

Graston Instrument Assisted Soft Tissue Mobilization (GISTM)

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Abstract

The effectiveness of soft tissue mobilization has been limited by common problems. The practitioner must find the correct areas to treat, which may be too deep or subtle to palpate. Therapy must be applied deep enough, but the practitioner's joints and soft tissues are then subject to strain that may result in repetitive strain injury (RSI). The area of treatment must be large enough to affect both the local lesion and the entire kinetic chain, which may strain the practitioner's joints and prolonging treatment time. Hand held instruments used to assist soft tissue mobilization are becoming popular and are being studied.¹ Physiologic effects of enhanced healing have been demonstrated in animal studies^{2,3} and human studies are in process⁴. Graston Instrument-Assisted Soft Tissue Mobilization (GISTM) uses six patented curvilinear non-invasive stainless steel instruments as part of a treatment protocol to treat a broad range of soft tissue conditions. There are anecdotal reports from practitioners of good response to GISTM^{5,6}.

Introduction

Graston Instrument-Assisted Soft Tissue Mobilization (GISTM) is a method of soft tissue treatment that uses six curvilinear instruments to treat soft tissue conditions. (Table 1)⁷ The development of Graston instruments to mobilize soft tissue began when David Graston ruptured three knee ligaments requiring surgical repair. The residual loss of range of motion and weakness responded partially to treatment with deep friction massage that was developed by James Cyriax, MD.⁸ Graston made a metal instrument to perform deep tissue mobilization, in an attempt to reduce his chronic knee complaints. His creative approach to instrument assisted soft tissue mobilization eventually lead to research studies at Ball State University in Muncie, Indiana. Now TherapyCare Resources Inc. teaches courses in GISTM to physical therapists, certified athletic trainers, and physicians (DC, DO, MD).

A standard medical history is taken to rule out contraindications to care (Table 2).⁹ A focused mechanical history is needed to identify the effects of activity (type, frequency, duration, intensity, ROM's, loaded v unloaded) before treatment starts to determine response to care. (Table 2). A physical examination is performed, which may include active range of motion (AROM), passive range of motion (PROM), orthopedic, neurologic and functional tests. Typically a four-step treatment protocol is performed.

1. Warm up of the area to be treated by passive modality or active exercises
2. Mobilization with the instruments, which may be followed by additional manipulative therapy depending on the practitioner's training.
3. Stretching to continue loosening soft tissue
4. Exercises are then prescribed complete the functional rehabilitation.

The average length of treatment is seven to twelve sessions, but varies from one to fifteen sessions depending on many variables. The natural progression of healing of the condition must be distinguished from the response to GISTM. While a practitioner could proceed with repeated treatment to the end of the range of care for a condition, in the author's experience, if there is no change by the fourth treatment, the condition will not respond to the practitioner's selected protocol and a revision of the protocol is indicated.

@picture of instruments

Table 1. Conditions that may be treated with GISTM

Soft Tissue Adhesions and Restrictions Of ROM

- Adhesive capsulitis (frozen shoulder)
- Trigger Finger
- Scar Tissue pain
- Dupuytren's contracture
- IT Band Syndrome
- Shin Splints
- Plantar Fasciitis (foot, arch and heel pain)

Myofascial Pain, Restrictions and Spasms

- Trigger Points
- Fibromyalgia, some cases
- Muscular Strains

Tenosynovitis, Tendinitis and Tendinosis

- Rotator Cuff (shoulder)
- Lateral Epicondylitis (tennis elbow)
- Medial Epicondylitis (golfers elbow)
- Tenosynovitis of the thumb (DeQuervain's disease)
- Patellofemoral Disorders (knee pain)
- Tibialis posterior tendonitis
- Achilles Tendinitis (ankle pain)

Non-acute Bursitis

Reflex Sympathetic Dystrophy (RSD)

