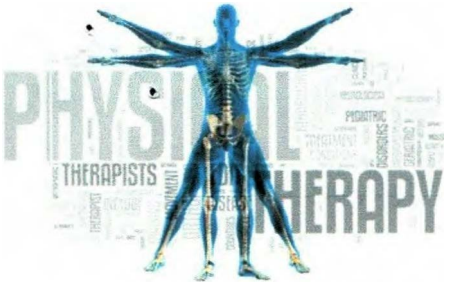
GENLIFE
Regenerative Medicine

Charles F Mahl, M.D. FACS FICS
Medical Director
BAC Colonnade 2333 Ponce De Leon Blvd, Suite 302. Coral Gables, Florida 33134
Telephone: 305.332.7234 Toll Free: 844.859.7788 Facsimile: 305.669.0241
Website: www.GenLifeRegenerativeMedicine.com

This article was dictated and written by my esteemed colleague, Dr. Michael Brown M.D. DC. Dr. Brown was a wonderful teacher and superb doctor who passed away too young. The information dictated by Dr. Brown still remains pertinent today and I corrected spelling and grammer to make it more easily readable and I find it useful to provide to my patients. I hope you like it.

Charles F Mahl M.D.

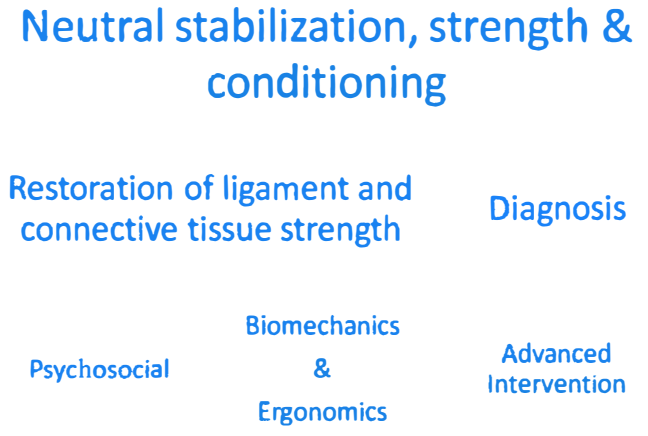


Concepts in Spinal Rehabilitation

Why did physical therapy make me worse?

INTRODUCTION:

As a spine interventional specialist I am typically referred patients for consultation that have failed usual conservative means. A common complaint that I hear quite frequently is "I tried physical therapy and it made be worse". Physical therapy is an important cornerstone in the management of low back pain.



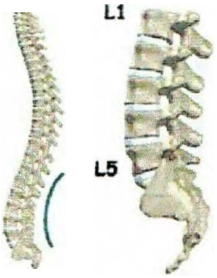
Many times once I make critical diagnostic conclusions that explain the details of the pathology affecting a specific individual's spine we can then begin to determine where things went wrong in the initial management steps.

The critical thing about physical therapy is What, When, Where, and Why? What is the precise diagnosis? This is a critical step in determining when we are going to implement physical therapy and rehabilitation exercise and where we will do that. Understanding what is wrong provides a specific indication why we will implement a specific strategy in the overall management scheme. Let's first understand what are the common reasons why physical therapy fails and why attempts at exercise has made an individual worse.

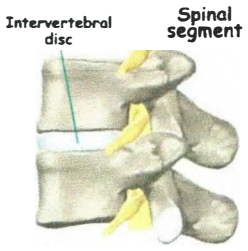
To understand what causes you so much trouble when a physical therapist requests that you do some specific movement or exercise we must first look at some critically important facts that are at the root of the problem. We have addressed many topics on this website. There are many aspects and categories of problems that are rather complex. Many of these topics will explain why a specific condition may not respond to conservative care and exercise. This discussion is a general discussion to address the

- topic of physical therapy and spinal exercise for back pain. One of the great spinal surgeons who I have had a great respect for over the years is Dr. Kirkadly-Willis. He outlined a simple model that we will be referencing throughout this article. He outlined 3 phases of spinal degeneration in his book published in 1983 which has influenced me throughout my professional career.[1] He outlined 3 phases of spinal degeneration:
    1. Dysfunction
    2. Instability
    3. Stabilization

