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An Analysis of Graston Technique® for Soft-Tissue Therapy

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Abstract: The Graston Technique® of Soft-Tissue Therapy (GT), also known as instrument-assisted soft tissue mobilization (IASTM), is used by chiropractors, physicians, and therapists to manage pain and range-of-motion limitations caused by scar tissue and musculoskeletal injuries. The GT treats tissue injuries and pain by separating scar tissue and producing heat, which increases blood flow to the areas affected by pain or trauma. This paper provides a systematic review of the research published on the GT, focusing on its efficacy and patient outcomes. It introduces and explains the GT and provides a detailed description of the therapeutic procedures used to alleviate pain and improve range of motion. It then provides a comparative meta-analysis of over 15 empirical studies that have examined the GT's effectiveness for a wide variety of tissue injuries. The GT is becoming increasingly popular, as patients do not need any medication and can fully recover with physical therapy after only a few weeks of treatment. The results from this meta-analysis suggest that patients show clinically significant improvement when the GT is combined with physical exercises, thus providing an important basis for holistic yet non-invasive treatment plans that can help patients recovering from traumatic injuries, muscle strain, or spinal and back pain.

Keywords: Graston Technique®, Soft-tissue Therapy, Chiropractic, Muscle Strain, Instrument-Assisted Soft Tissue Mobilization, Range of Motion, Pain Management

1. Introduction

Graston soft-tissue therapy, or the Graston Technique (GT), has been recently used with considerable success to manage range of motion (ROM) limitations and pain in patients. This study intends to ascertain the efficacy and safety of the GT and consider how it can be applied to manage patient care.

The GT is an instrument-assisted soft tissue mobilization (IASTM) technique that enables clinicians to detect and treat scar tissues and motion restrictions that cause pain and adversely affect normal bodily function [1]. The technique helps mobilize certain parts of the body that have been affected by injury and help improve range of motion [2]. GT can be used to treat common musculoskeletal injuries such as hamstring strain and carpal tunnel syndrome. In the GT, a stainless-steel instrument and a unique massage technique are used in combination to identify areas of adhesion or scarring that can be improved [3]. The massage and the instrument are used together to stretch and relax muscle tissues, improving blood flow and restoring movement patterns in injured tissues.

The GT is a manual therapeutic technique known as instrument-assisted soft tissue mobilization (IASTM). It is a specialized form of massage therapy, and massage therapists use instruments to massage and gently scrape the skin to reduce pain [4]. The tools assist the practitioner in guiding their treatment by identifying specific areas of tissue restriction in the affected muscle that may result in dysfunction.

GT is practiced by chiropractors, osteopathic physicians, physical therapists, massage therapists, and athletic trainers. The overall aim of the technique is to reduce patient pain. GT can improve functionality or ROM by breaking down scar tissue, enhancing fascia restrictions, and alleviating traumatic injury to the soft tissue, such as muscle strain, muscle tear, or sprained ligament [5].

The rest of the movement or motion is reduced by improved connective tissue alignment and rearranging soft tissue structure, including tendons, ligaments, muscle, and

fascia. The GT promotes better healing of the soft tissue as it increases vasodilation to the involved area. Patients with nerve pain can also be treated with GT as it also has a neurological benefit. This process occurs because nerve fibers are activated when patients receive manual or IASTM therapy. Sense organs such as the mechanoreceptors and proprioceptors receive signals to respond to this form of treatment [1, 5].

The course of treatment using the GT ranges from 1 to 10 visits over several weeks, and no medications are required in combination with this manual therapy [6]. Before treatment, patients complete five minutes of cardiovascular exercises, such as riding a stationary bike or walking on a treadmill. Then heat treatment is applied to the injured area so that the soft tissue can be warmed.

During the GT procedure, the practitioner uses the GT instruments for the first scan and then treats the area of trauma or injury. Therefore, the tools perform a dual function of scanning and treating or massaging the region [7]. The affected area is massaged with handheld stainless-steel GT instruments that use particular massage techniques. The treatment is done for 30 to 60 seconds, and patients tend to experience discomfort during the procedure [5, 8].