Pain, Strain and Sprain Injuries – Acute and Chronic

- Neck, back and joint pain

Entrapment Syndromes

- Carpal tunnel
- Thoracic outlet

Arthrosis

Table 2. Conditions that contraindicate the use of GISTM

RED FLAGS – Absolute contraindications include:

- Local infection, Open wound, unhealed sutures, ulcers, etc.
- Infection (Tuberculosis, Osteomyelitis, Cellulitis, etc.)
- Unhealed fractures
- Thrombophlebitis
- Uncontrolled hypertension
- Kidney dysfunction
- Hematoma
- Myositis Ossificans
- Patient intolerance/Non-compliance/Hypersensitivity

YELLOW FLAGS – Relative contraindications include:

- ❑ Skin problems (blisters, friable, etc.)
- ❑ Anti-coagulant Medications (Coumadin, Plavix, high dose NSAIDs)
- ❑ Cancer
- ❑ Varicose Veins
- ❑ Burn Scars
- ❑ Acute Inflammatory Conditions (synovitis, bursitis, etc.)
- ❑ Inflammatory reaction secondary to infection
- ❑ Acute inflammatory sites or stage of autoimmune diseases (Rheumatoid Arthritis, Lupus, etc.)
- ❑ Bacterial Infections of neighboring sites
- ❑ Neurologic disorders that impair sensation/tissue integrity of the treatment area (Diabetes, peripheral neuropathy, frost bite,
- ❑ Hematoma
- ❑ Osteoporosis
- ❑ Pregnancy in cases of ligament laxity

A Practitioner's Experience with Graston Technique Instruments

One must have a detailed knowledge of anatomy to locate nerves, ligaments, tendons, retinaculum, bursa, lymph and blood vessels to know where to look for what Cryiax called “the right spot.”¹⁰ Assessing the stage of inflammation and the functional status of the patient and area of treatment helps to develop treatment goals and rehabilitation strategy.

Finding the right area to treat can be difficult to locate because it can be too subtle to feel or be beyond the reach of the fingers of the practitioner. The Graston instruments can provide increased level of sensitivity to feel tissues which were too deep or subtle to palpate with the hands only. The tools seem to act like an amplifier to the soft tissue restrictions to anyone holding them. It is common for the patient to say they feel the sore spot while the practitioner feels vibration in the instruments like a “grittiness” over the soft tissue being examined/treated. A bystander can put their finger on the instrument and feel this vibration transmitted as the tool works on the soft tissue. Treating the insertion of the rotator cuff on the greater tuberosity of the humeral head is easier, and treating more distal parts of the myotendon junction of supraspinatus is possible with the small tip on the GT 6 instrument.

Treatment must be applied deep enough to be effective, but must be performed without causing injury to the provider. Repetitive strain injury (RSI) from over use is a risk that increases as a provider performs more sessions of deep tissue work with methods similar to cross friction massage described by Cryiax.¹¹ The treatment method puts repetitive strain on the neck, back and upper extremities which can cause RSI. Increasing the number of length treatments performed each day may result in practitioners developing RSI. Reduction of the amount of this type of work and/or improving the ergonomics of the work is recommended when symptoms appear. “Treatment can only be successful when exposure to adverse ergonomic risk factors is reduced or eliminated.”¹² Preventing RSI is a rational approach.¹³ GISTM instruments can reduce the strain on the practitioner's joints and soft tissues while still getting the desired deep penetration of the soft tissues. If a practitioner has stopped performing soft tissue mobilization GISTM instruments may allow them to return to performing this procedure without causing RSI.

Because the entire kinetic chain must be treated in many cases of chronic conditions to be more effective¹⁴, time constraints and fatigue of the practitioner's hands can result in ineffective or

prolonged treatment times. The instruments allow quick scanning the soft tissue along entire kinetic chain to help quickly detect areas of dysfunction, but this is an art and skill that requires all of the practitioner's senses and mental reasoning. If one understands the physiology and kinesiology of the normal human system, the concepts of load frequency, intensity and duration, and knows the actions of the sport or activity, then the instruments can be a valuable treatment adjunct that is a time saving aid in treating the soft tissue dysfunction.

