Case Study

AVOIDANCE OF "TRIGGER FINGER" REPAIR SURGERY AFTER ONE RAPID RELEASE THERAPY TREATMENT

ABSTRACT

Background and Purpose: Rapid Release Therapy (RRT) is a new therapy that seems to have a profound effect on scar tissue. RRT is based on a new treatment with compression waves at a frequency resonant with scar tissue.

This case report details the changes in function and motion in a patient complaining of limited left ring finger pain and "catching", also known as trigger finger, for over six months.

Mr. L is a 68 year old avid golfer, he is retired and enjoys gardening, cooking, and working with tools. His ability to do these tasks became challenged in December 2010 when his left ring finger began to produce pain and would not return to an open position after making a fist. His left ring finger PIP joint also felt very "tight" limiting a full fist position.

On 12/19/10 Mr. L. reported the pain, limited flexion and frequent "catching" or "locking" of his left ring finger to his internist. He was referred to an orthopedic hand surgeon. On his first visit 1/9/12, he received a cortisone injection to the left PIP joint of the ring finger. At the three week follow up appointment (2/13/12) there had been no change and the orthopedic hand surgeon suggested waiting longer. On 3/23/12 the pain and locking of the finger had worsened to 8-9/10 and he physically had to open his left finger after gripping tools, knives or golf clubs and the orthopedist scheduled surgery for a trigger finger release.

Pre-Treatment:

Mr. L. reports 2-3/10 resting pain in the left ring finger PIP joint. If he closes into a tight fist he reports a 5/10 intensity left PIP joint “tightness”. When opening the fist, the pain immediately escalates to an 8-9/10 and the left ring finger “locks” at 90-110 degrees of PIP flexion with severe pain that requires manual opening with the right hand to “unlock” the locked finger.
On 4/5/12, Mr. L received a 3.0 minute treatment of Rapid Release Therapy to his left ring finger and palmar surface of the left hand. At the two day follow up call, Mr. L. reported no significant change in the symptoms of his left trigger finger. However, at the four day follow up call, Mr. L. reported a “substantial” decrease in “locking” of his left ring finger and moderate decrease in the pain when opening the hand from a fist position (4-5/10 pain intensity) and no longer required manual intervention to straighten the finger.

On 4/13/12, Mr. L. reported more than an 80% decrease in pain and no episodes of “locking” or catching of his finger after golfing, using tools or kitchen knives.

On 4/16/12, Mr. L. reported to his doctor for a pre-surgical visit. Once the physician witnessed the improvement in his left hand function and decrease in pain, his scheduled surgery was cancelled.

DISCUSSION: This patient was diagnosed with trigger finger by an orthopedic hand specialist that included severe pain, locking of left PIP joint when attempting to release from a closed fist and limited left PIP flexion. Rapid Release Therapy proved to give this patient more than 90% correction of his reported dysfunction in just one visit. At the time of this report, the patient remains very satisfied with the results of his treatment and reports no return of his original symptoms. He has returned to a full schedule of golf, cooking activities and gripping tools without the fear of his left hand catching.

The fact that the results took four days to take effect brings in to question why the results were slower than previous case studies on Rapid Release. This researcher feels an inflammatory cascade may have taken effect possibly eliciting mild inflammation in the finger, although no increase in pain or loss of motion was reported, and after 2-4 days that cascade was complete allowing the tendon to again glide without catching within the synovial lining of the ring finger tendon.

KEY WORDS: Scar tissue, trigger finger, stenosing tenosynovitis, trigger finger release, range of motion, joint locking, vibration therapy, vibrational medicine.

BACKGROUND AND PURPOSE

Scar Tissue and Adhesions

Following injury or surgical repair the body undergoes an active repair process – the process of inflammation. The mention of the word “inflammation” has generally been seen as a bad thing – patients are prescribed anti-inflammatory medication to “reduce” the inflammation present.
Inflammation is a Positive Process: Repair cannot take place without inflammation.
The inflammatory response can been seen to have two major roles:
a) protection of the body from infection and clearance of tissue debris from the site of injury; and
b) structural repair of the damaged tissue [1].