The GT uses a very specialized form of massage with stainless steel instruments that are primarily employed to disrupt scar tissue and identify the affected area that may have a restricted range of motion [3]. The GT tools or instruments are the six core tools made of stainless steel, convex or concave shaped with rounded edges, and without any sharp edges since they are used for massage. The instrument scans and detects injured fibrous tissue, so the devices are used to identify and treat. The massage uses cross friction through rubbing or brushing against the scar tissue. Although the instruments are only involved in scraping the surface, small amounts or minor variations of trauma are also caused in the area, temporarily leading to inflammation and increased blood flow to the site [4]. The procedure initiates and promotes healing of soft tissues, and treatment is given along a chain of muscles for the back, neck, spinal cord, leg, knee, or any other injured or painful area

2. Research Studies – Literature Review

Several researchers have studied the efficacy and safety of GT on patients with various injuries or pain-related complications. Lee, Young, and Erb studied GT's impact before and after a 4-week intervention period when the pain was evaluated using a visual analog scale in a clinical setting [9]. The lumbar ROM was measured with a smartphone. A paired t-test showed that the pain decreased significantly in a post-intervention scenario within the group that used the GT. When used in a combined manner, both exercise and the GT resulted in reduced pain and increased ROM [9]. The GT can be most useful for patients with chronic low back pain (CLBP) as the technique helps reduce pain and increase ROM. Although the GT has its indications and limitations, it has gained popularity due to its efficiency and effectiveness while being entirely noninvasive. When appropriately practiced, the technique has been reported to reduce pain, increase muscle flexibility, and increase ROM within a few weeks of treatment, primarily when used with stretching exercises. More research studies have established the efficacy of GT, although the results of some studies remain inconclusive.

GT has been used to treat pain in athletes and active young people and in older adults with sports-related injuries and trauma or neck, shoulder, and knee or ankle problems. A study by Looney, Srokose, Fernández-de-las-Peñas, & Cleland described the outcomes of a set of patients with plantar fasciitis treated with GT [10]. In the study, ten patients with plantar heel pain completed three questionnaires – the Global Rating of Change Scale (GRC), the Numeric Pain Rating Scale (NPRS), and the Lower Extremity Functional Scale (LEFS). All the patients were treated with GT directed towards the triceps surae, plantar fascia, soleus, and medial calcaneal tubercle. All GT participants received a maximum of eight treatments over eight weeks with an exercise program at home, three times a week. Patients were required to complete outcome measures at baseline, sixth visit, and at discharge. The GT intervention showed that symptoms lasted about 32 weeks. There were significant improvements on the NPRS (lowered pain) and the LEFS (improved ROM). The authors concluded that the group of patients treated with GT and home exercise programs had clinically significant improvement [10].

The effectiveness of IASTM has been mainly studied in participants with upper extremity, lower extremity, and spinal conditions. In another study, GT was compared with other techniques such as placebo, active treatment, and control or no treatment. The outcomes studied were improvements in function, pain, grip strength, pressure sensitivity, and motion [11]. Several randomized controlled trials showed no difference; however, IASTM as the GT showed some differences in outcomes with muscle performance improvements in physically active patients compared with the no treatment group. However, Nazari et al. concluded that the prevailing data does not sustain the use of IASTM to alleviate pain, performance, or range of motion in clients without extremity or spinal dysfunctions or individuals with various pathologies [11].

Lee et al. discussed the IASTM GT and roller massage stick's acute and residual effects on the hamstring ROM [9]. The authors suggested that fascial adhesions can reduce the range of motion, and different approaches have been used and studied to release these adhesions. By far, the GT IASTM is one of the best methods to improve ROM along with the roller massage stick. However, some studies have provided significant evidence that exercise also plays a role in improved treatment outcomes. The study compared the acute and the residual or long-term effects of using GT IASTM after a single treatment and roller massage stick on active and passive ROM following a hamstring injury recovery measured by the range of motion [9]. In the study, active and passive ROM was measured pre-intervention, immediately post-intervention, and 48-hrs post-intervention. There was a significant increase

in active and passive ROM from pre-intervention to immediate post-intervention and 48-hr post-intervention. The authors concluded that the GT IASTM and roller massage stick were equally effective immediately and over time, although the roller massage stick is more affordable.