Patient Selection

Patient selection for treatment is first based on the presentation of conditions listed in Table 1. Next, the patient must not have the Red Flags listed in Table 2. The risks versus benefits of treatment in patients with Yellow Flags are weighed prior to initiating treatment.

It may be helpful to consider that because GSTIM mobilizes tissue and increases the inflammatory response by micro trauma, it would likely be contraindicated in inflammatory conditions or normal tissues that do not have restrictions or adhesions. When the condition is due to injury, especially when inappropriate or incomplete healing of soft tissue has occurred, GSTIM may be helpful.

If only short-term symptomatic relief of complaints is achieved, determine if the entire protocol was followed. Failure or ineffectiveness of treatment may be due to the patient being unable or unwilling to follow the complete protocol.

A patient who is overly sensitive or who has psychosocial issues may not tolerate treatment, even when working within a customarily acceptable level of pressure tolerance.

Therapeutic stretch and exercise are necessary to complete rehabilitation. Poor kinesthetic sense, deconditioning, loss of balance and/or joint proprioception from neurologic conditions, or factors that cause non-compliance indicate the treatment may not be appropriate or effective.

The treatment protocol

After proper patient selection a four-step treatment protocol is performed.

Warm-up

Warm-up is both for increasing blood flow to the area and heating the tissue. Hot packs are relaxing, but the heat only penetrates 1-2 cm.

Infrared heat can be used in the absence of advanced heart disease, local peripheral vascular disease, impaired skin sensation and significant hepatic or renal insufficiency.

Ultrasound (US) is deeper penetrating. US is known for its micromassage effect on the tissues. The shaking of the tissue produces heat, moves fluid and may induce an inflammatory response. It is preferentially absorbed by dense collagen tissues, and is therefore less effective in the muscle belly.^{15,16}

Short wave diathermy produces deep uniform heat that is selectively absorbed by tissues that have high water content. It may be helpful for warming bursa and muscle. It cannot be used in patients with pacemakers or over areas of surgery until it is verified that no metal is in the area (sutures, staples, plates, etc.).¹⁷

Exercise may be the best option to warm-up as it heats up and mobilizes the tissues at the same time. All exercise should be of mild to moderate intensity and only mild pain is acceptable. This can be done in office or in the hour prior to treatment by the patient who is functional and knowledgeable.

GISTM

The instruments are made of high chromium stainless steel that transmits vibration rather than absorbing it like plastic or aluminum materials. Each instrument is designed with a surface area of the body in mind. The shapes of the treatment surfaces are concave for convex areas, and convex for concave body areas, to make the treatment more comfortable and equalize the pressure of the instrument over the area being treated. The treatment edges of the instruments are also either single or double beveled. The double beveled edges are more comfortable, but produce less pressure, and are used early in the series of treatments or at the beginning of a treatment. As more pressure is desired the single bevel, convex and smaller surfaces are selected.

For the practitioner the instruments are ergonomically designed to reduce strain and fatigue. The feel of the instruments is comfortable, and provides mechanical advantage for soft tissue techniques. The larger broader instruments are used to scan over large areas and can accommodate two hands or allow the free hand to support the hand holding the instrument

For the patient the instruments are contoured to the body part and progressively penetrating treatment edges can be chosen to accommodate patient tolerance and treatment goals.

The first session is evaluation-based to determine the patient response and tissue reactivity. The practitioner uses different types of strokes with the instruments to scan the tissues for lesions and to treat the areas of soft tissue dysfunction. While bruising is common, it is usually not a sign of inappropriate treatment. Some people bruise easily and some scar tissue is highly vascularized, and a simple sweep over an area can produce dramatic bruising due to extravasation of soft tissue.

