Respiratory Neurodontics®

The Body and The Bite Essentials

AIA Masters Fellowship Series, Lecture 1

Simplifying the Complex

Lecture 1 Objectives

1. To understand the components and application of "Respiratory Neurodontics®" (RND®)
2. To understand normal cranial bone movement possibilities
3. To understand all known cranial strain patterns in context with the AIA Spectrum of Patterns®
4. To understand how "The Body IS The Bite" and "The Bite IS The Body"
5. To learn the unrelenting effect of the rib cage on the mandibular diaphragm and cranial performance

Respiratory Neurodontics (RND)

(plural noun, treated as singular) is an expansion of the commonly appreciated relationship between facial development and the alignment of teeth, emphasizing that this relationship is dependent on balancing respiratory patterns and coordinating movement into one half of the body and then the other.

The ability to successfully alternate into one half of the body and then the other refers to the uniform lateral shifting onto each heel, each hip, each posterior mediastinum, each half of the neck and each half of the posterior occlusal surface (molars and pre-molars)

Respiratory Neurodontics:

RND is a term that relates the neurologically-driven influence of breathing and the proprioceptive sense of occlusion to craniofacial development and subsequent orientation of the occlusal scheme, and vise versa.

Appreciating how craniofacial posture and the proprioceptive sense of occlusion can both negatively and positively influence breathing and movement into both sides of the body is at the heart of this interdisciplinary concept.

Respiratory Neurodontics:

When the human is able to access a full respiratory and movement profile on both sides of the body in a successful alternating fashion, then they are more likely to develop a resultant patent airway, full mid-face, balanced occlusion and a neck capable of normal motion.

Likewise, each of these outcomes in turn allows the ongoing opportunity for a full respiratory and movement profile to be maintained on both sides of the body.

RND Programming

It has been shown that a regimen of ***integrating*** Postural Therapy, Postural Dentistry, Postural Vision, osteopathy and myofunctional airway therapy is currently the most comprehensive and effective mechanism for establishing a true RND program.

These applied sciences delivered ***in isolation*** appear to fall short of true management of the posturally challenged, airway challenged or occlusally challenged patient.

RND Programming

Other treatment protocols that are of profound influence include but are not limited to: sleep therapy, orthodontics and airway-focused surgeries.

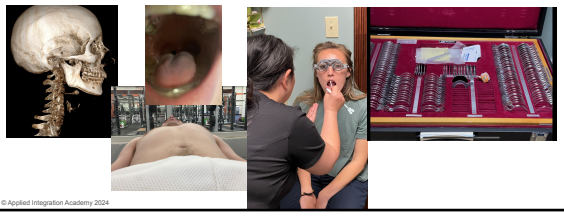
RND describes a holistic approach to achieving a harmonious balance of multiple systems of the body to allow for proper alignment of teeth, ideal cranial posture, optimized airway and an excellent approach toward pain-free living.

Respiratory Neurodontics

It has been shown that a regimen of ***integrating*** AIA Body & Posture Care, AIA Dentistry, AIA Vision, osteopathy and myofunctional airway therapy is currently the most comprehensive and effective mechanism for establishing a true RND program.

Respiratory Neurodontics

RND describes a holistic approach to achieving a harmonious balance of multiple systems of the body to allow for proper alignment of teeth, ideal cranial posture, optimized airway and an excellent approach toward pain-free living.



APPLIED • INTEGRATION • ACADEMY

Understanding Cranial Movement

Three things to gather in the next few minutes

1. Skull bones move and the movement affects teeth
2. Necks dictate skull movement
3. Ribcages dictate neck movement

Do Cranial Bones Actually Move?

Hargens AR. Noninvasive intracranial pressure (ICP) measurement. 1999 Space Physiology Laboratory. http://spacephysiology.arc.nasa.gov/projects/icp.html (the ultrasound device has sufficient sensitivity to detect transcranial pulsations which occur in association with the cardiac cycle.)

Nelson KE, Sergueff N, Glonek T. Recording the rate of the cranial rhythmic impulse. J AM Osteopath Assoc. 2006;106(6):337-341.(provides an explanation for the difference between palpated and instrumentally recorded rates for the cranial rhythmic impulse)

Oleski SL, Smith GH, Crow WT. Radiographic evidence of cranial bone mobility. J Craniomandib Pract. 2002;20(1):34-38. (This study concludes that cranial bone mobility can be documented and measured on x-ray.)

Frymann VM. A study of the rhythmic motions of the living cranium. J Am Osteopath Assoc. 1971;70:1-18. (Inherent motion does exist within the living cranium. It can be instrumentally recorded)

Heisey SR, Adams T. Role of cranial bone mobility in cranial compliance. Neurosurgery. 1993;33(5):869-876. (Cranial bone mobility plays a progressively larger role in total cranial compliance with larger ICV increases).

Do Cranial Bones Actually Move?

Michael DK, Retzlaff EW. A preliminary study of cranial bone movement in the squirrel monkey. J Am Osteopath Assoc. 1975;74:866-869. (reversible displacement of the parietal bones occurs with cranial compression and by spinal flexion and extension)

Pritchard JJ, Scott JH, Girgis FG. The structure and development of cranial and facial sutures. J Anat. 1956;90:73-86. (sutures never close in man)

Sahni D, Jit I, Neelam, Suri S. Time of fusion of the basisphenoid with the basilar part of the occipital bone in northwest Indian subjects. Forensic Sci Int. 1998;98:41-45. (SBS closes around 15 to 17 years of age)

Cohen MM Jr. Sutural biology and the correlates of craniosynostosis. Am J Med Genet. 1993 Oct 1;47(5):581-616. doi: 10.1002/ajmg.1320470507. PMID: 8266985. (First: cessation of growth does not necessarily, or always lead to fusion of sutures. Second: although patent sutures aid in the growth process, some growth can take place after suture closure).

Crow WT, King HH, Patterson RM, Giuliano V. Assessment of calvarial structure motion by MRI. Osteopath Med Prim Care. 2009 Sep 4;3:8. (MRI reveals that total intracranial area appeared to expand and recede)

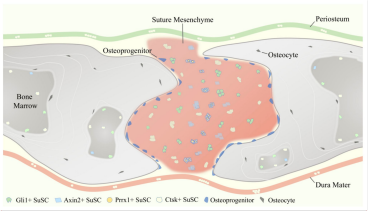
Do Cranial Bones Actually Move?

Timoshkin EM, Sandhouse M. Retrospective study of cranial strain pattern prevalence in a healthy population. J Am Osteopath Assoc. 2008 Nov;108(11):652-6. Erratum in: J Am Osteopath Assoc. 2008 (There are several common cranial strain patterns)

Rothbart BA. Vertical facial dimensions linked to abnormal foot motion. J Am Podiatr Med Assoc. 2008 May-Jun;98(3):189-96. (describes motion of the temporal bones relative to the body/foot)

Stigler RG, Becker K, Hasanov E, Hörmann R, Gassner R, Lepperdinger G. Osteocyte numbers decrease only in postcranial but not in cranial bones in humans of advanced age. *Ann Anat.* 2019;226:57–63. (positional changes control bone growth of the skull throughout the aging process)

Suture Mesenchymal Stem Cells



"...a tiny amount of movement is permitted at cranial sutures, which favors the elasticity and compliance of the skull."