In a study on physiological therapy, Gulick discussed a study that examined the influence of instrument-assisted soft tissue techniques (IASTT), a Graston approach for myofascial trigger points (MTrP) [12]. MTrPs are usually identified in the upper back, and trigger points in both right and left-back areas were identified. There were treatment and control groups, and the treatment group received six treatments of IASTT. The results showed significant improvement in both groups over time, so the authors argued that the effects of IASTT on MTrP remain inconclusive. This study suggests that evidence of GT's effectiveness is substantial but not conclusive, as the technique may not be 100% effective all the time, or there may be other factors to suggest that GT is not highly effective in treating tissue injury.

A case report by Strunk and Dube described multimodal chiropractic care of a female patient diagnosed with benign joint hypermobility and a history of chronic spine pain [13]. The case report was based on a 23-year old white female presented for chiropractic care with CLBP, neck pain, and headaches. The patient was diagnosed with joint hypermobility of thumbs, elbows, right knee, and lumbopelvic region. The patient reported chronic low back pain and varicose veins on her posterior thighs and knees. The treatment with GT involved spinal and extremity manipulation. GT was used with post isometric relaxation combined with sensory-motor stimulation and scapular stabilization exercises, and the patient was treated 15 times over 18 weeks. After the treatment, the Revised Oswestry Low Back Questionnaire, the Neck Disability Index, and Headache Disability Index demonstrated clinically significant improvements in reducing low back pain and headache but no change in neck pain. The study showed that the young female patient with CLBP had decreased disability, increased ROM, and decreased spine pain after multimodal chiropractic care over several weeks, focusing on GT and exercise. Strunk and Dube, and Solecki and Herbst discussed the chiropractic management of a patient with postoperative reconstructive surgery of an anterior cruciate ligament (ACL) tear [13, 14]. The case report is about a 25-year-old man who experienced a rupture of his left ACL and a handle tear of the medial meniscus and full-thickness tear in the posterior horn of the lateral meniscus, following direct-contact trauma while playing basketball. Postoperative care was based on a 12-week functional chiropractic rehabilitation program using the GT, Active Release Technique, and Kinesiotaping.

Following the 12-week treatment with these three methods, the patient recorded 0/10 on the Numeric Pain Scale and substantial improvements on the Patient-Specific Functional and Pain Scales. The patient could return to play with no complications, had a complete restoration, improved ROM, and better lower extremity muscle strength. A year later, the patient reported no pain, had a full ROM and was fully functional [14]. The study reported a multimodal approach to treating a post-surgical ACL, and the GT successfully restored functional ability and subjective pain relief as measured on several scales. GT, along with postoperative chiropractic care, have been clinically suggested for patients with similar tear and trauma.

In a study on spinal manipulative therapy (SMT) and the GT, Crothers, Walker, and French performed a randomized controlled trial to determine SMT and GT's efficacy for the treatment of nonspecific thoracic spine pain [15]. Their study stated a 17% prevalence of thoracic back pain, 64% prevalence for neck pain, and 67% for low back pain. The authors studied the efficacy of SMT for the thoracic spine pain and the GT. The study included 84 patients with nonspecific thoracic pain randomized to three groups either with SMT, GT, or a placebo for treatment over four weeks. Treatment outcomes were measured at baseline, one week, and completion of therapy with an intervention period of 3, 6, and 12 months. Results were determined on the Oswestry Back Pain Disability Index and the Visual Analogue Scale (VAS), and statistical analysis was done.

Hammer and Pfefer discussed the treatment of Subacute Lumbar Compartment Syndrome using the soft tissue mobilization GT [16]. The case report was about a patient who had low back pain after exercise combined with lumbar extension and prolonged flexion posture that was relieved following rest. The patient had a restrictive lumbar posterior fascia with no neurological deficits. The restrictive lumbar posterior fascial layers were treated with IASTM GT. The results showed that after six treatments, there was a restoration of fascial extensibility and resolution after the physiological complaint. The authors suggested that the posterior spinal fascial compartments cause intermittent lower back pain. However, clinicians must determine whether the involved fascia is too restrictive. Treatment was directed towards the restrictive fascia using the soft tissue GT, and the patient showed improved facial functional testing and reduced symptoms.

