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Faulty Movement Patterns as a Cause of Articular Dysfunction

By Craig Liebenson, DC

Modern occupations and lifestyles involve prolonged activities in monotonous static postures, along with one-sided repetitive movements. The result is postural overstrain and muscle imbalance. There is a normal balance of muscle groups which move joints. If this balance is disturbed the joint's function will suffer. Motor patterns will change to compensate for pain, and this change will become engrammatically stored in the CNS. Thus the faulty movement pattern may persist indefinitely, outlasting the painful episode. Whereas joint dysfunction is best treated with an adjustment, altered movement patterns are addressed with remedial exercise.

Predictable Muscle Imbalances

Janda studied the classic muscle test for individual muscles and observed that a greater number of muscles take part than is commonly thought. He found via electromyography that hip extension is not only a test for the gluteus maximus, but that the hamstrings and erector spinae also take part. In fact, the characteristic disturbance is that hip extension is decreased and the gluteus maximus is late to contract. The quality of the movement pattern may be altered considerably without an appreciable loss of strength, but the consequences on joint structures of this altered pattern are considerable.

Janda also discovered a surprising pattern as a result of observing muscle tests. Certain muscles showed a tendency to hypotonia (inhibition), while others tended to hyperactivity. The muscles which tend to inhibition are weak in upper motor neuron lesions, while those with a tendency to hyperactivity become spastic. Both muscle groups can house trigger points or test as weak, but only the muscles which tend to hyperactivity are found to shorten.

Some of the muscles with a tendency to inhibition are the gluteus maximus; gluteus medius; rectus abdominus; deep neck flexors; lower trapezius; and serratus anterior. Some of the muscles with a tendency to hyperactivity are the hamstrings; erector spinae; TFL; QL; adductors; piriformis; iliopsoas; SCM;

suboccipitals; upper trapezius; levators scapulae; pectorals; and subscapularis.

Key Functional Disturbances as a Result of Muscle Imbalances

Standing and Walking

Certain key functions are disturbed as a result of muscle imbalance. Walking and standing are affected by the imbalance between inhibited gluteals and hyperactive hip flexors, and hyperactive erector spinae and inhibited abdominals. Standing increases hyperactivity in the back muscles, and when walking, hip extension is achieved by erector spinae contraction rather than gluteal effort. The result is increased lumbar strain, due to hypermobility in the sagittal plane. Inhibition of the gluteus medius will cause further strain in the coronal plane from the increased lateral pelvic sway.

Raising the Arms, Carrying and Reaching

During activities involving lifting of the arms, fixation of the scapulae is the key. Upper trapezius and levator scapulae fix the scapulae from above, while the lower trapezius and serratus anterior do so from below. The upper fixators attach to the cervical spine while the lower ones attach to the thoracic spine. Since the upper fixators are usually overactive and the lower fixators inhibited, overstrain of the cervical spine during carrying or reaching activities is common.

A forward drawn shoulder resulting from overactivity of the pectoralis muscles and inhibition of the lower and middle trapezius and rhomboids can invite overactivity of the upper trapezius and levator scapulae, by requiring them to become active to carry weight which is in the arms. A forward drawn posture not only occurs in the shoulder girdle, but in the head with compensatory hyperlordosis of the cervicocranial junction. This tends to result in the SCM and suboccipitals becoming overactive, while the deep neck flexors are inhibited.

Respiration

Respiration is perhaps the most important of all movement patterns. Insufficient activity of the abdominal muscles results in a loss of diaphragmatic support for the spinal column. This can negatively affect the stability of the lumbar spine during lifting or bending activities. One should be able to observe in a supine patient the belly moving out with inhalation and in with exhalation.

In the thoracic spine widening of the thorax posteriorly during inhalation should be visible as a respiratory wave observed in a prone patient. Exhalation has a mobilizing effect on thoracic spine extension and is particularly important in those suffering from a forward drawn posture and kyphosis.

The most important fault during breathing is lifting the thorax with the scalenes and upper trapezius instead of widening it in the horizontal plane. This fault can be graded by looking for lifting of the thorax and an absence of abdominal respiration during inhalation in the following postures:

1. Deep inhalation only -- mild
2. Relaxed sitting or standing -- moderate
3. Supine -- severe

Conclusion

Faulty movement patterns cannot be ignored in the treatment of functional pathology of the motor system. Modern society overstresses the postural function of muscles, thus creating an ideal terrain for muscle imbalance to develop. Mobility is reduced and movements in constrained postures are performed repetitively, leading to static overstrain and cumulative trauma. The motor program for good quality movement and posture is thus compromised leading to poorer static and dynamic function of the locomotor system.

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Craig Liebenson, DC
Los Angeles, California

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