Dynamic Chiropractic – January 1, 2010, Vol. 28, Issue 01

Steps to Successful Rehabilitation, Part 1: Understanding Soft-Tissue

By K. Jeffrey Miller, DC, DABCO

Before employing rehabilitative exercise in the office or counseling a patient on rehabilitative exercises to be performed at home, you must have a basic understanding of soft-tissue injuries. This understanding will help in all aspects of rehabilitation including stretching, aerobic exercise and strength training.

The key lies in the understanding the four types of sprains and strains and the three phases of soft-tissue healing. Sprains are injuries (tears) of ligaments. Strains are injuries (tears) of muscles and/or their tendons. Both develop from macrotrauma and/or microtrauma to the tissues. Macrotrauma is a more sudden and violent type of injury that results in significant tearing of tissues. Microtrauma results in small tears over a period of time. Either way, the healing process for the tissues will be the same.

Sprain and Strain Injuries: The Grading System

- Grade I: Consistent with tearing of *less than 50 percent* if the tissue fibers. This is the same for ligaments and/or tendons/muscles.
- Grade II: Consistent with tearing of *more than 50 percent* of the of the ligament, tendon and muscle tissue fibers.
- Grade III: A *complete* tear*;* the muscle or ligament has been separated into two sections.
- Grade IV: Also a complete tear, but with the *separation occurring at the muscle's or ligament's attachment to the bone*.

  This results in the tissue detaching a small fragment or chip of bone. This is termed an *avulsion fracture*.

It must be stated here that grades three and four create instability and should not be subject to adjustment. These injuries are typically surgical cases. Chiropractors deal primarily with type I and type II sprains and

strains.

The soft-tissue-injury grading system based on numbers has been in use for a few decades. Prior to its use, the terms *mild, moderate* and *severe* were used. Mild equaled a grade I sprain or strain. Moderate equaled a grade II sprain or strain. Severe equaled a grade III sprain or strain.

However, this original system fell into disfavor as it was often confused with the system uses for rating a patient's degree of pain as mild, moderate or severe. If the doctor found physical evidence of a moderate sprain and/or strain, and the patient rated their pain a severe, an immediate conflict occurred. Third parties often choose to interpret the patient's "severe" as a complete rupture. To avoid this situation, use grades I through IV for your assessment of tissue damage and a 0-10 pain scale to rate the patient's pain.

While the grades for sprains and strains are usually described as individual entities, they can occur in combination. More than one grade can be present in a joint or series of joints. Varying degrees of sprain and strain can occur in the cervical spine following cervical acceleration-deceleration injuries.

With this in mind, consider the insurance industry's diagnostic coding system. Using the cervical spine as an example, there is only one code for cervical sprain/strain (847.0). The code does not differentiate between ligamentous and muscular tissues, or between the various grades of injury or the number of possible combinations for the injured area. This explains to a degree why some doctors see a patient for this diagnosis for only a few visits while others see a patient for an extended period of time for the same diagnosis.

A grade I strain is much easier to treat and resolve than a grade II strain.

To an insurance carrier, the doctors are treating the same diagnosis regardless of their. The carrier will then show preference to the doctor with the lowest utilization and cost.

The Three Phases of Soft-Tissue Healing

Phase One: The Inflammatory Phase. Inflammation is the highlight of the first phase, which lasts 48-72 hours. Torn tissues leak blood and exudates into the area. Swelling begins and the blood and exudates irritate surrounding tissues, causing pain. The key to controlling phase one is controlling the inflammation. Rest, Ice, Compression and Elevation (RICE) are standard procedures just after injuries. Therapy modalities aimed at reducing swelling and pain are helpful. Early movement with minimal weight-bearing and stress

are recommended.

Phase Two: The Repair Phase. After the initial 48-72 hours, the repair phase begins and lasts six or more weeks. During this period of time, care is predominately passive and the tissues begin to repair and regain tensile (functional) strength. Increases in exercise, stretching, and aerobic and resistance activity are all gradually employed. Once the tissues have achieved the strength needed to stabilize the area and resist further tearing, the remodeling phase begins. Activity usually increases significantly during the phase. Care is a mixture of passive and active activities during the repair stage.

