SENSE, 2012, Vol. 2 (2), 112-117
UDC: 233.852.5Y:613.7.73

Original Scientific Paper

Uddiyana Bhandha – a Yoga Approach to Core Stability

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Abstract: *Core stability in general involves the muscular control required around the lumbar spine to maintain functional stability. Stability and movement are both critically dependent on the coordination of all the muscles surrounding the lumbar spine. This paper describes a yogic breathing technique (Uddiyana Bandha) that helps in enhancing core stability. In order to verify whether the practical results of the exercise corroborated with the theoretical research, an observation of the Transversus Abdominis at the umbilical level was carried out using ultrasound imaging techniques. The findings support the theoretical analysis.*

Key Words: *Transversus Abdominis (TA), lumbar multifidus (MF), thoracolumbar fascia (TLF), intra-abdominal pressure (IAP) mechanism.*

Introduction

Core stability is the ability to control the position and movement of the central portion of the body. In other words, better core stability can serve to effectively recruit the trunk musculature and then learn to control the position of the lumbar spine during dynamic and static movements. Core stability training targets the muscles deep within the abdomen which connect to the spine, pelvis and shoulders, to assist in the maintenance of good posture and provide the foundation for all arm and leg movements. On a more significant note, power is derived from the trunk region of the body and a properly conditioned core helps control that power, allowing for smoother, more efficient and better coordinated movement in the limbs (*Omkar* et al. 2009). Moreover, well-conditioned core muscles help to reduce the risk of injury.

The deep trunk muscles, Transversus Abdominis (TA), lumbar multifidus (MF), Internal Oblique (IO), paraspinal, pelvic floor, are critical to the active support of the lumbar spine (Cholewicki, et al. 1996). The co-contraction of these muscles produce forces via the "thoracolumbar fascia" (TLF) and the "intra-abdominal pressure" (IAP) mechanism which stabilize the lumbar spine, while the paraspinal and MF muscles act directly to resist the forces acting on the lumbar spine. By definition, the TA and MF muscles act as stabilizers and are not involved in producing movements, but instead involve static, or isometric, contractions (*Richardson*, et al. 1999). Furthermore, they must act as *stabilizers* throughout everyday activities as well as fitness and sport activities, and hence require very good endurance of low-level forces. These muscles do not need to be very strong, but they must be correctly coordinated (*Kumar*, et al. 2002).

MacDonald, et al. in a recently published review paper on the Lumbar Multifidus (*MacDonald*, et al. 2006) pointed out that 'although contraction of the TA and MF is not simultaneous, it is possible that the mechanical effects occur more or less simultaneously'. They go on to suggest

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that the muscles do not co-contract tonically in function, but may do so during abdominal hollowing, though no research exists to prove the same. This suggests that these muscles anticipate dynamic forces that may act on the lumbar spine and stabilize the area prior to any movement. In other words, the timing of co-ordination of these muscles is of great significance.

Core stability involves osteo-ligamentous subsystem, muscular subsystem and control. Hence core stability is of great significance and the training for the same should be chosen appropriately. It is with regard to this that yoga can serve to be an effective instrument of relief. A particular exercise that aims to provide core stability is the *Uddiyana Bandha* – (The retraction of abdomen, i.e. a "drawing-in" of the abdomen). This paper suggests that the *Uddiyana Bandha* can become an essential part of core stability training.

Method

The exercise requires a stance with both feet placed apart, knees partially flexed and the spine maintained straight. Next, a controlled breathing has to be performed with full awareness about the core. The breathing proceeds in two stages. First, the controlled respiratory attempt should coincide with the practice of *Mula-Bandha*, consisting of the contraction of the *levator ani*, shifting up the rectum and its adnexa. The controlled suspension of breath (3-15 seconds) to coincide with *Jalandhara Bandha*, chin pressing against the chest, just below the jugular notch to bring about a firm compression on the two carotid sinuses. Next, the controlled expiration should proceed along with *Uddiyana Bandha* or retraction of the abdominal wall, particularly the below the navel followed by a suspension of breath for about 3-15 seconds (Fig. I). The exercise is repeated with an interval of a few deep breaths. In essence, this consists of manipulation of intra-pulmonic, intra-thoracic, and intra-abdominal pressures and retention of the same pressure changes for a particular length of time. This breathing technique is also in conformity with the various core stability models, which emphasize on the controlled activation of transverses, multifidus, diagphram and the pelvic floor muscles. In this the compressive forces on the lumbar segment is relieved during inhalation, by building the intra-abdominal pressure and during exhalation, by a complete retraction of the navel towards the spine.

