Breathing and the Alexander Technique

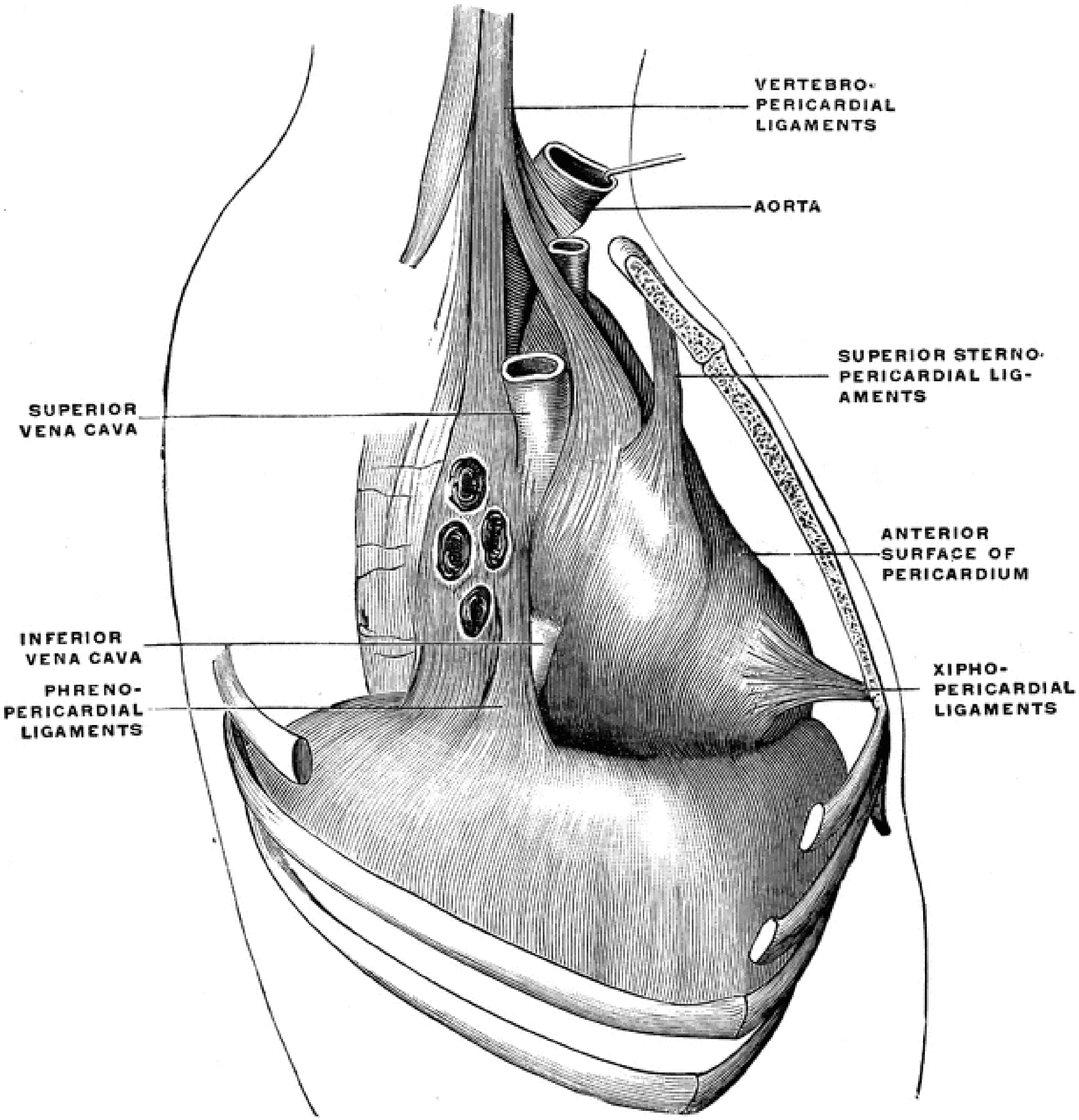
In natural breathing we see the neck and spine lengthen at the beginning of inhalation, so that the upper ribs lift, even in shallow breathing. Belly breathing, while possible, results in much less volume of inhaled air than does supported thoracic breathing.

In most discussions of respiration, the central issue in respiration – the support and opposition of the spine to the contraction of the muscles that move the ribs in breathing, is overlooked.

In natural, healthy respiration, the spine extends and its curves diminish on inspiration, which gives the diaphragm and the muscles that support the ribcage the opposition they need to expand the thoracic cavity.