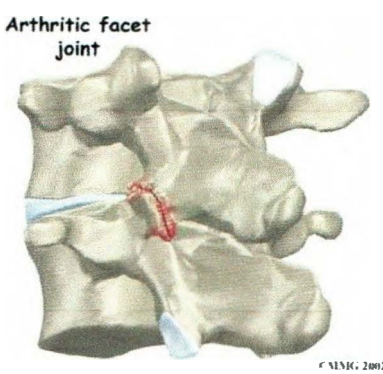
In the **dysfunction phase** one can experience tight muscles, muscle pain, restricted movement of a specific spinal segment such as dysfunction of facet joints or sacroiliac joints and early degenerative changes in the disc. Will spinal exercise and movement help with these problems? Yes if prescribed properly. In my opinion the use of manual medicine techniques and application of specific corrective movements and exercise works very well for this patient population. A physical therapist who is subspecialty trained in manual medicine or a chiropractic practitioner or osteopathic physician who performs manipulative or manual therapy can typically resolve these problems very rapidly with manual medicine principles. As the condition progresses gradual segmental instability can develop which may require a combination of manipulation and exercise. Typically however in the early phase of the degenerative cascade the use of manual medicine can make quick work in resolving the problem. Having practiced as a chiropractor and having studied osteopathic manual medicine before I attended medical school has given me I think a distinct advantage of understanding and an ability to sort out complex spinal problems as a subspecialty trained physician. I have been "preaching" for many years that in the phase of spinal dysfunction, manipulation is king. Practitioners who do not understand the basic principles and application of manipulation cannot compete in this type of problem. Do not waste time with physicians and other practitioners who do not understand the complexity of manual medicine. Also it is important not to waste time on a manual therapy practitioner who cannot resolve a problem quickly. A skilled manual therapist can resolve a problem within a few visits. Do not find yourself returning back on countless occasions for the "short term" relief that manipulation provides. If you are stuck in this rut then let go of the sides… and move on.



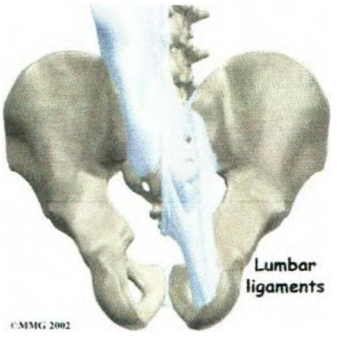
The instability phase is the most critical concept for this discussion of low back pain. Remember the lumbar spine has a curve shown in the picture to the right.

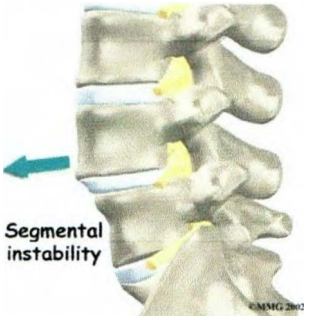


There is a very complex ligament structure that contributes to the stability of these spinal segments during movement.[2] Degenerative changes that occur include intervertebral disc (nuclear) degeneration, facet joint osteoarthritis, vertebral body degeneration and ligamentous degeneration and resulting instability.[2] **Each level of the spine is a three-joint complex consisting of one intervertebral disc and two facet joints, with complex load sharing between the three joints.**[3] It is important to understand that most individuals with chronic back pain have their inherent problem typically secondary to some type of instability. Even those who have advanced degeneration and arthritis have a component of instability as the source of pain. I often say in regards to segmental and joint instability that there are those who are "born loose, torn loose, or worn loose." There are those who were born with excessive mobility in joints. There

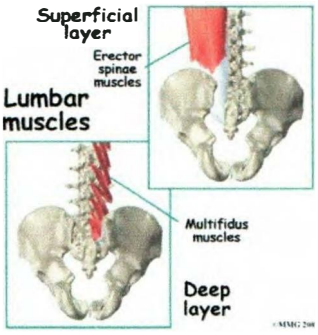


- are those who have injuries, or degeneration or combination of both. This process of developing spinal segmental instability often begins as early degeneration or a simple "tear" in the annulus of the disc.[4] This begins to destabilize the spinal segment. Once a tear begins to occur in the disc it has a poor healing potential and begins to perpetuate itself through the disc and cause a gradual disruption inside the disc.[5] These changes within the disc drastically effect the stability of the spinal segment.