Li, B.; Wang, Y.; Fan, Y.; Ouchi, T.; Zhao, Z.; Li, L. Cranial Suture Mesenchymal Stem Cells: Insights and Advances. *Biomolecules* **2021**, *11*, 1129. https://doi.org/10.3390/biom11081129

Do Cranial Bones Actually Move?

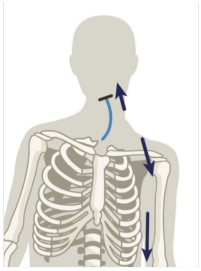
22 Bones! (not all pictured here)

Expansion occurs on Exhale

"4mm...That's 5 miles in a mouth!"

-Daphne Mitchell

Would the Movement Change if the Neck Did This?



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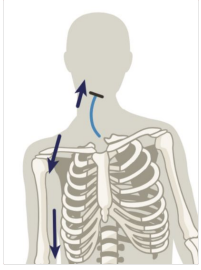

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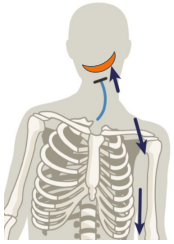
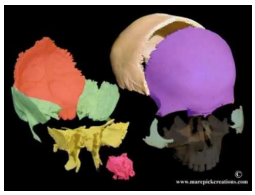
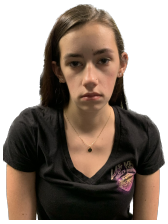
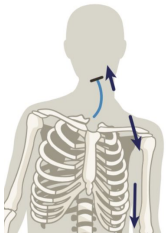
Would the Movement Change
if the Neck and Body somehow got stuck like this?









Would the Movement Change
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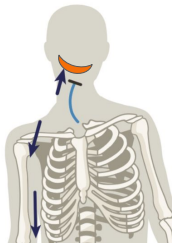
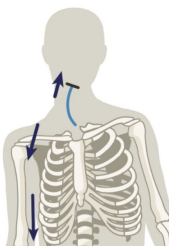
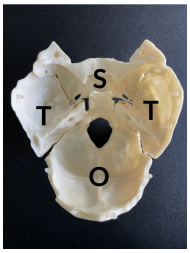


Which bones matter to your work the most?

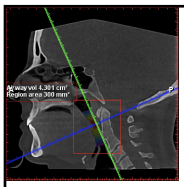


Top View

Anterior

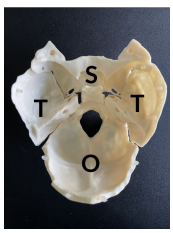


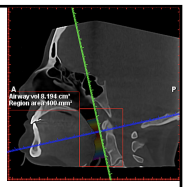
Posterior



Top View

Anterior

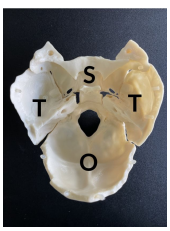


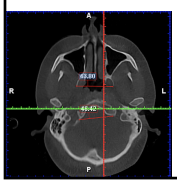


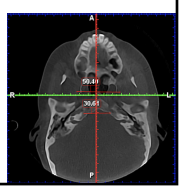
Posterior

Top View

Anterior







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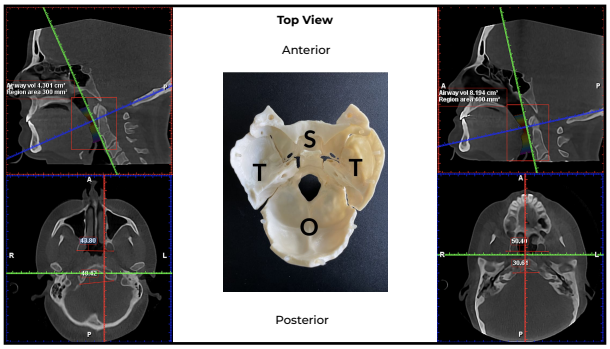
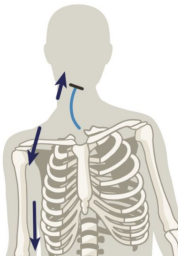


Would the Movement Change if the Neck Did This?



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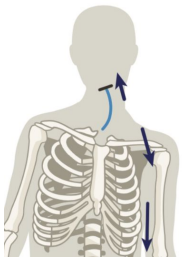

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APPLIED • INTEGRATION • ACADEMY

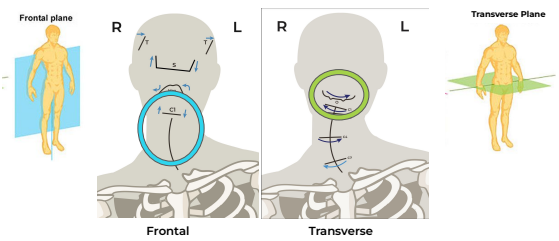
How the Body Gets To The Bite: Respiratory Neurodonics

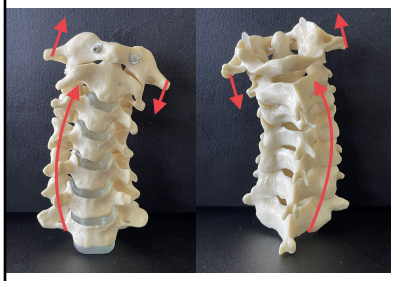
Connecting the Dots...Neck to Teeth

- You don't need to know the dialed-down specifics of Cranial Strains for this class
- You DO need to know that there is a connection and, roughly what that connection is
- The connection of body to bite goes all the way from the feet to the teeth!
- This section takes us from the neck to the teeth in a general way

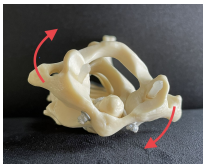
Rothbart, B. Malocclusion Driven by the Feet. Positive Health. September 2008; Vol 151.
(Supinated feet trend toward Class II bite configuration and Pronated feet trend toward Class III bites)

Neck **Initiates** Skull Rotation





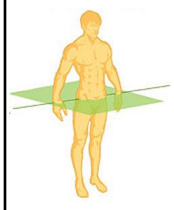
Back of body



Front of body

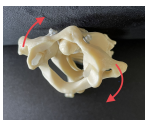
Pandamsee M. Incidence of cervical disorders in a TMD population. J Dent Res IADR; Abstract No. 680, 1994.

Occiput Rotation and Sphenoid Counter-Rotation



Transverse

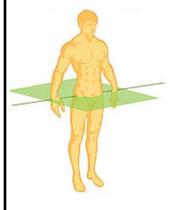
Top View



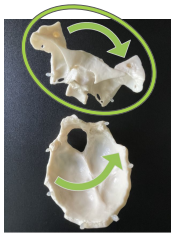
Top View

Farmer PK, et al. An investigation of cervical spinal posture in cervicogenic headache. Physical Therapy. 2015; 95(2): 212-222.

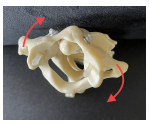
Occiput Rotation and Sphenoid Counter-Rotation



Transverse

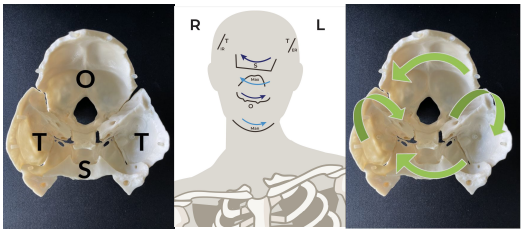


Top View



Top View

Occipital Rotation and Sphenoid Counter-Rotation



Transverse

Sutherland WG. The cranial bowl, 1st edition reprinted 1994. Free Press Company, Mankato.

