# Distinctly DO: Elevating OMM Foundationally and Longitudinally

OnlineMedEd

# Today's Session

The Past (Steve)

The Present (Jeremy+ Steve)

The Future (All of us)

# The Past (Steve)


- Transition from Pre-Clinical to Clinical Phase
- How does OPP fit in
- Distributed Rotation Sites
- ACGME Peds Residency
- Identity as a sub-specialist
- Identity as a DO preceptor

# Regionalized? Based on tradition? Taught in a box? EBM?

# The Present (Jeremy+ Steve)

- Expansion of DO schools
- Distributed Clinical Campuses
- Maintaining Osteopathic Focus During Rotations
- Jeremy's student experience
- Genesis of the OMM curriculum

# OMM + PACE- A Digital Curriculum

### Multiple Learning Modalities With One Unified Voice

- Notes to read, video to watch, and practice questions for each lesson.
- Coordinated, deliberate repetition to make things stick

### Commitment to Educational Excellence

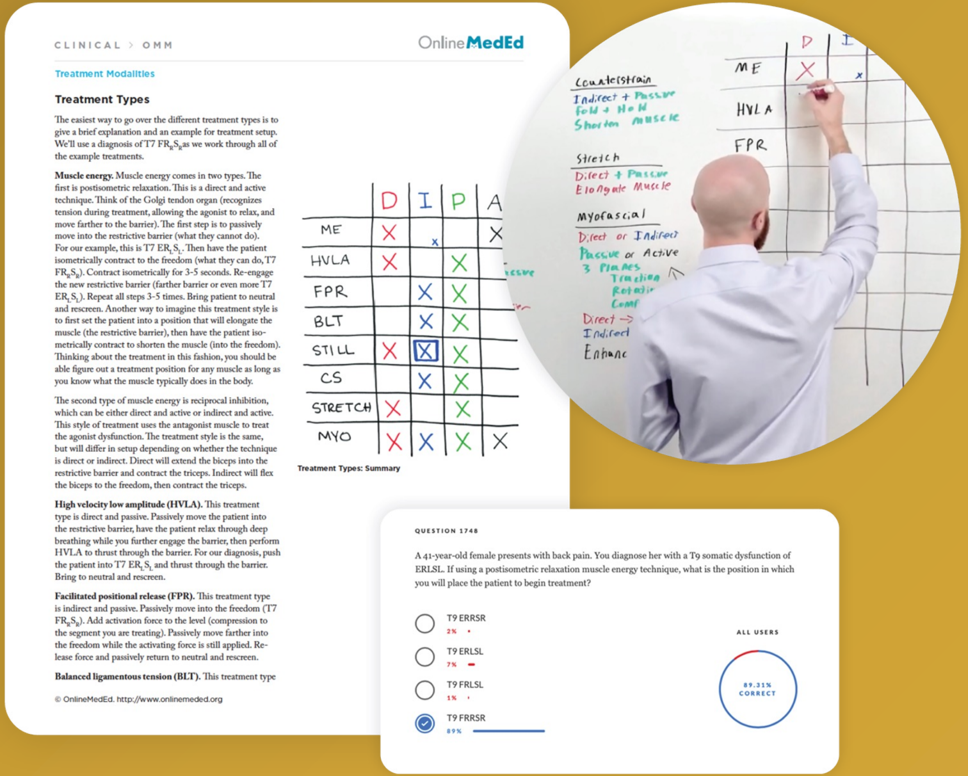
- Language that makess sense for the first-time learner
- Thoracic Spine

### Learner-centered Educational Design

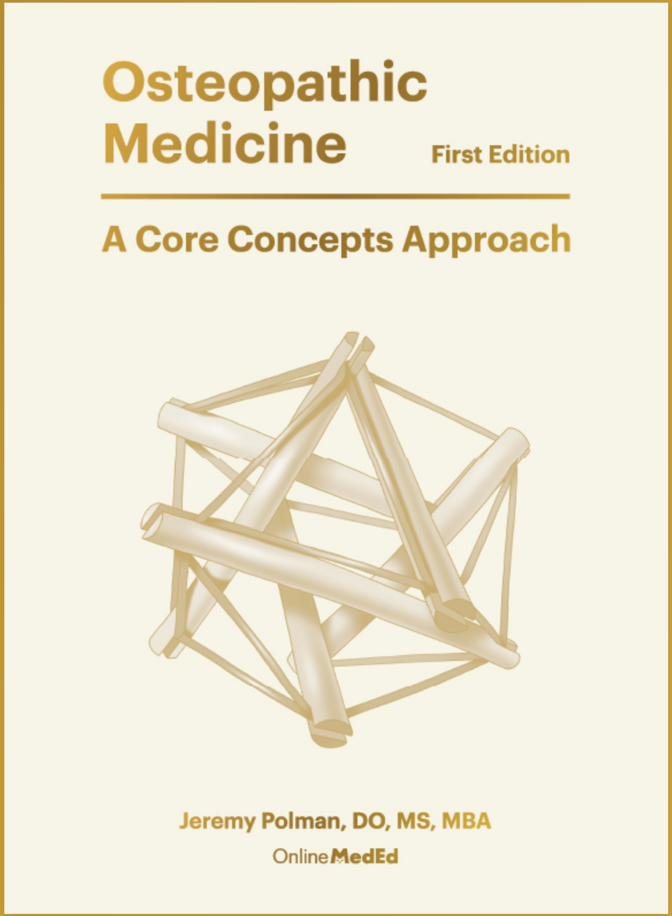
- Language that makess sense for the first-time learner
- Thoracic Spine Diagnosis
- Thoracic Spine Facet Model

### Complete Curriculum

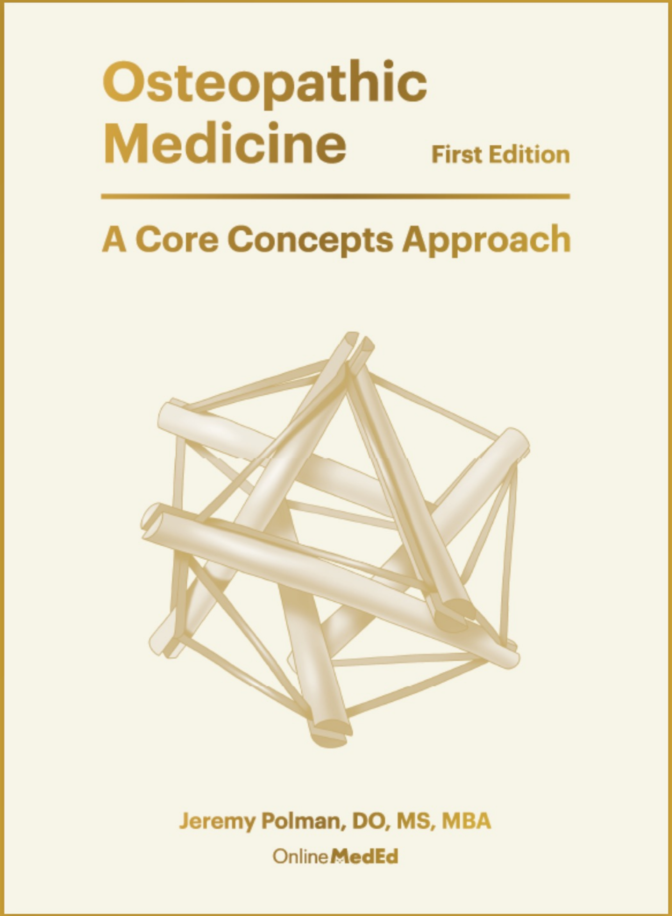
- 25 lessons organized by region of the body
- 4 Lessons specifically  for help on exams



