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NATURE'S SOLUTION: PROLOTHERAPY

By Thomas H. Ravin MD

In the last 10 years, there has been an explosion in our understanding of how torn muscles, broken bones, and stretched ligaments heal¹. If the injuries to the ligaments, bones and muscles are not too severe, they return to an uninjured state by the processes of inflammation and wound healing. The natural healing process is replicated in a treatment therapy known as prolotherapy. To understand how prolotherapy works, a short review of the healing process is helpful.

Natural Healing

The healing process has several distinct phases: the acute inflammation phase, the granulation phase, and the remodeling phase. Each phase is dependent upon the previous phase for initiation of the next step, and each has its own cellular and chemical processes and changes².

The acute inflammation phase begins at the time of the injury, when the ligament and the adjacent cells are broken open and their contents spill at the wound site. The ligamentous, cellular debris and a number of chemicals in the fluid or plasma around the broken-open cells attract an influx of leukocytes. Many of the chemicals released during this phase of inflammation will be broken down into messenger or chemical signals that tell cells to become active or inactive. Some of these chemicals are prostaglandins and cause pain. The leukocytes also secrete hormones which attract macrophages.

The arrival of the macrophages at the injury site signals the beginning of the next phase in the healing process - the granulation phase. The macrophages begin to "clean up" the area through a combination of digesting the broken-down cell parts and secreting enzymes that break down many of the damaged ligament molecules. The macrophages release a number of hormones that will bring more cells to the injury site³. The macrophages also release chemicals (growth factors) that stimulate the growth of new blood vessels, intercellular matrices, and fibroblasts, which are responsible for the actual repairing of the sprained ligament. The combination of these

cells and the new blood vessels being formed causes the thickness and the fullness that can be felt at the injury site. The granulation phase is present for 10 days to two weeks. The fibroblasts are stimulated to make new ligaments by chemicals and hormones released by the macrophages. When the fibroblasts are "turned on" they rapidly manufacture the basic building blocks of ligaments - collagen. This cellular proliferation is not a systemic event and is strictly limited to the region of the injury.

During the third phase of healing, called "wound contraction" the new collagen deposited at the injury site is organized into new ligament tissue. As the collagen fibers wind around each other, they begin to contract, and the molecules become shorter and tighter; water is squeezed out, increasing the shrinkage. As the millions of collagen fibers shrink, the ends of the ligament are slowly pulled together, and the laxity is decreased. During wound contraction, the cells originally present to "clean up" the wound are recalled by the body. All that is left at the injury site are the fibroblasts that have been "turned on" and are secreting collagen and other substances that will be used to increase the integrity of the injury site. This third phase of inflammation lasts for a number of weeks, and the "new ligament" tissue will not reach its maximum strength for several months.

Prolotherapy

The most commonly used proliferant consists of 50% local anesthetic (1% procaine to numb the

skin), 45% P2G (a combination of 25% glucose, 25% glycerin, and 2% phenol) and 5% sodium morrhuate. Over the last 30 years, this proliferant combination has proven to be safe and creates reliable results.

Large ligaments, like the iliolumbar, require 5-6 cc's of the proliferant agent. The lumbosacral ligaments can use up to 25 cc's. Intensive proliferative treatment usually requires three to five treatment sessions, treating the ligaments at two to four week intervals. The wounds created by prolotherapy heal like any other wounds, so the 2^{1/2}-3 week intervals between treatments allow both the patients and the doctor to accurately evaluate progress.

After the injection, patients should be encouraged to be active and move the injured area. The movement will actually enhance the healing of the ligamentous injury.

Ligament injuries are the most common minor traumas experienced by humans in the modern industrial world and represent a major source of impaired function and chronic pain complaints. This may be the result of the increased speed of our cars and our active and often aggressive leisure activities. Prolotherapy is the only non-surgical treatment for ligamentous laxity currently available. It is safe if the practitioner understands the anatomy, biomechanics, and biochemistry of the body and as long as the proliferant is injected only where the ligament attaches to the bone. It is at this "fibroosseous" junction that most lumbosacral ligament injuries occur. This is the safest area to inject, because when the needle is against the bone, it is not at risk of injuring a nerve, artery, or other vital structure. Needle against the bone is the number one rule of prolotherapy for this reason.

The treatment of sacroiliac joint and low back pain with prolotherapy is now more than 50 years old. The techniques have remained almost unchanged since first described by George S. Hackett, MD, in the late 1930s. This useful therapeutic method has not achieved its rightful place in back pain and other ligament treatment paradigms for a number of reasons. One is that ligaments still have not received the respect they deserve as pain generators in the low back. Two

is that the scientific principles that explain why it works have only recently been elucidated. The third reason is that prolotherapy doesn't generate as much money for hospitals and drug companies as surgery does. What are needed now to win greater acceptance by the medical community are double-blind studies that document its safety and efficacy so that it may gain its rightful place in the array of treatment options for ligamentous injuries.

Prolotherapy is a great, but underutilized, treatment modality.

Editor's Note: Because of the controversial nature of prolotherapy, we decided to seek an expert opinion about its validity as a treatment option. We interviewed Vert Mooney, MD, a professor of orthopaedic surgery and the University of Southern California, San Diego. Here's what he had to say:

"Prolotherapy does what it is purported to do. After having been asked to observe a clinical trial in which it was tested and seeing its positive results firsthand, I have incorporated prolotherapy into my medical practice. However, I think prolotherapy remains on the fringe of medicine for a number of reasons. First, it is not taught in medical school, which makes many physicians unaware of it and its potential. Also, because proliferant is injected into the soft tissue area, which in itself is hard to define, the results are hard to document quantitatively with MRI's and other scanning equipment. Physicians have to rely on the visible results of patients regaining their functionality and no longer being in pain."

Dr. Mooney was the observer of a study of prolotherapy conducted in 1992 in Santa Barbara, CA of 95 people with chronic back and pelvic pain. Half of the group was injected with xylocaine for six consecutive weeks. The other half was injected with a proliferant that consisted of hypertonic dextrose, glycerin, and phenol. After six months, participants' progress was assessed. There was a noticeable reduction of pain and improved functional outcome in patients who had received the proliferant

injections. The study was published in the *Journal of Spine Disorders*, 1993; 6(1): 23-33.

Readers interested in further documented results of the treatment should refer to the following article: Dorman TA, Prolotherapy: A Survey, *Journal of Orthopaedics*, 1993; 15(2): 49-50.

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