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Diaphragmatic entrapments: what they are and how they affect breath and voice

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Introduction

My voice career began as a bodyworker long before I became a voice or movement teacher. This has always affected my approach to voice work and this article is written from that perspective.

Voice is a physical action. The voice comes out of the body. So it logically follows that movement of the body (or lack thereof) affects the health, sound, and expressive capability of the voice. And, likewise, the *health* of the physical instrument affects the expressive and movement capability of both the body and voice. Therefore, I approach voice as a physical capability and my approach to voice work has always been influenced largely by what I know of the body.

Likewise, as I have always been a singer and actor who had the sensitivities of a voice teacher, when I did bodywork with my clients I was taking note of changes in vocal capabilities that resulted from my work with them. As a voice teacher knows, the voice is a wonderful diagnostic tool for what may be going on in the body if one pays attention.

My area of bodywork expertise is Quantum Energetics Structured Therapy® (QEST). I suffered a traumatic head injury when I was 22, which slowly but completely ended my performing career. A few years later—years during which my treatment involved both western and complementary medicine—I was introduced to QEST. There are few practitioners of this methodology. It is a complex and specific type of bodywork that requires of a practitioner both the intellectual rigor of western medicine and the energetic awareness required in eastern medicine. It worked for me, and I was deeply curious about it, so I began my training to become a practitioner. It's a long process—study and testing from medical texts, hands-on work, clinical hours, and certification exams. I began training in early 1998, began my clinical practice in late 1999, and was certified in 2000. I then served as a clinical practice trainer for four years. In 2001, I was physically capable enough to return to performing and to school to finish my theater degree and begin the training that would eventually lead me to my career as a voice and movement trainer. I have always maintained an active QEST practice.

This personal information is germane to this article because though there is support in medical texts for much of the information in this article, most of it I learned *as a practitioner* from clients on my table and students in my classroom. How it all fits together makes logical physiological sense, but my specific expertise and interests combined with almost two decades of practical work have led me to make unique connections that other bodywork practitioners and voice teachers have not. Only someone who shares the passions I share

would care enough about it to explore, or even necessarily notice, the connections. Years ago, I was talking with another QEST practitioner about diaphragmatic entrapments and their affect on the voice, and she said,

Oh, now that you mention it, maybe *that's* why their voices get stronger early on in the work—I never would have thought about it. I guess I don't really think about their voices. I think I have always been more focused on the back pain all these years.

My mentor and primary QEST teacher had a very sensitive ear, so she and I had always talked about how you could hear certain dysfunctions of the body in the voice. I was blessed with a mentor/teacher who listened the way I did. I didn't realize everyone wasn't listening in the same way.

The connection: diaphragmatic entrapments

This article addresses one of the areas where voice and bodywork meet most directly and have a major impact on the quality, resonance, strength, and expressive capability of the voice: diaphragmatic entrapments. It reflects knowledge I have gained over years in both bodywork and voice work and years of experimentation with my students to find tools that helped them address entrapments themselves. I have also always done manual diaphragmatic entrapment release work with my students when it was needed. However, I found that with these types of approaches, many of them were able to take care of the issue themselves without my physically intervening.

Writing this article has been a process of working backwards—starting with what I know and the affect these practices have, and working backward to the literal, linear “why” it is likely happening. After many years of study, I do not find linear anatomy all that interesting, and it is easy to look up if that is your passion. I have spent many years translating complex medical anatomy “whys” into simpler, less complicated “whats” for clients and students. One of the things I have learned is that the simplest explanation is often the most useful. For those of you who want anatomical detail, I have provided references you can follow. But I choose not to bog those of us in search of the “what” and “how” down with that level of detail.

What I find fascinating is the sound and expressivity that can be found when one does the work of releasing diaphragmatic entrapments either passively, as I address here, or manually if you choose to do so with a bodywork practitioner (many different types of practitioners besides QEST practitioners do diaphragmatic entrapment release). My approach to this material, were I the reader, would be to try the practices and listen to and explore the effect these practices have on the voice. The doing will lead to the knowing if you pay close attention.