Figure 1: *Uddiyana Bandha*

Results

The Uddiyana Bandha exercise was performed by the author in a clinical setup where ultrasound scanner is available. First, the bent-knee stance was assumed and the TA was observed at the umbilical level using Ultrasound Imaging. The ultrasound image obtained is shown in Figure 2. Then the uddiyana bandha was performed and while holding the posture ultrasound image of TA was captured. The image of TA in uddiyana bandha is shown in Figure 3. An obvious inference from the observation of the two images is that the thickness of the TA increases from 10.5 mm to 17.5 mm. This finding indicate that the actual ultrasound data, obtained during the test, corroborate with the author's hypothesis.

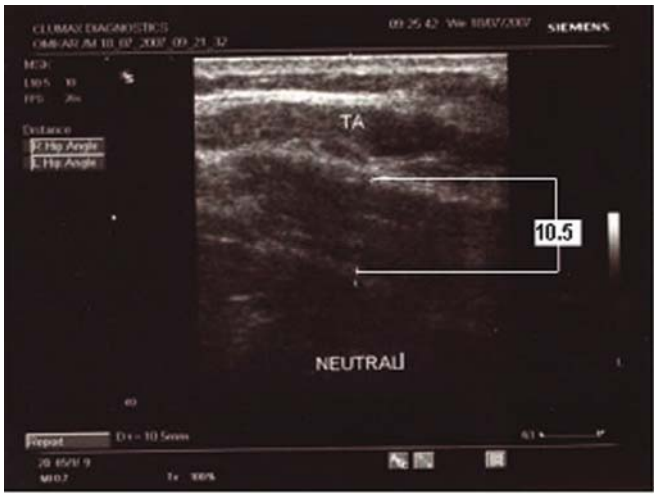

Figure 2: Ultrasound image of the TA at the umbilical level in neutral position
Note: The two '+' marks were used to determine the thickness of the TA

Figure 3: Ultrasound image of the TA after the *Uddiyana Bandha* is performed
Note: The '+' marks used to indicate the thickness of the TA have moved further apart, which indicates that the thickness of the TA is increased during the exercise

Discussion

The *Uddiyana Bandha* can be proven to be effective from the point of view of the basic mechanics involved as well. A test conducted by Hides (Hides, et al. 2006), proved that in response to the action of drawing-in of the abdominal wall, 'the transversus abdominis contracted bilaterally to form a musculofascial band that tightened like a corset'. This well-coordinated movement, from the point of view of Panjabi's statement on spinal stability (*Punjabi*, 1992), clearly is a factor that contributes to lumbo-pelvic stability. The mechanism of corset shape in core stability is well discussed by Omkar and Vishwas (*Omkar* et al. 2009).

In another such work, Richardson, et al discovered that the action of "drawing-in" caused a stiffening of the sacroiliac joint (*Richardson* et al. 2002), another factor that contributes to stability of the lumbo-pelvic region. With particular reference to the *Uddiyana Bandha*, from the point of view of IAP generation, a correlation of the above statements clearly suggests that the "drawing in" of the abdominal wall activates the transversus abdominis, which increases the transverse tension acting around the abdominal form (*Daggfeldt* et al. 1997). Consequently, the magnitude of the IAP-generated force is increased (*Daggfeldt* et al 1997), resulting in a greater IAP-generated torque about the lumbar disc which helps unload the spine (*Daggfeldt* et al. 2003).