# Osteopathic Medicine:
# A Core Concepts Approach



# Examples


Osteopathic
Medicine
First Edition
A Core Concepts Approach
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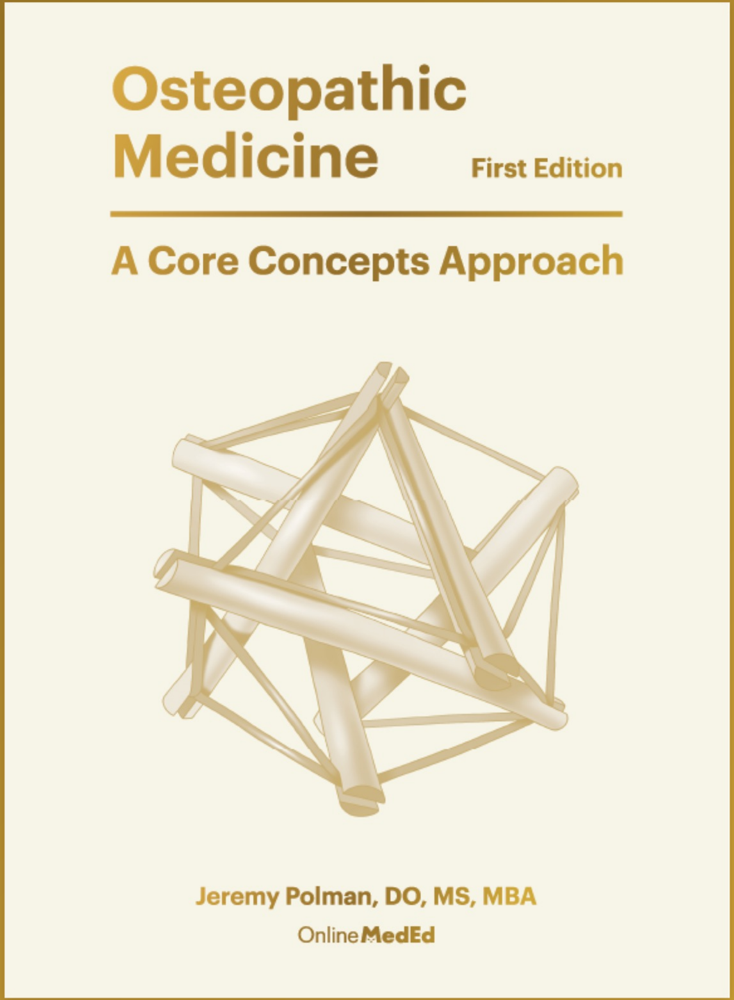
OnlineMedEd




# How to Use This Book

This book has several unique features. Its design is strictly intentional. Therefore, this page is mandatory reading to understand how to get the most out of this book. Those who skip this page and view this book through a traditional lens may find the presentation uncomfortable and erroneous, and ultimately not utilize the book to the fullest.

**Read the book in order the first time.** Its curriculum is integrated and longitudinal, each chapter building on the last. Only after mastering the core concepts should you consider reading sections out of sequence. In addition, this book purposefully teaches the palpatory findings of a dysfunction and how to name the dysfunction before teaching how to screen for the dysfunction. The final chapter of the book teaches how to quickly and effectively screen a patient for any somatic dysfunction.

**Vocabulary is for clarity.** We recognize and respect official osteopathic terminology. We also recognize that some of these terms or phrases can be confusing. Our new method of teaching osteopathic medicine includes saying some things differently. This is not a challenge to the established lexicon, but a simple way to eliminate confusion and promote understanding. We'll define the established terms and then explain any changes we've made to them. And rest assured, our new formulations are clear and logical. You'll never be misunderstood if you use our terms in discussion or on an exam.

**Scope.** The presentation maximizes learning of concepts. We don't aim for encyclopedic scope, photorealistic accuracy, or perfect harmony with other texts (especially review resources). The illustrations may omit or modify details to better convey a concept—when the anatomy is not exactly accurate, it is by design. The book is designed through and through to give the must-know information in the most effective way. The information should stick and be easy to recall when needed.

**Color-coding is intentional.** The illustrations, besides being beautiful, use specific colors to help solidify important ideas. For example, green represents flexion or extension, purple represents rotation, and gold represents sidebending. So, if you should blank on the words to describe an anatomical function or a manipulative technique, perhaps the answer will come by recalling the colors on the illustrations.

**Treatment pages and QR codes.** To apply concepts concretely, most chapters include high-yield, step-by-step osteopathic manipulative treatments. These treatments start with a known diagnosis and walk through the steps to treat the dysfunction. In life, you will have to go from patient complaint to diagnosis to treatment. But to master the concepts, we start with the diagnosis and then teach you how to reach it. Each treatment page has a shortened URL to type into your browser and a QR code to snap with your phone. These lead to a demonstration of the treatment being performed on a real person to further reinforce the concepts.

**Outcomes.** If this is your first foray into osteopathic medicine, we are honored to be your guide, and hope that our efforts help make yours easy and enjoyable. And if you are a seasoned DO, we hope you will find what you're looking for, and maybe pick up some bonus knowledge in the bargain. The book will have served its purpose if it helps solidify basic osteopathic knowledge and inspires deeper research by its readers.

**Palpation**—assessing the patient's body through touch—is used to assess for somatic dysfunctions. This can be as simple as testing whether the patient can turn their head to the left and right equally.