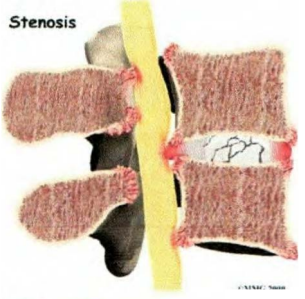




This early changes in the disc create excessive load on the facet joints and often proceed the early arthritic changes and ligamentous laxity that begins as part of facet joint arthritis.[6] Eventually one will begin to see early excessive translational movement of the intravertebral segments which leads to further breakdown in the disc and facet joints. The facet joints and lumbar spinal segments are stabilized by a number of things. They are stabilized by a complex and intricate ligamentous system that attaches to the facet joints and bony prominences of the spine. This creates a complex infrastructure and stabilizes the spinal segment against excessive movement and loads. In addition the spine is also stabilized by and intricate and complex set of muscles. The small intrinsic muscles such as the multifidus muscles noted to the right are just a small sampling of the dozens of small muscles that attach to the spinal segment to refine and stabilize movement. It is these muscles that we often target for spine stabilization exercises.



The stabilization phase is the latter stage of spinal degeneration. When spinal instability ensues the tension or the ligaments and connective tissues attached to bone begin to cause proliferation of bone which can begin to narrow the spinal canal and the nerve passageways through the spine which ultimately can cause compression of the spinal cord, or spinal nerve roots. So, the final stage in progressive degenerative change is ultimately the body's attempt to try to stabilize spinal instability. It is the reason why I am so fixated on stabilizing spinal segmental instability as I have discussed in some of the articles on this website. Spinal stenosis is a term used for "narrowing" of a spinal passageway. This can either be within the main spinal canal or through the foramen where the nerves exit the spine which we call neural foraminal stenosis.



The process of developing spinal degenerative disease and ultimately spinal segmental instability is often only one component in a complex process. An individual who is beginning to develop changes within the disc and spinal segmental instability will often begin in their earlier years to have episodes of back pain that will come and go and eventually progress to become more frequent until one day symptoms persist on a constant basis. In addition to the degenerative changes and breakdown of segmental stability that is happening in your spine we frequently see individuals undergo progressive physical deconditioning, obesity and lifestyle changes that perpetuate the problem. The manner in which your particular back pain progresses and its effect on your ability to tolerate movement and loads is quite unique from person to person. **It is this individuality and complex differences from**

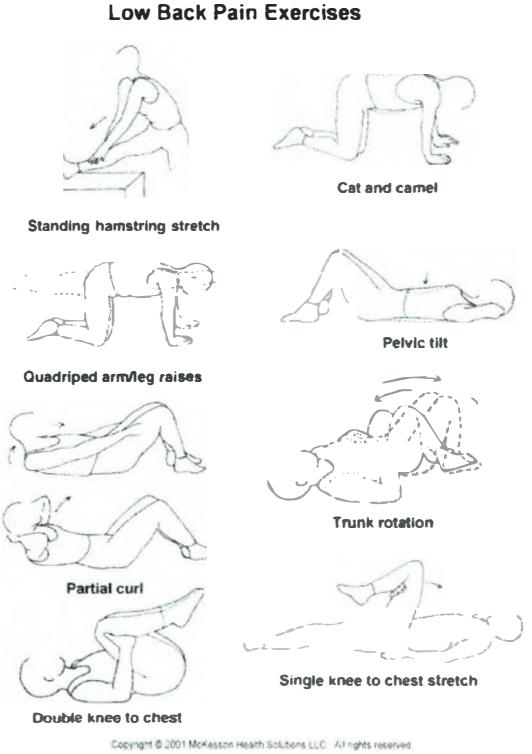
individual to individual that make it difficult to simply prescribe a universal exercise program for all individuals with back pain.

THE DOCTOR SAID HE WANTS ME TO EXERCISE TO HELP MY BACK PAIN:

It is almost a universal belief of most physicians that exercise is an important component to the "conservative management" of low back pain. Therefore, it is no wonder that almost all patients with back pain who consult a physician has at least on one or more occasions been sent to a physical therapist for exercise. Most physicians have never been in a physical therapy facility or gym where they were involved in and held accountable for the active day-to-day rehabilitation process of a back pain patient. Thus most of them really have little understanding of what transpires in those encounters. Most physicians have a relatively superficial understanding of the various exercise protocols available to clinicians prescribing exercise for back pain patients. They also do not understand how to interpret what has gone wrong when a prescription for exercise has been given and the patient comes back stating they are "worse" when they perform the exercises. Many physicians will assume it is lack of motivation, or psychological processes such as "fear avoidance behavior." Because there is no understanding of this complex process and the various strategies and methods used by individuals who prescribe movement and exercise they do not have the knowledge necessary to correct the treatment failure and make appropriate changes to the exercise protocol to ensure better success.

