

## **DYNAMIC LUMBAR STABILIZATION TRAINING**

### **History of Spine Rehabilitation**

Approaches to rehabilitation of patients with low back pain have changed greatly during the twentieth century. Early on bed rest was the treatment of choice for most back pain. Later, in the 50's and 60's many spine practitioners felt that positioning in flexion (forward bending of the low back) was optimal and patients were taught to perform a posterior pelvic tilt (flattening the low back by tightening the front abdominal and the buttock muscles) when standing and lifting, etc. In the 70's the extension theory became popular based on the work of Robin McKenzie. The basis of extension training (backward bending of the low back) is that the intervertebral discs most frequently bulge or herniate towards the rear and positioning in flexion, as frequently happens in sitting, tends to encourage this bulging. By teaching patients to perform extension exercises daily and to avoid flexed positions pressure on the discs is reduced. During the 70's the concept of back school became popular. In back school patients were taught self care of back pain through resting positions, use of ice and stretches as well as ways to modify their movements to avoid undue stress on the spine. Throughout these phases spine practitioners have had a number of other treatment devices (modalities) and techniques available help decrease pain. These include heat, ultrasound, electrical stimulation, traction, massage and joint mobilization.

Each of these approaches to spine care has advantages and disadvantages. Bed rest, while still appropriate for a very limited duration in a few selected cases of acute and severe back pain, has been shown by recent research to cause more harm than good. Flexion, while it does tend to decrease stress on the posterior elements of the spine like the joints between vertebrae (facet joints) and the muscles which run up the sides of the spine, does put stress on the discs and it is not possible to perform most daily activities while maintaining a full posterior pelvic tilt. Extension training has been shown to be effective in decreasing symptoms associated with disc problems but extension tends to compress the facet joints and is not position in which one can perform daily activities. The techniques taught in back schools of the 70's and 80's helped patients see that they have an active role in care of their back and did provide some useful strategies for managing back pain, but the "body mechanics" techniques (how to perform daily activities) taught were often impractical. These movement techniques were based on the guarded, robotic movements of a person in acute back pain. It is true that maintaining a vertical spine and shuffling the feet to position the body close to and directly in front of any object being manipulated or activity being performed will decrease forces on the spine. Unfortunately, it is very difficult to perform many ordinary tasks in this way. For example, taking objects out of a shopping cart is not possible when squatting straight down with a vertical spine. Nor is it possible to keep the low back from flexing when squatting down to reach something on the floor with a vertical trunk.

Although this kind of movement decreases stress on the spine it markedly limits the force that can be generated by the legs. This kind of movement tends to be weak and therefore not applicable to activities requiring significant force like sports, construction work, etc. The passive modalities (treatments performed on the patient without the patient's active participation) can be helpful in decreasing pain and muscle spasm but generally do not address the initial cause of the pain; pain and spasm are responses to injury or irritation.

## **Stabilization Training**

In the 80's a new approach to spine rehabilitation, stabilization training, was developed to a large extent by spine rehabilitation specialists in Northern California. The underlying basis for stabilization training is that the various structures of the spine degenerate (wear and tear) as a result of the forces associated with daily activities. This degeneration is usually not a painful process. Sometimes it will result in temporary, relatively minor pain - the "back strain" - and usually resolves in a day or two. Sometimes the consequences are more significant - "my back went out" - but usually, in several weeks the pain is gone. Eventually this essentially pain free wear and tear (cumulative micro-trauma) may result in such a level of degeneration that the elements of the spine are unable to tolerate the forces associated with daily activities and pain may become chronic. At this point neither positioning routines, like flexion or extension, nor modalities like heat, massage and manipulation have any lasting effect on improving the patient's functional ability.

To decrease cumulative micro-trauma and avoid this progression of disability the patients must learn their "neutral spine position" and develop the ability to maintain this position in daily activities. The neutral spine position is the alignment of the spine where it tolerates mechanical forces best. This position can be different for different people; often it is related to the specific problem in the spine. Someone with spondylolisthesis (a problem in the posterior part of the spinal column) may have a slightly flexed neutral position (flexion bias). Someone with a severe disc herniation may have an extension bias neutral. Many people have a mid-range neutral position. This is the position that the patient must maintain when there are significant forces acting on the spine. Significant forces on the spine occur during:

- Prolonged positioning (for example, sitting or standing for a long time, etc.)
- Major movements (for example, getting in and out of the car, getting in and out of bed, etc.)
- Movements requiring force (for example, pushing, pulling, reaching, etc.)

This kind of movement does not have to be forced, robotic or weak. It can be fluid and more powerful than the "normal", spine-stressing way of doing things but it has to be learned. This takes active participation on the part of the patient, specialized knowledge and experience on the part of the physical therapist or trainer, and insightful supervision and coordination of the various components of rehabilitation on the part of the physician. This is the reason that a multidisciplinary center devoted solely to the management of spine problems is the optimum setting for the rehabilitation of difficult spine problems.