When palpating dysfunctional areas of the body, anatomical changes may provide clues as to how long the area has been dysfunctional. These clues are termed **TART palpatory findings**. TART stands for **texture**, **asymmetry**, **restriction**, and **tenderness.** These four findings help identify dysfunctional areas and differentiate between **acute** (new) and **chronic** (old) dysfunctions. Typically, a dysfunctional area will have at least two of the four TART changes. In an **acute dysfunction**, the **texture** will be **hot, boggy, and moist**. It will have noticeable **asymmetry compared to the other side**. **Restriction** of movement results in **obvious pain with movement**. **Tenderness** of the dysfunctional area may cause **intense, sharp pain** upon palpation. With the exception of asymmetry, which is the same for acute and chronic dysfunctions, the opposite findings are true for a chronic dysfunction. A **chronic dysfunction** will have a **cool, ropy, and dry texture**. It will still be **asymmetrical** (however, you may notice decreased asymmetry due to compensatory patterns), but there will be **decreased or no pain with movement**. And palpation of a chronically dysfunctional area will produce an **achy and dull sensation**.

| | ACUTE | CHRONIC |
|---|---|---|
| TEXTURE | HOT, BOGGY, MOIST | COOL, ROPY, DRY |
| ASYMMETRY | + | + |
| RESTRICTION | PAIN WITH MOVEMENT | LESS/NO PAIN WITH MOVEMENT |
| TENDERNESS | INTENSE, SHARP | ACHY, DULL |

**Figure 1.3: TART Palpatory Findings**

Here is a memory tool for TART changes: Imagine rolling an ankle while running. Acutely, the ankle would be warm, painful to move, and intensely painful when palpated. Chronically—after a few days—the ankle would feel cool, less painful to move, and achy when touched.

## Planes of Motion

Three major anatomical motions are critical in the understanding of osteopathic medicine: **flexion/extension**, **rotation**, and **sidebending**. Each motion occurs **in its own plane and around its own axis**. The anatomical planes include the **sagittal**, **transverse**, and **coronal** planes. Each plane cuts the body in half in a particular manner. The **sagittal plane** cuts **vertically** along the bridge of the nose, dividing the body into right and left halves. The **transverse plane** cuts **horizontally** through the hips, dividing the body into top and bottom halves. The **coronal plane** cuts the body **vertically** from top to bottom into front and back halves. An **axis** is a singular point around which motion occurs. The three anatomical axes are **horizontal**, **vertical**, and **anterior-posterior (AP)**.







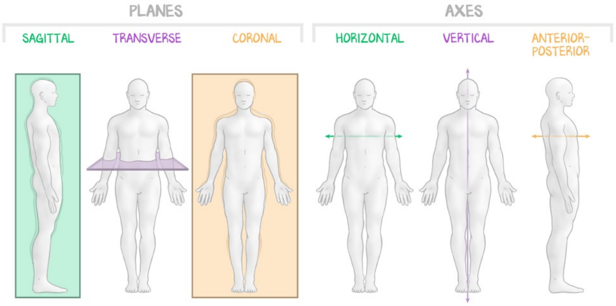



**Figure 1.4: Axes and Planes of the Body**

So how do these planes and axes relate to the major motions of the body? **Imagine an umbrella. The canopy is the plane, and the shaft is the axis.** Twisting the shaft causes the canopy to rotate. Now, let's translate this to anatomical movements. Imagine bending forward to tie your shoelaces (flexion, the approximation of two ends of a joint) or arching your back while yawning (extension, the distancing of two ends of a joint). **Flexion and extension occur in the sagittal plane around a horizontal axis.** Now, imagine sitting in class and hearing the person behind you ask a question. Turning your body without leaving the seat is rotation. **Rotation occurs in the transverse plane around a vertical axis.** Finally, imagine standing upright and dodging a punch by bending your torso to the left or right. This motion is called sidebending. **Sidebending occurs in the coronal plane around an anterior-posterior axis.** If it helps, as you make a particular motion, the line your nose follows is the plane of motion.

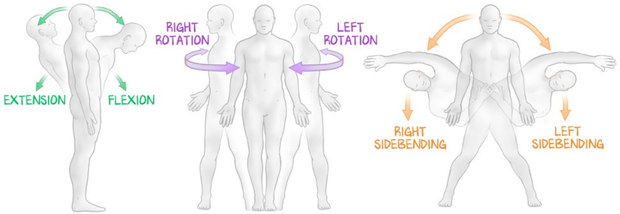



**Figure 1.5: Basic Body Motions**

## Thoracic Spine Motion

As mentioned in the previous chapter, the human body has three main anatomical motions: flexion/extension, rotation, and sidebending. The **primary motion of the thoracic spine is rotation** (though capable of flexion/extension and sidebending). The **directionality of the body** of the vertebra indicates which **direction the vertebra is rotated**. For example, when the torso is rotated to the right, the thoracic vertebral bodies face right. But because thoracic vertebral bodies are too deep to be felt by palpation, their movement is determined through **palpation of their bony landmarks**—for rotation, we'll use the **transverse processes**. If palpation reveals that the **right** transverse process is more **posterior** and the left transverse process is more anterior, the vertebral body is **rotated to the right**. If palpation reveals the **left** transverse process to be more **posterior** than the right transverse process, the vertebral body is **rotated to the left**. Sidebending is less easily palpated but can be easily determined using Fryette's laws of spinal motion.

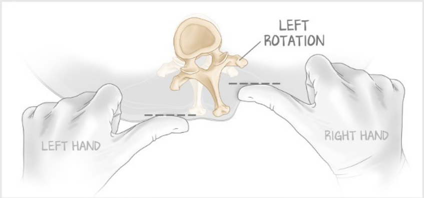



Figure 2.4: Palpation of the Transverse Process

## Fryette's Laws of Spinal Motion

Fryette's three laws of spinal motion explain **how idebending and rotation relate** to one another **depending on the flexion/extension/neutral component of the thoracic vertebra**. **Law 1** states that in a neutral dysfunction, sidebending and rotation occur in opposite directions to one another. (Remember this by drawing arrows on the ends of the letter N, which shows that they are pointing in opposite directions.) **Law 2** states that in a flexed or extended dysfunction, sidebending and rotation occur in the same direction as one another. (Draw arrows on the arms of the F or E as a reminder: they are pointing in the same direction.) **Law 3** doesn't help with diagnosis but explains stacking: the concept that **as one vertebral segment goes into one plane of motion, the range of motion for the rest of the planes decreases**. The more one flexes, the less one will be able to rotate and even less able to sidebend. Fryette's laws of spinal motion work in reverse as well. Given the data on flexion/extension and sidebending, Fryette's laws can determine the rotational component of a dysfunction. As a side note: osteopathic physicians refer to somatic dysfunction "types," according to which of Fryette's laws they follow. "Type 1" dysfunctions follow law 1, and "type 2" dysfunctions follow law 2.