Stretching

Prescribed therapeutic stretches for shortened or stiff tissues from injury, inappropriate loading strategies and faulty postures to support rehabilitation goals of the treatment plan. It is important to note that increased range of motion is not always the goal. In some cases stiffening is a desirable goal. Also bare in mind the patient's normal range of motion should be the goal, which is remarkably variable from older folks to young gymnasts. The ranges of motion published in the *Guides to the Evaluation of Permanent Impairment* by the American Medical Association are valid for legal expediency, but therapeutically are of questionable value.¹⁸

Exercise

A key part of treatment is to restore functional activity. The challenge of motivating a patient to perform the exercise portion of treatment can be more difficult than selecting the appropriate exercise. Exercise prescription in a well conditioned, healthy, active patient can be as simple as telling them to "return to what you used to do." In other patients, the routine must start with extensive posture instruction, modification of activities of daily living, core stabilization exercises, and progressive reactivation with aerobic and resistance training.

The Suggested Physiological Basis of GISTM

While the literature has not established the mechanism for GISTM's response, animal research and related hypothesis may be applicable to humans described below. There are several physiologic responses that have been suggested in the literature.

Augmented soft tissue mobilization (ASTM) has been used to describe GISTM type treatment. ASTM appears to allow for healing and earlier recovery compared to controls, and there is increased fibroblast proliferation in rat Achilles tendons treated with ASTM¹⁹

Heavy pressure of ASTM is more effective than light or moderated pressure in augmenting the healing soft tissues by promoting fibroblast proliferation probably due to microtrauma created by ASTM²⁰

The release of blood into the tissues that is commonly seen after GISTM may induce healing due to the release of platelet derived growth factor (PDGF) that is stored in platelets. Because PDGF induces proliferation of fibroblasts, smooth muscle and may be a chemotactic agent for inflammatory cells.²¹

Theoretically, the immediate effects of reduced pain and stiffness many patients report may be due in part to:

- ❑ mobilization of the tissue that increases circulation and removes lymph congestion in the deep tissue,
- ❑ higher brain center modification of pain perception from the deep pressure applied to the area of dysfunction
- ❑ reduced supersensitivity of pain transmitting nerve C fibers by PDGF

What is observable during treatment is increased redness and temperature of the skin. Often rupture of small capillaries can be seen, an indication to stop treatment over that site for the session.

A change in ROM, both active and passive is common even after the first treatment. The possible reasons for the increased ROM may be due to a number of factors including: release of myofascial restrictions, increased pain threshold from pain gating effect, and changes in reflexes in the tissue or portions of the reflex arc.

LIMITATIONS AND SIDE EFFECTS OF GISTM INSTRUMENTS

The "right spot" as Cryiack called it, must be found while applying the instruments. The instruments only enhance effectiveness if the treatment is correct. Using the instruments in a cookbook technique in which you just "rub where it hurts" is of little use.

Bruising is common and occurs in some patients even with light to moderate pressure. The history must include questioning about how easily the patient has bruised to help determine how deep to apply pressure. Before treatment, patients should be informed that bruising is common and consent should be obtained. Practicing with self-treatment will quickly teach you the difference between traumatizing the tissue and extravasation of fluids that occurs from use of the instruments on soft tissues.

The dramatic responses to treatment when one first uses the instruments may cause loss of focus on appropriate rehabilitation. This can occur both because the patient may think they are “fixed” on the first visit when the pain is reduced, and the practitioner may feel stretching and exercise is not needed. While the immediate reduction in symptoms after treatment may be gratifying, a reduction in symptoms does not obviate the need to assure the treatment program includes rehabilitation protocols to restore function.

Initial response to instruments that cost thousands of dollars to treat soft tissue dysfunction may be met with scrutiny. A two-day course of instruction teaches the theory, provides hands on basic skills using the instruments to allow a practitioner to begin using the instruments in their practice. In less than thirty days of treating patients, one can easily learn how the instruments can assist in the treatment of the conditions discussed above. Further training is of benefit to learn additional functional testing and treatment methods. GISTM can be an important addition to a practice both in terms of effectiveness of care and ability to practice without subjecting the practitioner’s joints to unnecessary overuse.