Phase Three: The Remodeling Phase. Remodeling occurs as the body redirects the healing fibers attempting to increase the strength and orient the tissue fibers along the lines of greatest stress. This is the longest of the three phases. Beginning at six weeks, the process can continue for up to two years. This may seem like a very long time, but it is a necessary process.

To provide an example of this time frame, think about a surgical scar you or someone you know had or currently has. The scar remains red for a considerable period of time after surgery. It eventually fades from red to skin color. The red color seen after surgery is the result of capillary vessels in the scar that are supplying the nutrients for healing and remodeling the scar. Once remodeling is complete, the capillaries are absorbed and the red color (blood) will disappear.

Care is predominately active during the remodeling phase. It is obvious the soft-tissue healing is not a quick process. Additionally, the process is not perfect. The scars formed during soft-tissue healing are not as functional as the injured tissues. Scars are fibrous, inflexible and weaker than the original tissue. This leaves the area of the injury(s) vulnerable to future injury. Appropriate rehabilitation helps reduce the factors, but it is not a complete or perfect cure. The key is to start treatment early and provide proper care during each phase in order to achieve the best results.

Resources

- Baechle T, Earle R, editors. *Essentials of Strength and Conditioning, Second Edition*. Human Kinetics, 2000.
- Cotton R, Ekeroth C. *Personal Trainer Manual, The Resource for Fitness Professionals*. American Council on Exercise, 1997.
- Deuster P. *The Navy SEAL Physical Fitness Guide*. Department of Military and Emergency Medicine,

Uniformed Services University of the Health Sciences, F. Edward Hebert School of Medicine, August 1997.

- Siff M. *Facts and Fallacies of Fitness, Fourth Edition*. Self-published, 2000.

Click here for more information about K. Jeffrey Miller, DC, DABCO.

■

Dynamic Chiropractic – February 12, 2010, Vol. 28, Issue 04

Steps to Successful Rehabilitation, Part 2

Warming Up, Stretching and Cooling Down

By K. Jeffrey Miller, DC, DABCO

This article is the second in a series on successful rehabilitation and focuses on three fitness activities that are often minimized or completely overlooked: warming up, stretching and cooling down. While they are often considered important for working out or training, they are also vital to the overall rehabilitation process.

Recovering patients and even elite athletes often skip these activities and go straight to their primary workout. The activities are slow, tedious, and they do prolong an exercise session. For those who are already less than thrilled to be exercising, warming up, stretching and cooling down are not popular. However, the importance of these activities cannot be overlooked. They have specific functions and aid in the success of any exercise/rehabilitation program, regardless of the goals and intensity of the program.

Warming Up

There are two types of warm-ups: general and specific. General warm-up is for the entire body and is not the focus of a particular event or sport. In patient rehabilitation, general warm-up is preferred and is typically achieved by walking, jogging slowly or riding a stationary bicycle. Five to 10 minutes of one of these activities readies the patient/athlete for exercise by slowly increasing heart rate, blood flow, muscle temperature, respiration rate, perspiration and the viscosity of joint fluid.

Specific warm-up uses the movements that will be used in the exercise or sport. An example of specific warm-ups can be seen prior to most baseball games. The majority of running in baseball involves short sprints between bases or to field a ball. Players can be seen running short sprints prior to a game, usually at a slower speed than they would during the game. Swinging a bat in the on-deck circle prior to an at-bat is another example of a specific warm-up exercise. Players are using the muscles they will use in competition,

but in slower and less forceful ways.

As stated above, general warm-up is preferred for rehabilitation of the average patient. Doctors working with a more accomplished athlete will probably want to employ both methods of warm-up to maximize results.

Stretching

Stretching of muscles, tendons and joints is important. Many claim it helps prevent injury or re-injury. Some claim there is no conclusive proof of this; however, this author takes the side that it helps and certainly cannot hurt if performed correctly. Stretching can be performed prior to warming up, after warming up or during cooldown. It can also be performed independently of any exercise session. Once again taking sides, this author prefers stretching after warming up.