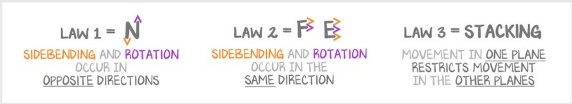



Figure 2.5: Fryette's Laws

## How to Diagnose the Thoracic Spine

Now that you understand how the thoracic vertebrae move, how to palpate this movement, and Fryette's laws, you are able to diagnose thoracic spine somatic dysfunction. **The name of a thoracic spine diagnosis must include all three planes of motion (flexion/extension, sidebending, and rotation) and explain what the vertebra CAN do.** For example, a diagnosis of "T4 flexed, rotated right, sidebent right" means that T4 can flex, rotate to the right, and sidebend to the right normally. This is written in shorthand as $T4FR_RS_R$, where F stands for flexed, $R_R$ stands for rotated right, and $S_R$ stands for sidebent right. For **type 2 dysfunctions**, nomenclature requires the **rotational component to be listed before sidebending**. This is the opposite of **type 1 dysfunctions**, where the **sidebending component is listed before rotation**.

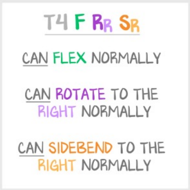



Figure 2.6: Somatic Dysfunction Shorthand

**The first step to diagnosing the thoracic spine is to assess for rotation in neutral.** Rotation is named for the direction the vertebral body is rotated. Because the vertebral body cannot be palpated directly, the transverse processes are used. With the patient seated comfortably, palpate the transverse processes at the level of the suspected dysfunction. If the **right** transverse process is more **posterior** than the left, the vertebra is **rotated to the right**. If the left is more posterior than the right, the vertebra is rotated to the left. Write down the rotational finding for later. Next, **assess for rotation again** while the patient is **flexing forward**. If the rotation gets better or goes away, it's a **flexed dysfunction**. If it gets worse or stays the same, **assess the rotation in extension**. When assessing for rotation in extension, if it gets better or goes away, it's an **extended dysfunction**. If it gets worse or stays the same, it's a **neutral dysfunction**. In the real world, you may have to assess both flexion and extension a few times to palpate the difference, but on an exam, you'll be told

TREATMENT

## Muscle Energy

Muscle energy, developed by Dr. Fred Mitchell, is a cornerstone treatment modality in osteopathic medicine. The two muscle energy techniques—postisometric relaxation and reciprocal inhibition—differ in which muscles the patient contracts during treatment.

**Postisometric relaxation muscle energy** is a **direct** and **active** technique that utilizes **Golgi tendon organs**. Muscles have many Golgi tendon organs at the origin and insertion points of the muscle fibers. Golgi tendon organs can sense changes in muscle tension, initiating reflexive relaxation of the antagonist muscle fibers. This is a direct technique, so the patient is placed into the **restrictive barrier** (what the segment cannot do) during setup. As this is an active technique, the patient is then asked to **isometrically contract** in the direction of the **freedom** (what the segment can do). For the example diagnosis of $T4FR_RS_R$, you would set the patient into T4 extension, left rotation, and left sidebending (the restrictive barrier), then have the patient isometrically contract into T4 flexion, right rotation, and right sidebending (the freedom).

The steps to perform postisometric relaxation muscle energy using the example diagnosis of $T4FR_RS_R$ are as follows:

1. Passively move the patient into the **restrictive barrier**—$T4ER_LS_L$.
2. Have the patient **isometrically contract** against your counterforce/body weight into the **freedom**—$T4FR_RS_R$ (the same as the diagnosis).
3. Hold this isometric contraction for 3–5 seconds.
4. Instruct the patient to relax as you **re-engage the new restrictive barrier**. For this example, this is further into $T4ER_LS_L$. You will be able to move the patient farther into the barrier than before due to the reciprocal relaxation of the antagonist muscles caused by the Golgi tendon organs.
5. Once at this new barrier, repeat steps 2–4 three to five times.
6. Passively return the patient to neutral.
7. Rescreen.

**Watch the treatment in action!**

**See Dr. Polman perform this treatment and explain the steps in real time.**

Scan the QR code or follow the link below to be taken to a video from OnlineMedEd.

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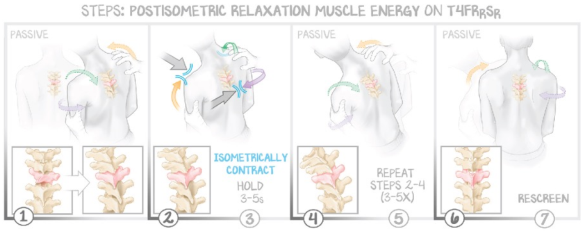


Figure 3.4: Postisometric Relaxation Muscle Energy on $T4FR_RS_R$







TREATMENT

Let's relate this to a dysfunctional muscle—a dysfunctional biceps—to show how simple this concept can be. When the biceps contracts normally, the upper extremity flexes at the elbow. When the biceps relaxes, the upper extremity extends at the elbow. When the biceps is dysfunctional, it becomes hypertonic and contracted. In this state, the two ends of the muscle become "stuck" closer together, meaning that the muscle is "stuck" in flexion. So the freedom for a dysfunctional biceps (or any muscle) is what the muscle typically does; in this case, flexion of the upper extremity. Because the biceps is hypertonic, it cannot relax as it normally would, making extension the restrictive barrier. To apply these concepts to postisometric relaxation muscle energy treatment of a dysfunctional biceps, place the muscle into the restrictive barrier of extension at the elbow, and ask the patient to isometrically contract into the freedom, which is flexion at the elbow. Said another way, engage the restrictive barrier by elongating the muscle and ask the patient to isometrically contract into the freedom by shortening the muscle.

Let's review the steps of postisometric relaxation muscle energy, but for a dysfunctional biceps muscle:

1. Passively move the patient into a position that **elongates the muscle** (the restrictive barrier)—extend the patient's arm at the elbow to elongate the biceps.
2. Have the patient isometrically contract the biceps against your counterforce to **shorten the muscle** (into the freedom)—ask the patient to flex the arm at the elbow to shorten the biceps.
3. Hold this isometric contraction for 3–5 seconds.
4. Instruct the patient to relax as you re-engage the new restrictive barrier—further extend the patient's arm at the elbow.
5. Once at this new barrier, repeat steps 2–4 three to five times.
6. Passively return the patient to neutral.
7. Rescreen.

**Watch the treatment in action!**

**See Dr. Polman perform this treatment and explain the steps in real time.**

Scan the QR code or follow the link below to be taken to a video from OnlineMedEd.

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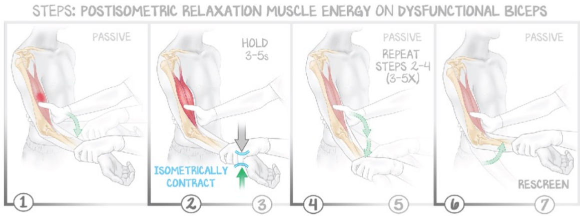



Figure 3.5: Postisometric Relaxation Muscle Energy on a Dysfunctional Biceps

By understanding how postisometric relaxation works in terms of placing the dysfunction into the barrier and having the patient isometrically contract into the freedom, you should be able to figure out any treatment position for any muscle as long as you know what the muscle typically does in the body.

