PERFORMANCE CYCLING CONDITIONING
A NEWSLETTER DEDICATED TO IMPROVING CYCLISTS

The Relationship between Postural Asymmetry and Cycling Injuries Part II- Breathing

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Lori completed her Bachelor of Biology degree from Nebraska Wesleyan University in Lincoln, Nebraska and her Master of Physical Therapy from the University of Nebraska Medical Center. Her 11 years of clinical experience has resulted in a strong passion for the Postural Restoration science and patient interventions. Lori has recently moved back to the Lincoln area from North Dakota where she enjoyed providing in-services to physicians, chiropractors, physical therapists, coaches and athletes in the implementation of Postural Restoration in their practices. She currently practices at the Hruska Clinic, Restorative Physical Therapy Services in Lincoln, Nebraska. Lori is a member of the American Physical Therapy Association. Lori has earned the designation of Postural Restoration Certified (PRC) as a result of advanced training, extraordinary interest and devotion to the science of postural adaptations, asymmetrical patterns, and the influence of polyarticular chains of muscles on the human body as defined by the Postural Restoration Institute™.

BEG
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Faulty breathing patterns affect cycling performance. Coaches, athletic trainers and physical therapists will at times get complaints from athletes feeling fatigued or short of breath more than expected from a normal workout or difficulty with "side stitches." Often times these complaints are dismissed for reasons being that the athlete started cycling too fast, had too much resistance pushing up hill, or is suffering from exercise induced asthma. Rib alignment and position and its affect on respiratory dysfunction can easily be overlooked. The diaphragm and abdominal obliques are not only important muscles for breathing with correct rib mechanics, but they also are important for maintaining pelvic symmetry.

In part one, we discussed a 34 year old cyclist who presented to physical therapy with a forwardly rotated and anteriorly tipped left pelvis. This influenced the cyclist's center of gravity which shifted him over his right leg. This asymmetry no longer allowed this patient to be able to turn muscles "on" and "off" correctly to allow for reciprocal activity to occur at his pelvis resulting in pain in his left TFL and knee, affecting power stroke on the left lower extremity and improper wear pattern on the outside sole of his right shoe with forefoot varus. Important symptoms of this patient include difficulty breathing with competition, right side stitch pain, right psoas discomfort, and low back pain. Physical therapy observations included "belly" breathing and poor chest expansion with inhalation, dropped right shoulder compared to the left, and elevated ribs on the left.

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Upper body rib and trunk position as a result of a forwardly rotated and anteriorly tipped left pelvis.

Left pelvis asymmetry results in lower lumbar spine (L4-L5) and sacrum orientation to the right. As a result, the upper body will be rotated to the left to allow for forward walking. This rotation to the left is further reinforced by the liver positioned on the right side and the heart positioned in the left upper trunk of the body as well as our counterclockwise and right handed dominant world. People tend to reach with their right hand for objects and turn to their left. Postural asymmetry from this left trunk rotation will be noticeable with the right shoulder below the left and a more prominent rib flare on the left (Figure 1). This is a result of rib rotation that accompanies trunk rotation. The ribs on the front of this asymmetrical body are elevated and up (externally rotated) on the left and down and in (internally rotated) on the right again reinforcing trunk rotation to the left. Rib rotation also allows the trunk and lungs to inflate and

Side

Front

Figure 1 - Rib Flare

deflate during respiration. The left front ribs are externally rotated with the left lung hyperinflated making it hard for our cyclist to get air out. On the right the ribs were internally rotated with the lungs deflated making it difficult for the right chest to expand. This was easily observed during the physical therapy evaluation. The cyclist, lying on his back, was asked to inhale through his nose and exhale through his mouth while the examiner gently assisted the lower ribs down. The guidance of the ribs down on the right was easy for the cyclist which allowed air in his left chest wall as observed by the chest expanding. On the left, however, not only was it difficult for the cyclist to get the left lower ribs down it was hard for the cyclist to take a breath of air in and expand his right chest wall (Figure 2). Effective diaphragmatic breathing, therefore, has been compromised with the reliance of accessory muscles to assist with breathing. This accessory muscle overuse is noted by the cyclist "pulling" his air in. Observation of his shoulders shrugging, anterior neck muscles contracting, active lumbar extension and belly expansion were noted with inability of the chest wall to expand during deep inhalation.