Daniels and Morell presented another case report of a ten-year-old football player [17]. The patient had bilateral plantar fasciitis. The patient had bilateral plantar heel pain at the origin of the plantar fascia for three weeks. Treatment was provided over six weeks with chiropractic care consisting of soft tissue therapy (GT) and manipulative therapy. The duct tissue therapy was performed on the plantar fascia and triceps surae. In the restricted ankle joint, high-velocity, low-amplitude manipulation was applied. After six treatments, the patient reported the resolution of bilateral pain and improvement in daily activities. The patient's condition improved after using the multimodal chiropractic treatment. Three months later, the patient reported a complete resolution of pain. This case study involved a patient with bilateral plantar fasciitis that improved after multimodal treatment using chiropractic manipulation and soft tissue (GT) and physical exercise and stretching therapies. This study suggested the efficacy of GT along with physical exercise for treating pain and similar muscle or tissue conditions.

All the above research studies suggest that the GT has been primarily useful for patients with muscle or tissue injuries with no other disease or pathologies. GT was also practical when used for over four weeks of treatment sessions in combination with physical exercise.

3. Meta-Analysis

A meta-analysis of the research results is presented here, considering the systematic review's empirical studies. A meta-analysis is an epidemiological study used to systematically review and assess several research papers' findings to derive conclusions about the published research results. These studies are case reports or based on randomized, controlled clinical trials [18].

A search of the terms "Graston Technique®" and "Instrument Assisted Soft Tissue Management (IASTM)" on online journal databases returned up to 50 relevant results, and selected research papers were used for the literature review of this paper. These research studies' general directions provided the trends of research and treatment outcomes for patients with muscle injuries, pain, or related ailments.

This paper primarily focuses on using the GT and other massage therapy, along with stretching or other physical exercises. The primary research question is: is the GT an effective and safe therapeutic method for pain and muscle or tissue injuries? Each study was extended for weeks, but there were some variations in the treatment methods used. Some studies used a placebo or control group to compare the treatment outcomes used by the GT or IASTM. The investigations concerned treating patients with different injuries or physical trauma, from a hamstring injury to carpal tunnel syndrome, neck and thoracic pain to back pain and muscle, tendon, or ligament tear. A muscle injury or back pain can be corrected with the GT and instrument-assisted mobilization of the affected soft tissue areas. A tabular format of the analysis is given here. Fourteen research papers were selected for the meta-analysis. The meta-analysis procedure is shown in Figure 1 below.

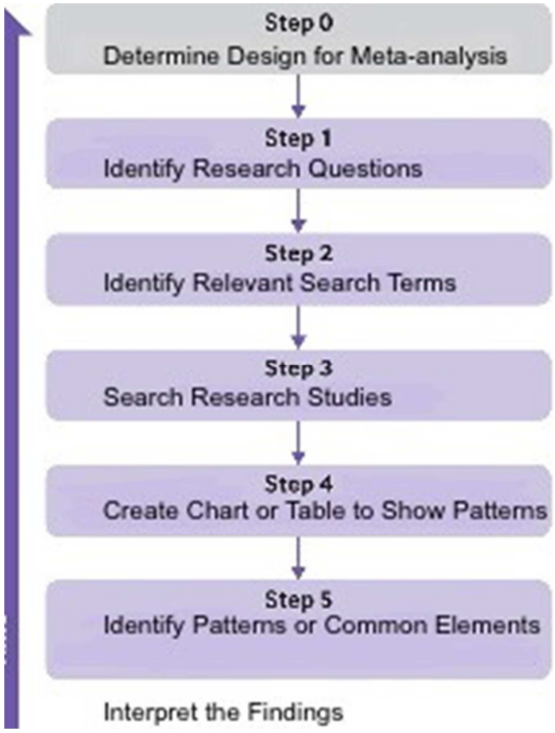

Figure 1. *Meta-analysis chart.*

The results of this meta-analysis are presented in Table 1 below.