THE PHYSICAL THERAPY ENCOUNTER

Physical therapists are as individual a practitioner as physicians, chiropractors, osteopaths, etc. Each practitioner develops an individual level of expertise and adapts specific protocols based on their individual likes and dislikes and most importantly beliefs. The physical therapist like all healthcare clinicians also dealing with the public on a day-to-day basis can become bored and complacent. The demands placed on them especially in the corporate model for production contributes to this.



The bad physical therapy experience: If you go to a physical therapist and they do a basic history and your experience goes something like this you can assume you are in the wrong place. You are asked to do a few basic stretching movements and then you limp on a treadmill for 15 minutes. During the whole process you continue to report that your pain is worsening while using the treadmill. The therapist tells you that you must continue the exercise because it is part of the process. After you limp on the treadmill for a period of time you are given a sheet of exercises similar to what is seen to the left. You are placed on a mat face up and asked to rotate your trunk back and forth. You are asked to pull your knees to the chest repetitively and then

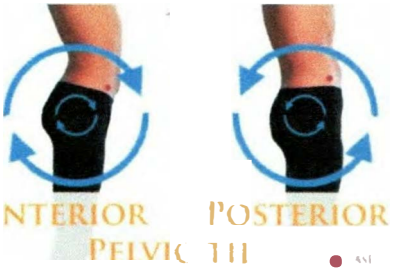
perform a few cat and camel stretches as noted to the left. Each day you go in reporting no improvement you are requested to do the same exercises, the same way and continue to report the same aggravation of back pain. Sounds familiar? Then, you are in the wrong place.

So what happened with this encounter? What was wrong and why did these individuals feel worse when performing these movements when exercise is supposed to be "good for back pain?" We are now going to introduce the concepts of "neutral spine stabilization" and we will begin to explore how everyone with back pain can exercise without aggravating their problem. One of the first questions that I asked the patient who has tried physical therapy and failed is for the patient to tell me what they have learned in physical therapy. Do they go there and just go through a simple basic routine day after day and learn nothing? I ask the patient if they understand what neutral spine positioning is? I ask them to show me what skills they have learned in the process. Rarely does a patient even understand what I am talking about.

Remember we began this article with a discussion on spinal instability. The answer to why you are having problems tolerating specific loads and stresses put on your spine is because there is a failure to make a precise diagnosis as well as a failure to recognize the specific component of your muscular dysfunction and instability! There are countless syndromes that will need more advanced intervention even before you begin the process of stabilization exercise. There are others that simply need to learn a few specific skills to make them independent of all practioners.

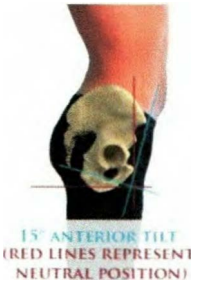
WHAT IS THE NEUTRAL SPINE POSITION?

The neutral spine position is the most pain-free and balance position that you can position your spine and pelvis in any given posture.



There are, for example, specific disc pain disorders where you can have a tear in the internal annulus of the disc that requires specific positioning of your spine and pelvis to reduce pain and take excessive pressure off the portion of the disc that is painful. In other conditions you may have disc degeneration with associated instability of the facet joints and ligaments and thus will have to find a "neutral position" that may favor a more reduced curve to your back and will have to position your spine differently to find the most pain-free and balanced position. Let us first begin to explore more of this concept. Stand up and try this simple maneuver.

1. Tilt your pelvis backwards or posterior flattening or back. Notice that this is a difficult position to maintain and is not all that comfortable.
2. Next tilt your pelvis anteriorly in order to increase the curve in your back. This will more than likely cause increased pain and a sense of tension in your back. This position is also not all that comfortable.
3. Now, tighten your abdominal muscles slightly and tilt the pelvis back and forth until you come to a position which feels the most comfortable and most pain-free. I am not stating that you have to position your back where you have no pain because that may not be possible. I am simply stating to position the spine and pelvis in the standing position by tilting the pelvis backwards and forwards until you fine the position that feels the most

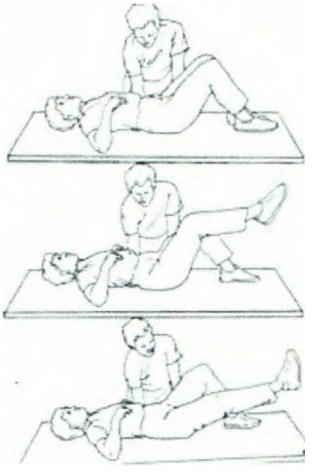


balance and most comfortable. That is what we are referencing "the neutral position."