Often times the end result approaches an
Angle Class II on the Left and Class I on the Right

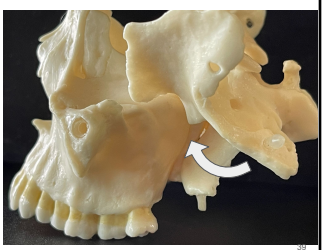


Image by Strokon and James, Cranial Strains and Malocclusion: V. Side-Bend part 1, International Journal of Orthodontics, vol 17, no 2, Summer 2006.

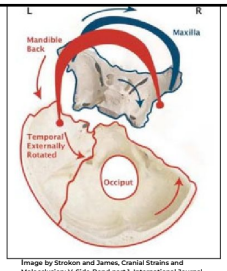
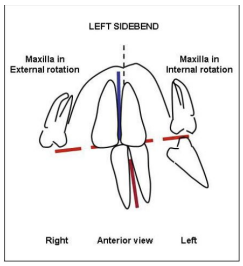
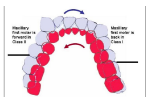


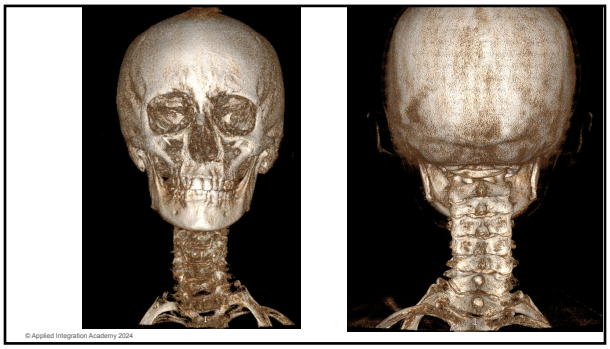
Image by Strokon and James, Cranial Strains and Malocclusion: V. Side-Bend part 1, International Journal of Orthodontics, vol 17, no 2, Summer 2006.

James G, Strokon D. Cranial strains and malocclusion. International Journal of Orthodontics 2006. Vol 17 (1-3).





James, G.A., Strokon, D. "Cranial Strains and Malocclusion: V Side Bend-Part 1." Int. J. Orthodontics 17:2:19-23 2006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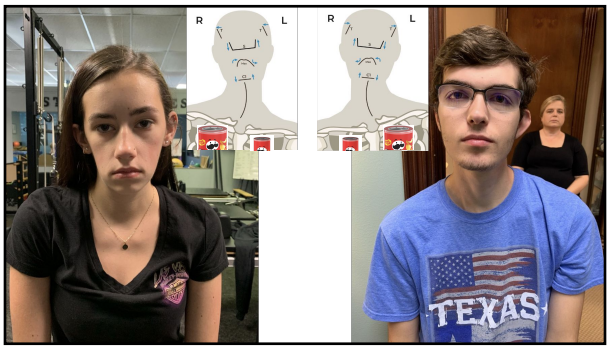
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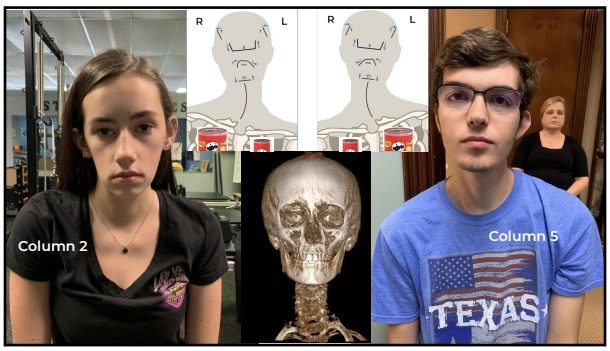
TEXAS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Column 5
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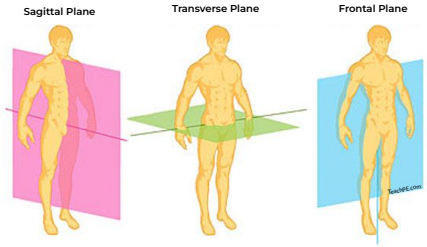
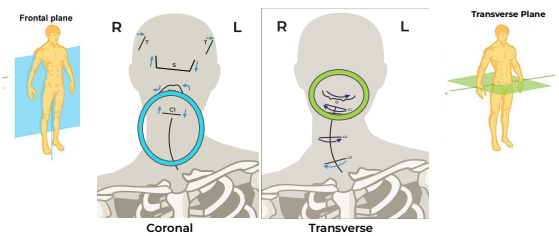
Foundations for Human Movement



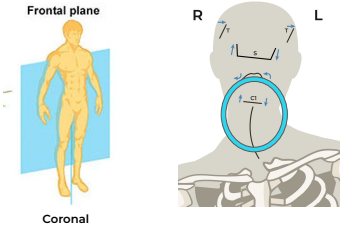
Neck Initiates Head Rotation



Sakaguchi K, Mehta NR, Abdallah EF, Forgione AG, Hirayama H, Kawasaki T, Yokoyama A. Examination of the relationship between mandibular position and body posture. Cranio. 2007 Oct;25(4):237-49.

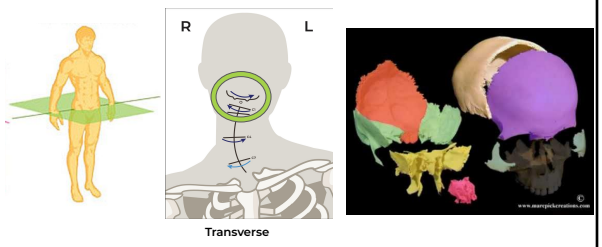
Based on these findings, it was concluded that changing mandibular position affected body posture. Conversely, changing body posture affected mandibular position.

Neck Initiates Head Rotation



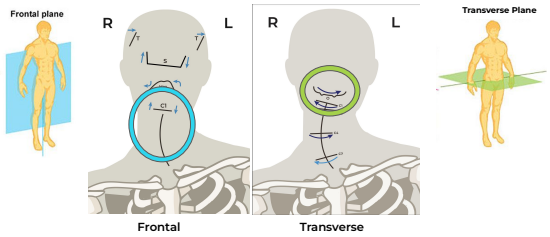
Rothbart, B. Malocclusion Driven by the Feet. Positive Health. September 2008; Vol 151.

Neck Initiates Head Rotation



Marchena-Rodriguez A, Moreno-Morales N, et al. Relationship between foot pressure and dental malocclusions in children aged 6 to 9 years. Medicine. 2018; 97:19.

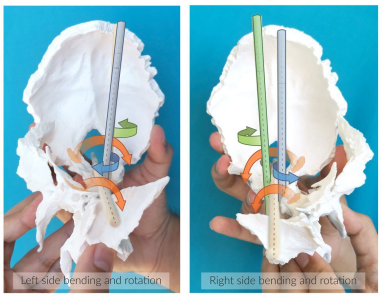
Neck Initiates Head Rotation



Cabrera-Dominguez ME, Dominguez-Reyes A, et al. Dental malocclusion and its relation to the podal system. Front Pediatr. 2021;9:654229.