## Core Concepts

### Treatment Terms:

**Direct:** The restrictive barrier (what the patient cannot do) is directly engaged during treatment setup.

**Indirect:** The freedom (what the patient can do, the opposite of the restrictive barrier) is engaged during treatment setup.

**Active:** Patient assists during treatment.

**Passive:** Patient remains still, relaxes, and doesn't assist during treatment.

### Choosing a Treatment:

Direct treatment for younger patients who have no pain with motion of the dysfunctional area or may have a chronic dysfunction.

Indirect treatment for someone who is older and has pain with motion of the dysfunctional area or an acute dysfunction.

### Treatment Modality Highlights:

**Muscle energy:** Direct and active (although occasionally indirect if using postisometric relaxation).
**HVLA:** Direct and passive.
**FPR:** Indirect and passive.
**BLT:** Indirect and passive.
**Still:** Direct and indirect (but stick with indirect for exams) as well as passive.
**Stretching:** Direct and passive.
**Myofascial:** Direct or indirect and active or passive depending on treatment setup.
**Counterstrain:** Indirect and passive.

### Steps to Perform Counterstrain:

1. Find the tender point through palpation.
2. Compress the tender point and ask the patient how painful the area is.
3. Release pressure on the tender point, but do not lift your finger.
4. Tell the patient that this pain is considered 10/10 for the treatment.
5. Without lifting your finger from the tender point, passively move the patient into the treatment position.
6. Once in the treatment position, compress the tender point again and ask the patient how painful the area is. If they say 3/10 or less, the patient is in the correct position. If they say 4/10 or more, readjust the treatment position.
7. Release pressure on the tender point, but do not lift your finger.
8. Once the patient is in a position where their pain is 3/10 or less, hold it for 90 seconds.
9. After 90 seconds, passively return the patient to neutral.
10. Rescreen.







### Thoracic Spine Counterstrain:

| TENDER POINT | LOCATION | TREATMENT POSITION |
|---|---|---|
| AT1* | Midline at the sternal notch | Flexed |
| AT2* | Midline at the sternal angle | |
| AT3–AT6* | On the sternum in the same horizontal plane as the corresponding thoracic vertebra | |
| AT7 | Inferior tip of the xiphoid process, lateral to the midline | Flexed, sidebent toward, and rotated away |
| AT8 | Halfway between the tip of the xiphoid and umbilicus, lateral to the midline | |
| AT9 | Three-fourths the distance from the tip of the xiphoid to the umbilicus, lateral to the midline | |
| AT10 | One-fourth the distance from the umbilicus to the pubic tubercle | |
| AT11 | Halfway between the umbilicus and pubic tubercle | |
| AT12 | Anterior-superior surface of the iliac crest at the midaxillary line | |
| PT1–PT12 (midline)* | On the spinous process of the corresponding thoracic vertebra | Extended |
| PT1–PT12 (lateral) | On the transverse process of the corresponding thoracic vertebra | Extended, sidebent away, and rotated toward |

* Maverick points; i.e., those that don't follow the usual "fold and hold" rules.

The second type of sacral dysfunction is **torsion dysfunction**. A torsion dysfunction can either be a **forward torsion** (right on right or left on left; also called a **flexed torsion**) or a **backward torsion** (right on left or left on right; also called an **extended torsion**). The naming of torsion dysfunctions indicates, first, the direction the sacrum has **rotated**, and second, the **oblique axis** around which the rotation has occurred. For example, "**left on right** sacral torsion" indicates that the sacrum is rotated to the **left** on the **right** oblique axis. An easy way to discern the direction the sacrum has rotated is to imagine eyeballs on the anterior portion of the sacrum. Whichever direction the eyeballs are looking after the sacrum has rotated is the direction the sacrum is rotated. In the the illustrations below, the pentagon model is drawn as if the pentagons are transparent planes of glass to allow better visualization of the direction the eyes are looking.

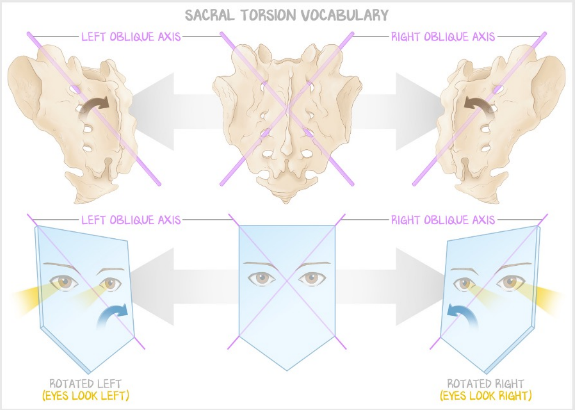



**Figure 6.16: Sacral Torsion Vocabulary**

**Forward torsions** are easy to notice when written out because both the rotation and axis are in the **same direction** (right on right or left on left). The sacrum appears, from the posterior, to rotate in a certain direction (e.g., right rotation around the right oblique axis). Remember that the rotational component of the sacral diagnosis is named for which direction the imaginary eyeballs are looking.







Another way to visualize a **right on right** sacral torsion is to imagine a model sacrum with a positive seated flexion test on the left. If the left (ipsilateral) SS is pushed anteriorly (deep) and the right (contralateral) ILA is allowed to move posterior/inferior, the top left of the sacrum will rotate forward around the right oblique axis, and the bottom right of the sacrum rotates backward around that axis. Where are the eyeballs looking on the front of the sacrum? To the right, so this is a right on right torsion. Where is the SS deep? On the left. Where is the ILA posterior/inferior? On the right. Thus, the palpatory findings for a **right on right sacral torsion** (rotated right around the right oblique axis) are a **positive seated flexion test on the left**, a **deep SS on the left**, and a **posterior/inferior ILA on the right**.

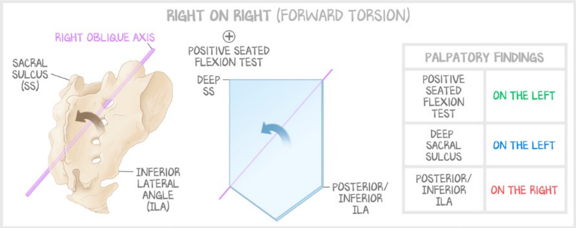



**Figure 6.17: Right on Right Sacral Torsion**

The palpatory findings for a **left on left sacral torsion** (rotated left around the left oblique axis) are a **positive seated flexion test on the right**, a **deep SS on the right**, and a **posterior/inferior ILA on the left**, the exact opposite of the right on right forward torsion.