## **Evaluation**

In such a spine center, when the physician feels stabilization training is indicated, the patient is evaluated by a physical therapist. Among other things, the therapist determines the patient's neutral position and their ability to maintain the spine in this position during specific exercises. This depends on flexibility, coordination, endurance and strength. The patient is graded on a scale of one to three. Often, patients with chronic back pain are not able to complete the tests for level one. Also evaluated is the patient's ability to maintain the neutral position in functional activities like lifting and reaching. This is also graded on a one to three scale.

Based upon the results of the physical therapy evaluation a treatment plan is established. If the patient's ability to progress in stabilization training is inhibited by pain, the therapist may use various modalities to lower the level of pain so that training can be initiated. Consultation with the supervising physician may be needed to determine if more aggressive pain reducing interventions are necessary. However, since the stabilization training program is progressive and can begin at a very low level, virtually all patients can start training at a level appropriate for their condition.

## **Exercise**

Training begins with instruction in the patient's neutral position and in the use of the abdominal muscles to maintain this position (abdominal brace). The abdominal muscles both in the front and around the sides towards the back are extremely well suited to maintaining the spine's position and to absorbing forces that would otherwise be transmitted to the spinal structures at risk. Many patients are amazed at how abdominal bracing and neutral positioning alone can eliminate the pain associated with various, simple activities. The patient then begins to learn a stabilization exercise program including:

- Exercises in which the abdominals work to hold the neutral position while movements of the arms and legs increase and decrease forces which would tend to take the spine out of neutral. This helps develop coordination and endurance of the abdominals.
- Flexibility exercises with particular emphasis on the hips and legs. This helps develop the mobility needed as the patient learns to make more effective use of the legs as the power source for movements.
- Aerobic activities. This helps build up cardiopulmonary ability and therefore generalized endurance. Aerobic exercises are also known to increase the body's production of natural, pain relieving chemicals (endorphins).

Each exercise program must be developed specifically for the individual patient and close supervision is needed to assure perfect technique both at the beginning of training and when exercises are progressed to more difficult variations. Each patient should have a written home program of exercises and daily exercise is critical to the development of stronger and more automatic control of the spine.

## Functional Training

Probably the most important component of the stabilization program is functional training - instruction in the practical application of neutral spine positioning techniques. The key word here is practical. The traditional body mechanics instruction of the 70's and 80's may have helped decrease pain but no one, including those who taught the techniques could put them into practice consistently. Efficient movement requires power and the body's most effective power source is the legs. Traditional body mechanics instruction included maintaining the spine in a vertical position and keeping the feet under the trunk: "Use the legs, not the back. Keep objects close to you. Keep objects in front of you. Move your feet, not your trunk". If these were powerful ways to move, we would throw a ball with the feet directly under us and use only the arm. In order to generate power from the legs and transfer it to the hands, which we usually use for daily activities, we must transfer our body weight from one leg to the other, and transmit the force generated from the legs through the trunk to the arms. Unless the spine is in its optimum position to transmit this force and the abdominals are braced to protect the spine, the spine will not tolerate this kind of action well and we would be better off moving with minimal power from the legs. By using the abdominals to maintain the neutral position a wide variety of powerful movements are possible making spine safe body mechanics practical, fluid and powerful.

Functional training begins with examining how various activities and positions tend to affect the spine. For example, reaching up with the arms tends to extend the spine, while sitting or squatting tends to flex it. The front abdominals can be used to counter forces which tend to extend us, and hinging at the hip can help us avoid flexing out of neutral while bending forward. Hip hinging refers to bending forward from the hips (and usually knees) rather than from the low back. This takes special instruction and practice since it requires the use of muscles in sequences which are not intuitive, for example, bracing the abdominals and using the buttock muscles to straighten the trunk. Instruction in various ways of pivoting to avoid twisting the spine allows one to move for objects from side to side without having to shuffle the feet. Bracing, hip hinging and pivoting are combined to teach various ways to get from standing to supine on the floor, come from sitting to standing, pushing, pulling, lifting, reaching, etc., all while maintaining the neutral position and while moving fluidly. As the patient improves in the ability to maintain neutral position specialized techniques for individual job or recreational activities are taught. Patients are also taught various strategies for static positioning like sitting and lying. For most of these activities there are several ways to perform the task while maintaining neutral. Having options from which to choose is important if the techniques are to be practical and adaptable to various situations. The ultimate goal is for the patient to have a complete understanding of how to control the various forces which act upon their spine so that they can solve movement problems independently

Functional spine stabilization is not physically difficult for most people. It does take "reprogramming" of movement habits and, for most patients, the hardest part is in the beginning when it is easy to forget the techniques, especially when the pain is decreased. But ultimately most patients find that functional stabilization techniques make daily activities easier, less painful and, because they are based on principals of athletic movement, more powerful. This kind of training is not just indicated in cases of difficult, chronic spine problems where avoidance of surgery is the goal. By incorporating aggressive, conservative care when low back pain first begins many of the "back sprains" and periods where the "back goes out" which often lead to chronic back problems can be eliminated.