Cranial Strain Patterns

The following pictures depict both
standard (non-traumatic)
and non-standard (traumatic)
cranial strains



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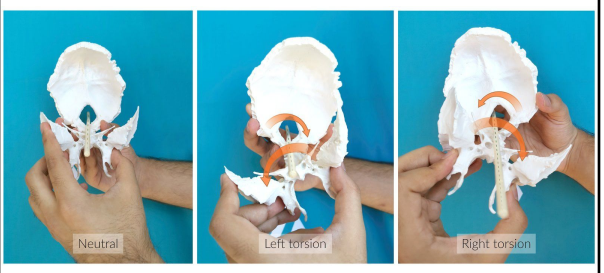

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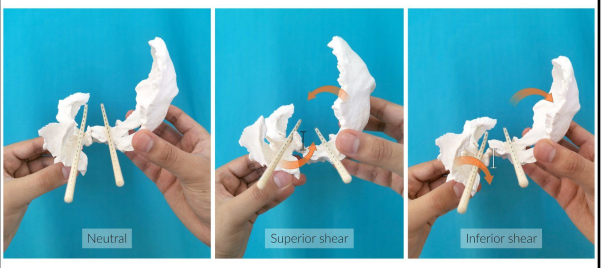

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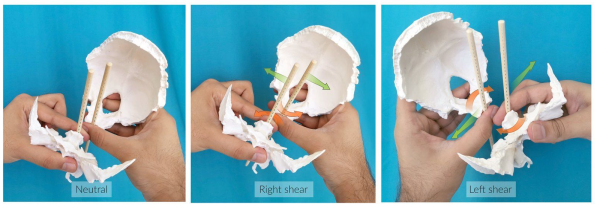

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Compression

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Cranial Strain Patterns

The research shows us that 72% of cranial strain patterns are comprised of side bending and torsion. The left side bend is prevalent but so is the right.

Additionally many strains overlay one another as evidenced by their research.

Timoshkin EM, Sandhouse M. Retrospective study of cranial strain pattern prevalence in a healthy population. J Am Osteopath Assoc. 2008 Nov;108(11):652-6. Erratum in: J Am Osteopath Assoc. 2009 Jan;109(1):63. PMID: 19011228.

Timoshkin and Sandhouse

After providing each subject with an explanation of the study and procedures, the osteopathic physician (M.S.) asked the participant to lie down in a supine position and to relax. The subject was told that some gentle pressure would be applied to the head intermittently for approximately 5 to 10 minutes.

The cranial examiner (M.S.) was then seated at the head of the table with his fingers contacting the sphenoid and the occiput on both sides of the subject's head. Tendency of the cranial bones to move into certain cranial strain positions was assessed by applying a few ounces of pressure.

Timoshkin and Sandhouse

Limitations: The lack of multiple observers may present a limitation. The present study used one osteopathic physician (M.S.). In this single-rater design, the observer may have been biased to specific cranial strain patterns, and there was an absence of control.

Timoshkin and Sandhouse

The majority of subjects had some type of side bend and rotation or both.

Why do we care? Because this will directly affect your treatment plans! Especially the side bends

Strain Pattern									
Lateral		Sidebending Rotation		Torsion		Vertical			
Left	Right	Left	Right	Left	Right	Inferior	Superior	No. (%)*	
		X			X			24 (17)	
X		X			X			20 (14)	
			X		X			16 (11)	
X					X			10 (7)	
	X				X			8 (6)	
X		X						6 (4)	
X			X		X			6 (4)	
X		X		X				6 (4)	
		X		X				5 (4)	
					X			5 (4)	
X				X				4 (3)	
			X	X				4 (3)	
X								3 (2)	
	X	X						3 (2)	
		X						3 (2)	
	X		X					2 (1)	
	X		X		X			2 (1)	
	X			X				2 (1)	
					X	X		2 (1)	
					X		X	2 (1)	
X			X	X				1 (1)	
X				X			X	1 (1)	
X			X					1 (1)	
X							X	1 (1)	
	X	X		X				1 (1)	
	X	X			X			1 (1)	
	X	X			X		X	1 (1)	
	X	X			X	X		1 (1)	
		X			X	X		1 (1)	

* Percentages do not total 100 because of rounding.

The Two Most Common Cranial Strain Patterns

1. Left Cranial Sidebend- the most common cranial strain, a natural outcome with the Right Lateralized patterned patient[1].
2. Right Cranial Torsion- less common strain, that adds a frontal plane twist at the SBS and occurs *within* the skull more so than at the neck.

[1]*AIA Spectrum Of Lateralized Patterns evaluative instrument*

The Two Most Common Cranial Strain Patterns

PROBLEM: A Right Cranial Torsion not only occurs in Right Lateralized patients[1], but also occurs in the Left Lateralized patient[1], which is why it is erroneous to describe right torsions as being underpinned by the left side bend.

Torsional strain patterns have less to do with the side bend and more to do with the body's position.

This is why we see them often in non-intact lateralized patterns[1].

[1]*AIA Spectrum Of Lateralized Patterns evaluative instrument*

Torsion

T&M show that multiple presentations exist for right torsion that have nothing to do with a left side bend. Blue arrows
Likewise, there are many Right side bends that must be understood. Red arrows

Strain Pattern								
Lateral		Sidebending Rotation		Torsion		Vertical		
Left	Right	Left	Right	Left	Right	Inferior	Superior	No. (%)*
		X			X			24 (17)
X		X			X			20 (14)
			X		X			16 (11)
X					X			10 (7)
	X				X			8 (6)
X		X						6 (4)
X			X		X			6 (4)
X		X		X				6 (4)
		X		X				5 (4)
					X			5 (4)
X				X				4 (3)
			X	X				4 (3)
X								3 (2)
	X	X						3 (2)
		X						3 (2)
	X		X					2 (1)
	X		X		X			2 (1)
	X			X				2 (1)
					X	X		2 (1)
					X		X	2 (1)
X			X	X				1 (1)
X				X			X	1 (1)
X			X					1 (1)
X							X	1 (1)
	X	X		X				1 (1)
	X	X			X			1 (1)
	X	X			X		X	1 (1)
	X	X			X	X		1 (1)
		X			X	X		1 (1)

* Percentages do not total 100 because of rounding.

Torsion

This matters because we need to understand that the s
change. We can control the strain with body work, der

However, if we misdiagnose and then “move” someone
will be disastrous. Proper diagnosis is critical!

Strain Pattern								
Lateral		Sidebending Rotation		Torsion		Vertical		
Left	Right	Left	Right	Left	Right	Inferior	Superior	No. (%)*
		X			X			24 (17)
X		X			X			20 (14)
			X		X			16 (11)
X					X			10 (7)
	X				X			8 (6)
X		X						6 (4)
X			X		X			6 (4)
X		X		X				6 (4)
		X		X				5 (4)
					X			5 (4)
X				X				4 (3)
			X	X				4 (3)
X								3 (2)
	X	X						3 (2)
		X						3 (2)
	X		X					2 (1)
	X		X		X			2 (1)
	X			X				2 (1)
					X	X		2 (1)
					X		X	2 (1)
X			X	X				1 (1)
X				X			X	1 (1)
X			X					1 (1)
X							X	1 (1)
	X	X		X				1 (1)
	X	X			X			1 (1)
	X	X			X		X	1 (1)
	X	X			X	X		1 (1)
		X			X	X		1 (1)

* Percentages do not total 100 because of rounding.