In four-legged mammals, respiratory cycle is linked to gait, such that inspiration occurs only on extension https://www.physiology.org/doi/pdf/10.1152/advan.00057.2009. As the study explains, the mechanical needs of stride and respiration are co-ordinated. Every known running quadruped inhales on extension. Obviously, man has not evolved a respiratory system that functions best in a completely contradictory manner, independent of spinal support.

The central tendon of the diaphragm is joined to a network of fascia, primarily through the pericardium, to which it is welded, that attaches to the upper ribs and cervical spine. It is also supported by the phreno-periocarial ligaments. Thus, when the spine is allowed to lengthen on inspiration, the vertical travel of the diaphragm is restrained, which allows its contraction to work with intercostal muscles in lifting the ribs



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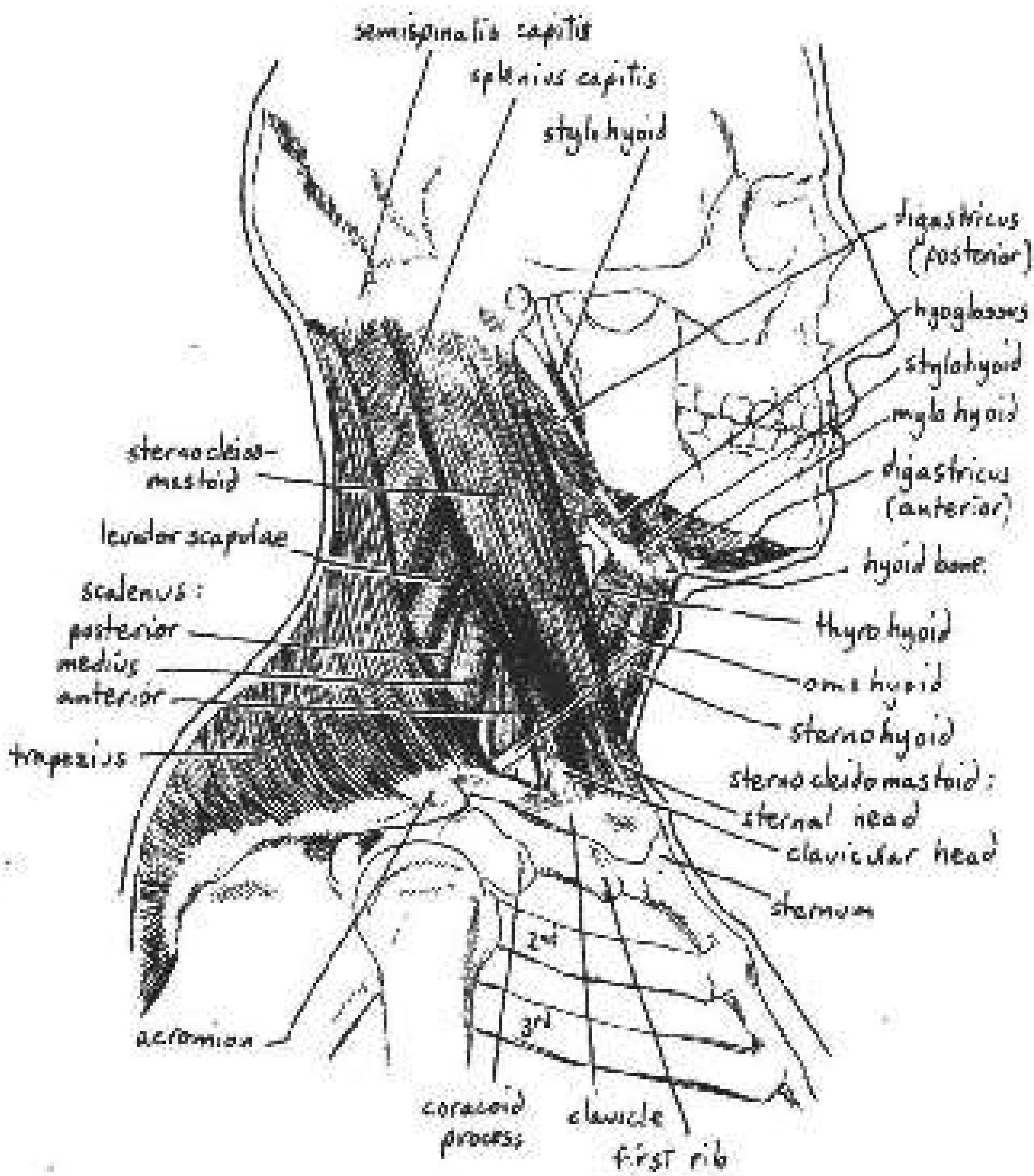
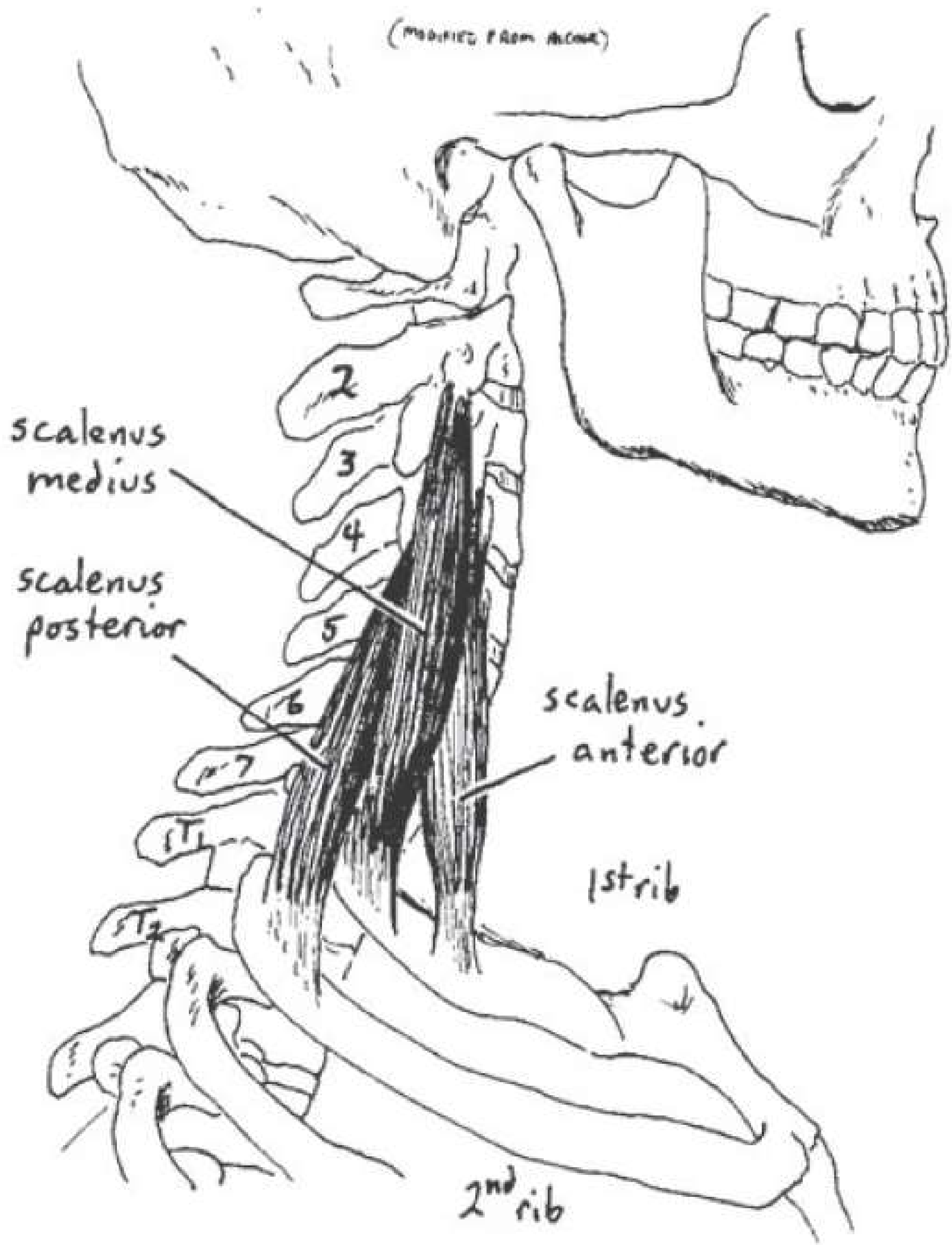
What this diaphragm cannot show is the network of fascia that supports and suspends the diaphragm and the pericardium.