As a bodywork practitioner and voice professional, I often find it useful to deal with physical impairments that impede healthy voice work from the perspective of a bodyworker. One of the most effective physical interventions I use as a voice teacher is releasing diaphragmatic entrapments. Although many forms of bodywork exist, most bodywork practitioners utilize physical manipulation of the body/organs to effect change. As a QEST practitioner, I have been encountering and releasing diaphragmatic entrapments for many years; however, I absolutely do not recommend that untrained personnel try to do this work. In QEST, we accomplish this release by manually working the internal organs out of and away from the diaphragm. This article will provide an overview of what diaphragmatic entrapments are, how to recognize when they may be present, and possible courses of action to effectively manage them.

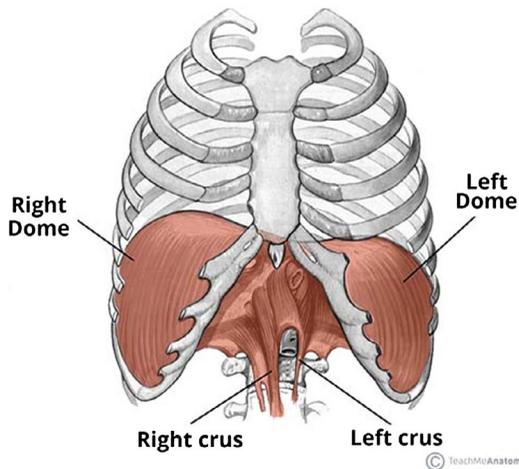
Before we can understand what diaphragmatic entrapments are, we need to understand the basic anatomy and physiology of the body. When working with first semester voice students—or in the early stages of private vocal coaching—I review the anatomical properties

of the diaphragm, as most voice teachers do. I find many of my students, particularly singers, have heard a great deal about the diaphragm but lack knowledge of the position and action of this critical muscle of inspiration. About half of them are under the impression that it is the rectus abdominis (the vertical muscle that is most easily described as “the six pack”), since it is so common for singing teachers to say some version of “sing from the diaphragm” and then pat the student on the stomach. The following section on “Basics of the diaphragm”, as it appears below, is how I begin my instruction.

Basics of the diaphragm

Location of the diaphragm

The diaphragm attaches posteriorly (back) to the lumbar spine, particularly, to lumbar vertebrae 1, 2, and 3, with a narrow portion extending downward (caudally) to the coccyx (the final segment of the vertebral column, commonly referred to as the tailbone).¹ As an interesting note, the attachment of the diaphragm to the coccyx is one of the reasons a fractured or dislocated tailbone causes so much pain—every time one breathes, the injured area is stimulated.² Anteriorly, the diaphragm attaches to the lower part of the rib cage, specifically the costal cartilages of ribs 7–12 and the xyphoid process, which forms the inferior aspect of the sternum. Given its location, the diaphragm literally cuts the body in half—front to back—as previously described. It also divides the body in half horizontally, separating the thoracic cavity from the abdominal cavity.



Diaphragm, anterior view (image © 2015–2017 TeachMeAnatomy.com [CC-BY-NC-ND 4.0]).

Actions of the diaphragm (as taught to my students)

When one exhales (i.e. emptying the lungs), the diaphragm is in its released or uncontracted state. In its released state, the diaphragm is like an upside-down bowl (i.e. concave). When one inhales (i.e. filling the lungs), the diaphragm contracts, flattening out and becoming basically horizontal. This flattening action causes the diaphragm to lower, and the lung distends from the pulling action of the diaphragm.³ I am fully aware this explanation is highly simplified. For more detailed explanations of the anatomy of the diaphragm, I recommend my favorite anatomical reference, *Anatomy: A Regional Atlas of the Human Body* by Carmine D. Clemente, though virtually any other anatomy reference book will do.

Online, I frequently recommend the following website: <http://teachmeanatomy.info/thorax/muscles/diaphragm>.

