Why Does Back Pain Recur? New Research Findings and Treatment Considerations

Addressing wasting and dysfunction of the multifidus muscle.

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The multifidus muscle has garnered increased attention over the years as an important contributor to low back pain because it has been shown to atrophy following LBP. Although symptoms may improve, multifidus wasting persists, leading to the premise that recurring low back pain may be due to this lumbar stabilizer. Treatments directed at normalizing its level of function have been formulated to effectively address low back pain. This has led to an increasing amount of "spinal stabilization" training programs to address multifidus muscle dysfunctions. However, not all "recommended" exercises have proven to be effective. Let's explore the latest research findings regarding the role of the multifidus muscle in chronic recurrent low back pain, as well as the value of spinal manipulation and exercise programs you can easily integrate within your practice.

Recurrent LBP: The Role of the Multifidus Muscle

Approximately 34 percent of people who experience acute low back pain will suffer recurrent episodes.1 There are many theories on why some patients experience these episodes while others don’t. One area of thought is the possible loss of normal motor control of the deep muscle fibres in the lumbar spine.

A recent study by MacDonald, et al. (2009) provided some of the first evidence of a connection between altered deep muscle activity and recurrent low back episodes.1 The study assessed whether the control of the deep muscles (multifidus) differed between the normal population and those with unilateral recurrent low back pain. EMG onset of the muscles occurred later in participants with recurrent low back pain than in normal individuals. Since the multifidus muscle is a stabilizer of the spine, any delay in muscle firing may lead to abnormal biomechanics. If there is a delay in muscle activation, the question arises on whether this is present when unpredictable loading is applied, considering this type of loading is a common injury mechanism for low back pain.
In a second study, MacDonald, et al. (2010) assessed the impact of unpredictable loading on muscle activation and found that both the deep and superficial fibers of the multifidus muscle had less EMG in people with recurrent low back pain than with healthy subjects.2

In addition to altered movement patterns, atrophy of the multifidus has also been demonstrated following episodes of low back pain. Asymmetric atrophy is seen in those with unilateral lumbosacral radiculopathy, which may reflect denervation of the multifidus muscles.3 In patients with long-standing unilateral back pain due to monosegmental degenerative disc disease, selective multifidus atrophy develops on the symptomatic side.4 Selective atrophy of the multifidus muscle may also be an important factor in the occurrence of low back pain after prolonged bed rest.5

**Treating the Multifidus: Rehab Strategies**

Now that we know the effects of low back pain on multifidus function and structure, how do we go about treating it? Various rehabilitation exercises exist, ranging from low tech to state-of-the-art equipment. We provide the latest research findings into rehabilitation of the multifidus muscle. Utilizing these key principles and findings should help you refine and modify your rehabilitation plan.

Rehabilitation of the multifidus muscle involves several key goals: 1) initiate activities that increase co-activation of the multifidus with the transverse abdominus muscle; 2) normalize motor control of the multifidus and surrounding muscles; and 3) increase hypertrophy, strength and endurance of the affected muscles.6

Although we talk specifically about rehabilitation exercises, one should never forget the importance of spinal manipulation in the care of the patient. Spinal manipulation has been shown to influence multifidus muscle function, resulting in improved muscular control of the trunk, thereby enhancing the effects of exercise.7-8

Initial exercises should include specific motor control training. A bed rest study found that although there was no difference in outcomes between a specific motor control and a trunk flexor / general strength program, the specific motor control training program was preferable in restoring the cross sectional area of the multifidus since it limited the potentially harmful compressive forces through the spine.9 Therefore, specific motor training is an effective way to begin a rehabilitation program for someone who may not be able to tolerate more aggressive exercises.
Most clinicians progress the patient to different floor exercises, such as the plank, the bird dog, back extension, back bridge, curl-up and side bridge. Research shows the activity of the multifidus is greatest during the back bridge exercise. The exercise that produced the greatest activity level for the transverse abdominus (to maximize co-contraction with the multifidus) was the elbow-toe (plank) exercise with contralateral arm and leg lift.  

Upper-extremity isometric exercises can also be incorporated. Horizontal isometric shoulder extension elicited an activity level of 84 percent for the multifidus muscle in comparison to a trunk extension exercise. Therefore, upper-extremity isometric exercises can be incorporated into a rehabilitation program prior to lumbar extension exercises, allowing for optimal progression of exercises based on muscle activation and difficulty level.

Proper progression of exercises is based on utilizing low-intensity exercises and progressing to those that require more muscle activity. One recent study looked at EMG data for the multifidus muscle, normalized to percent of the maximum voluntary isometric contraction (MVIC). The progression from low intensity to high intensity is as follows: low intensity: bridging / side bridge / upper and lower body raises in either prone or quadruped positions; medium intensity: prone lumbar extension to neutral / resisted lumbar extension while sitting / prone extension with all extremities lifted (Superman exercise); high intensity: Prone lumbar extension to end range with resistance applied.

Instead of progressing from a low-intensity exercise to a higher intensity one, utilizing an unstable surface can enhance the effects of an exercise. For example, during a plank exercise, progression to lifting of the extremities may be too difficult for the patient. Instead, simply incorporate an unstable surface (rocker board, wobble board, etc.) into the plank exercise to further enhance trunk muscle activity.

Clinicians often utilize a gym ball for exercise progressions. However, the assumption that an exercise ball will increase the challenge to the muscular system was not supported by one recent study. Although performing a back extension exercise on a gym ball was no different than performing on a mat for a healthy, young population, the use of a ball produces less spinal loading stresses and may be used in rehabilitation to reduce the potential for re-injury. Therefore, using a gym ball may be more a factor of decreasing spinal loads rather than providing a more challenging exercise.
For prolonged bed rest, vibration exercise has been shown to offset multifidus wasting. These findings support the view that initiating vibration exercise in the early stages of rehabilitation may provide an effective stimulus to offset wasting. This is an effective “early adoption” to exercise in the rehabilitation setting.

Lumbar extension machines have shown to be effective in increasing back strength, decreasing pain and accelerating return to work in patients post disc surgery. However, adding pelvic stabilization to the lumbar and hip extensor muscles during dynamic back extension increases activity of the multifidus by 51 percent.

All of the above considerations will allow for proper progression of exercises for patients with chronic recurrent back pain. However, one study that examined the effects of three different exercise strategies on inducing multifidus muscle hypertrophy found that general stabilization and dynamic intensive lumbar resistance training had no significant effect on cross sectional area of the multifidus muscle. The most critical part of the program was the static holding component between the concentric and eccentric phase of a dynamic resistance program. Therefore, integration of a static holding component to a stabilization and dynamic strengthening program may be the most effective consideration to prevent multifidus hypertrophy.

The importance of the multifidus muscle cannot be overstated. In addition to traditional chiropractic care, adding an effective rehabilitation program will allow the clinician to address a muscle that is increasingly shown to be a contributing factor in recurrent low back pain.

References


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