AIA Spectrum of Lateralized Patterns

Pattern Description	1. Functional Left Occupancy	2. Intact L Lateralized Pattern	3. Broken L Lateralized Pattern	4. Broken R Lateralized Pattern	5. Intact R Lateralized Pattern	6. Functional Right Occupancy
Cranial Strain (CS)	Mobile Right Side Bend	Likely Restricted R Side Bend	Restricted R Side Bend[1]	Restricted L Side Bend[2]	Likely Restricted L Side Bend	Mobile Left Side Bend
Complex (CS)	Mobile Left Torsion	Unlikely Left Torsion[3]	Possible Left Torsion[4]	Possible Right Torsion[5]	Unlikely Right Torsion[6]	Mobile Right Torsion
Occlusal Grounding[7]	Left or No Bias	Ideally Left Bias[8]	Left but possibly Right Bias[9]	Right but possibly Left Bias[10]	Ideally Right Bias[11]	Right or No Bias
Mid-Cerv Rotation	No Limit	Limited Right	Limited Right and/or Left	Limited Left and/or Right	Limited Left	No Limit
Mid-Cerv Lateral Flex	No Limit	Limited Left	Limited Left and/or Right[12]	Limited Right and/or Left[13]	Limited Right	No Limit
ARA	Even	R Wider[14]	R Wider &/or L Wider	L Wider &/or R Wider	L Wider[15]	Even
Lower Cage Expansion	Even Compr/Expan	R Expanded	R Expan &/or L Expan[16]	L Expan &/or R Expan[17]	L Expanded	Even Compr/Expan
Shld IR	No Limit	Limited Left	Limited Left and Right	Limited Right and Left	Limited Right	No Limit
Shld Horiz Abduction	No Limit	Limited Right	Limited Right (possibly Left)	Limited Left (possibly Right)	Limited Left	No Limit
Trunk Rotation	No Limit	Limited Knees Right	Limited Knees Right (poss Left)	Limited Knees Left (poss Right)	Limited Knees Left	No Limit
Hip Adduction	No Limit	Limited Right	Limited Right (possibly Left)	Limited Left (possibly Right)	Limited Left	No Limit
Hip Abduction	No Limit	Limited Left	Limited Left (poss Right)	Limited Right (poss Left)	Limited Right	No Limit
Hip IR	No Limit	Limited Right	Limited Right (poss Left)	Limited Left (poss Right)	Limited Left	No Limit
Hip ER	No Limit	Limited Left	Unlimited Right (possibly Left)	Unlimited Left (possibly Right)	Limited Right	No Limit
SLR[18]	Balanced	Limited Right[19]	Limited Right (poss Both)[20]	Limited Left (poss Both)[21]	Limited Left[22]	Balanced
Foot & Ankle Pattern	Balanced Inversion	Left Inversion	Left &/or Right Inversion)	Right &/or Left Inversion	Right Inversion	Balanced Inversion
Grounding Performance	Non-Biased Power	Left Biased Power	Left (possibly Right) Biased Power or No Power[23]	Right (possibly Left) Biased Power or No Power[24]	Right Biased Power	Non-Biased Power

1. Because this pattern is broken, the standard Right Side Bend Rotation could easily advance to a more complex compensation called a Left Torsion. As the pattern becomes less "standard", the likelihood of torsion increases as abnormal compensation is carried up into the cranium.
2. Because this pattern is broken, the standard Left Side Bend Rotation could easily advance to a more complex compensation called a Right Torsion. As the pattern becomes less "standard", the likelihood of torsion increases as abnormal compensation is carried up into the cranium.
3. More likely to be a Restricted R Side Bend Rotation because the pattern is intact and following the normal rules of cranial compensation.
4. The Left Torsion is a logical compensatory continuation of the R Side Bend Rotation strain pattern where the occiput compensates frontally on the sphenoid by tipping down on the L side at the Spheno-Basilar Synchondrosis.
5. The Right Torsion is a logical compensatory continuation of the L Side Bend Rotation strain pattern where the occiput compensates frontally on the sphenoid by tipping down on the R side at the Spheno-Basilar Synchondrosis.
6. More likely to be a Restricted L Side Bend Rotation because the pattern is intact and following the normal rules of cranial compensation.
7. Abnormal tooth orientation, cross-bites, anterior open bites, missing teeth, a history of orthodontia with or without extractions, uneven restorations or crowns, etc. can all affect standard occlusal contact and change it.
8. On an Intact Left Lateralized Pattern, the left palate will migrate into External Rotation and the ground reaction force at the AO joint will increase on the left, thus increasing the likelihood of left occlusal contact (standard R Side Bend Rotation strain pattern).
9. This is associated with the idea that palatal ER and IR can be on either side when a torsional influence is exerted on the cranium. Thus, occlusion can be heavier on either side in a broken pattern if torsion occurs.
10. This is associated with the idea that palatal ER and IR can be on either side when a torsional influence is exerted on the cranium. Thus, occlusion can be heavier on either side in a broken pattern if torsion occurs.
11. On an Intact Right Lateralized Pattern, the right palate will migrate into External Rotation and the ground reaction force at the AO joint will increase on the right, thus increasing the likelihood of right occlusal contact (standard L Side Bend Rotation strain pattern).
12. When Mid-Cervical Rotation and Lateral Flexion are limited in the same direction, the neck is developing a mixed pattern.
13. When Mid-Cervical Rotation and Lateral Flexion are limited in the same direction, the neck is developing a mixed pattern.
14. With a left lateralized diaphragm, the rib cage will rotate right and expand on the right, increasing the right ARA.
15. With a right lateralized diaphragm, the rib cage will rotate left and expand on the left, increasing the left ARA.
16. When the expansion of the lower rib cage does not line up with the wider ARA, the lower thorax is developing a mixed pattern.
17. When the expansion of the lower rib cage does not line up with the wider ARA, the lower thorax is developing a mixed pattern.
18. Many times, unlimited SLR (Greater than 100 degrees) can be seen. When this occurs, the associated innominate can, and will, nutate forward. The implications of this are profound but for this document note that the forward rotated innominate is now the result of hamstring hyperflexibility and this phenomenon must be addressed.
19. SLR is limited on the Right LE because the right innominate will have gone into forward nutation with leftward pelvic orientation, thus lengthening the right hamstring.
20. Bilateral forwardly rotated innominates, because the Left Lateralized Pattern directed the right innominate forward and the left innominate is starting to come forward as a Left pelvic pattern develops.
21. Bilateral forwardly rotated innominates, because the Right Lateralized Pattern directed the left innominate forward and the right innominate is starting to come forward as a Left pelvic pattern develops.
22. SLR is limited on the Left LE because the left innominate will have gone into forward nutation with rightward pelvic orientation, thus lengthening the left hamstring.
23. In swing-phase of gait there is little power or grounding sense. With bilateral forwardly rotated innominates, both lower extremities are in swing-phase so grounding sense, while possibly greater on the left, is likely to not be present on either lower extremity.
24. In swing-phase of gait there is little power or grounding sense. With bilateral forwardly rotated innominates, both lower extremities are in swing-phase so grounding sense, while possibly greater on the right, is possibly not present on either lower extremity.

