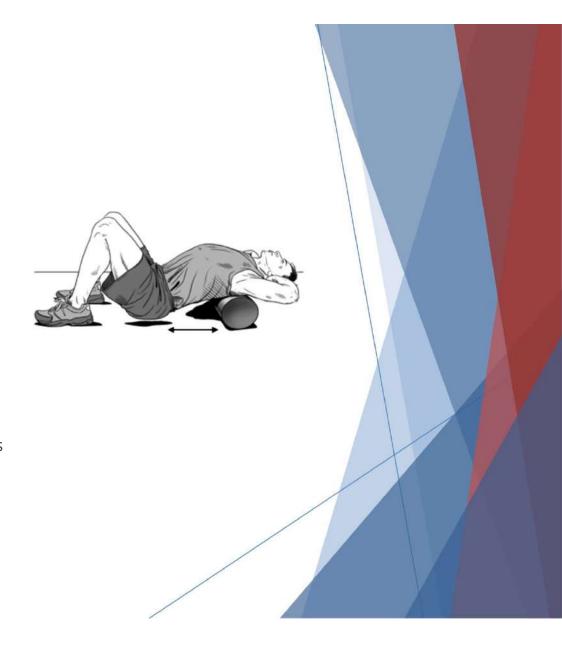
### 10. Half Cobra pose





## Foam Rolling

- Thoracic Extension
- Lay down with your arms behind your head and the foam roll perpendicular to your spine at the base of your neck.
- Keeping your chin tucked, slightly lift your hips and extend over and roll your spine down the foam roll.
- Repeat 8-10 times
- Alternatively, keeping your hips on the floor and without rolling down the spine, perform 3-5 isolated extensions over the roll. Then move the roll down 1-2 spinal segments and perform 3-5 more extensions over the roll. Repeat this process all the way down the middle back until you reach the lower ribs.



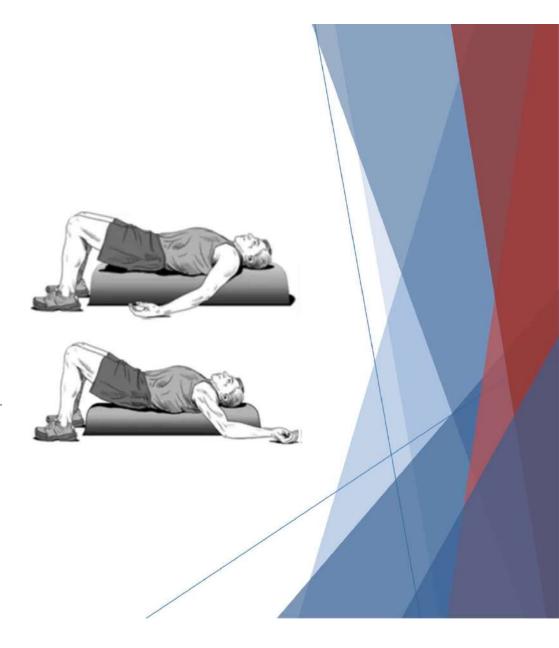
#### 2. Upper back cat

- Kneel on the floor with hips back towards your heels and forearms on a foam roll (as shown).
- First, round your middle back up and breathe in. Then, as you breathe out, let your chest fall towards the floor in an arch shape.
- You should `feel' this in your mid-back especially when you let your back fall to the floor.
- If you feel this in your lower back move your buttocks closer to your heels – this will limit the movement in your lower back and isolate the stretch to your middle back
- Repeat 8-12 times, 2-3 times per day



#### 3. Foam roll angels

- Lie on your back on the foam roll with your hands at your side and palms facing upwards.
- Gently tuck your chin to lengthen the back of your neck stretching the suboccipitals. (If you are very rounded through the mid back you may need a small pillow under your head.)
- Bring your ribs down to flatten your lower back (but do not tense your abdomen).
- Slowly breathe in and out for 3-20 minutes feeling your shoulders drop towards the floor with each exhalation.
- As your chest and shoulders relax you can slowly move the arms higher (second image), but only move as far as you can keep the forearms on the floor.
- One effective variation is to gently push the arms into the floors as you breathe in and then relax the arms as you breathe out.