Each postural position that you put yourself in has a different "neutral position". There is a neutral position for sitting, standing, laying on your back, etc. If you can master this simple process of finding "neutral" before you introduce a movement or exercise and you can maintain that position throughout that movement or exercise you will not stress or overload your spinal discs or your facet joints or pelvic joints worsen your condition. What happens is that most individuals with back pain lack abdominal strength and intrinsic muscle support and strength to maintain that "neutral position" during various movements. The second you lose the muscular and positional control over "neutral" you are now capable of overstressing the ligaments, joints and disc and thereby creating an opportunity to experience increased pain.

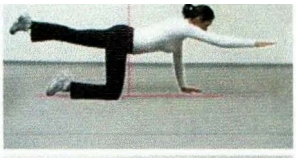
MOVEMENTS THAT CAN CAUSE BACK PAIN:

Lets now use the basic principles of "neutral positioning" to learn how the simplest of exercises may or may not cause back pain depending on your ability to control "spinal neutral". Take for example the straight leg movement noted to the right. Typically this is not a movement that we would allow unless you have progressed and had sufficient abdominal strength to handle the leverage that the weight of your leg has on your lower back. In order to progress to being able to do this simple straight leg raise maneuver you would typically be requested to first press your back against the floor, tilt the pelvis, contract the abdominal muscles and put your spine into a supine "neutral position".



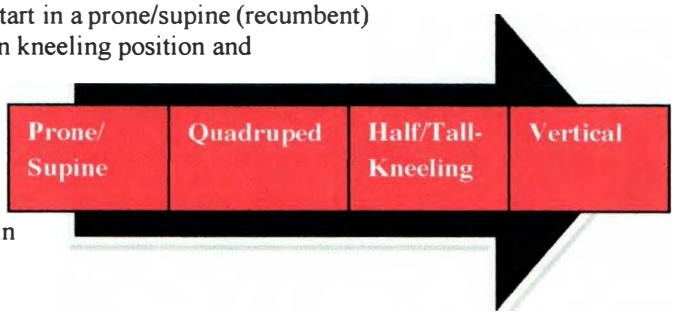
Following this the physical therapist or doctor would place their hand and fingertips behind your back, monitoring whether or not you could maintain pressure against the practitioners finger as you simply raised your heel off the ground 1 or 2 inches with both knees bent as in the position on the left. If you could not maintain a neutral position where you are unable completely control stability of the lumbar spine in this position you would never be allowed to progress to a straight leg raise maneuver. We would then begin practicing maintaining a neutral position before you could ever progress to even elevating your leg in a bent knee position also as shown on the left. So you can see that the straight leg raise maneuver would technically be an advanced movement that he would have not been allowed to do unless you had worked your way up to a point where your abdominal muscles were strengthened and you had practiced and mastered the method of maintaining "spinal neutral" by co-contraction of the muscles of your abdomen and spine. So your initial regimen may start with both knees flexed and lifting just the heel off the ground and then progressing to possibly a straight leg position later. As you progress through this movement and exercise you would then be placed in a position with the knees flexed and hips flexed in the arms out straight as shown to the left. We call this position the "dead bug". An individual performing these movements would be monitored by the therapist to determine whether or not they could maintain a neutral position when performing the simple movements. This movement would be progressed to simultaneously moving the arm overhead with one knee up and then switching to the other leg and the other arm. The complexity of the movements would be progressed only when the patient's ability to

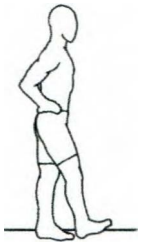
maintain neutral position is demonstrated. The movement noted on the right would be considered a very advanced movement and would only be performed if an individual demonstrated the ability to control the spinal neutral position. This movement may seem rather simple but actually create significant stress on the spine. I had a patient who underwent a spinal surgery with excellent outcome and was sent to a physical therapist who prescribed this very straight leg movement as discussed as an initial starting exercise which caused a severe flareup of pain that she never recovered from and to this date remains in chronic pain.