The “holes” in the diaphragm

Because I know I am going to need to address diaphragmatic entrapments with some of my students, my anatomical instruction includes a discussion of the “holes” in the diaphragm and what purposes they serve. The spinal column, containing nervous system pathways, is behind—and surrounded by—the diaphragm. Other than the spine, anything that needs to pass from the upper body down or from the lower body up must pass *through* the diaphragm. The things that pass through the openings in the diaphragm are food and blood. Blood must circulate below the diaphragm (to the legs, etc.) and back to the heart, and food must pass from the mouth to the stomach. The primary areas of concern are the openings (“holes”) where the aorta, vena cava, and esophagus pass through the diaphragm. It should be noted that two other minor openings in the diaphragm that do not have any “tubes” passing through them exist, but they are not commonly involved in diaphragmatic entrapments and do not impact breath and voice as commonly as the openings for the aorta, the vena cava, and the esophagus. A simple diagram illustrates openings in the diaphragm and what occupies the “holes”.⁴ The following image provides the necessary detail without excess information⁵:

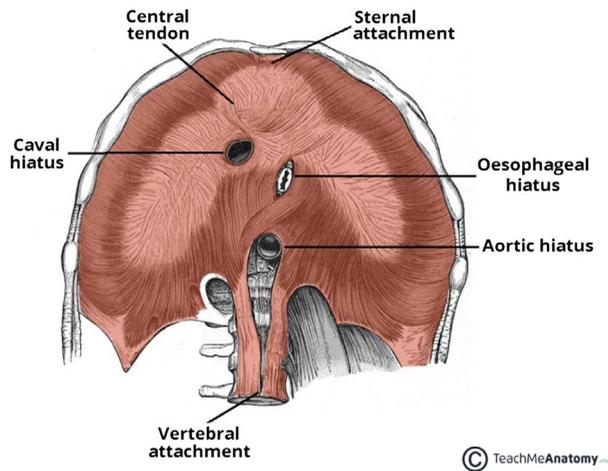


Fig 1.1 – View of the inferior surface of the diaphragm. Note the three openings.

Diaphragm, inferior view (image © 2015–2017 TeachMeAnatomy.com [CC-BY-NC-ND 4.0]).

Note these structures of the Diaphragm (inferior view from the lower part of the body up)

- (1) Vertebral attachment at the lumbar spine.
- (2) Sternal attachment.
- (3) Rib cage attachment all along the inferior ribcage.
- (4) The opening for the Aorta (Aortic hiatus) through which blood travels from the heart to the lower body via the Aorta.

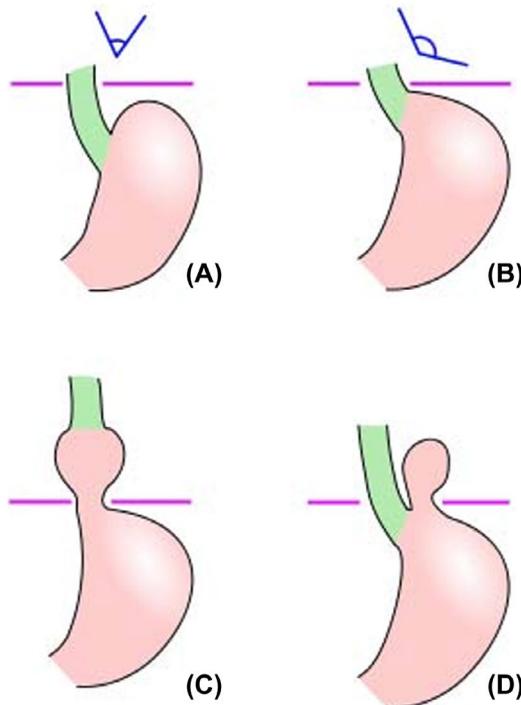
- (5) The opening for the Esophagus (Oesophageal hiatus) through which food moves from the mouth to the stomach via the Esophagus.
- (6) The opening for the Vena Cava (Caval hiatus) through which blood returns to the heart from the lower body via the Vena Cava.

Defined simply, a “hiatus”, medically speaking, is an *opening* or passage.⁶

What is a diaphragmatic entrapment?