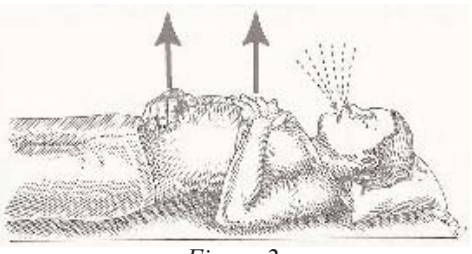

Figure 2

Rib movement also accompanies further motion of the thoracic and lumbar spine. During inhalation, as noted on the left side of our cyclist, the ribs in front were up (external rotation) while the ribs in back were down (internal rotation). This accompanies trunk extension. The opposite was true on the right side of our cyclist. He was in a state of trunk flexion with the right front ribs in internal rotation while the back ribs were in external rotation. The coupling of the cyclist's rib and trunk position to the left, lower spine orientation to the right, and inability to shift into his left hip socket (discussed in article one) with every walking and running step and cycling revolution forced him into extensive left lumbar extension (lordosis) resulting in his low back pain. Therefore, the importance of correct rib and trunk motion in the cyclist's physical therapy program is of paramount with his pelvic position. The number one influence on rib position affecting trunk motion is BREATHING!

Inspiratory Muscle

The most important muscle when it comes to inspiration is the diaphragm. It is responsible for 70% to 80% of the work under breathing conditions. The diaphragm is dome-shaped, like an "upside down bowl," and attaches to the lower lumbar spine, lower ribs, and the bottom of the breastbone (sternum). The fibers of this muscle go inward to a central tendon. The diaphragm separates the thorax from the abdomen with support from the liver on the right side and no organ support on the left. During inspiration, the diaphragm contracts and moves down causing the chest to expand as the lungs fill with air.

Expiratory Muscle

Abdominal muscles are accessory expiratory muscles secondary to the elastic recoil of healthy lungs. These muscles, especially the obliques, are important for maximizing the action of the diaphragm. The obliques help to maintain the dome shape of the diaphragm resulting in increased lung volumes because of the length tension curve they provide the diaphragm. During exhalation, the obliques assist with pulling the ribs down and in or internal rotation with ability to get air out of the lungs which maximizes the dome shape of the diaphragm for inhalation. They also assist with maintaining trunk rotation and stability of the rib cage. If the obliques are weak, the dome shape of the diaphragm is lost and becomes flat resembling a "plate" instead of a dome which results in hyperinflation of the lungs, passive rib flares and overuse and development of dyssynchronous breathing patterns with accessory muscle overuse (Figure 3).

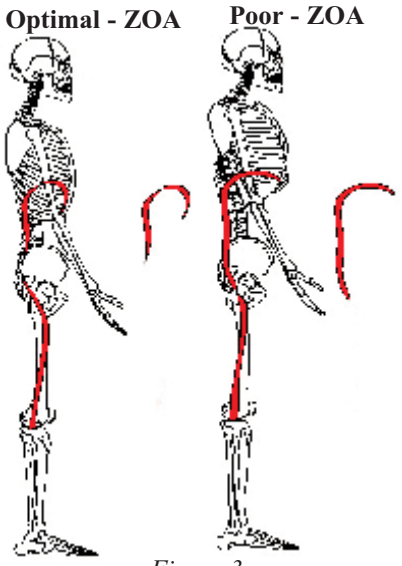

Figure 3

Inspiratory and Expiratory Muscles with Upper Trunk Asymmetry

In the cyclist with postural asymmetry, the lower lumbar spine is oriented to the right with the upper trunk rotated to the left. Trunk rotation to the left causes the left front ribs to be externally rotated and the right to be internally rotated. In addition to this rib rotation, remember our cyclist favors his right leg. This position reinforces the length tension relationship of the right diaphragm with its dome shape which is also reinforced by the liver. This right sided diaphragm is overactive contributing to spasms contributing to the "stitch in his side." On the left side, our cyclist's ribs are externally rotated with left oblique weakness, therefore, the diaphragm is shaped more like a plate and is not as effective in respiration. This again results in decreased chest expansion, overuse of the neck, back and shoulder muscles to assist inhalation, and lung hyperinflation.

Treatment Considerations

Balancing the respiratory system with diaphragmatic breathing techniques that are carried out at the same time with oblique strengthening exercises is important for postural symmetry of the pelvis and upper trunk. This will be emphasized on the left side of our cyclist to help increase the dome shape of the diaphragm and to assist with trunk rotation to the right with left front rib internal rotation and right front rib external rotation. This emphasis will therefore create synchronous breathing patterns and postural balance throughout the trunk and pelvis. Exercises should reflect the following: 1) inhaling through the nose 2) exhaling through pursed lips or "sighing out" the air reinforcing the ribs and the sternum moving down and in with internal rotation 3) pausing 3-4 seconds after the exhalation to allow the diaphragm to set for inhalation 4) exhalation should be two to three times longer than inhalation and 5) quiet breathing outside of exercise activity should be done through the nose.

Treatment recommendations with exercise examples will be discussed in our third and final part of this series.

More Information Please! To contact Lori and or obtain a list of references, please visit www.posturalrestoration.com.