According to research, contraction of the abdomen also results in increased thickness of the TA muscles (*Richardson* et al. 2002).Thicker muscles are generally stiffer and increased stiffness later results in increased activity (*Ainscough-Potts* et al. 2006). That apart, the stiffening of the muscles surrounding the spine contributes to its stability. In other words, when the active system is spurred to work in an appropriate manner, it helps support the spine, thus imparting great stability. From the viewpoint of the subsystems that stabilize the spine, this exercise helps regulate the coordination between the subsystems and thus enhance neuromuscular control (*Punjabi*, 1992). Furthermore the *Rene Ferdinands* study (*Ferdinands* et al. 2011), suggested that the relative segment energy expended during the cricket fast bowling action was highest at the trunk region (lower trunk and upper trunk) and concluded that the kinetic energy generated at the distal body segments to achieve high end-effector speeds during throwing and bowling actions originated from the trunk regions or the core region mentioned in our study

Another important benefit of this exercise is its contribution to diaphragmatic breathing. Diaphragmatic breathing, in general, involves a good coordination of the diaphragm and the abdominal muscles. In this exercise, when the abdomen is drawn inward, the diaphragm is flexed. This in turn causes the diaphragm to cover a larger area, resulting in more efficient breathing. The ability of this exercise to impart greater control on the abdominal musculature is another factor that aids diaphragmatic breathing. Thus, the various benefits of this exercise make it a useful tool to enhance core stability.

Conclusion

Core stability is one of the basic issues in combating problems associated with the lumbosacral spine. Recent advances, both theoretical and experimental, in the field of core stability training have given a new dimension to the understanding of yogic postures and breathing techniques. The *Uddiyana Bandha* is one such yoga exercise that holds a position of great pertinence with regard to core stability.

References:

1. Ainscough-Potts, A., Morrissey, M.C., Critchley, D. (2006). The response of the transverse abdominis and internal oblique muscles to different postures, *Manual Therapy*; 11: 54-60
2. Cholewicki, J. and McGill, S.M. (1996). Mechanical stability of the in vivo lumbar spine: implications for injury and chronic low back pain. *Clinical Biomechanics*, 11: 1-15
3. Daggfeldt, K. and Thorstensson, A. (1997). The role of intra-abdominal pressure in spinal unloading. *Journal of Biomechanics*; 30: 1149-1155
4. Daggfeldt, K. & Thorstensson, A. (2003). The mechanics of back-extensor torque production about the lumbar spine. *Journal of Biomechanics*; 36: 815-825
5. Hides, J.A, Wilson, S., Stanton, W., McMahon, S., Keto, H., McMahon, K., Bryant, M. & Richardson, C. (2006). An MRI Investigation into the function of the transversus abdominis muscle during "Drawing-In" of the abdominal wall. *Spine Journal*; 31: 175-178
6. Kumar, S., Narayan, Y. & Garand, D. (2002). Electromyography of trunk muscles in isometric graded axial rotation. *Journal of Electromyography and Kinesiology*, 12: 317-328
7. MacDonald, D.A., Moseley, G.L. & Hodges, P.W. (2006). The lumbar multifidus: Does the evidence support clinical beliefs? *Manual Therapy* 11: 254-263
8. Omkar, S. N. & Vishwas, S. (2009). Yoga techniques as a means of core stability training. *Journal of Bodywork and Movement Therapies*, 13, 98–103
9. Panjabi, M.M. (1992). The stabilizing system of the spine Part 1: Function, dysfunction, adaptation, and enhancement. *Journal of Spinal Disorders*, 5: 383-389
10. Ferdinands, R.E.D. (2011). Analysis of segmental kinetic energy in cricket bowling, 5th Asia-Pacific Congress on Sports Technology (APCST), *Procedia Engineering* 13, 246–251
11. Richardson, C.A., Jull, G., Hodges, P. & Hides, J. A. (1999). *Therapeutic exercise for spinal segmental stabilization in low back pain: scientific basis and clinical approach*, Edinburgh (NY): Churchill Livingstone
12. Richardson, C.A., Snijders, C.J., Hides, J.A., Damen, L., Pas, M. S. & Storm, J. (2002). The relation between the transversus abdominis muscles, sacroiliac joint mechanics, and low back pain. *Spine Journal*; 27: 399-405

Received: January 1, 2012
Accepted: March 9, 2012