A diaphragmatic entrapment occurs when some part of the body is “stuck” in one of the openings alongside the “tube” that typically traverses it. The additional tissue in this opening, which is ideally perfectly sized only to accommodate the “tube” that typically passes through it, impairs the motion of the diaphragm. The tissue that gets “stuck” in the opening is usually soft tissue that normally moves freely in the abdominal cavity such as intestine or stomach. Occasionally, the sphincter of the stomach can become entrapped in the opening through which the esophagus passes (the esophageal hiatus). In some cases, it can even work itself up above the diaphragm. This is referred to as a hiatal hernia.⁷ A hiatal hernia is a type of diaphragmatic entrapment, and the one most commonly diagnosed by western medicine.

However, diaphragmatic entrapments also occur in the Caval opening and the Aortic opening. When one has *any* diaphragmatic entrapment, it becomes difficult for the diaphragm to move up and down freely. These diaphragmatic entrapments are also known as hernias. The word “hernia” simply means something is in an opening where it does not belong. Numerous possible causes/aggravations of diaphragmatic entrapments include intestinal distress, vomiting, stress resulting in abdominal tension, or physical injury, among others.⁸



Different degrees of severity in hiatal hernias. The purple line represents the diaphragm. These are all hernias in the esophageal hiatus (image © 2015–2017 TeachMeAnatomy.com [CC-BY-NC-ND 4.0]).

Common physiological symptoms associated with diaphragmatic entrapments include:

- (1) Indigestion.⁹
- (2) Heartburn (see endnote 2).
- (3) Feeling the stomach is full even though not enough food has been eaten to satisfy hunger.
- (4) Frequent belching.
- (5) A feeling of tension or pain under the ribcage and inferior to the ribs, that is, closer to the feet.¹⁰

The diaphragmatic entrapment most commonly diagnosed in western medicine is the hiatal hernia. Importantly, a hiatal hernia is NOT the same as an abdominal hernia¹¹ with which people are most familiar. The abdominal hernia is relatively common in middle-aged men and is often related to physical strain. Were I to use the word “hernia” in class, at least one of my college-age students would bring up that their father had surgery for that problem. The confusion created by using the word hernia and the association people commonly have with that word is why I prefer to use the word entrapment. Both terms are technically accurate, but entrapment is less likely to cause deep concern, as it does not carry the linguistic baggage that hernia often does. Diaphragmatic entrapment is also, technically, a more accurate term for the type of hernia I am addressing.

If one looks up “hiatal hernia and breath” online, it does not take long to end up in a chat room populated with multiple sufferers of hiatal hernia complaining about not being able to take a deep breath, getting pain between their shoulder blades, and getting winded while running short distances or climbing stairs. If you read long enough, you will also find some who write about difficulty giving presentations at work or singing. When we understand the role of the diaphragm in breath and voice, it seems pretty obvious that if something is stuck and inhibits the ability of the diaphragm to move up and down freely it would affect the ease with which one can breathe. And as voice professionals, we know that impaired breath results in a less healthy and expressive voice.

Vocal effects of diaphragmatic entrapments

The implications of diaphragmatic entrapments for the voice become obvious when we consider that the diaphragm cannot move freely when entrapments are present. Diaphragmatic entrapments can cause/aggravate numerous issues that affect the voice to varying degrees:

- (1) Inability to take a deep breath.
- (2) Inability to engage the various muscles needed to lift (open) the ribcage consciously due to the diaphragm’s inability to descend fully.
- (3) Reduced access to “body tones” and chest resonance because these tones require openness and movement in the ribcage.
- (4) Vocal strain due to the over-reliance on sub-glottal pressure to provide the air used to speak. An inability to take a deep breath can result in becoming overly dependent on laryngeal mechanisms of sub-glottal pressure (the build-up of air immediately

inferior to the vocal folds of the larynx) to generate enough air to produce sound because the respiratory system is simply not responsive enough.