Stretching can also be general or specific. General is for full-body benefit, while specific is for the body regions used in the specific activity or sport. Regardless of the type of stretching employed, there are a few rules that should always be followed to obtain maximum benefit. These rules should be provided to each rehab patient:

- Perform each stretch slowly without bouncing or jerking movements.
- Perform each stretch 3-5 times.
- Hold each stretch 10-20 seconds before releasing.
- The time required to stretch is dependent upon the number of stretching exercises you are instructed to perform.
- Stretch to the point at which a pulling sensation is experienced. Do not push the stretch to the point that burning, tearing or painful sensations are felt.
- Perform only the stretches you are instructed to perform.
- If stretching is the only activity recommended, perform the stretches at least three times per week.
- Do not move on to sport- or activity-specific stretches until instructed to do so.
- If you are unsure of any of the instructions provided, ask the doctor *before* proceeding.

Cooling Down

Cooling down is obviously the opposite of warming up. Slowing activity levels down to the intensity of the warm-up period provides several benefits. Heart rate and blood pressure will slowly return to normal. Continued muscle contraction enhances venous return of blood to the heart. These factors help prevent light-headedness and dizziness after exercise.

Continued circulation as activity decreases also helps remove lactic acid that accumulated during exercise. The body can disperse heat generated during the exercise session and respiration can return to normal.

A working knowledge of warming up, stretching and cooling down is essential for both you and your patient before proceeding to aerobic and/or resistance exercise, which will be discussed in parts 3 and 4 of this series.

Resources

- Baechle T, Earle R. *Essentials of Strength and Conditioning, Second Edition*. Human Kinetics, 2000.
- Cotton R, Ekeroth C. *Personal Trainer Manual: The Resource for Fitness Professionals*. American Council on Exercise, 1997.
- Deuster P. *The Navy SEAL Physical Fitness Guide.* Department of Military and Emergency Medicine, Uniformed Services University of the Health Sciences F. Edward Hebert School of Medicine, August 1997.
- Siff M. *Facts and Fallacies of Fitness,4th Edition*. Self published, 2000.

This is part 2 of a four-part series on rehabilitation. Part 1 appeared in the Jan. 1 issue.

Click here for more information about K. Jeffrey Miller, DC, DABCO.

■

Dynamic Chiropractic – March 26, 2010, Vol. 28, Issue 07

Steps to Successful Rehabilitation, Part 3

Aerobic Exercise

By K. Jeffrey Miller, DC, DABCO

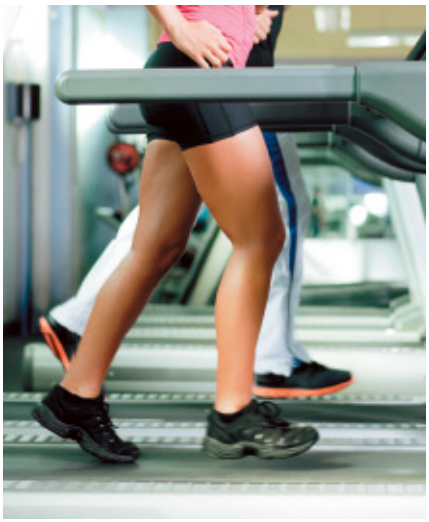
If a doctor is already using aerobic rehabilitation exercise in practice or is planning to, there are specific procedures that must be followed in order to develop the most productive program for any patient. These procedures also hold true when developing training programs for healthy patients. Four steps in particular are necessary when formulating a plan for aerobic exercise for the heart and lungs. Following these steps in order will assure that all bases are covered with each care plan.

1. Exercise Mode

The type of aerobic exercise employed is the mode of exercise. Walking, running, riding a stationary or road bike, elliptical trainer, or stair-step machine, swimming, and performing many other exercises are possibilities. The choice of which to use is based on what equipment is available, the expense involved, the physical condition of the patient and the patient's commitment to participation.

The easiest form of aerobic exercise is walking. It does not require a membership and cost is limited to a good pair of shoes and flexible, custom-made orthotics for proper support. It can be performed indoors or out and does not require a great deal of athletic ability. The benefits of walking are numerous. Weight reduction, improved heart and lung health, stress relief, improved bone density and lower rates of injury are among the attributes associated with walking for exercise.

2. Training Frequency



The number of times exercise is performed per week is the training frequency. The frequency may be low at first and build as the patient's health improves. As a general rule, three sessions per week is the minimum number needed to produce noticeable results. Frequency can increase up to seven sessions per week depending upon the intensity of exercise mode chosen.