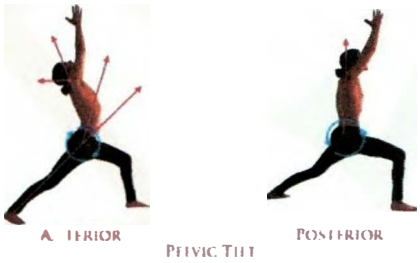
Notice the position in a hands and knees position. Notice the individual keeps her pelvis in neutral position and as she elevates her arm and her leg maintains cocontraction and abdominal muscles and spinal neutral position. This movement would be only advanced by demonstrating first your ability to control the neutral position with movement of the legs first and then advanced with simultaneous movement of the arms and legs only when the individual is capable of controlling movement of the arms and legs with control of the neutral position.

Hopefully by now you are beginning to get the picture. The patient will be typically started in a face up (supine) position flat on the floor where all other factors can be controlled. Only when the patient is able to demonstrate and maintain neutral position with simple movements that place little stress and mechanical leverage on the spine will the patient be allowed to progress to more difficult tasks. Your exercise progression will start in a prone/supine (recumbent) position and progress to a quadruped position and then kneeling position and eventually you will allowed to become vertical when doing exercises. Your exercises would progress as you have gain the appropriate control and skill necessary to progress to the next movement. You are then held accountable for controlling your own symptoms and learning the skills necessary to maintain symptom control and at the same time progressing through the program.





Another example of neutral spine progression would be starting in a standing or vertical position. Your therapist would teach the patient how to position your spine and pelvis into the "spinal neutral position". You may be requested to place your hands over your waist with your thumbs on either side of your spine monitoring your muscles. You would be requested to step forward with 1 foot lifting the foot as if to take a step. You would simultaneously tense the transversus abdominis muscles of your abdomen and tighten the small intrinsic muscles of your spine monitoring this as you begin to move your leg. As you monitor these muscles "kicking in" as you initiate the movement to control your neutral spine position only then would you progress. It is only through the control of these isometric contractions of small muscles of your spine such as the multifidi muscles discussed previously and the abdominal muscles that you are able to maintain spinal neutral in all vertical movements and positioning. If you were requested to eventually progress to a lunge position and simultaneously elevate your arms you would be taught how to control this movement and neutral position. Notice the proper position in the picture to the right and the improper position noted in the picture on the left.



You would not be asked to go limp on a treadmill for 15 or 20 minutes and perform uncontrolled movements that could only result in aggravation of your back pain.

WHY DID YOU BECOME WORSE WHEN YOU PARTICIPATED IN PHYSICAL THERAPY?

The reason you flaired when doing exercises in therapy is you were prescribed either the incorrect movement or a movement you were not ready to perform without first learning critical skills as we have discussed. You continue to return back appointment after appointment performing the same incorrect movements and not progressing these movements in the proper way. You were not taught the proper skills and techniques to control your symptoms while you begin your exercise program.
Utilizing the proper progression and techniques allows anyone with back pain to participate in exercise and progress thorugh that exercise program. Most importantly this whole concept is supposed to be taught to you and allow you do develop the skills to be **INDPENDENT** of the therapist!

Lets use one more example. Take the simple movement noted to the right where the individual is pulling their knees to the chest. This is another common exercise or stretch taught to patients. This movement may be the worst movement that you can do depending on your diagnosis. There are certain types of disc disorders that these movements will make worse if you do not have an understanding of what you are doing. Ill explain that in the article entitled the "internal disc derangement".

In this syndrome repeated flexion makes the condition worse. In addition to understanding spinal neutral and the concepts of "neutral spine stabilization" there are countless other factors that are at play. It is critically important to have an appropriate workup and diagnosis before starting the program. For example we always perform an examination according to Mckenzie protocols as a part of the normal workup of all of our patients. This is also described in the previously mentioned article. We never place a patient who is demonstrating "centralization" on spinal extension on knee to chest movements during the exercise process when the patient's disc condition favors an extension position. Again this is described in the article the internal disc derangement. In addition there are specific manipulative and manual therapy techniques that can be employed initially that also may be important in implementing as a part of your comprehensive management. Too much emphasis on manual and manipulative therapy without simultaneously learning the skills described also is a common problem made by therapy practitioners as well.

