Research Overview
Astym® therapy

Astym® therapy: scientific and clinical research

Background:

Research on Astym therapy began with a multi-disciplinary research team theorizing about a potential physical treatment method with the ability to regenerate and remodel soft tissues. These theories were built upon emerging evidence regarding the degenerative nature of tendinopathy, and the investigations into how cellular mediators and growth factors may enhance healing. Hypothesizing that an external, non-invasive intervention could impact cellular activity, basic science studies were conducted on Astym treatment[1,2] to elucidate physiologically relevant mechanisms, and to develop specific treatment protocols aimed at **stimulating the regeneration of soft tissues and the resorption of inappropriate scar tissue/fibrosis.** Specific protocols were developed defining the use of hand-held instrumentation to topically locate underlying dysfunctional soft tissue and then transfer particular pressures and shear forces to the dysfunctional tissue.

In vivo studies revealed that the **Astym protocols improve tendon repair, increased limb function, and normalized movement patterns** in animal models.[1,2] Further, Astym treatment results in a **significant increase in both fibroblast activation and fibroblast number**, as well as the production of fibronectin, which together with interstitial collagens may interact to form a fibrillar component of the extracellular matrix.[1,2] The increase in fibronectin is notable in that fibronectin is thought to be required for normal collagen organization and deposition by fibroblasts, and they have the potential to guide cell and tissue behavior during healing as a function of their unique mechanical and bioactive properties.[3,4] This preparatory line of basic science research substantiated the cellular impact of Astym treatment and refined the protocols to be used clinically.

In addition to the intended regenerative effects and cellular impact, the standardized Astym therapy process contains: (i) the assessment and treatment of the **entire kinetic chain** to address improper movement patterns; and (ii) functional exercise programs which include **stretching and strengthening** to properly load the tissues along longitudinal lines in order to promote healthy, functional alignment of new collagen deposition, and also to address the need for mechanical loading to extend and enhance regenerative properties of growth factors as shown in animal models.[5,6,7]

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Evidence of Effectiveness of Astym Therapy:

An extensive Systematic Review conducted by leading researchers concluded that Astym therapy is **consistently safe and effective** in the conditions studied.[32] Further, the Systematic Review noted Astym therapy results in **significantly better outcomes** in a variety of musculoskeletal disorders, including post-surgical pain, tendinopathy, and soft tissue dysfunction. It went on to point out that perhaps one of the main reasons why Astym Therapy is **different from the less optimal approaches** can be attributed to how it was developed; as the review summarizes, Astym therapy was: "*developed methodically from theory through basic science investigation to clinical study and practice."* [32]

Astym therapy has been found to reduce pain and increase function in cases where **scar tissue** is interfering with movement or causing pain.[6,8,9,10] Scar tissue may result from overuse, problematic biomechanics, trauma, or surgery. Although Astym therapy routinely demonstrates success in the treatment of conditions where scar tissue is present, dramatic improvement has been shown when Astym therapy is used post-surgically. In a large study of post-surgical TKA patients suffering from persistent knee stiffness, patients who underwent Astym treatment reported significant mean improvements in both Knee Society objective (80 vs. 57 points; $p < 0.0001$) and functional scores (80 vs. 54 points; $p = 0.0003$).[11] The mean flexion deficit improved significantly ($p < 0.001$) in all patients after Astym therapy. The mean flexion contracture improved significantly ($p = 0.001$) in 91% of patients after Astym therapy.[11] These dramatic improvements were achieved even though the subject patients had already failed standard rehabilitation intervention. Another, larger study demonstrated how Astym therapy can significantly reduce arthrofibrosis and the need for manipulation under anesthesia (MUA) in the post-surgical TKA population.[12] A third study of post-surgical TKA patients confirmed that Astym therapy contributed to optimal range of motion and significantly reduced the need for repeat MUA.[13] All these studies show Astym therapy to be **highly effective and safe in post-surgical treatment**. In this difficult patient population, these results are quite significant.

The **Bone & Joint Journal** published the **international consensus** on the definition and classification of fibrosis of the knee joint to define and advise on post-operative knee fibrosis.[14] This **respected international consensus recommends Astym therapy, noting it has shown good results in this post-surgical population.** Beyond traditional post-surgical applications, Astym therapy is also being applied successfully in more complex situations, such as assisting with the soft tissue aspects in leg-lengthening procedures/surgeries.[15]

Specific Astym treatment protocols have been developed for post-mastectomy patients with restricted movement, and the efficacy of those protocols have been demonstrated in clinical studies. Following a course of treatment with Astym therapy, which includes treatment application to the thickened scar tissue and hypersensitive soft tissue adhesions in the affected area, patients experience less pain, increased function, and reduced hypersensitivity.[6,10] Shoulder range of motion was improved with clinically significant and meaningful change in both flexion and abduction.[10]