Recognizing diaphragmatic entrapments

Several telltale signs can alert a person that entrapments may be present:

- (1) Tightness under the ribcage.
- (2) Struggling to take a deep breath.¹²
- (3) An inability to expand the ribs on inhalation.
- (4) “Tightness” in the voice—often a result of the use of subglottal pressure to create air flow
- (5) Heartburn, indigestion, or GERD (see endnote 12).

What can be done about diaphragmatic entrapments

Applying basic anatomical principles, we can determine some actions that would likely help relieve symptoms of diaphragmatic entrapment. Basically, we are looking for actions that allow SPACE in the abdominal cavity. The voice user can take actions to provide self-care, but practitioner intervention, when available and desired, is also possible. The suggestions provided here are what I call “passive approaches” as they allow the diaphragmatic entrapments to work themselves out, rather than a practitioner actively and manually working the tissue out of and away from the diaphragm.

Self-care

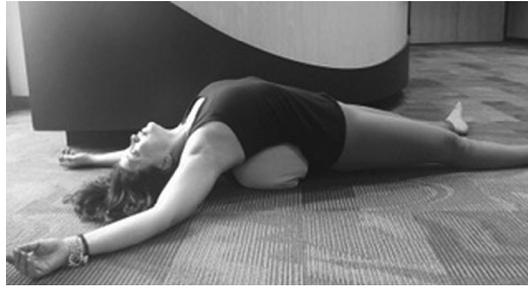
Anytime one has the opportunity to “open” or create expansion of the abdomen, it is helpful. The more we create lift between the chest and abdomen, the more helpful this action is for the problem.

- (1) Elevate the chest and let the abdomen and spine drop down toward the floor. A zafu or firm pillows can be used to do this action.



All photo credits: Missy Rugg

- (2) Elevate the entire abdominal cavity. Again, a zafu or firm pillows can be used to do this action.



- (3) Lie back across an exercise ball to allow space in the abdomen.



If any posture causes discomfort in the low back, bending the knees can help.



- (4) One can make lifestyle choices that allow the abdomen to open. For example, we can sit on the couch to watch TV and open the chest by spreading the arms wide open along the back of the couch. If the back of the couch is too high, one can sit on the floor and use the seat of the couch to accomplish the same effect.



- (5) The same thing can be accomplished while sitting in a chair by opening the chest and leaning back over the chair. If one can find a chair with a back that allows the scapula to fold over the back of the chair, that is ideal.



In performing actions that facilitate opening of the abdomen, do be mindful of the lower back—do not allow it to arch too sharply as it may cause back pain. If pinching in the lower back is present, simply tucking the pelvis slightly will generally alleviate the discomfort. Above all, practice self-care and respect the messages your body sends you in determining what is and is not good for you and your body.

Diaphragmatic entrapment release by practitioners

Manual physical intervention is the most direct route to release diaphragmatic entrapments. The release of these entrapments allows the diaphragm to contract and release (i.e. lower and raise) more freely. Releasing diaphragmatic entrapments involves working into the abdominal cavity and moving the stomach or intestines inferiorly (i.e. toward the feet) to move them out of the openings in the diaphragm. Many bodywork practitioners do this work. You may need to make some calls, but it is likely that you can find someone in your area who can assist you and your clients if physical manipulation is of interest to you. Check with chiropractors, massage therapists, QEST® practitioners, osteopaths, or myofascial release practitioners, to name a few.

Is diaphragmatic entrapment release permanent?

In some cases, one session of bodywork is all that is required to release a diaphragmatic entrapment without the need to address it again in the future. That said, commonly the action will need to be repeated as a number of contributors are associated with the onset of diaphragmatic entrapments (e.g. stress, physical injury, poor food choices, heredity, habitual postural issues). The flip-side of this problem, however, is that making better life choices decreases the necessity to repeat the procedure. Positive life choices include passive opening practices, healthy physical activity that contributes to strength and flexibility in the structures of the body, avoiding food allergens, and practicing awareness when eating—not eating past the point of satiation.

