



Dynamic Chiropractic – October 11, 1991, Vol. 09, Issue 21

Rehabilitation of Soft Tissue Injuries in the 1990s

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The days of prolonged immobilization are a part of the past for the treatment of soft tissue injuries. The increased attention toward sports medicine throughout the late 1970s and 1980s has led to research and many clinical studies that will outline the course of rehabilitation throughout the years to come. A review of the current literature on acute soft tissue injuries classifies different types of soft tissue lesions as well various phases of healing.¹ Current literature redefines the aims and objectives of rehabilitation pointing out the many benefits of the use of modalities, early mobilization, and the importance of a full rehabilitation program.

Over the past two decades, soft tissue injuries have hit the spotlight. Almost all traumatic injuries, automobile accidents, athletic or other injuries result in some degree of soft tissue damage. It's now recognized that many soft tissue injuries result in a degree of permanent impairment and leave their host with some permanent pain, restrictions, and loss of function.² To combat the debilitating (aftermath) of soft tissue injury, new technology and rehabilitation protocols have been developed.

Etiology of Soft Tissue Injuries, Direct and Indirect Trauma

Many soft tissue injuries come from direct trauma such as being struck by a moving object or a fall; other injuries may be classified as indirect trauma and result from overloading or chronic overuse, thus giving us the classification of direct and indirect etiology.³ Indirect can be further divided into three sub-classes: acute -- which occurs from sudden overloading as seen in many lifting injuries; chronic or overuse -- which are often seen in many assembly line or factory workers who must perform repetitive movements hundreds of times daily; acute on chronic -- occurs when a chronic conditions hits an acute phase. This third sub-class is also very common in the work environment where the same job is performed day in and day out. By first defining the etiology of a condition, we are on the proper course toward treatment and the prevention of further injury.

Phases of Healing -- Phase I

The current literature describes three main phases of soft tissue healing. An initial reaction phase which lasts up to 72 hours post-injury.⁴ This phase is also referred to as the acute inflammation phase.³ The reaction phase displays with the classic signs of inflammation with pain, swelling, redness and warmth. In the cases of indirect etiology, these classic signs may not be readily visible but are proceeding at the microscopic level.⁵

The long-used application of cryotherapy (ice) is still supported by numerous studies as very effective treatment in this initial phase.^{6,7,8,9} Cryotherapy slows the inflammatory process as well as provides an analgesic effect. Ultrasound may also be used to decrease swelling in this inflammatory phase, but must be used for short periods to prevent hyperemia.¹⁰ Transcutaneous nerve stimulation (TNS) and electric muscle stimulation (EMS) have also been shown to be effective.

The use of continuous passive motion (CPM) has been shown to clear hemoarthrosis (blood present in the synovial joints post-trauma) during the initial reaction phase. In the 24 hours following trauma, the synovial fluid in joints treated with CPM displayed less blood than immobilized joints. At 48 hours the joints treated by CPM demonstrated the synovial fluid was clear where as the immobilized joint remained grossly bloody.¹¹

The use of manipulation can also be employed in the reaction phase and is suggested in the areas of fixation that have resulted from the injury. This will expedite the removal of hemoarthrosis, reduce spasms, edema and pain as well as reduce nerve root irritation when present.¹² Cyriax states, "When free mobility was encouraged from the onset, the fibers in the scar were arranged lengthwise as in a normal ligament. Gentle passive movements do not detach fibrils from their proper formation at the healing breach, but prevent their continued adherence at abnormal sites."¹³

In the initial reaction phase, the use of CPM and manipulations (which are both mobilization techniques) must be used in a controlled protective manner to prevent any further damage to the healing ligaments.¹¹

The initial reaction phase can be treated effectively using classic cryotherapy, specific modalities, as well as a controlled program of CPM and manipulations.

Phase of Healing -- Phases II and III

The second stage of healing, the repair phase, may last from 48 up to 6 weeks. This phase is characterized by the production and laying down of new collagen.⁴ During this phase, the collagen is not fully oriented in the direction of tensile strength.⁵

The third phase, the remodeling phase, which lasts from 3 weeks to 12 months or more, is the phase in which the collagen is remodeled and along with with phase II determines the functional capabilities of the soft tissue after the healing process is completed.¹⁴ True rehabilitation must focus on maintaining these functional capabilities. Oakes³ describes the aims of rehabilitation as regaining pain-free movement with full strength, power and range of motion, thus describing the functional capabilities of the soft tissue.

To regain the functional capabilities, stresses of function must be put on the healing tissue. As described by Roy:¹⁵ "If a limb is completely immobilized during the recovery process, the tissues may emerge fully healed but poorly adapted functionally with little chance for change, particularly if the immobilization has been prolonged." Mobilization techniques must take place throughout the repair and remodeling phases to insure proper tissue adaptation. Several benefits of mobilization have been defined which include increased strength^{3,16} and flexibility of healed tissue, less scar formation and adhesions,¹⁴ increased cartilage nutrition,¹⁷ and lesser incidence of recurrence of injury.¹⁸

Rehabilitation Protocol

Rehabilitation protocol following soft tissue injury must include mobilization techniques to insure good functional adaptation. A program combining manipulations, the use of modalities, mobilization technique, and a strengthening program will insure optimal rehabilitation.

Manipulations and modalities should be used during all three phases of healing to limit fixations, control pain and spasms as well as maintain neurologic integrity. Mobilization should be carried out within the limits of pain on the patient, starting with controlled passive motion. Controlled passive motion should be employed until a maximum range of motion is reached. At this point, active assistive motion should be employed. As the injury heals and the tissue adapts, the patient can be graduated to active resistive motion. Active resistive motion should be followed by a strengthening program of kinetic resistive exercise. This will insure a return to maximum strength for the patient. Keep in mind all rehabilitation should be performed within the patient's limits of pain and periodic re-evaluation and testing such as muscle testing

and surface EMG should be performed to evaluate the patient's progress. Also remember that the final remodeling phase can last over a year post injury; rehabilitation should be directed accordingly.

By following this rehabilitation protocol and progression, a return to maximum functional capabilities can be insured, returning the patient to maximum pain free range of motion and strength.

Rehabilitation in the 1990's focuses on regaining function. After all, function does determine what we can do with our lives.

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