#### DESK YOGA CAT COW To round INHALE SIT to arch STRAIGHT spine ... back ... + move SPINAL Shoulders 1 TWIST away from ears: move Shoulders down! move Shoulders down INTERLACE FINGERS SIDE ARCH BACK STRETCH NECK + UPPER BACK STRETCH BACK & SHOULDER NECK STRETCH Interface Fingers >> Slowly transition to arched back Gently pull head to each side Release head & move thoulders away! 10 sec - 10 sec 21 10 FOL 23 to sec.

FOCUS: SHOULDERS, BACK & NECK

## Schroth Method for Scoliosis

- ▶ A scoliosis-specific exercise approach that focuses primarily on the threedimensional correction of the curve pattern.
- Developed by Katharina Schroth in 1921

Interesting fact: the Schroth breathing technique was inspired by a balloon.



- Reduces pain
- ► Stops curve progression
- Increase lung capacity
- Improve posture during routine daily living



## What is the method?

The spine rotation in scoliosis is different in each person. Schroth exercises are tailored to the unique curvature of the spine. The exercises can be performed while standing, sitting or lying down.

#### The Three Components:

- 1. Muscular symmetry
  - Stretch the overworked, strengthen the weak
- 2. Rotational angular breathing
  - Breathing into the concave side of the body
- 3. Awareness of the posture
  - Practice in front of the mirror!



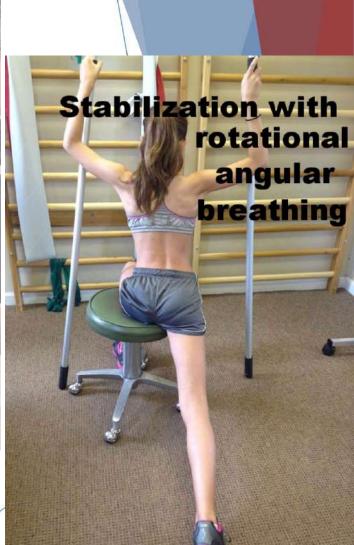








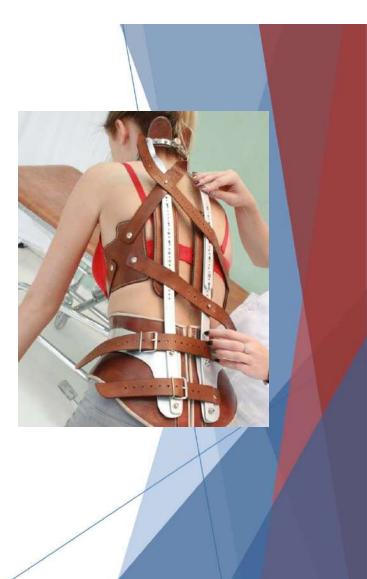




## Types of Braces for Scoliosis

- Milwaukee brace(CTLSO/cervicothoraciclumbosacral orthotic)
  - Very rigid and bulky appearance
  - Contains metal bars
- Boston brace("low profile" TLSO/thoracolumbosacral orthotic)
  - Most commonly prescribed
  - Fits under clothing







- Copes brace ("dynamic" TLSO brace)
  - ► Air-injected pneumatic force vector units (PFVUs) air migrates with motion providing "dynamic corrective force"
- ► Gensingen Brace (TLSO)
  - ► Measure by 3D scanning
  - ▶ Made from a lightweight, moldable polyethylene
- Charleston bending brace (TLSO)
  - Most prescribed nighttime brace

Recommended full time wearing (except for nighttime braces).

Dynamic ones are LESS effective than the rigid ones.

Bracing is most effective is before and at the time of menarche.

## **Nutrition**

- Anti-inflammatory Diet
- Bone-healing diet



## **Anti-inflammatory Diet**

- ► For pain and inflammation
- ► Favors fruits and vegetables, foods containing omgega-3 fatty acids, whole grains, lean protein, healthful fats, and spices.
- Discourages or limits the consumption of processed foods, red meats, and alcohol.