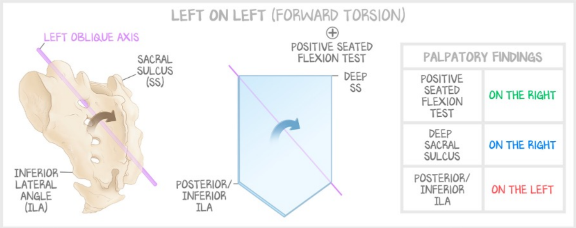
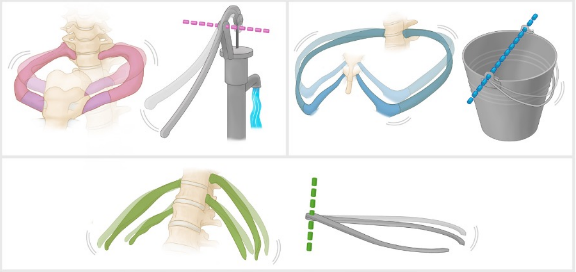
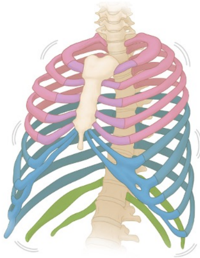



**Figure 6.18: Left on Left Sacral Torsion**

## Rib Motions

In general, all ribs move **superiorly during inhalation** and **inferiorly during exhalation**. However, each section of the ribs moves in a slightly different way from the others. Rib motions are described as **pump handle, bucket handle, and caliper**. Pump-handle motion is when the anterior portion of the rib moves superiorly during inhalation and inferiorly during exhalation while the posterior portion of the rib remains steady. This motion looks like that of an old-fashioned water pump, hence the name. **Ribs 1–5 move in a pump-handle fashion.** Bucket-handle motion is when the anterior and posterior portions of the ribs remain steady, but the medial portion swings up during inspiration and down during exhalation—like a bucket handle. **Ribs 6–10 move in a bucket-handle fashion.** Caliper motion is when the posterior portion of the rib remains steady, but the anterior portion moves laterally during inhalation and medially during expiration. **Ribs 11 and 12 move in a caliper fashion.**





| | ANTERIOR | MIDDLE | POSTERIOR |
|---|---|---|---|
| PUMP RIBS 1-5 | SUPERIOR/ INFERIOR | N/A | STEADY |
| BUCKET RIBS 6-10 | STEADY | SUPERIOR/ INFERIOR | STEADY |
| CALIPER RIBS 11-12 | LATERAL/ MEDIAL | N/A | STEADY |

**Figure 8.5: Rib Motions**







## Muscles of Respiration

The muscles of respiration are classified as either **primary or secondary**. The **primary muscles** are used during **relaxed respiration**, whereas the **secondary muscles** are used when more air exchange is needed (e.g., **during exercise**).

The **primary muscles of respiration** are the **diaphragm** and **intercostals**. In contrast, there is no primary muscle of exhalation—the force is generated by the absence of diaphragmatic contraction and the inherent **elastic recoil** of the alveoli, which create positive pressure in the lungs. The diaphragm attaches to ribs 6–12, L1–L3, and the xiphoid process. Diaphragm contraction creates negative pressure by opening the alveoli, causing air from the atmosphere to enter the lungs. The diaphragm resists the alveolar elastic recoil until it stops contracting. Then, the alveoli shrink, creating positive pressure against the air, forcing it out. The diaphragm is innervated by the **phrenic nerve**, which originates from **C3, C4, and C5**. A helpful mnemonic is, "C3, 4, 5 keeps the diaphragm alive." The diaphragm pulls on the alveoli, which in turn pull on other alveoli, effectively opening all of the alveoli. The contraction and relaxation of the diaphragm also help with the flow of lymph around the body (see chapter 12).

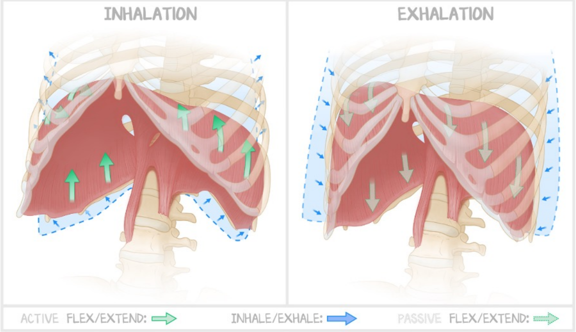



**Figure 8.6: The Diaphragm during Inhalation and Exhalation**

The **intercostals**—divided into **external, internal, and innermost**—are the muscles that run between the ribs. All intercostals are innervated by the intercostal nerves. These muscles help **expand and shrink the chest during respiration**.

## Structure of the Lymphatic System

The lymphatic system is similar to the vascular system. Each is a series of tubes; the vascular system transports blood around the body and back to the heart, and the lymphatic system transports lymph the same way. Lymphatic capillaries are generally found together with the vascular capillaries, from which fluid, particulate matter, and proteins are transferred into the lymphatic system.

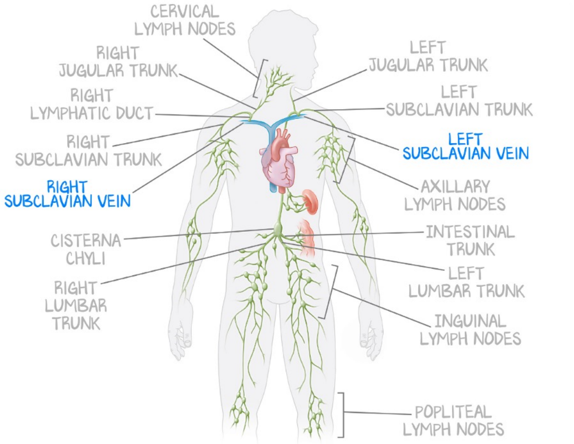



Figure 12.2: Overview of the Lymphatic System

The **lymphatic capillaries** are composed of a single layer of endothelial cells and are typically found entwined among arteriole and venule capillary networks. **Anchoring filaments** between the cellular layers support the capillary network openings, creating an open space for the passage of fluid and preventing capillary collapse. All but the largest **lymphatic vessels** are made up of just an endothelial layer. In contrast, even small arteries and veins have an endothelial layer (tunica intima), a layer of vascular smooth muscle (tunica media), and a layer of connective tissue with a vasa vasorum (tunica adventitia).

The general direction of lymphatic flow mirrors venous flow. More specifically, lymphatic flow occurs **from the lymphatic capillaries to the lymphatic ducts, then to the subclavian veins, and finally, to the superior vena cava**. Regardless of the location of the original lymphatic capillary, whether above or below the heart, the lymphatics always drain into the cardiovascular system through the superior vena cava.







