

What is a neutral pelvis?

By Joshua Morton, LMP

Your pelvis is in a neutral position when it is not tilted, elevated, depressed or rotated in any direction. A pelvis can tilt anteriorly, posteriorly, inferiorly and superiorly it can also rotate internally and externally. This is not taking into account the added movement that occurs at the S/I joint. Of course the pelvis can move in any combination of these directions on either side depending on what is demanded of it. As the pelvis repeatedly tilts or rotates or both in the same direction, it becomes stuck in a certain pattern. When this happens physiological dysfunction can and often will occur. The problems usually manifest in splinting of the muscles and inflammation around the L/S and/or S/I joints.

This dysfunctional pattern is especially common in instances of a Leg Length Inequality (LLI) (for treatment protocols, refer to the hip chapter). Nearly everyone has some asymmetry in their leg length, and it is estimated that almost 80% of the population has a difference of up to 8mm. That may not seem like a lot but when you are standing and walking with that type of discrepancy all your life, it can and likely will result in joint deterioration, muscle pain or in some of the worse cases these sorts of discrepancies can even lead to a joint replacement! An LLI falls into one of two categories: it is either functional or structural. When an LLI is functional, the soft tissues of the limb, especially around the iliofemoral joint, are often the cause or one of the primary factors behind the difference in leg length. Even if one leg is *structurally* shorter than the other, there is always some functional issue behind the length inequality since the joint has been compromised since birth.

When an LLI is structural, the bones on one or both sides of your lower body are not equally formed. In time this creates soft tissue dysfunction, which will result in a pelvic imbalance, premature or unnatural wear and tear on all of the joints from the spine down to the foot. These imbalances will become stuck patterns. These patterns will affect the body all the way up and down the kinetic chain. The most notable problem that may develop if an LLI is not properly taken care of is

scoliosis. Due to uneven hips, the spine ends up compensating in the opposite direction. If the left leg is shorter, the lumbar spine lists to the right. The spine will continue to compensate until the body has leveled off the head in relation to the horizon. These changes of static joint positioning may create compensation into the thoracic and cervical spine in most severe cases.

There are several orthopedic tests that reveal an LLI. However the tests are based more on soft tissue than bone structures. In order to truly identify an LLI, an x-ray is required in order to measure actual bone length. An x-ray takes soft tissue issues behind an LLI out of the picture and reveals the true differences in the bone from side to side. One thing is for sure; a foot lift must always be part of a complete treatment resolution. Do not opt for a heel lift. This may help your short leg, but it will create its own set of problems. If your entire foot is not elevated, your weight will be placed onto the balls of your feet. This additional stress will likely have adverse effects on your foot, which will in turn contribute to other problems up the anatomical kinetic chain. For example, tight gastrocnemius muscles will eventually cause a forward head posture!

How can I achieve a “neutral pelvis”?

In order for the rectus abdominus and the obliques to be able to keep the pelvis in a neutral position, the thorax must first be stabilized. This occurs when the pyramidalis contracts and creates tension in the linea alba, forming a solid wall for the other abdominal muscles to pull from. The upper rectus abdominus then tenses to stabilize the thorax and pull it out of any extension and into neutral, creating a more stable top point. The oblique muscles reinforce the upper rectus and the transversus abdominus stabilizes the abdominal wall at the deepest layer. Remember, the transversus is not lifting the pelvis; it is creating a protective girdle for the abdominal contents.

Once the thorax is strong and stable, the internal obliques have greater functionality to stabilize and move the pelvis and torso. Lastly, the lower bellies of the rectus abdominus recruit as well to stabilize and level off the pelvis by pulling up at the pubic symphysis. No other abdominal muscle has this ability.

In summary, to achieve a neutral pelvis and maintain the appropriate curve (lordosis) in your lower back, it is necessary to recruit the lower rectus abdominal muscles to level off the pelvis. At the same time the internal obliques assist with pelvic stabilization by pulling obliquely upward on the pelvis.

When the pelvis is stabilized, the abdominal and spinal muscles can move the thorax from a strong foundation, anchored to the pelvis by the oblique muscles and reinforced by the transversus abdominus. When the abdominals are recruited in this manner, a firm, powerful "core" is created which provides your body with the dynamic strength and power it needs to function without injury to your spine.

What am I doing "wrong"?

In order to understand what you are doing wrong, you must first understand the structure and movements of the bones, joints and muscles, in particular the lower rectus abdominus muscle. The most common practices and advice on creating a neutral pelvis are unsafe and have the potential to aggravate what is already riled up or create a new problem.

The most common method I have heard of is to pull your navel towards your spine and/or your pelvis upward towards your head. This is often referred to as "hollowing" your stomach. This movement tends to place the pelvis into a posteriorly tilted position by dropping the pelvis posterior and pulling the thorax forward. Posteriorly tilting your pelvis and flexing your thorax may have an adverse affect on the curve of your lumbar spine by flattening it. This movement pattern will negatively affect the thoracic and cervical curves if it is allowed to continue and takes hold. Another potential risk is the possibility of causing or contributing to a protrusion of one or more lumbar discs. It is precisely for this reason that some therapists advise against this common practice as it may further aggravate an existing pathological disc condition. Taking it one step further, this type of practice can be unsafe even if you do not have a disc protrusion. The repeated flattening of the spine *might be what causes* such a problem in the first place!