Food Category	Types of Food	Role in inflammation control and injury healing
Antioxidants Vitamin A, C, E Various seasonings	Vitamin A: carrots, sweet potatoes, leafy greens (kale, spinach), broccoli Vitamin C: peppers, citrus, strawberries, guava, kiwi, pineapple Vitamin E: almonds, spinach, avocado, sunflower seeds, butternut squash Seasonings: turmeric (curry), garlic, cinnamon, rosemary	Help control oxidative stress caused by exercise and injury
Anthocyanins: purple, red, and blue foods	Blackberries, blueberries, cherries, cranberries, eggplant, grapes, plums, blood orange, red or purple skinned potatoes, radishes	Work to reduce inflammation and to help promote muscle pain and reduce soreness
Vitamin D	Fatty fish(tuna, mackerel, and salmon); foods fortified with vitamin D (some dairy products, orange juice, soy milk, and cereals), cheese, egg yolks	Helps reduce inflammation within the body
High quality protein	Meat, fish, eggs, and dairy products	Reduce exercise induced muscle damage and support muscle health
Nitric Oxide and Nitrates	Beets, celery, and leafy greens	Nitrates convert to nitric oxide in the body which help increase blood flow helping to reduce inflammation and optimize recovery
Omega 3 Fatty Acids	Fatty fish(salmon, mackerel, tuna), chia & flax seeds, walnuts	Support brain health and reduce inflammation



Chronic inflammation has been linked to cancer, heart disease, diabetes, arthritis, depression, and Alzheimer's. Fight inflammation with a healthy



#### **ANTI-INFLAMMATION FOODS**



**Tomatoes** 



Fruits Strawberries, blueberries, oranges and cherries.



Nuts Almonds, walnuts, and other nuts.





Spinach, kale, collards, and more.







#### INFLAMMATION FOODS











Fried foods Refined carbs Sodas

Lard

**Processed meats** 

## Diet for Bone Healing

### 1.) EAT ENOUGH CALORIES



Major injuries increase your calorie needs. A good rule of thumb is to eat 25–30 calories per kilogram of body weight. To get your weight in kilograms, divide your weight in pounds by 2.2. (example: if you weigh 150 lbs, you'll need about 1,700 to 2,050 calories)

## 2.) EAT MORE PROTEIN

Protein acts as a building block for new bone during fracture healing, so your body needs more protein to heal properly. You'll need about 1-1.5 grams of protein per kilogram of body weight. (example: if you weight 150 lbs, you'll need about 68 to 100 grams of protein)



#### 3.) EAT BONE-HEALING NUTRIENTS



#### CALCIUM

Calcium is needed for rebuilding strong bone structure. Aim for 1,000 to 1,200 mg daily. Food sources of calcium include dairy products, green veggies, and fortified non-dairy milks.



#### VITAMIN D

Vitamin D helps your body take in calcium, so it's also needed for rebuilding strong bone structure. Aim for 1,000 IU daily during fracture healing. Food sources of vitamin D include egg yolks, oily fish, and fortified milks.



#### VITAMIN C

Vitamin C is necessary for rebuilding collagen, a main component of bone. Many fruits and vegetables are high in vitamin C, including citrus, strawberries, bell peppers, and broccoli.



#### VITAMIN K

Vitamin K helps bind calcium to bone to strengthen the bone structure. Aim for 90 to 120 mcg daily from green veggies like kale, collards, spinach, and broccoli.



#### ZINC

Zinc stimulates bone-forming cells to speed up fracture recovery. Aim for 8 to 11 mg daily. Food sources of zinc include shellfish, beef, chicken, beans, nuts, and whole grains.

## Bone-Healing Meal Plan Sample

#### BREAKFAST

plain Greek yogurt topped with strawberries, kiwi, walnuts, and chia seeds

#### LUNCH

Mediterranean kale and spinach salad with bell peppers, tomatoes, cucumbers, grilled or roasted chicken, feta cheese, chickpeas, and vinaigrette dressing with whole wheat bread on the side

#### SNACK

Hard boiled egg with an orange and a handful of almonds





## Heart-Healthy Meal Plan Sample

#### DAY 1

Breakfast: I serving avocado egg
toast
Snack: I cup of blueberries
Lunch: I serving loaded black bean
nacho soup
Dinner: Seared salmon with green
peppercorn sauce

#### DAY 2

Breakfast: 1 cup bran cereal
Snack: One medium apple
Lunch:Spinach and strawberry
meal-prep salad
Dinner: Charred shrimp and pesto
Buddha bowls



#### DAY 3

Breakfast: 1 cup nonfat plain Greek
yogurt
Snack: 1 cup raspberries
Lunch: Spinach and strawberry
meal-prep salad
Dinner: Curried sweet potato soup

#### DAY 4

Breakfast: Bran cereal and ½ cup blueberries Snack: One medium apple, 1 cup raw broccoli and cauliflower Lunch: Cod with tomato cream sauce Dinner: Skillet lemon chicken and potatoes with kale