3. Exercise Duration

The number of minutes performed and/or distance traveled during aerobic exercise is termed the *exercise duration*. Treadmills, stationary bikes and other machines allow the patient to track one or both of these factors. In the absence of a monitor to measure distance, time can be used as the benchmark, as measured by a watch. Duration should not fall below 10 minutes. Optimal time is 20 minutes or more.

4. Training Intensity

The amount of exertion or stress placed on the body is the training intensity. A patient may be performing all three of the above steps, but if they are not performing them with enough intensity, the patient will derive little benefit. For exercise to be beneficial, the intensity of the exercise must go beyond the intensity experienced during normal daily activities.

Many patients will make statements like, "I walk in the factory all day at work. I don't need to walk for exercise." While walking all day is better than sitting all day, it is *not* exercise if it is what the patient does every day. The walking may not be fast enough to evoke the physical response necessary for training and improving the body. The daily activities also likely involve many stops and starts that prevent the duration of the activity from being continuous enough to be beneficial. The intensity must stress the body above the patient's normal activities, but not to the point of detriment or injury.

Monitoring Training Intensity: As a general rule of thumb, if the patient is not sweating after 10 minutes of exercise, they are not achieving the minimal amount of intensity needed to improve health. On the opposite side of the coin, if the patient cannot carry on a conversation while exercising, then intensity is too high.

15-Pt. Borg Perceived Exertion Scale	Rating
No exertion at all	6
Extremely Light	7-8
Very Light	9-10
Light	11-12
Somewhat Hard	13-14
Hard (heavy)	15-16
Very Hard	17-18
Extremely Hard	19
Maximal Exertion	20

Heart rate is another good method for tracking intensity. To do this, subtract the patient's age from 220 and then multiply that number by the intensity selected for the patient. For example, the doctor who wishes to start a 50-year-old patient at 60 percent of maximum heart rate should subtract 50 from 220 = 170, and then multiply 170 by .60, obtaining a target heart rate of 102 beats per minute. The patient should monitor their heart rate during exercise to maintain the 102 level, being careful not to drop below or exceed this number.

Rating Perceived Exertion: The 15-point Borg scale (**see table**) is often used to rate perceived exertion. The scale is a little harder for patients to use. The doctor may wish to use the Borg scale for in-office assessment and have the patient use the methods listed above at home.

Exercise Velocity (Pace): Intensity can also be monitored by tracking the velocity (speed) at which the exercise is performed. Obviously the higher the velocity, the higher the intensity of the exercise. Velocity must be taken into consideration with the other methods of measurements of intensity.

Beginning a walking program is recommended early (within two weeks) after injury, especially spinal injury. This will help the healing process and speed recovery of the patient. Early professional care and developing an aerobic fitness base will aid in the transition to the next phase of rehabilitation, strength training, to be discussed in part 4 of this series.

Resources

- Baechle T, Earle R. *Essentials of Strength and Conditioning, Second Edition*. Human Kinetics, 2000.
- Cotton R, Ekeroth C. *Personal Trainer Manual: The Resource for Fitness Professionals*. American Council on Exercise, 1997.
- Deuster P. *The Navy SEAL Physical Fitness Guide.* Department of Military and Emergency Medicine, Uniformed Services University of the Health Sciences F. Edward Hebert School of Medicine, August 1997.
- Siff M. *Facts and Fallacies of Fitness,4th Edition*. Self published, 2000.

This is part 3 of a four-part series on rehabilitation. Part 1 appeared in the Jan. 1 issue; part 2 ran in the Feb. 12 issue.

Click here for more information about K. Jeffrey Miller, DC, DABCO.

■

Dynamic Chiropractic – April 22, 2010, Vol. 28, Issue 09

Steps to Successful Rehabilitation, Part 4

Develop a Resistance Exercise Program

By K. Jeffrey Miller, DC, DABCO

If you are already using resistance exercise in practice or are planning to, there are specific procedures that must be followed in order to develop the most productive program for any patient. These procedures also hold true when developing training programs for healthy patients. Once soft-tissue healing is significant enough for tissue to be a tensile strength and a foundation in aerobic training is underway, six steps are necessary when formulating a plan for resistance exercise. Following these steps in order will assure that all bases are covered with each exercise plan.