Astym treatment has also been used to assess and successfully treat **tendinopathy** and has been found to reduce pain while increasing motion and functional ability.[16,17,18,21] When Astym treatment was compared to deep transverse friction massage (DTFM), exercise and stretching in a prospective, randomized, controlled trial design, Astym treatment showed superior efficacy in the resolution of tendinopathy, and further demonstrated efficacy in the cases of tendinopathy that were recalcitrant to DTFM, exercise and stretching.[19]

In a large, randomized trial on Astym therapy vs. eccentric exercise in the treatment of **lateral elbow tendinopathy**, Astym treatment resolved 78.3% of subjects with tendinopathy of the lateral elbow, and eccentric exercise resolved 40.9% of subjects. Interestingly, of the recalcitrant subjects who did not resolve with eccentric exercise and then chose to receive Astym treatment, four weeks of Astym application resulted in a resolution of 95.7% (20/21) of subjects, who showed significant improvements in pain with activity ($p<0.005$), function ($p = 0.002$), and DASH scores ($p<0.005$). Long-term follow-up at 6 and 12 months revealed subjects maintained their gains.[20]

A randomized, controlled clinical trial on insertional Achilles tendinopathy demonstrated that Astym therapy yielded superior results within 12 weeks, and those superior results were maintained at 26 weeks and 52 weeks.[21] The **long-term improvement achieved with Astym therapy** is important, as various interventions may have an effect in the short term, but are unable to achieve positive results in the long-term.

The positive **neural effects of Astym therapy** have been demonstrated in a large, three-arm randomized trial, which showed that Astym therapy improves muscle performance.[22] In this trial, **Astym therapy immediately improved muscle performance** (maximal force output) for patients presenting with muscular weakness caused by an injury. Subjects that received Astym therapy increased maximal force output of the lower extremity immediately following treatment by an average of 15% from pre-treatment values. This was significantly greater ($p < 0.01$) than the average 1% and 6% decrease in maximal force output (Newtons) demonstrated in the control and placebo treatment groups, respectively. The results from this RCT indicate positive neural effects from Astym therapy and are supported by other clinical study indicating improvement in neural conditions such as carpal tunnel syndrome[23], restricted movement due to cerebral palsy[24,25] and brain injury.[26]

It is notable that the positive results on muscle strength from Astym therapy are not shared by some other common approaches. Decreases in muscle strength have been shown to result from various forms of massage[27-29] and soft tissue mobilization using devices such as “the Stick”[28] and foam rollers.[29,30] The **beneficial neural effects** of Astym therapy have also been shown in the treatment of **cerebral palsy**. Astym therapy led to significant gains in flexibility, functional strength, and **discontinued use of ankle-foot orthotic devices**, resulting in improved gait pattern with even stride length and diminished genu recurvatum, decreased pain with standing and walking, and improved activity tolerance.[24]

In recent years, it has been recommended that observational research be utilized to supplement randomized, controlled clinical trials. **Observational study** can be used to evaluate the impact of therapies in the real world, and many believe it is essential to translate the findings from RCTs into clinical practice. Consistent with these recommendations, outcomes data on Astym therapy has

been collected and analyzed on over 10,000 patients who received Astym therapy. Astym therapy was delivered by hundreds of different clinicians, across multiple sites and in various settings (including outpatient therapy clinics, hospitals, in the military, within industry, and in the workplace), and the extensive outcomes data collected is consistent with the results shown in the RCTs on Astym therapy. According to a recent Cochrane Review, on average, there is little difference between the results obtained from quality RCTs and observational studies.[31] Following this principle, the consistency between the RCTs on Astym therapy and the extensive outcomes data on Astym therapy supports the quality of both.

The extensive outcomes data on Astym therapy show the actual response rates and include data such as response for each diagnosis, patient type, and how co-morbidities impact the response. This database shows:

- expected resolution rates and time frames, which guide routine clinical practice with valuable benchmark data
- Astym therapy is highly effective and safe across a large population
- the heterogeneity and generalizability of Astym treatment
- clinical research findings translate into real-world results
- results similar to FOTO data, indicating superior effectiveness when compared with other interventions.

In addition to the research outlined above, findings of case studies and case series performed on Astym therapy indicate the effectiveness and safety of Astym therapy when applied to other neuromusculoskeletal conditions. For a full listing of research publications, please visit the Research Page of the Astym therapy website.

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Is the evidence base on Astym therapy applicable to Instrument Assisted Soft Tissue Mobilization (IASTM) or vice versa?