#### DAY 5

Breakfast: Rolled oats cooked up in 1
cup milk topped with cinnamon
Snack: One medium bell pepper and
three tablespoons hummus
Lunch: Chicken cauliflower fried rice
Dinner: Charred shrimp and pesto
Buddha bowls

#### DAY 6

Breakfast: Cooked oatmeal sprinkled with chopped walnuts Snack: One medium orange Lunch: Tuna, white bean, and dill salad Dinner: Toaster-oven tostada

#### DAY 7

Breakfast: Avocado egg toast Snack: I cup raspberries Lunch: Melba toast crackers Dinner: Skillet lemon chicken and potatoes with kale





## Effective factors on brace compliance in idiopathic scoliosis: a literature review

Sara Rahimi 1, Adele Kiaghadi 1, Nader Fallahian Disability and Rehabilitation: Assistive Technology. 2020 Nov

**Objectives:** Compliance plays a major role in the success of brace treatment and is influenced by factors such as the kind of brace, measurements method, regimen for brace wear, pattern wearing at night/day or full/part time and another factor is also psychological condition of the wearer. The objective of this review is to assess affecting factors on compliance of spinal braces in idiopathic scoliosis.

Materials and methods: The guideline of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) was used for conducting review and assessing the quality of evidence. The search in PubMed databases had 175 results of which 17 articles met the inclusion criteria. Effective factors on compliance were extracted and categorized into six groups based on type of brace, measurement method, age, day/night time pattern wearing, full/part time wearing and psychological aspect that can improve the result of spinal brace treatment in idiopathic scoliosis.

**Results:** The results demonstrated that the type of braces determines structure and appearance and affects compliance. Psychological aspects, age, brace wear pattern (daytime or nighttime or part-time versus fulltime) and the assessment method (using temperature versus pressure sensors) can affect recorded compliance.

Conclusions: Compliance can be augmented by considering factors in the design and delivery of the brace. Superior appearance and comfortable within the brace can improve psychological acceptance and improve the compliance. Lower age, involving the patient in treatment procedure, considering the child habits, and improved family awareness of the treatment plan of idiopathic scoliosis can also improve overall compliance of the brace.

## Spinal Manipulative Therapy for Adolescent Idiopathic Scoliosis: A Systematic Review

<u>Jean Théroux 1, Norman Stomski 2, Christine Dominique Losco 2, Christelle Khadra 3, Hubert Labelle 4, Sylvie Le May JMPT, Jul-Aug 2017</u>

**Objective:** The purpose of this study was to perform a systematic review of clinical trials of spinal manipulative therapy for adolescent idiopathic scoliosis.

**Methods:** Search strategies were developed for PubMed, CINHAL, and CENTRAL databases. Studies were included through June 2016 if they were prospective trials that evaluated spinal manipulative therapy (eg, chiropractic, osteopathic, physical therapy) for adolescent idiopathic scoliosis. Data were extracted and assessed by 2 independent reviewers. Cochrane risk of bias tools were used to assess the quality of the included studies. Data were reported qualitatively because heterogeneity prevented statistical pooling.

**Results:** Four studies satisfied the inclusion criteria and were critically appraised. The findings of the included studies indicated that spinal manipulative therapy might be effective for preventing curve progression or reducing Cobb angle. However, the lack of controls and small sample sizes precluded robust estimation of the interventions' effect sizes.

Conclusion: There is currently insufficient evidence to establish whether spinal manipulative therapy may be beneficial for adolescent idiopathic scoliosis. The results of the included studies suggest that spinal manipulative therapy may be a promising treatment, but these studies were all at substantial risk of bias. Further high-quality studies are warranted to conclusively determine if spinal manipulative therapy may be effective in the management of adolescent idiopathic scoliosis.

# A Prospective Cohort Study of AIS Patients with 40° and More Treated with a Gensingen Brace (GBW): Preliminary Results

Weiss HR, Tournavitis N, Seibel S, Kleban A The Open Orthopaedics Journal 2017

**Introduction:** There is a growing resistance from patients and their families to spinal fusion surgery for scoliosis. Due to inconclusive evidence that surgery has a long-term effect on scoliosis and/or improves the quality of life for patients with scoliosis, there is a need to extend the conservative perspective of treatment to patients with curvatures greater than 40 degrees. For that reason, a prospective cohort study was initiated to determine the effectiveness of the Gensingen brace (a Cheneau-style TLSO) in preventing progression in skeletally immature patients.

