Dynamic Chiropractic

SPORTS / EXERCISE / FITNESS

Core Stabilization Strategies: Abdominal Hollowing vs. Bracing

Malik Slosberg, DC, MS

For the past several years, there has been a raging debate about which motor control strategy is best for providing dynamic core stabilization. Beginning in the early 1990s, a creative and very productive group of Australian PT PhDs began publishing a series of highly acclaimed studies that identified feet-forward activation of the transverse abdominis (TrA) muscle as an important unconscious motor activity to provide a stabilizing force which increased intra-abdominal pressure and, through its insertion into the thoracolumbar fascia, resulted in increased stiffness of the lumbar spine. In addition, voluntary TrA contraction, produced by consciously sucking in the belly toward the lumbar spine (often called *abdominal hollowing* or *abdominal drawing-in maneuver*) while maintaining a normal lumbar lordotic curve or neutral spine was found to be associated with an unconscious co-contraction of the lower lumbar multifidi (MF).

This co-contraction of the TrA and the MF increased stability of the lumbar spine. Some of their studies demonstrated that activation of these muscles appeared to decrease low back pain and reduce the risk of subsequent low back injury.[1] In one of their highly regarded publications, Hides, et al., concluded that low back pain (LBP) recurrence was 12.4 times more likely at one year and nine times more likely at two- and three-year follow-up in a control group treated with medication, bed rest, and advice to resume activity as tolerated, as compared to subjects in an intensive exercise rehabilitation program that focused on co-contractions of the TrA and MF.[2]

In the past two years, however, a number of studies have challenged the effectiveness of a TrA-MF program. Some of the research has been published by PhDs in biomechanics from Canada and the United States. These authors contend that the focus on just these two muscles is an overly simplistic approach to core stabilization, especially when dynamic stability is considered within a three-dimensional context as opposed to stability in static uniplanar positions.[3] A relative efficacy study by Vera-Garcia, et al., compared core stability as provided by abdominal hollowing and abdominal bracing and found that hollowing was not effective in reducing the kinematic response to sudden perturbation.[4] Bracing, on the other hand, did foster torso co-contraction, reduced lumbar displacement and increased trunk stability.

The paper concluded that all muscles play an important stabilizing role and must work harmoniously. This suggests that stabilization training should not focus on isolating the co-activation of a few muscles, but instead produce a more global co-activation as generated with bracing stabilization. Abdominal bracing with a neutral spine produced patterns of antagonist trunk co-contraction that significantly increased spine stability and reduced lumbar spine movement after rapid loading.

Abdominal bracing can be easily taught to patients. Liebenson recommends that clinicians have their patients explore the functional range of the lumbar spine and find the neutral spine posture that includes a slight lordosis.[5] While maintaining a neutral spine, the patient is taught to tense

muscles in 360* around the lower lumbar spine while continuing to breathe naturally. The muscles involved in this co-contraction include the transverse abdominis, internal and external obliques, rectus abdominis, quadratus lumborum, erector spinae, and multifidi. In addition, the patient should practice abdominal bracing in a variety of positions. Abdominal bracing should be maintained while adding basic core-stabilizing exercises such as the bird dog, side-bridge and curl-up. According to McGill, et al., abdominal bracing emphasizes locking the rib cage to the pelvis in order to eliminate spine twisting or torsion by transforming the involved muscles into isometric stabilizers.[6]

In an article by Faries, et al., the authors conclude that many scientists disagree with abdominal hollowing and the attempt to singularly activate the TrA and MF before dynamic movements.[7] The authors cautioned that abdominal hollowing may decrease activation of many muscles that are normally active during dynamic movements, thus preventing the natural abdominal co-contraction of other core-stabilizing muscles. This is a concern voiced by several researchers who have noted that in the process of learning abdominal hollowing, patients are trained to isolate the TrA.[8] This process of isolating the TrA comes at the cost of inhibiting the internal oblique, external oblique, and rectus abdominis.

The process of learning to isolate the TrA from these other muscle groups is a means by which to enhance motor control, but may dramatically weaken core stability by inhibiting all these muscle groups involved in providing dynamic stability when three-dimensional activity is performed. Faires, et al., state that abdominal hollowing may be better suited for static exercises that focus on training the local muscle system, but may be a poor suggestion for activating abdominals during performance of tasks in which the global muscle system must be active.

In a study by Grenier and McGill that evaluated spine loading under four different conditions, the authors concluded that whatever the benefit of transversus abdominis activation training is, it is unlikely to be mechanical.[9] There seems to be no mechanical rationale for using an abdominal hollow or the transversus abdominis to enhance stability. Bracing creates patterns that better enhance stability.

A study by Stanton and Kawchuk comparing posterior-to-anterior stiffness of the spine while trained subjects were at rest, performed an abdominal hollow or an abdominal brace, concluded that when the hollow and brace were compared, the brace contraction produced significantly greater posterior-to-anterior stiffness.[10] In a clinical trial comparing an abdominal-hollowing approach to a more general back and abdominal muscle-strengthening program in a group of nonspecific recurrent low back pain patients, Koumantakis, et al., found that the general back and abdominal exercise program reduced disability in the short term to a greater extent than an abdominal-hollowing enhanced exercise approach.[11] The authors concluded that abdominal-hollowing enhanced exercises do not provide additional benefit for patients with subacute or chronic low back pain.

In an article in the health section of *The New York Times* Stuart McGill, PhD, an influential biomechanist, recommended that the muscles forming the core must be balanced to allow the spine to bear large loads.[12] If you concentrate on strengthening only one set of muscles (TrA) within the core, you can destabilize the spine. McGill noted, "In research at our lab, the amount of load the spine can bear without injury was greatly reduced when subjects pulled in their belly buttons during crunches and other exercises. Instead, a core exercise program should emphasize all of the major muscles that girdle the spine."

Further, doubts about whether abdominal hollowing to isolate the TrA is the most effective approach to core stabilization were raised in a paper by Allison and Morris.[13] The authors concluded that although bilateral transversus abdominis isolation has demonstrated some clinical utility, the assumption that it plays a significant and direct mechanical role in stability of the spine is unclear. The evidence is just not there.

Ideally, science is intended to be an evolving, self-correcting progression. As new research is published and added to the cumulative database, paradigms are challenged and begin to change. It appears that we are now in the middle of one of these transitions. Chiropractors must weigh the evidence and decide how to incorporate the latest data into clinical practice in order to provide the best outcomes possible for their patients. Although,the consensus is growing that abdominal bracing is more effective at providing dynamic core stability than abdominal hollowing, the final word is never in. Science is a process rather than a destination.

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