Table 1. *Summary of the studies included in the meta-analysis, including the patient characteristics, intervention provided, and treatment results.*

Authors	Title	Patients	Intervention	Results
Hammer, W. I., & Pfefer, M. T. (2005)	Treatment of a case of subacute lumbar compartment syndrome using the Graston Technique®	One patient presented with low back pain related to exercise combined with flexion posture.	Restrictive lumbar posterior fascial layers and adjoining restrictive fascia (thoracic, gluteal, hamstring) were treated with instrument-assisted soft tissue mobilization (the Graston Technique®),	Treatment with GT resulted in improved fascial functional testing and reduction of pain symptoms.
Crothers A, Walker B, French S. D (2008)	Spinal manipulative therapy, Graston Technique® and placebo for non-specific thoracic spine pain: a randomized controlled trial.	One hundred and forty-three participants were randomly allocated to the three groups (SMT = 36, GT = 63 and Placebo = 44). SMT is Spinal Manipulative Therapy, GT is Graston Technique®,	Each participant received 10 supervised treatment sessions over a four-week period.	Study showed no difference in outcomes in between groups
Solecki T. J, Herbst E. M. (2011)	Chiropractic management of a postoperative complete anterior cruciate ligament rupture using a multimodal approach: a case report.	A 25-year-old man had a rupture of left ACL, handle tear of medial meniscus and full-thickness tear within posterior horn of the lateral meniscus, due to direct-contact trauma while playing basketball.	Postoperative care included a 12-week functional chiropractic rehabilitation program along with Active Release Technique, Graston Technique®, and Kinesiotaping.	A multimodal approach to the treatment of postsurgical ACL repair was successful in restoring functional ability, reducing pain, as well as pain relief
Strunk R. G., Pfefer M. T.., Dube D. (2014)	Multimodal chiropractic care of pain and disability for a patient diagnosed with benign joint hypermobility	Patient was a 23-year-old white female presented for chiropractic care with CLBP chronic low back pain, neck pain, and headaches.	Treatment consisted of spinal and extremity manipulation, Graston Technique®, and post-isometric relaxation with sensory motor	Revised Oswestry Low Back Questionnaire and Headache Disability Index demonstrated clinically significant