The inflammatory process has three distinct phases 2:
acute (inflammatory) Phase 0-3 days
sub acute (proliferative) Phase 3-21 days
chronic (remodeling) Phase 21 days+

During the acute inflammatory phase injury manifests as swelling, redness, heat, pain and loss of function. Within this time the main aim of treatment is to minimize hemorrhage, swelling, inflammation, cellular metabolism and pain, and also provide ideal conditions for healing and repair processes 3.

During the sub acute proliferative phase, the debris of damaged cells is removed by phagocytosis, and fibroblast cells produce weak collagen fibers which begin to form weak scar tissue. Increased amounts of scar tissue (collagen) and reduced cross-links between fibers have been associated with increases in the strength of the tissue 4.
During this phase the irritation produced by early tissue mobilization is desirable. There is an accumulating body of research that supports the role of controlled mechanical stress to connective tissue to aid repair and provide optimal healing. This mechanical stress can be brought about by exercise and manual therapy techniques 5. This process is highly dependent on stresses that are imposed on the scar tissue 6, 7.

Tension and movement to connective tissue encourages normal collagen turnover and aligns the collagen fibrils along the lines of stress within the repairing tissue. When stress is applied to tissues, adaptation occurs through a process of mechano-transduction, whereby the mechanical or manual therapy is converted into biochemical signals which bring about the synthesis of “repair cells” within the connective tissue or muscle 7, 8. Hence the repair will be incomplete if the tissues are not provided with the correct level of mechanical stress. Evidence of incomplete repair includes excess scar tissue with adhesions and a mechanically weaker tissue.

The mechanical tension applied to the healing tissue should be within the pain-free range and to the onset of tissue tension as felt by the therapist (if utilizing a manual technique) or the patient (if utilizing active or passive movement). This motion should be dynamic and rhythmical in order to stimulate adequate repair 9, 10, 11.

Scar tissue mechanics:
When we are injured, the body launches a complex rescue operation. Specialized cells called fibroblasts lurking just beneath the surface of the skin jump into action, enter the provisional wound matrix (the clot) and start secreting collagen to stabilize the injury as fast as possible. This matrix is initially soft and loaded with growth factors. The fibroblasts “crawl” around the matrix, pulling and reorganizing the fibers. The matrix grows stiffer, and at a certain point, the fibroblasts stop migrating and change into powerful contractile cells, anchoring themselves to the matrix and pull the edges of the wound together (12).

The mechanical nature of the switch ensures that the contraction only develops when the matrix is "ready."

Although this process will heal a wound quickly, if left unchecked, it can also lead to a buildup of fibrous tissue. Following trauma to vital organs such as the heart, lung, liver and kidney, overzealous fibroblasts can continue to build fibrous strands, leading to scar tissue buildup that can impair the organ's function. This condition, called "fibrosis", can be fatal. Fibroblasts are also the culprits in problems caused by implants -- if the implant is too smooth; it never becomes properly incorporated into the connective tissue. But if it is too rough, scar tissue develops around it and it won't function properly. Occasionally, following plastic surgery, unsightly excessive scar tissue can develop in the skin as well (12).

Even if actual tissue contractures and adhesions are prevented through early intervention, connective tissue repair inherently involves development of an abnormal fibrotic scar matrix that lacks the plasticity and tensile strength of normal tissues. Hence, the affected tissues may be more susceptible to recurrent injury during strenuous sports activities. The term plasticity refers to the ability of tissues to adapt, in form and behavior, to strain or tension without rupture **(Thomas 1993)**. Similarly, tensile strength refers to the ability of body tissues to resist elongation, or tensile strain, without tearing (Whiting and Zernicke 2008).

During scar tissue formation and maturation, several events occur that determine the ultimate structure and functional properties of scar tissue (e.g., collagen deposition and degradation, wound contraction, collagen fiber realignment). Without therapeutic intervention, the definitive quality of the scar matrix is determined solely by these mechanisms. The usual result is formation of dense, fibrous scar tissue that lacks both the plasticity and tensile strength of normal connective tissue. (Delforge, 1992).