Cases Treated with GISTM

Patient A Carpal Tunnel Syndrome (CTS) and osteoarthritis. A 60-year-old obese woman with a history of lupus, osteoarthritis and sleep apnea controlled with continuous positive airway pressure device (CPAP). She suffered an acute episode of severe pain in her neck, shoulders and right hand, inability to raise her arms above the horizon, numbness, weakness and swelling of her right forearm and hand with inability to close her hand. She was unable to sleep through the night and her activities of daily living were limited. The osteophytes in the joints of the fingers were moderately swollen and painful. Dietary modification to eliminate food reactions and nutritional supplementation was prescribed to support the immune system and reduce inflammation. Lab tests and rheumatological consult showed no signs of lupus or systemic illness. The rheumatologist prescribed a non-steroidal anti-inflammatory medication for her pain and swelling.

Because her initial presentation suggested lupus, she did not appear to be a good candidate for GISTM. When no apparent acute inflammatory condition could be found, a trial of GISTM was offered with limited expectation. After a cautious treatment with hot packs, GISTM and Grade III mobilizations to the cervicodorsal spine and upper extremity, her pain and swelling subsided moderately. After the second treatment the numbness was limited to the median distribution of the hand, her shoulder ranges of motion were 85% of normal and her ADL’s were unrestricted, but she still suffered pain and weakness of her hand. Stretching and exercises were added as tolerated. After five treatments in three weeks time she reported minimal symptoms of faint numbness at the tips of the thumb and first two fingers that was only noticed with sensory testing and low-grade stiffness she typically notices. She was released from treatment with instructions for home stretching and exercise.

Patient B Trigger Finger and Rotator Cuff Tendinitis.

A 53-year-old male with chronic left rotator cuff tendinitis developed triggering in the fourth finger of his left hand shortly after an intense day of pistol target practice. He had repeatedly used his left hand gripping over his right hand for support while firing. His symptoms were catching of the finger on flexion and extension with stiffness, mild weakness and painful spasm when he forcefully gripped with his left hand. His hand symptoms had not changed for over one year.

He was referred to a hand surgeon, which he did not desire. GISTM was recommended. After one treatment with GISTM alone a 50% improvement in symptoms was noted. After six treatments over three weeks 100% improvement occurred with no catching, weakness or feeling of tension. No exercises or stretches were prescribed for the hand. In the fourth week of treatment the patient suffered one episode of triggering, pain and weakness that lasted one day after gripping and turning a knob. His symptoms decreased over the next day to 80% improvement. After his seventh treatment he was 100% improved. Stretching and exercises were added to his treatment program.

He was concurrently treated for rotator cuff tendinitis with exercises and stretches. He reported an 85% improvement in this separate area of pathology. His most persistent complaint was pain when putting on his coat; he felt weakness and pain but it continued to improve. After the seventh treatment with exercises he was 90% improved.

In this case the dramatic resolution of trigger finger to GISTM alone and the shoulder problem caused focus on the shoulder, and no hand/forearm stretches and exercises were prescribed. As his symptoms decreased, it seemed unnecessary. But with the return of symptoms, it seems the aggravation of symptoms was due in part to the omission of the active component of care.

The author has been trained and certified as a Graston practitioner, but has no vested interests and wishes to acknowledge TherapyCare Resources, Inc. assistance in the production of this article by allowing use of their materials. Further information is available at www.grastontechnique.com.

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In My Pictures/Graston

bw.jpg:

GT1 Instrument has a broad concave surface used to scan large areas for generalized restrictions.

w.jpg:

GT6 Instrument has a narrow concave surface for small focal restrictions such as those found in the wrists, hands and feet.

tool-foot.jpg

GT4 Instrument has broad convex surface for scanning deeper into the tissues for assessment and beginning of treatment.

tools.jpg

The Graston Technique Instrument set in its protective carrying case.