AIA Spectrum Of Lateralized Patterns evaluative instrument

The Left Cranial Side Bend

*AIA Spectrum Of Lateralized Patterns evaluative instrument

AIA Spectrum of Lateralized Patterns						
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Mid-Cerv Lateral Flex	No Limit	Limited Left	Limited Left and/or Right[12]	Limited Right and/or Left[13]	Limited Right	No Limit
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Lower Cage Expansion	Even Compr/Expan	R Expanded	R Expan &/or L Expan[16]	L Expan &/or R Expan[17]	L Expanded	Even Compr/Expan
Shld IR	No Limit	Limited Left	Limited Left and Right	Limited Right and Left	Limited Right	No Limit
Shld Horiz Abduction	No Limit	Limited Right	Limited Right (possibly Left)	Limited Left (possibly Right)	Limited Left	No Limit
Trunk Rotation	No Limit	Limited Knees Right	Limited Knees Right (poss Left)	Limited Knees Left (poss Right)	Limited Knees Left	No Limit
Hip Adduction	No Limit	Limited Right	Limited Right (possibly Left)	Limited Left (possibly Right)	Limited Left	No Limit
Hip Abduction	No Limit	Limited Left	Limited Left (poss Right)	Limited Right (poss Left)	Limited Right	No Limit
Hip IR	No Limit	Limited Right	Limited Right (poss Left)	Limited Left (poss Right)	Limited Left	No Limit
Hip ER	No Limit	Limited Left	Unlimited Right (possibly Left)	Unlimited Left (possibly Right)	Limited Right	No Limit
SLR[18]	Balanced	Limited Right[19]	Limited Right (poss Both)[20]	Limited Left (poss Both)[21]	Limited Left[22]	Balanced
Foot & Ankle Pattern	Balanced Inversion	Left Inversion	Left &/or Right Inversion)	Right &/or Left Inversion	Right Inversion	Balanced Inversion
Grounding Performance	Non-Biased Power	Left Biased Power	Left (possibly Right) Biased Power or No Power[23]	Right (possibly Left) Biased Power or No Power[24]	Right Biased Power	Non-Biased Power

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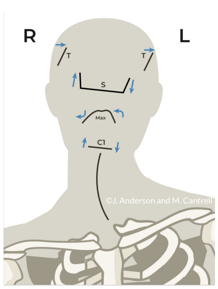
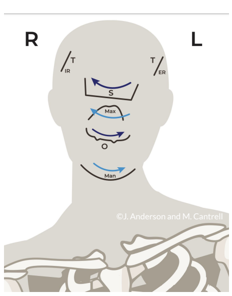




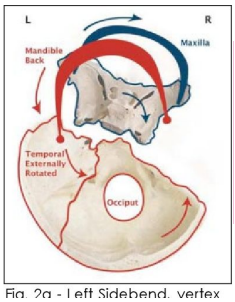


Fig. 2a - Left Sidebend, vertex

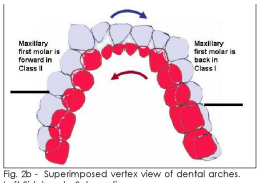


Fig. 2b - Superimposed vertex view of dental arches. Left Sidebend - Schematic

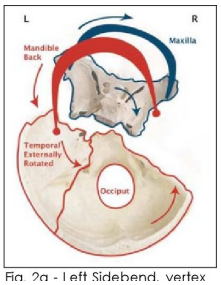


Fig. 2a - Left Sidebend, vertex

Notice:

1. Blue maxilla going R along w the sphenoid
2. Red mandible going L following the temporal bones
3. The occiput rotating (transverse plane) to the L

The "Standard" Bite Distortion of a L CSB

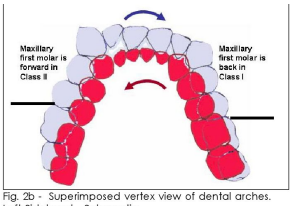


Fig. 2b - Superimposed vertex view of dental arches. Left Sidebend - Schematic

Notice:

1. Blue Maxillary teeth "twisting" to the R
2. Red mandibular teeth "twisting" to the L

Proprioceptive Influence of Teeth

The very end result of a cranial strain pattern is a bite distortion. Keep in mind, dentists are mostly unaware of cranial strain etiologies for bite distortions. They are taught that bite distortions are present…just because. In other words, no real reason.

Proprioceptive Influence of Teeth

We care about bites because patients tend to use the bite as a solid proprioceptive reference that tells them the position of their body, where they are in space; that they are upright, that they are "balanced" and that they are not falling down. The problem is that the feedback received from the teeth may be linked to a faulty body pattern, may be "phony", or inconsistent with the leg upon which they are standing or the position their body occupies.

Proprioceptive Influence of Teeth

Often times when we remove, through disclusion, the powerful proprioceptive influence the teeth possess…

We immediately reset the nervous system and see profound changes in movement ability…

Neurological Influencers

Shoes

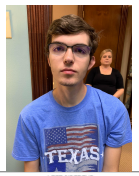
Orthotics

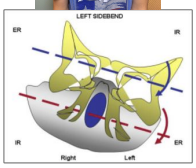
Shoes WITH orthotics

Oral appliances

Glasses

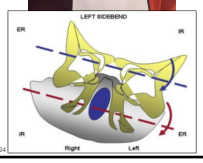
This is an obvious example of a Left CSB pattern patient. Not all are this obvious.

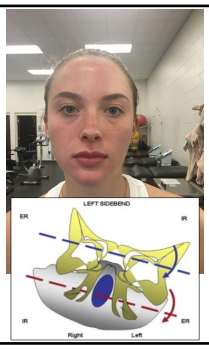


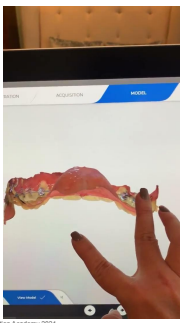


Note:

1. L eye lower (orbital cant)
2. Chin going Leftward
3. Counterclockwise face
4. Prominent and/or low L ear

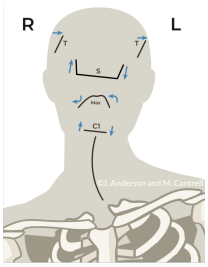


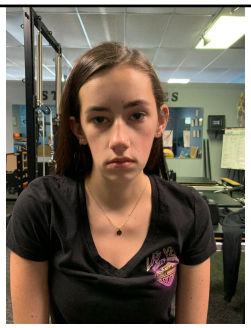


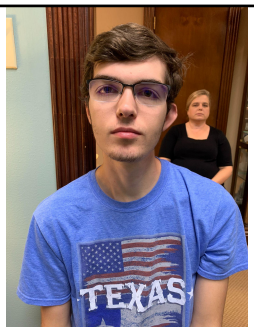


This is a digital impression of a palate

What do you see?







When in Right Stance...

- Left internal rotation of the L greater wing of the sphenoid (L side going toward midline)
- Right external rotation of the R greater wing of the sphenoid (R side going away from midline)

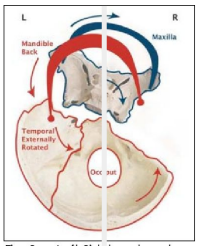


Fig. 2g - Left Sidebend, vertex

When in Right Stance...

- Distal and upward rotation of the mandibular glenoid fossa of the L temporal bone (meaning the fossa moves back in the direction of the ear)

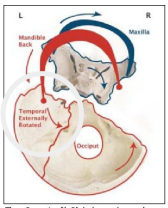
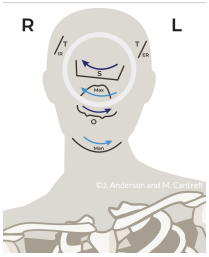


Fig. 2g - Left Sidebend, vertex

Image by Strokon and James, Cranial Strains and Malocclusion: V. Side-Bend part 1, International Journal of Orthodontics, vol 17, no 2, Summer 2006.