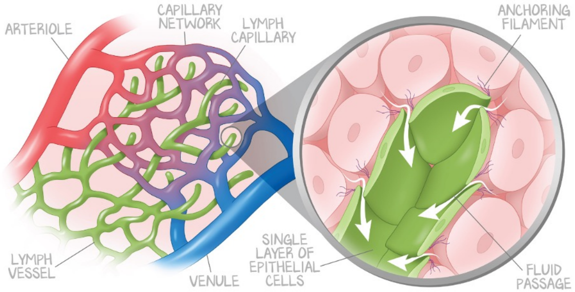



Figure 12.3: Lymphatic Capillaries

Along the way, from the lymphatic capillary network to the subclavian veins, many lymphatic capillary networks are attached to lymphoid tissues, such as lymph nodes, where additional cleansing of tissues and immune activation occur. Lymph **enters** a lymph node through **afferent (prenodal) lymphatic vessels**, and **exits** the node via **efferent (postnodal) lymphatic vessels**. Lymph can travel through multiple nodes before reaching the lymphatic ducts.

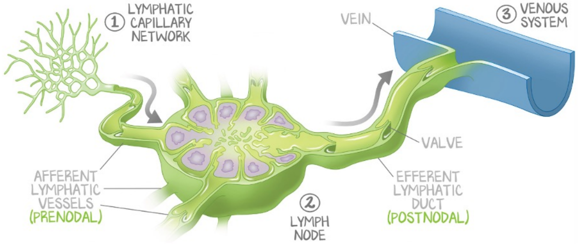



Figure 12.4: Flow Through the Lymphatic Vessels

### Must-Know Info

*Remember not to get lost in the weeds. In order to remain osteopathically focused, we must lay a foundation of knowledge on which we can build later.*

| SYMPATHETIC INNERVATIONS | | |
|---|---|---|
| STRUCTURE | SPINAL CORD LEVEL | NERVE AND PLEXUS |
| Head and neck | T1-T4 | |
| Heart | T1-T6 | |
| Lungs | | |
| Stomach | T5-T9 (on the left) | Greater splanchnic nerve and celiac plexus |
| Spleen | T5-T9 (on the left) | Greater splanchnic nerve and celiac plexus |
| Tail of pancreas | | |
| Liver | T5-T9 (on the right) | Greater splanchnic nerve and celiac plexus |
| Gallbladder | | |
| Duodenum | | |
| Head of the pancreas | | |
| Jejunum | T10-T11 | Lesser splanchnic nerve and superior mesenteric plexus |
| Ileum | T10-T11 | Lesser splanchnic nerve and superior mesenteric plexus |
| Kidneys | | |
| Proximal half of ureters | | |
| Ovaries and testes | | |
| Cecum | T10-T11 (on the right) | Lesser splanchnic nerve and superior mesenteric plexus |
| Appendix | | |
| Ascending colon | | |
| Proximal half of transverse colon | | |
| Distal half of transverse colon | T12-L2 | Least splanchnic nerve and inferior mesenteric plexus |
| Sigmoid colon | T12-L2 | Least splanchnic nerve and inferior mesenteric plexus |
| Rectum | | |
| Distal half of ureters | | |
| Bladder | | |
| Uterus | | |
| Cervix | | |
| Prostate | | |
| Erectile tissue of the penis and clitoris | | |

Table 13.2: Sympathetic Innervations







Alternatively, here is a visual representation of sympathetic and parasympathetic innervation to aid in memorization:

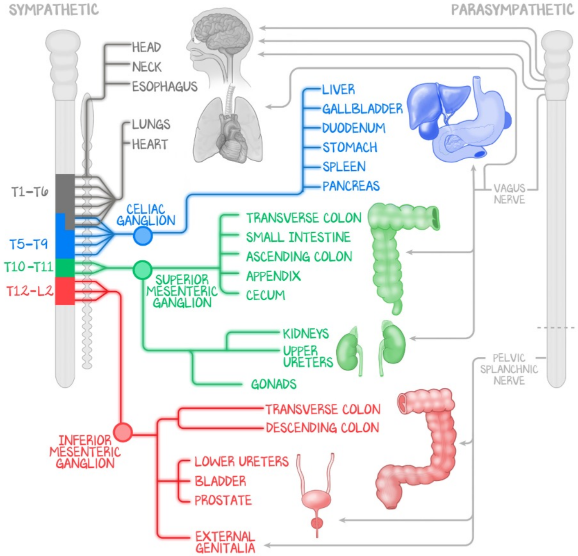



Figure 13.7: Visual Representation of the Autonomic Nervous System

## OMT Strategies

By treating the spine, we can treat the ANS and the structures each spinal segment innervates. For example, treating T2 also affects the ANS's innervation of structures at that spinal level, including the heart. Of note, osteopathic research has determined that there is **hypersympathetic autonomic facilitation in disease processes**, so it is important to evaluate and treat the autonomics when a disease process is identified. There are many strategies for treating the ANS, but we only cover the more popular treatments here. The goal of any treatment directed to the **sympathetic** spinal levels (T1–L2) is to **normalize or decrease autonomic activity**. In contrast, the goal of treatment directed to the **parasympathetics** is to **enhance or increase parasympathetic activity**.

Modern-day osteopathic physicians use Chapman points to **aid in diagnosis**. For example, palpation of the Chapman point associated with the heart will clue the physician in to a possible visceral dysfunction at the heart.

**The highest-yield portion of this chapter is the list of which Chapman points correlate with which anatomical structures**. These need to be memorized, anterior and posterior.

## Anterior Chapman Points

**Anterior Chapman** points are typically located **within the fascia of the intercostal spaces**, with some others located **within the fascia of different structures**. Below is a table of the anterior Chapman point locations and the structures they represent. This table is not all inclusive, but rather lists the highest-yield Chapman points. Notice that the locations of the anterior Chapman points generally line up with where the structure they represent lies anatomically. Once you memorize the anterior Chapman points and which structures they represent, test yourself by naming a structure and identifying where you would find an anterior Chapman point if that structure were dysfunctional. For example, where would you find an anterior Chapman point on a patient who has a stomach ulcer? (Find the answer at the end of this section.)

There is a table with all of the anterior Chapman points at the end of this chapter. For those who benefit from visual representations, here is a way to draw the locations of the anterior Chapman points. First, draw 12 horizontal lines representing the ribs, and a line down the middle for the sternum. Place clavicles bilaterally. Move to the right of the drawing and place a dot in the $2^{nd}$ rib interspace, as well as the $5^{th}$, $6^{th}$, and $7^{th}$. Move to the left side and place a dot in each rib interspace from the $7^{th}$ to the $1^{st}$. Label all dots in the order that you drew them: heart, stomach acid, stomach motility, spleen, pancreas, liver/gallbladder, liver, lower lung, upper lung, thyroid/bronchus/esophagus/myocardium, and finally tonsils. Place four additional dots in the $1^{st}$ interspace on the left and name them nose, pharynx, sinus, and tongue/larynx. On the lateral portion of the left clavicle, place an "ear" dot. Place an "appendix" dot on the tip of the $12^{th}$ rib on the patient's right (left of the drawing). Place six dots, three on each side, in the $8^{th}$, $9^{th}$, and $10^{th}$ rib interspaces laterally, and name all of them for the small intestine.