Astym therapy and IASTM are very different in goals and application, and therefore, research findings from one would not apply to the other. In a Systematic Review authored by leading researchers, it is noted that Astym therapy: "is a **distinctly different** approach than Tooling/Scraping, which is also referred to as Instrument Assisted Soft Tissue Mobilization ("IASTM"). The methods and results are quite different from Astym therapy, and IASTM methods are often not well-tolerated by patients."[32]

What is the research on IASTM techniques?

IASTM techniques

Background:

IASTM is described as "an instrument assisted form of deep transverse friction massage (DTFM) as proposed by Cyriax."[a] The goal of IASTM is to mechanically break up scar tissue and fascial restrictions.[c,d] Tools made of steel or an otherwise rigid material are utilized to induce trauma to the affected soft tissues and initiate an inflammatory response.[b,c] Applying ice is a standard practice after performing IASTM to help abate excessive inflammation sustained from the treatment.[e] The amount of trauma or the extent of the inflammatory response are not defined in the limited amount of literature on IASTM, however, anecdotal reports and video documentation of IASTM indicate the trauma may be significant. The **questions regarding the safety** of IASTMs are also reinforced by cautions issued by the major IASTM tool manufacturer about concerns of IASTM's safety, "causing therapists and medical doctors to 1) not consider IASTM for their outpatient clinics and 2) specifically rule out Graston Technique® treatment for their patients".[f] The safety concerns and questionable effectiveness have resulted in some physicians and physician groups recommending against IASTM application. Research has demonstrated an increase in pain and decrease in the perception of function following IASTM, substantiating these safety concerns.[g]

Animal studies have shown that transverse frictions do not promote repair of sprained ligaments,[h] and this apparent inability to heal soft tissue appears to extend to the tooled versions of DTFM (IASTMs). In an animal study where IASTM tools were used to perform cross-fiber massage, it was shown that the potential for initial acceleration of tissue healing did not result in improved overall ligament healing.[i] Further, study in humans shows **no positive physiologic effect**. When

measurements were taken, no significant difference in studied parameters was found in muscle biopsies.[g]

Evidence of Effectiveness of IASTM techniques:

There are some anecdotal reports suggesting that the IASTM techniques may be helpful in soft tissue disorders; however, there is inadequate evidence in the literature to support clinical use. A **systematic review** evaluated the research on IASTM and concluded the **current research does not support the efficacy of IASTM** for treating musculoskeletal pathologies. Recognizing the fact that some clinicians utilize IASTM without supporting research, the systematic review noted there is a **gap between the current research and clinical practice**. This systematic review did not include Astym therapy, but rather distinguished Astym therapy and acknowledged Astym therapy has its own body of evidence that differs from IASTM.[j] Following the Systematic Review, a large controlled clinical trial of 143 participants showed that there **is no difference between Graston Technique® and sham therapy**.[k] Another study completed after the systematic review revealed that IASTM had **no positive effect on muscle performance.** Although IASTM was applied by a certified and experienced IASTM provider, no significant difference could be found between the treated and untreated group.[l] A good sized clinical trial in 2018 showed **myofascial release without tools was superior** to Graston technique to improve stiffness and range of motion; in this study, **Graston technique was comparable to the control group receiving no treatment**.[m] In 2018, an abstract systematic review once again confirmed research does not support the efficacy of IASTM.[n]

In a controlled study with a repeated measures design, patients who were treated with IASTM showed a **significant increase in pain** and a **significant decrease in the perception of function,** where the **ability to perform activities of daily living decreased** following IASTM.[g] In this 2015 study, the treating clinician had completed the Advanced Upper/Lower Quadrant Training in IASTM, Module 2 (Graston Technique®, Indianapolis, IN), and used this technique in the study.[g]

In a pilot study where the same clinician used IASTM tools to deliver treatment to one group and then performed the same treatment on another group with only the clinician's hands, it was found that using tools did not improve clinical results, **suggesting that manual therapy with IASTM tools is no more effective than manual therapy with hands alone**.[o]

In a larger study adding IASTM to a dynamic balance training program for chronic ankle instability, it was shown that the addition of **IASTM did not improve treatment results** of subjects.[p]

In a study of 30 subjects with lateral elbow tendinopathy, IASTM was compared to no treatment (subjects waiting with information provided on stretching, ergonomics and what to expect with the condition), and it was found that **IASTM results were comparable to no treatment being provided.**[q]

Case reports and a case series have been published where IASTM was applied; however, IASTM is typically combined with other approaches, such as chiropractic manipulation, ART, electrical

stimulation, ultrasound, exercise, and acupuncture, making it difficult or impossible to draw conclusions or determine the effectiveness of any one approach.

Further study is needed on IASTM to determine if it has any role in the treatment of soft tissue dysfunction. Some weak evidence could be interpreted to suggest that IASTM may assist in hamstring extensibility, and pain management in nonspecific chronic low back pain.[r,s]

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