With timely intervention, however, the quality of developing scar tissue can be enhanced. Most commonly, therapeutic measures to achieve this objective are introduced during the period of scar formation and continued into the tissue remodeling phase.

Tillman and Cummings (1992) suggested that therapeutic intervention to increase tissue mobility and joint motion is most effective during the period of fibroplasia and wound contraction (day 5 to day 21 after injury). As consolidation of the scar matrix occurs (day 21 to day 60), however, the ability of scar tissue to respond to treatment decreases. During the maturation stage of connective tissue repair (day 60 to day 360), scar tissue response to treatment continues to decrease.

RAPID RELEASE THERAPY AND SCAR TISSUE RELEASE

Sonic Vibrations: Rapid Release Therapy generates mechanical compression waves right in the middle of the audio range of humans. Let's explore sonic energy and its effects on soft tissues. First, the physics:

Mechanical vibrations that we interpret as sound can travel through all forms of matter: gases, liquids, solids, and plasmas. Sound cannot travel through a vacuum. The matter that supports the sound is called the medium. Sound is a pressure disturbance that moves through a medium in the form of compression waves. When a force is exerted on a particle (atom or molecule), it moves from its rest or equilibrium position and exerts a force on the adjacent particles. This transfer of energy from one particle to the next is how sound travels through a medium.

When the medium is solid, (such as scar tissue) sound energy is also exerted in planar or transverse waves which generate shear force perpendicular to the direction of wave propagation (13). This shearing force releases its energy into the rigid and brittle scar tissue but passes through healthy, supple tissue. There is evidence of this in a high speed video shot at 2000 frames on the vendor's website (14).

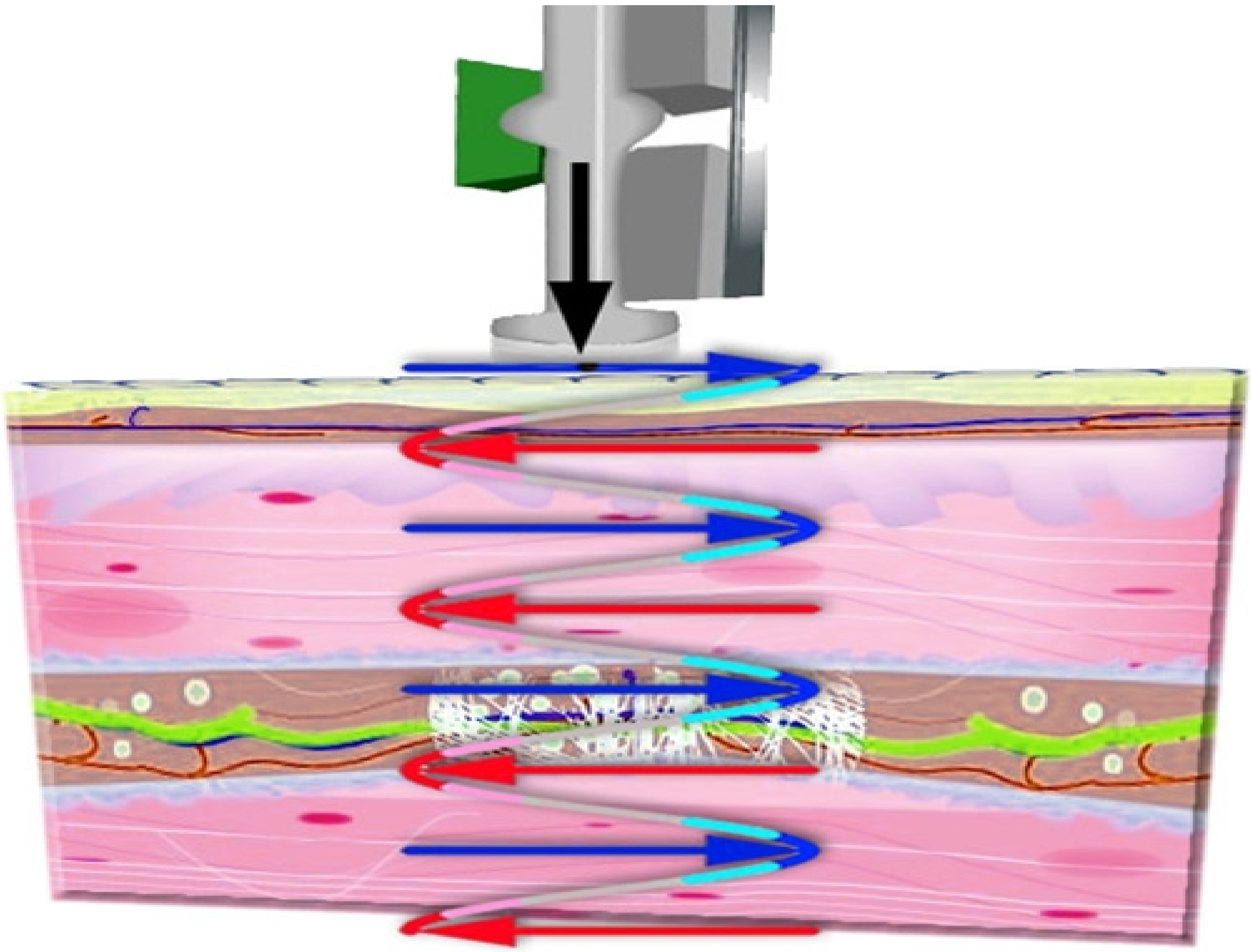
From the air medium, it must enter the skin/fat which has a significantly higher density. There is 100% reflection of the sound wave at the air-skin interface. By putting the mechanical wave source directly onto the skin, reflection is nullified and the sound energy is efficiently transmitted through the skin barrier. As noted in the absorption coefficients table for human tissue (15), sound energy travels through much of the soft tissue without much absorption until it reaches tissue with high collagen content, such as scar tissue, periosteum, ligaments, capsules, fascia, tendons, and tissue interface (bursa).