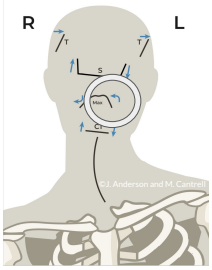
When in Right Stance…

- Rightward (transverse plane) migration of the maxilla (with the sphenoid)



When in Right Stance…

- Loss of solid referencing contact with the L molars because of IR of the L palate



When in Right Stance…

- Increased <u>R molar contact</u>
- Obligatory Leftward migration of the mandible (condyles follow the temporal fossae)

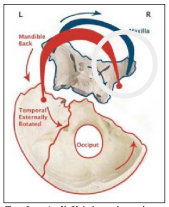


Fig. 2g - Left Sidebend, vertex

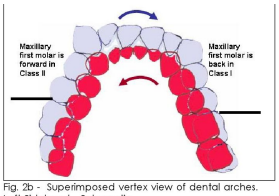
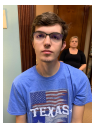
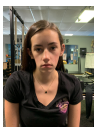


Fig. 2b - Superimposed vertex view of dental arches.
Left Sidebend - Schematic

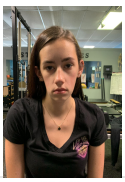




L Sidebend Rotation
-Counterclockwise face
-L Eye low
-R Eye big
-L Ear prominent &/or low
-Mandible L
-R Shld low
-L Palate IR

R Sidebend Rotation
-Clockwise face
-R Eye low
-L Eye big
-R Ear low
-Mandible R
-L Shld low
-R Palate IR

This is an obvious example of a Right CSB pattern patient. Not all are this obvious.



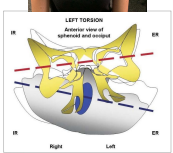
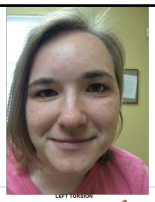


Figure 6

Note:

1. R eye lower (orbital cant)
2. Chin going Rightward
3. Clockwise face
4. Prominent and/or low R ear



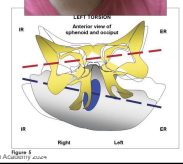
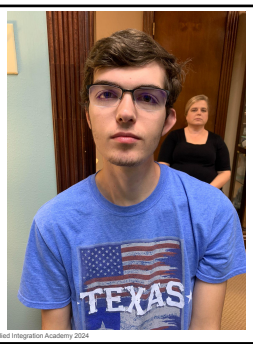
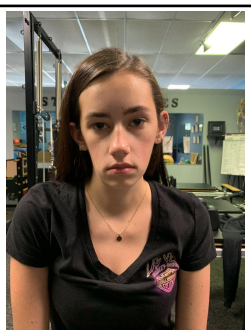


Figure 5

Right Side Bend Rotation or possible Left Torsion





APPLIED • INTEGRATION • ACADEMY

Airflow,

the Mandibular Diaphragm

and Cranial Performance

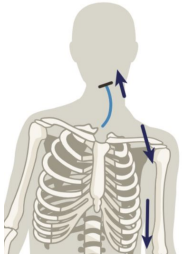
Rethinking:

Airway **vs** Airflow

Airway or Airflow?

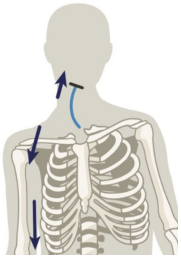
Layachi L, Georges M, et al. Diaphragm pacing failure secondary to deteriorated chest wall mechanics: When a good diaphragm does not suffice to take a good breath in. Respiratory Medicine Case Reports 15 2015:20-23.

Would the Movement Change if the Neck Did This?

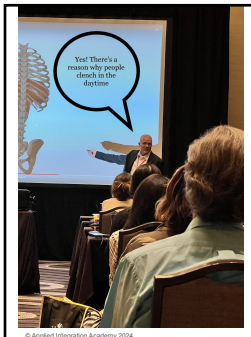


©J. Anderson and M. Cantrell

Would the Movement Change if the Neck Did This?



©J. Anderson and M. Cantrell



Understanding the relationship between the **Respiratory Diaphragm** and the **Mandibular Diaphragm**

"Top-Down" problems with respiration are legitimate concerns and can be quite evident when the patient is closely observed.

A few "Top-Down" considerations that are in your wheelhouse already:

- Tongue ties
- Bruxism
- Medications SSRI's
- Malocclusions
- Upper Airway Restrictions

There is also a Bottom-Up consideration that should be explored.

That exploration could begin with understanding what is normal respiration

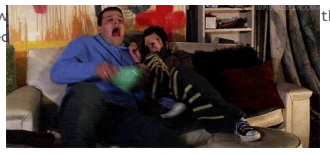
Quiet Respiration vs Challenged Respiration

Normal, quiet inhalation is carried-out through activation of the diaphragm and external intercostal muscles. Normal, quiet exhalation is a passive activity that requires no muscle activation but is more dependent upon elastic recoil for expiration.

De Troyer A, Estenne M. *Functional anatomy of the respiratory muscles.* Clin Chest Med 1988;9:175-93

Soley MH, Shock NW. *The aetiology of effort syndrome. Am J Med Sci* 1938; 196: 8

Breathing is alw these challenges affec



Something as simple as watching an exciting movie, for example, can cause respiratory rates to increase and alter the normal recruitment of respiratory muscles.

Challenges to normal respiratory activity can be even more intense as a result of *high-level physical activity* or even pathologic in the form of unrelenting, heightened sympathetic drive stemming from moderate to severe psychological disorders such as *panic attacks* and the like.

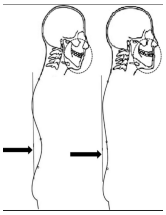
Cassart M, Pettiaux N, Gevenois PA, Paiva M, Estenne M. *Effect of chronic hyperinflation on diaphragm length and surface area.* Am J Respir Crit Care Med. 1997; 156:504-08

Additionally, *positional influences* on the ribcage and diaphragm can influence the ability to adequately respire, which could result in increased respiratory rates or altered or increased use of primary or accessory respiratory muscles.

Scoppa F, Pirino A. *Is there a relationship between body posture and tongue posture? Glosso-postural syndrome between myth and reality.* Acta Medica Mediterranea 2019;35:1903.

Chaitow L. *Breathing pattern disorders, motor control and lower back pain. J Osteopath Med* 2004;7:33-40.

Flexion or extension states of the pelvis, spine, ribcage and diaphragm can create difficulties with normal inhalation and exhalation ability.



Correlation between craniofacial parameters and back shape profiles: patients with distal and vertical craniofacial patterns present higher than normal upper thoracic, lumbar-lordotic and pelvic angles; patients with mesial and horizontal craniofacial pattern present smaller than normal upper thoracic, lumbar-lordotic and pelvic angles. Figure modified from Lippold et al. (1971)

Cuccia A, Caradonna C. *The relationship between the stomatognathic system and body posture. Clinics* 2009;64(1) 61-6.

In other words: if your mid-face is underdeveloped, check your neck, mid-back and low back curves!

To Recap:

1. Exercise
2. Anxiety
3. Body Position

All 3 can increase respiration, cause abnormal respiration and can increase the use of accessory respiratory muscles

Gilbert C. *Hyperventilation and the body.* Journal of bodywork and movement therapies. July 1998.