What is achieved by releasing diaphragmatic entrapments

Many benefits come with releasing diaphragmatic entrapments—some are subtle and others are profound. The most profound change clients and students recognize is an immediate change in their ability to take a deep breath. Once diaphragmatic entrapments are released, it becomes much easier to contract and lower the diaphragm on inhalation. Additionally, actors, singers, and other people who pay attention to vocal function generally notice an almost immediate change in vocal tone—they report easier access to deeper tones and increased chest resonance. Most voice users also notice that they have improved access to vocal power once diaphragmatic entrapments are released. The ability to take a deep breath and increase lung volume allows the vocalist to generate large lung recoil pressures to increase vocal power. When working with a group, commonly group members will notice immediate changes in the voices of their classmates once diaphragmatic entrapments are released. Once their attention is called to it, most voice users notice an increase in the resonance of their voice—it “feels” and “sounds” ringier and they experience more vibration in their bodies, particularly in the area of the ribs and sternum.

I frequently receive feedback from other acting and singing teachers. The first time I did this work with students, the primary acting teacher showed up in my office later in the day asking, “What on EARTH did you do today? The students sound AMAZING!” Now that this work has become commonplace at our school, I routinely get emails from the acting teachers and singing coaches saying things like, “I noticed you did entrapment work this week—the students sound great!”

What you can do now

Here are steps you can take as a teacher/coach to help your students:

- (1) Begin to pay attention to possible diaphragmatic entrapments in your students—note the symptoms and start to pay attention to when they may be present. Ask questions and encourage your students to pay attention to their abdominal health in a new way!
- (2) Encourage your students to take some of the self-care steps listed above. The more space they allow for their abdominal organs to move around, the better they manage their stress, and the more consciousness with which they make dietary choices, the less likely they are to be affected by diaphragmatic entrapments.
- (3) Make some calls in your area and develop a list of practitioners to whom you can refer students.
- (4) Experiment on yourself! Pay attention to your own body and notice changes in your own voice as you make better choices for abdominal health.

Beginning to notice and pay attention to diaphragmatic entrapments is one of those instances in which addressing a physical issue can make a huge difference in the quality of your students’ voices. I encourage you to begin to ask questions, first of yourself and then of your students. Take the time to experiment on yourself through self-care and possibly with practitioner intervention. Lastly, pay attention to how these practices affect the voices around you - your own and those of your students.

Notes

1. <http://teachmeanatomy.info/thorax/muscles/diaphragm/>.
2. http://www.innerbody.com/image_skelfov/skel38_new.html.
3. <http://teachmeanatomy.info/thorax/muscles/diaphragm/>.
4. <http://teachmeanatomy.info/thorax/muscles/diaphragm/>.
5. <http://teachmeanatomy.info/thorax/muscles/diaphragm/>.
6. <https://www.merriam-webster.com/dictionary/hiatus>.
7. <http://www.mayoclinic.org/diseases-conditions/hiatal-hernia/basics/definition/con-20030640>.
8. This is not an exhaustive list. This information is not intended for diagnosis.
9. This information is in no way intended to replace medical intervention. If you, a client, or student suffers from extreme indigestion, heartburn, or gastro-esophageal reflux disease (GERD), the individual should manage the problem with the assistance of a healthcare professional.
10. If there is chest pain, it should be attended to by a medical professional immediately to rule out serious health conditions.
11. <https://www.reference.com/health/abdominal-hernia-827bb0916dad749?qo=cdpArticles>.
12. This information is in no way intended to replace medical intervention.
If you or a client or student suffers from extreme indigestion, heartburn, or GERD, the suffering individual needs to manage it with the assistance of a healthcare professional. If there is pain in the chest, it should be attended to by a medical professional immediately.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor



Elizabeth Terrel is an associate professor and the Director of Voice and Movement at the Western Michigan University, Department of Theatre. She is an associate teacher of Fitzmaurice Voicework®, an RYT500 Yoga teacher, creator of Terrel Presence Training®, the author of *Auditioning for Actor Training Programs* (booklocker.com 2016), and a Quantum Energetics Structured Therapy® practitioner. She lives in both Chicago and Kalamazoo working professionally as a performer and as a coach (elizabethterrelcoaching.com).

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