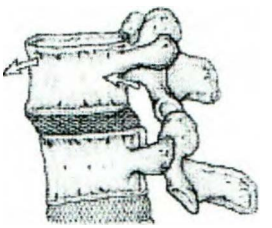
CAN SPINE STABILIZATION TRAINING STABILIZE MY "SPINAL INSTABILITY"?

Now that we have discussed this topic and have a better understanding of the basic rehabilitation principles utilized in spinal instability we can now more intelligently discuss even more critically important concepts about the treatment of spinal instability. Remember we started this discussion with the concepts of spinal degeneration, attenuation of ligaments, degenerative changes in the disc and the pathology involved in chronic low back pain. What we did not discuss is which **patient would benefit** from simply spine stabilization training and which ones would require more advanced integrative interventional orthopedics. As we discussed the phase of degeneration involving spinal instability is extremely complex and far too extensive a discussion for this article. However with progressive changes in the disc, laxity of the ligamentous structures and capsules of the facet joints, loss of nuclear substance within the disc, coalescence of tears in the disc and the resultant abnormal or increased sheer and torsional movements, chronic pain can ensue. This can cause persistent irritation of the annulus of the disc and the facet joints. The support of ligaments become painful and irritated thereby setting off increased muscle tension as a protective mechanism resulting in chronic myofascial or muscular pain as well. Instability leads to

progressive stenosis and therefore the spinal nerve roots eventually can be compromised secondary to chronic compression which can set off complex neurophysiologic changes.

I have often divided spinal instability into 3 separate categories:

1. Mild instability
2. Moderate instability
3. Severe instability



The patient with spinal dysfunction and mild instability may respond simply to manual therapy and stabilization exercise. If spinal instability progresses depending on the degree of instability and the type of pathology that is manifested simple neutral spine stabilization exercise by be inadequate. Although patients with more advanced spinal instability can safely participate in neutral spine stabilization and improve strength, conditioning, and function the one thing they cannot achieve is control of pain. We find in patients with more advanced degenerative changes, and spinal instability patients find it frustrating participating in the stabilization exercise process because of the pain. It is critical for advanced spine physicians to become involved that are capable of being able to sort out the exact pathology and diagnosis and determine where exactly your pain is coming from. If your pain stems from sacroiliac instability for example then there are techniques to regenerate ligamentous tissue and stabilize the sacroiliac joint. If your instability and pain stems from predominantly the facet joints then there are targeted therapies that can be performed to improve stability. Once the instability is addressed by advanced interventional orthopedic procedures the patient can comfortably participate in stabilization training and exercise. I have addressed that topic in detail in the article on this website entitled "regenerative injection therapy and pain medicine". Most pain physicians perform radiofrequency neural lysis to destroy the nerves that innervate the facet joints. This only results in a period of temporary symptomatic relief and when the facet joint undergo reinnervation the symptoms return. It is only a matter of time before the reinnervation patterns become so complex that these destructive procedures are no longer effective.

The degenerative orthopedic approach to spinal conditions and other orthopedic conditions makes more academic and scientific sense then to perform nerve distructive procedures which I was taught to do in fellowship training. Although this concept is beginning to become popular if does not represent the majority of practitioners in spine medicine. To date is much more common to receive steroid injections and neural destructive procedures. Simple regenerative injection therapies previously described as collagen proliferation therapies in many of these patients is sufficient to stabilize chronic joint dysfunction, improve excessive translational and excess movements and improve or resolve pain. At that point the patient can then transition into and tolerate neutral spine stabilization training and progress that training into a full comprehensive exercise program. This provides a means to improving strength, conditioning, flexibility and function.

REFERENCES:

1. Kirkaldy-Willis, WH. Ed. managing low back pain. New York: Churchill Livingston, 1983.
2. Niosi C, Oxland T. Degenerative mechanics of the lumbar spine. *The Spine Journal* 2004;4:202S-208S.
3. White AA, MM. P. Clinical biomechanics of the spine. 2nd ed. Philadelphia: Lippincott, 1990.
4. JA. B. Aging and degeneration of the human intervertebral disc. Spine 1995;20(11):1307–14.
5. Moore R, Crotti T, Osti O, Fraser R, Vernon-Roberts B. Osteoarthrosis of the facet joints resulting from anular rim lesions in sheep lumbar discs. Spine 1999;24(6):519–25.

6. Butler D, Trafimow J, Andersson G, McNeill T, Huckman M. Discs generate before facets. Spine 1990;15(2):111–3.