Authors	Title	Patients	Intervention	Results
	syndrome: a case report	Patient had joint hypermobility of thumbs, elbows, right knee, and lumbopelvic region along with thigh varicose veins.	stimulation and scapular stabilization exercises. Treatment was given 15 times over 18-week period.	improvements in low back pain and headache. No change in neck pain.
Gulick D. T. [12]	Influence of instrument assisted soft tissue treatment techniques on myofascial trigger points.	Phase 1 = 27; Phase 2 = 22. MTrPs (myofascial trigger points) were identified in the upper back of patients	In phase 1, one group was treated with IASTT, the other was a control. In phase 2, one MTrP was identified in a treatment and a control group. Treatment groups received 6 treatments of IASTT.	There was a significant improvement in both groups over time and no difference between the treatment and control groups.
Lee, J, Young, A, Erb, N. J, Herzog, V. W. [9]	The acute and residual effects of IASTM and roller massage stick on hamstring range of motion.	Sixteen (8M, 8F) recreationally active individuals (age 23.38±2.45 years).	IASTM using Graston instruments and a roller massage stick were applied to the hamstrings for 3.5 minutes. Active and passive ROM were measured baseline/pre-intervention, immediately post-intervention, and 48-hrs of post-intervention.	IASTM and the roller massage stick were equally effective immediately and over time
Nazari G, Bobos P, MacDermid JC, Birmingham T. [11]	The effectiveness of instrument-assisted soft tissue mobilization in athletes, participants without extremity or spinal conditions, and individuals with upper extremity, lower extremity, and spinal conditions: a systematic review	Several randomized controlled trials reported with participants without extremity or spinal conditions and in people with upper extremity, lower extremity, or spinal conditions	Data extraction and synthesis of several studies	The evidence from results of the studies did not support the use of IASTM to improve pain, function, or range of motion in individuals without extremity or spinal conditions
Looney B, Srokose T, Fernández-de-las-Peñas C, Cleland JA. [10]	Graston instrument soft tissue mobilization and home stretching for the management of plantar heel pain: a case series	10 patients with report of plantar heel pain completed self-report questionnaires including the Global Rating of Change Scale (GRC), the Numeric Pain Rating Scale, and the Lower Extremity Functional Scale.	Patients were treated with GT on the triceps surae, soleus, plantar fascia, and medial calcaneal tubercle. Patients received 8 treatments over 3 to 8 weeks at a frequency of 1 to 2 sessions per week with stretching programs at home, 3 times daily.	Patients who got GT and followed an exercise schedule at home, experienced clinically meaningful improvements.
Schaefer, J. L.[19]	The effects of a randomized four-week Graston Instrumented-Assisted Soft Tissue Mobilization (GISTM) dynamic balancing-training program on individuals with chronic ankle instability	Thirty-six healthy, physically active individuals (5 female, 31 males; age 17.7 ± 1.9 y; height 175.3 ± 14.6 cm) with a history of (chronic ankle instability) CAI as determined by an ankle-instability questionnaire were participants	Participants were randomly assigned to 1 of 3 intervention groups: both treatments (DBT/GISTM, n = 13), DBT and a placebo GISTM treatment (DBT/GISTM-S, n = 12), or DBT and control-no GISTM (DBT/C, n = 11). All groups participated in a 4-wk DBT program	Subjects in all groups demonstrated an increase in FAAM, (Foot and Ankle Ability Measure) FAAM Sport, ROM (Range of Motion), and SEBT (Star Excursion Balance Test) in all directions.
Lee, J, Young, A, Erb, N. J, Herzog, V. W. [9]	The effect of Graston Technique® on the pain and range of motion in patients with chronic low back pain.	30 patients with CLBP participated in the study (Graston Technique®: 15; Control: 15)	Four-week intervention program with Graston Technique® (GT) given to treatment group.	The Graston Technique® and general exercise resulted in pain relief and increased ROM.
Daniels C. J., Morrell, A. P. [17]	Chiropractic management of pediatric plantar fasciitis: a case report	Presented the case of a 10-year-old football player with bilateral plantar fasciitis	Treatment was provided for 6 visits over a 6-week period. Chiropractic care consisted of manipulative therapy, soft tissue therapy, and home rehabilitation exercises.	The patient with bilateral plantar fasciitis improved after a multimodal treatment approach using chiropractic manipulation, soft tissue therapy and exercise or stretching therapies.
Rhyu H. S., Han H. G. Rhi S. Y [20]	The effects of instrument-assisted soft tissue mobilization on active range of motion, functional fitness, flexibility, and isokinetic strength in high school basketball players	Active range of motion (AROM), functional fitness, and isokinetic lower strength in the knees and ankles were measured in 40 healthy young basketball players. They were then divided into an IASTM group (n= 20) and a control group (CG, n= 20).	20 participants were treated with IASTM six times per week for 8 weeks. The remaining 20 participants did not receive a treatment intervention	Results suggested that IASTM improved functional fitness and lower body muscle strength in young basketball players.
Aspegren, D., Hyde, T., & Miller, M. [21]	Conservative treatment of a female collegiate volleyball player with costochondritis.	A 21-year-old collegiate volleyball player had right anterior chest pain and midthoracic stiffness of 8	High-velocity, low-amplitude manipulation was performed to associated hypokinetic	Athlete responded positively to manipulation, instrument assisted soft tissue

Authors	Title	Patients	Intervention	Results
		months duration.	costovertebral, costotransverse, and intervertebral zygapophyseal thoracic joints. Instrument-assisted soft tissue mobilization (IASTM) was performed by using the Graston Technique®.	mobilization, and taping.

4. Conclusion

The studies above show that all participants had baseline complaints of pain or injury and were treated with IASTM, IASTT, or other GT massage therapy forms. In most cases, the studies compared a treatment group and a control group, although the papers also included several single case reports of athletes or young people. Five of the research reports are case studies. Injuries were reported in different parts of the body but mostly the back or upper or lower extremities. In most cases, the patients received more than four weeks of treatment (usually eight weeks) and more than eight treatment sessions (2-3 times per week) using the GT Massage Therapy. However, most case reports and studies show that participants showed clinically significant improvement only when the GT was combined with physical exercises. This finding is significant as it could help create a treatment plan that is entirely noninvasive and yet effective with the right kind of therapeutic approach. A holistic treatment plan with noninvasive massage therapy, exercise programs, physical therapy, GT, and a healthy diet and daily activity schedule can be recommended for patients recovering from traumatic injuries, muscle strain, or spinal and back pain symptoms.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

James McKivigan PhD, DPT, DC: Manuscript, Review Design, Data Analysis.
Gina Tulimero DPT: Data Collection, Collation, Editing

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