To Recap:

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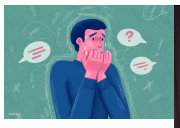
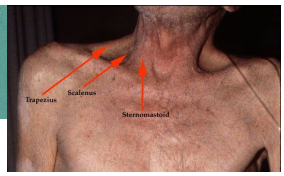
All 3 can increase respiration, cause abnormal respiration and can increase the use of accessory respiratory muscles

Gilbert C. *Hyperventilation and the body.* Journal of bodywork and movement therapies. July 1998.

So not only can there be a neurologic drive (anxiety) for increased use of primary and accessory muscles of respiration there can also be a postural influence on these muscles that creates a demand for their increased activity.





The diaphragm, when positioned at rest (normal post-exhalation position) is domed and this domed position enhances the Zone of Apposition (ZOA). ZOA is defined by DeTroyer as: that area of the diaphragm encompassing the cylindrical portion of the diaphragm which corresponds to the position directly apposed to the inner aspect of the lower rib cage.

Puranik D, Bhat SR. Spatial changes in upper airway induced by change in head posture in horizontal, average and vertical growth pattern: A comparative lateral cephalometric study. Indian Journal of Orthodontics and Dentofacial Research. 2018;4(4):208-215.

De Troyer A, Estenne M. Functional anatomy of the respiratory muscles. Clin Chest Med 1988;9:175-93

Mead J: Functional significance of the area of apposition of diaphragm to rib cage. Am Rev Respir Dis 11:31, 1979.

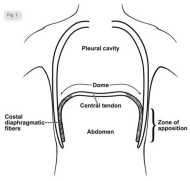
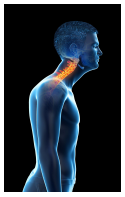


Image from Detroyer

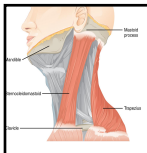
Any compromise to the position of the right or left hemi-diaphragm or to bilateral leaflets of the diaphragm can result in dyspnea (an uncomfortable awareness of one's breathing effort).

Layachi L, Georges M, et al. Diaphragm pacing failure secondary to deteriorated chest wall mechanics: When a good diaphragm does not suffice to take a good breath in. Respiratory Medicine Case Reports 15 2015:20-23.

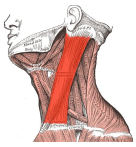
As dyspnea increases, the rate of respiration can increase. Additionally, posture can change to provide a mechanical advantage for accessory muscles of respiration. (forward head posture or military straight neck)



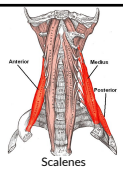
Szczygiel E, Weglarz K, et al. Biomechanical influences on head posture and the respiratory movements of the chest. Acta of Bioengineering and Biomechanics. 2015;17(2):143-148.



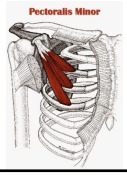
Upper Trapezius



Sternocleidomastoid

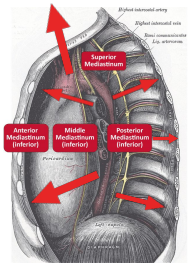


Scalenes

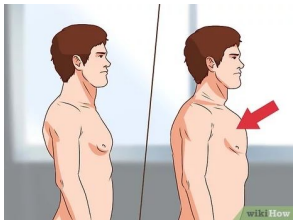


During full mediastinal expansion the chest wall should be able to expand forward apically & inferiorly, laterally, anteriorly and posteriorly.

Accessory muscles can aid in this expansion but primarily act to "lift" the chest wall. This is fine in the short term but must not continue in the long term.



When the human “lifts” the chest wall with the accessory muscles, he involves almost the entire body!



Cassart M, Pettiaux N, Gevenois PA, Paiva M, Estenne M. Effect of chronic hyperinflation on diaphragm length and surface area. Am J Respir Crit Care Med. 1997 Aug;156(2 Pt 1):504-8.

Meet Kayla:

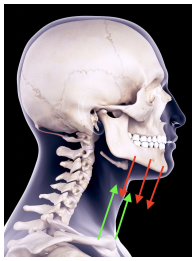
1. Significant scoliosis
2. Pectus Excavatum
3. Compromised Anterior Chest wall expansion
4. Cross bite and invisalign twice with return of X-bite after each
5. Increased bruxism after each invisalign
6. Greater loss of AP chest expansion

Korbmacher H, Koch L, et al. Associations between orthopaedic disturbances and unilateral crossbite in children with asymmetry of the upper cervical spine. Eur J Orthod. 2007 Feb; 29(1):100-104.

Saccucci M, Tettamanti L, Mummolo S, Polimeni A, Festa F, Tecco S (2011) Scoliosis and dental occlusion: a review of the literature. Scoliosis. 6:15. Pmid:21801357

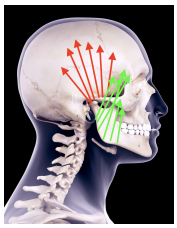
Gonzalez H, Manns A. Forward head posture: Its structural and functional influence on the stomatognathic system, a conceptual study.J of craniomandibular practice. Jan 1996, Vol 14(1):71-80.

The upward vectors of pull on the chest by “the accessories” creates downward vectors of pull on the mandible

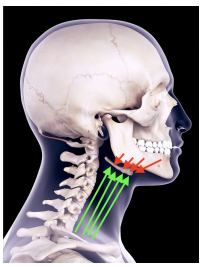


Dasgupta S, Rozario JE. Troika of posture, occlusion and airway. Indian J Otolaryngol Head Neck Surg. Jan-Mar 2020; 72(1):49-54.

As neck pulls the jaw down, the masseters and temporalis MUST pull up and teeth clench

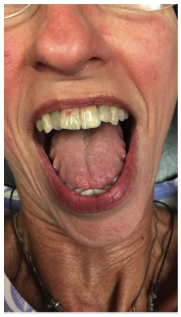


Simultaneously there is a downward vector of pull on the tongue as the “struggle” to raise the anterior chest wall continues.



Yamakazi Y, Higashi K, et al. *Excessive anterior cervical muscle tone affects hyoid bone kinetics during swallowing in healthy individuals.* Clin Interv Aging 2017;12:1903-1910.

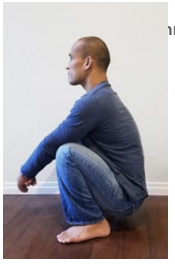
There is a strong tendency for the tongue to then “splint”



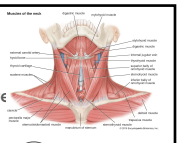
To Recap:

1. As the need to breathe increases (anxiety/hyperinflation)-(hyper-erect posture)
2. Accessory muscles increase activity
3. Chest raises
4. Accessory muscles further increase
5. This pulls jaw and tongue down
6. Teeth MUST clench
7. Tongue MUST lay low and thrust

Now What?
A technique to lower the ribs, centralize the mandible, rib cage and pelvic diaphragms



hragm Posture



Relax Relax

Relax Relax

Contract Contract

Lecture 1 Objectives

1. To understand the components and application of “Respiratory Neurodontics®” (RND®)
2. To understand normal cranial bone movement possibilities
3. To understand all known cranial strain patterns in context with the Spectrum of Patterns®
4. To understand how “The Body IS The Bite” and “The Bite IS The Body”
5. To learn the unrelenting effect of the rib cage on the mandibular diaphragm and cranial performance