For the colon, just imagine how it sits anatomically in the body, and flip it forward on the thighs, with the pelvis as the axis or pivot point. Draw a Chapman point on the medial aspect of the left thigh, representing the prostate. Next, draw a bellybutton somewhere else on the page. One inch lateral and two inches superior to this will be the anterior Chapman point for the adrenal gland, located bilaterally. One inch lateral and one inch superior to the bellybutton is the anterior Chapman point for the kidney, located bilaterally. Around the belly button is the anterior Chapman point for the bladder. You should be able to draw this quickly for easy reference on test day. As for the few strange stragglers that are a little more difficult to draw: the ovary/urethra Chapman point is on the pubic tubercle, the uterus Chapman point is on the lower innominate, the cerebellum Chapman point is on the tip of the coracoid process, and the retina/conjunctiva Chapman point is on the superior lateral portion of the humerus.





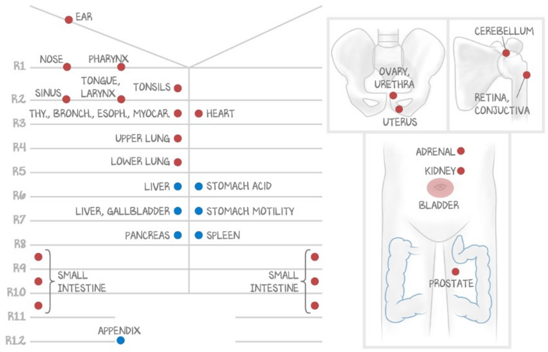




**Figure 14.2: Drawing the Anterior Chapman Points**

Where will an anterior Chapman point be palpated in a patient who has a stomach ulcer? At the $5^{th}$ rib interspace on the left. Stomach ulcers are usually caused by stomach acidity, thus you will palpate the stomach acidity anterior Chapman point.

## Posterior Chapman Points

If you liked anterior Chapman points, you will be even more excited about **posterior Chapman points**. Instead of being located within the fascia of the intercostal spaces like the anterior Chapman points, the posterior Chapman points are typically located on **the periosteum of bone**, specifically the vertebral transverse processes and the PSIS. Below is a table of the highest-yield posterior Chapman point locations and the structures they represent. Notice that the locations of the posterior Chapman points sometimes line up with where the structures they represent lie anatomically, but others are in strange locations. After reviewing the posterior Chapman points and which structures they represent, test yourself by naming a structure and identifying where you would find a posterior Chapman point if that structure were dysfunctional. For example, where would you find a posterior Chapman point on a patient who has pyelonephritis? (Find the answer at the end of this section.)

As with the anterior Chapman points, there is a table of the posterior Chapman points at the end of the chapter. But to draw the locations of the posterior Chapman points, start by drawing 19 horizontal lines, then draw one vertical line down the middle. Move to the left of the drawing and label each line C1–C2, T1–T12, and L1–L5. On the C1 line, place one dot to the left and one dot to the right of the midline, representing the ears. Draw a square on the left and right halves of C2, representing the HEENT grab-bag of nose, sinus, tonsils, larynx, and pharynx. Next, draw a heart on both sides of the T2 line, representing . . . the heart. On each

**Lateral strain (left/right).** This dysfunction occurs **around two vertical axes**, one through the sphenoid and the other through the occiput. The sphenoid and occiput rotate in the **same direction** (either clockwise or counterclockwise) around each bone's particular axis. Their paired rotation will cause the sphenoid to deviate laterally to the right or the left at the SBS. The naming of this dysfunction is based on the laterality of the sphenoid in relation to the SBS, or by whichever little finger is the most lateral.

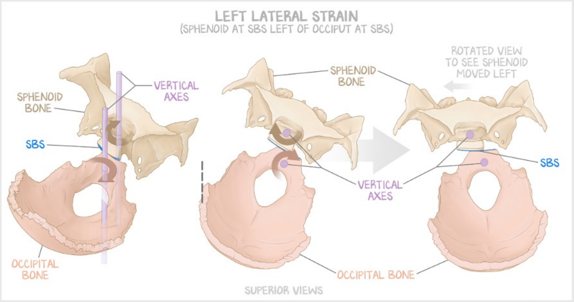



Figure 15.15: Left Lateral Strain Dysfunction

When palpating this dysfunction in the vault hold, your index and little fingers will make a parallelogram. If the sphenoid is located **farther to the left than the occiput at the SBS**, then the dysfunction is named a **left lateral strain**. This causes the left index finger to move to the right and the left little finger to move to the left. Name the dysfunction for the side on which the little finger is more lateral.

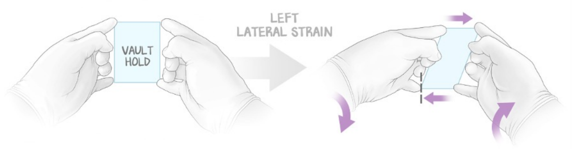



Figure 15.16: Palpatory Findings for a Left Lateral Strain Dysfunction







If the rotation around the vertical axes of the sphenoid and occipital bones is counterclockwise, **the sphenoid bone deviates to the right**. Because these dysfunctions are named for laterality of the sphenoid, this is named a **right lateral strain dysfunction**.

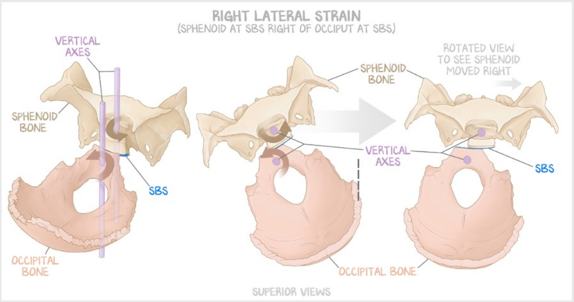



Figure 15.17: Right Lateral Strain Dysfunction

When palpating this dysfunction in the vault hold, if there is a right lateral strain dysfunction, the sphenoid will be located farther to the right than the occiput at the SBS. This is caused by the rotation of the sphenoid and occiput around their vertical axes. These motions will cause your right index finger to move to the left and your right little finger to move to the right.

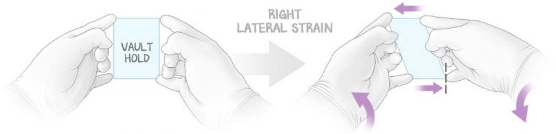



Figure 15.18: Palpatory Findings for a Right Lateral Strain Dysfunction

# Open Discussion

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