At the same time, the sterno-cleido mastoid muscles, which originate from the upper sternum, have their insertion in the mastoid process, on the skull behind the ears. When the spine lengthens on inhalation, the sternocleidomastoids are prepared to provide support for the sternum against the contraction of the diaphragm and intercostal muscles. Note that this is not the same as lifting the chest. The extension of the spine simply allows it to support the upper ribcage against the strong contraction of the diaphragm and para-sternal intercostal muscles that lift the ribs in inhalation.



Also, the scalenes, which attach to the transverse processes of the cervical vertebrae, descend to the 1st and 2nd ribs. When the spine lengthens on inspiration, these muscles are supported so that their action may lift the top ribs, and so that contraction of the para-sternal intercostals, which assist the diaphragm in lifting the ribs, does not compress the upper chest.



Further, physiologists have observed that lower abdominal muscles actually increase tone during inhalation, pressing the viscera inwards and creating upward pressure on the diaphragm, further restricting its descent, so that rib movement is maximized. When we're breathing vigorously, especially, the diaphragm is pushed upward actively by contraction of the muscles of the abdominal wall. These raise the pressure in the abdomen, limiting the descent of the diaphragm by retaining the internal organs.Thus, we get the whole thoracic cage expanding in 3 dimensions, and the diaphragm works, not like a plunger, but more like an umbrella opening.

Look at it this way: if you go to lift a heavy weight, does the back shorten? Or does it lengthen to oppose the weight and support the action of muscles which, however, indirectly, depend on the spine for support?

Most of us have been exposed to breathing methods that emphasize maximizing the descent of the diaphragm. These methods are referred to as "diaphragmatic" or "belly" breathing.I believe that these mechanical methods are ways to increase respiratory volume without improving overall use. Someone with poor posture can get more air in and out by collapsing support further. Of course, if one can learn to allow the neck to free and the spine to be mobile and extendable, one will improve all parameters used to measure respiration. The following study shows improvements in respiration in subjects who take lessons in the Alexander Technique without directly addressing respiration: http://www.alexandertechnique.org.uk/respiration.pdf

So, what's the problem?

The deep spinal muscles that extend the spine to support the muscles of respiration (and the large muscles that move the limbs) are small muscles that work in chains (erector spinae, etc.). When these muscles function normally, they are engaged at the beginning of movement, and are powerful enough to resist compression from the large muscles of respiration (diaphragm, etc.) and those that attach the limbs to the spine and ribcage. If they are not engaged, large muscles will overwhelm them, and they will not be able to extend the spine against the action of large muscles. Note how large in mass the muscles around the shoulders are. If you lift a heavy weight without using spinal extensors, you will hunch over and put excessive strain on the spinal column. Notice how Olympic weightlifters are able to keep the neck and spine long so that the work of lifting is distributed throughout the body.

We do this naturally when we are children, and we see this still in some tribal cultures. What goes wrong? For many reasons, we tend to contract and retract the limbs when under stress. We can see this in children at school when they begin to learn to write – they often hunch over and grip their pencils with excessive force. This action is evidence of the over-stimulation of grasping reflexes. Startle reflex, Moro reflex – we are born with reflexes that cause us to retract when we perceive a threat – hands will grip, arms retract, toes will be drawn up, legs retract, and the trunk will flex. This is useful in protecting an infant against a fall – it holds fast to the mother in time of danger (we see this in apes – the infant clings to its mother, and the mother has her arms free to climb and escape a predator). A child who is afraid of not doing well on a task (writing, for example) will exhibit these same actions of retraction, which will involve isometric contraction of the muscles that connect the arms to the neck, spine and ribcage. Repeated stimulation of these fear responses will lead to constant contraction of the large muscles of the limbs, and to suppression of the small extensor chains of the spine. We see this in most adults – give someone a knife and a cutting board and ask them to cut carrots and watch them hunch over. They have come to feel that they need to retract in order to control movement. The same can be seen in actions in which one must be "careful" –painting a detail, for example – do you hunch over when doing this? When this constant isometric contraction of muscles around the shoulders and neck is present, the muscles of spinal extension cannot work at the beginning of inspiration, so the large muscles involved in respiration will contract and further compress the trunk. A diaphragm without spinal support will travel downwards, and, instead of lifting the ribs, will actually draw them together as it flattens out and displaces the internal organs. Belly breathing or diaphragmatic breathing is an example of this. It is possible to get some movement in the lower ribs while breathing thusly, but it takes more effort and will never create the volume that one can get when the neck is free and the trunk is allowed to lengthen on inspiration.

In natural breathing we see the neck and spine lengthen at the beginning of inhalation, so that the upper ribs lift, even in shallow breathing. Only when one needs a large volume of air, for exercise or for singing, do we begin to see a large movement of the lower ribs. And it would be wrong to state that there is no descent of the diaphragm in inhalation, as there is some movement of the diaphragm downwards before the limits of its central tendon are reached, and further contraction lifts the ribs. The more the spine is collapsed, the further the diaphragm descends and pushes out the viscera. The further the diaphragm descends, the more it will pull the ribs inward and actually decrease thoracic space. Belly breathing, while possible, results in much less volume of inhaled air than does supported thoracic breathing.

Take your dog for a run, and then watch its belly as it pants after stopping. Its abdomen does not bulge, its ribs move freely.