Materials and Methods: Since 2011, fifty-five patients have been enrolled in this prospective cohort study. This report includes the mid-term results of twenty-five of these patients, who have a minimum follow-up of 18 months and an average follow-up of 30.4 months (SD 9.2). The twenty-five patients had the following characteristics at the start of treatment: Cobb angle: 49° (SD 8.4; 40°-71°); 12.4 years old (SD 0.82); Risser: 0.84 (SD 0.94; 0-2). A z-test was used to compare the success rate in this cohort to the success rate in the prospective braced cohort from BrAIST. Results: After follow-up, the average Cobb angle was 44.2° (SD 12.9). Two patients progressed, 12 patients were able to achieve halted progression, and eleven patients improved. Angle of trunk rotation (ATR) decreased from 12.2 to 10.1 degrees in the thoracic spine (p = 0.11) while the ATR decreased from 4.7 to 3.6 degrees in the lumbar spine (p = 0.0074). When comparing the success rate of the BrAIST cohort with the success rate of patients in this cohort, the difference was statistically significant (z = -3.041; p = 0.01).

**Conclusion:** Conservative brace treatment using the Gensingen brace was successful in 92% of cases of patients with AIS of 40 degrees and higher. This is a significant improvement compared to the results attained in the BrAIST study (72%). Reduction of the ATR shows that postural improvement is also possible.

## Visceral responses to spinal manipulation

Philip S Bolton 1, Brian Budgell J Electromyogr Kinesiol . 2012 Oct

#### Abstract

While spinal manipulation is widely seen as a reasonable treatment option for biomechanical disorders of the spine, such as neck pain and low back pain, the use of spinal manipulation to treat non-musculoskeletal complaints remains controversial. This controversy is due in part to the perception that there is no robust neurobiological rationale to justify using a biomechanical treatment of the spine to address a disorder of visceral function. This paper therefore looks at the physiological evidence that spinal manipulation can impact visceral function. A structured search was conducted, using PubMed and the Index to Chiropractic Literature, to construct of corpus of primary data studies in healthy human subjects of the effects of spinal manipulation on visceral function. The corpus of literature is not large, and the greatest number of papers concerns cardiovascular function. Authors often attribute visceral effects of spinal manipulation to somato-autonomic reflexes. While this is not unreasonable, little attention is paid to alternative mechanisms such as somato-humoural pathways. Thus, while the literature confirms that mechanical stimulation of the spine modulates some organ functions in some cohorts, a comprehensive neurobiological rationale for this general phenomenon has yet to appear.

Scoliosis deformity reduction in adults: a CBP® Mirror Image® case series incorporating the 'non-commutative property of finite rotation angles under addition' in five patients with lumbar and thoracolumbar scoliosis.

Harrison DE1, Oakley PA2 Journal of Physical Therapy Science, 24 Nov 2017

**Purpose:** This case series presents the unique application of the non-commutative property of finite rotation angles under addition to the CBP® mirror image® treatment protocol for adult lumbar and thoraco-lumbar scoliosis.

Subjects and Methods: Five adult patients having lumbar/thoraco-lumbar scoliosis and back pain, and having at least two prominent thoracic postural abnormalities according to Harrison's rotations and translations of thoracic postures were included. After initial assessment, mirror-image stress x-rays were taken. For each patient, one stress film was taken using the order of mirror image movements with the largest displacement followed by the second largest (primary + secondary) and one stress film was taken in the opposite order (secondary + primary). The consecutive ordered movements that resulted in the largest reduction of curvature were chosen as the order-specific series of movements all exercises and postural traction were to be performed for each patient. Spinal manipulation was also performed. [Results] All patients had a reduction of curvature concomitant with a reduction in pain levels.

**Conclusion:** This unique treatment approach offers a patient-specific, targeted structural rehabilitative procedure to stress the spine towards a more straightened configuration. Adult lumbar and thoraco-lumbar curves can be reduced and improved by these non-invasive CBP methods.

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**Facts** 

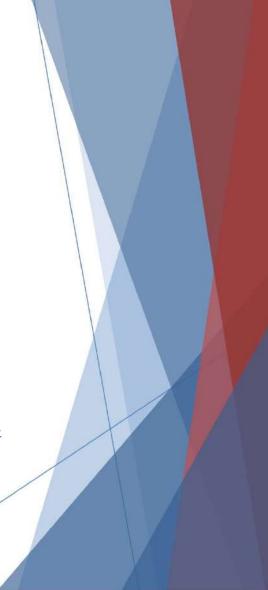
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