1. Needs Analysis

Determining the muscles that must be stretched and those that must be strengthened is a good first step. Evaluating the ratio between aerobic and resistive exercise is a good second step. In most cases resistive exercise should follow aerobic training. The effects on the injury or injuries being rehabbed must be considered to avoid re-injury and setbacks.

2. Exercise Selection

Full-body resistance training is good for almost all patients. A mixture of core, multi-joint and assistance exercises must be considered. Exercises that are specific to the injured area or the sport in which the patient is participating are also important for improving flexibility and strength in the injured area(s). This is a key to returning the patient to health and preventing re-injury.

- *Core exercises* strengthen the chest, shoulders, back, hips and thighs. Examples are crunches, push-ups and rowing exercises.
- *Multi-joint exercises* involve movement of multiple joints and muscle groups. Examples include squats and shoulder presses.

- *Assistance exercises* involve a single joint and the primary muscle or muscles that move the joint. Doing biceps curls by moving the elbow joint only is a good example.

Core exercises are important to everyone, but especially patients with spinal conditions. Multi-joint exercises are less specific and generally work multiple areas and involve heavier resistance. Assistance exercises are more specific, placing the majority of work on a single muscle.

The type of resistance selected is also important. Free weights and machines are common but less practical than rubber tubing equipment. Look for equipment that requires minimal space and offers options for both home and office use. The use of rubber tubing at home and in the office helps the patient make the transition to at-home exercising. Also, the at-home exercises are the same as or similar to those performed in the office.

3. Exercise Frequency

How often the patient will exercise is a key to effectiveness and the prevention of re-injury. Too little exercise (low frequency) will not produce the results desired, and too much exercise (high frequency) may result in re-injury. Initially the frequency should be timed to coincide with office visits. This will make the transition to exercise frequencies specifically for the home or outside gym facilities.

4. Exercise Order

This is the sequence in which exercises should be performed during each session. Warm-up and aerobic exercises should be used to prepare for resistance training. In resistance training, core and multi-joint exercises are generally performed first, followed by assistance exercises. When a choice between lower body and upper body exercises is necessary, the lower body should be exercised first.

5. Exercise Load and Repetitions

The *load* refers to the amount of resistance used during the exercise. *Repetition* refers to how many times the resistance will be used during a set or grouping. The load for a patient rehabbing an injury should be minimal initially. The key here is to have the patient become familiar with the exercises in the program. This helps develop muscle coordination and the movements involved.

Resistance can be added once the patient is familiar with the exercise program. Even then the resistance should increase slowly. One of the primary causes of injury during resistance training is advancing the exercise load too rapidly.

A general rule for repetitions is fewer repetitions with higher resistance for muscle building and higher repetitions with lighter resistance for muscle toning. In rehabilitation, toning is the initial focus.

When using rubber tubing, for resistance, the patient should use the smallest diameter tubing until the exercise routine is familiar. Stronger tubing can then be utilized as the patient gains strength. Thinner and longer tubing provides lower resistance. Thicker, shorter tubing provides greater resistance. Again, start light. Heavy resistance early may cause re-injury.

6. Rest Periods

Rest must be factored into every rehabilitation and exercise program. This is closely related to exercise frequency and is a key factor in avoiding over-exercising, re-injury or developing new injuries. Without rest, the patient will get too much of a good thing.

Resistance exercises help in soft-tissue and scar remodeling by helping reorient the scar tissue along the lines of the original tissue to help achieve the highest degree of healing. It is vital and effective as long as soft-tissue healing is on the right path and aerobic exercise has assisted in developing a basis for the patient to continue to the point that resistance exercise is possible.

Resources

- Baechle T, Earle R. *Essentials of Strength and Conditioning, Second Edition*. Human Kinetics, 2000.
- Cotton R, Ekeroth C. *Personal Trainer Manual: The Resource for Fitness Professionals*. American Council on Exercise, 1997.
- Deuster P. *The Navy SEAL Physical Fitness Guide.* Department of Military and Emergency Medicine, Uniformed Services University of the Health Sciences F. Edward Hebert School of Medicine, August 1997.
- Siff M. *Facts and Fallacies of Fitness,4th Edition*. Self published, 2000.

Part 1 of this four-part series appeared in the Jan. 1 issue. Part 2 ran in the Feb. 12 issue, while part 3 ran in the March 26 issue.

Click here for more information about K. Jeffrey Miller, DC, DABCO.

■