Acoustic resonance is the tendency of an object to absorb more energy when it is forced or driven at a frequency that matches one of its own natural frequencies of vibration (its resonance frequency) than it does at other frequencies. An acoustically resonant object usually has more than one resonance frequency, especially at harmonics of the strongest resonance. It will easily vibrate at those frequencies, and vibrate less strongly at other frequencies. It will "pick out" its resonance frequency from a complex excitation, such as an impulse or a wideband noise excitation (16).

Resonance disaster can cause catastrophic failures in structures such as bridges, buildings, and airplanes. An example is when a singer hits the right note that resonates with a glass. The sound energy is efficiently transferred to the glass which begins oscillating until it shatters. Different types of tissue in our bodies resonate to specific frequencies of vibration. The specific frequency used by Rapid Release targets scar tissue.

Rapid Release Action

Shearing forces are generated when a compression wave passes through a solid. The Red and Blue arrows denote the shear force direction and the Black Arrow the propagation direction. White is scar tissue and Green is a pinched nerve in the inter-stitial space.



Summary: Due to the quick and dramatic improvement in the case study subject and similar results in many other patients that have similar pain or range of motion deficits, the hypothesis is that scar tissue structure causing these deficits is broken up by either the shearing forces or resonance or perhaps both. The fact that the patient results took four days demonstrates the probability of an inflammatory cascade likely adding two or possibly three days to the response time.

There is a body of scientific research that supports the role of controlled mechanical stress to connective tissue to aide repair and provide optimal healing. This mechanical stress has been defined as exercise or manual therapy but the hypothesis is that the RRT combination treatment of measurable vibration energy and resonance may be equally beneficial as exercise or mechanical stresses.

Being that tension and movement to connective tissue encourages normal collagen turnover and aligns the collagen fibrils along the lines of stress within the repairing tissue and RRT vibrational energy provides both fiber movement and tension we aim to prove the mechano-transduction of RRT is converted into biochemical signals which bring about the synthesis of "repair cells" within the connective tissues.

If this hypothesis is proven effective, the need for manual treatment may be reduced in favor of a measurable vibrational tension device such as the RRT.

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