One common misconception in achieving a neutral pelvis relates to the transversus abdominus muscle. It is important to remember from a physiological standpoint that the transversus muscle is responsible for creating inter-abdominal pressure; it is the girdle that keeps your abdominal contents in check. It is not a very active component in creating overall stability of the thorax or pelvis. Countless hours of research have been spent studying this muscle and documenting thoroughly what actions it is capable of. In an electromyogram (EMG) it has been shown that the transversus abdominus is activated in all torso movements. However, this discovery can be misleading. It is clear that the muscle is recruited with every torso movement in order to fully protect the abdominal contents. This recruitment, however, does not equal stability or involve any major action of movement other than to "hollow" the stomach and compress (protect) the abdominal contents.

In understanding the mechanics of the "core", it is the rectus abdominus (especially the lower bellies) and oblique muscles that are responsible for pelvic stabilization. The importance of the rectus abdominus becomes even clearer when it is realized that this abdominal muscle is active during gait while the rest of the abdominals remain less active, nearly dormant. In particular the lowest bellies of rectus abdominus maintain an active contractile effort to keep the pelvis lifted with each and every step we take. Any time we take the weight off of either foot or shift our balance, it is the rectus abdominus that is *always* active, working to maintain pelvic stability. EMG results point this out clearly. And let us not forget the role of pyrimidalis in all of this. This small, often overlooked muscle is the "first line of core" stability. Its function is to create tension in the linea alba, which provides a "solid" point for all the abdominal muscles to pull from. The linea alba also translates force from one side of the obliques to the other allowing for full rotation. Without the ability to generate this tension, it would be difficult to get full use of your abdominal muscles. This is why it can be so problematic for women to regain abdominal strength following a C-section.

Another misunderstanding comes from the idea of "sucking it in" or "hollowing" your stomach. The effort of pulling the navel towards the spine puts the abdominal muscles at a contractile disadvantage by being pulled into a shortened position. This position compromises the ability of the rectus and oblique abdominal

muscles to "shore up" their ends for pelvic stabilization as there is a "kink" in the muscles keeping them from engaging fully and properly.

Lastly, although all of the abdominal muscles attach to the pelvis, only the rectus abdominus has the ability to contract below the arcuate line. The arcuate line is 1 - 2" below your navel. In Asian culture, it is known as the "dan tien." All of the other muscle bellies blend into and become denser tissues. These tissues lack voluntary muscle fibers and are unable to be recruited to help stabilize the pelvis.

So how do I do it "right"?

Instead of pulling your navel towards your spine, first flatten your stomach. There should be no barreling or hollowing of your abdomen and your back should maintain its natural curve. Next imagine pulling your ASISes towards each other. Visualize a line spanning the distance between one bone and the other, just below your navel, (this is where and how the arcuate line runs) and pull the bones inward along this line towards your centerline. Remember, no hollowing or barreling out. As you begin to feel this tension, expand out through the rest of your abdominal muscles, pulling them towards the centerline (linea alba).

Next, engage your lower rectus abdominal muscles to pull up gently from your pubic symphysis toward your navel. Do not exaggerate the upward tilt of your pelvis; only engage your abdominals enough to eliminate any posterior tilting of your pelvis. This is usually little more than an inch, maybe even only millimeters. Above all else, remember to keep your stomach flat, not sucked in or "barreled" out. A point worth noting, barreling your stomach out has the potential to create an abdominal or inguinal hernia. This is obviously not something you want to happen. It will severely complicate any existing back condition and can be exceptionally painful, often requiring surgery to fix.

Practice this technique diligently until it becomes automatic. With continued effort you will feel the tension build up in your linea alba, from your pubis to your xyphoid process. Keep working at it and you will "wake up" your lower abdominal muscles, just below your navel, and actually start to feel your arcuate line. The

stability of your pelvis held in a neutral position will give your body the ability to generate greater power in all of its endeavors.

References:

1) McGill, S.M. Ultimate back fitness and performance, Backfitpro Inc., Waterloo, Canada, 2004. ISBN 0-9736018-0-4 (www.backfitpro.com). Fourth edition 2009.

2) McGill, S.M. Low back disorders: Evidence based prevention and rehabilitation, Human Kinetics Publishers, Champaign, IL, U.S.A., 2002. ISBN 0-7360-4241-5, Second Edition, 2007.

3) Gilroy / MacPherson / Ross / Schuenke / Schulte / Schumacher. Atlas of Anatomy. Thieme Medical Publishers Inc, New York, NY. USA. ISBN: 9781604060621. First edition 2008.

4) Gray's Anatomy: The Anatomical Basis of Clinical Practice. Edited by Susan Standring et al. Elsevier Churchill Livingstone. 39th edition, 2005.

5) Travell & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual, Volume 1: Upper Half of Body. Lippincott Williams & Wilkins. ISBN-10: 0683307711. 1999.

6) Travell & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual, Volume 2: The Lower Extremities. Lippincott Williams & Wilkins. ISBN-13: 978-0683307719. 1999.

What are “stacked hips”?

When you or your client is lying on your side, your hips are “stacked” when both of your ASISes are pointing straight ahead. Your torso points straight ahead without rolling forward or backward and you are not flexing or extending your torso. This is the ideal position to do any side-lying exercises. If you are not in a stacked position, your body will compensate the joint movements to match your positioning. In this case you may struggle to achieve results. Or worse yet, you may cause problems or exacerbate preexisting conditions due to the aberrant movement pattern your body is making. For example, if your client’s hips are not properly “stacked”, you may run into problems when stretching their quadriceps in a side-lying position. Many issues can arise. If the torso is rotated forward, it will shift the pelvis by throwing off the angle of the ilium in relation to the femur and then the tibia in relation to the femur. This will throw off the Q-angle¹ of the joints; potentially aggravating tissues (usually ligaments) around the knee when you bring your client through knee flexion.

¹ Q angle or “quadriceps” angle describe the angle of the femur to the knee. It is used to describe valgus and varus strain.