

Instrument Assisted Soft Tissue Mobilisation

Instrument Assisted Soft Tissue Mobilisation (IASTM) is a simple, non-invasive form of manual therapy to manipulate or mobilise soft tissue structures of the human body. IASTM is becoming increasingly popular these days among both practitioners and patients alike due to its remarkable safety and efficacy profile. The therapy is nonaggressive, yet effective, and can be applied either alone or in conjunction with supplementary exercises and additional modalities (Baker et al., 2013).

What is IASTM?

IASTM is a procedure in which instruments are used to mechanically stimulate soft tissue structures to relieve musculoskeletal pain and discomfort and improve overall mobility and function. In other words, IASTM is a common term that describes the use of a range of ergonomically designed tools to enable clinicians to detect and treat soft tissue pain, injury, and dysfunction (Cheatham et al., 2016). These include:

- Fascial restrictions
- Scar tissue
- Adhesions
- Thickenings
- Fibrotic nodules
- Fibrosis
- Tissue degeneration

The IASTM instruments are uniquely designed to provide an efficient detection of soft tissue dysfunction and accurate application of force during treatment. These tools help clinicians to apply different strokes and palpate at deeper levels of the body. In other words, they allow greater depth of mechanical force transmission at various body points where the hands simply cannot reach (Stow, 2011).

The IASTM tools can be either convex or concave in shape and are made of many different materials, including stainless steel, wood, plastics, ceramics, and stone. Of these, stainless steel instruments are the most popular ones that have been used frequently in practice.

History

In many traditional and folk medicines worldwide, several forms of instrument assisted manipulation exist that are very similar to IASTM. These therapies have been around for centuries. Hence, there are quite a few stories on where IASTM originated. The root can be traced back to ancient Egypt, China, India as well as Greece. However, the most widely accepted origin of IASTM is *Gua Sha*, a form of Traditional Chinese Medicine in which the skin is scraped with instruments to make light bruising. This technique is still in use today, though largely in Asia (Cheatham et al., 2016).

In western medical model, IASTM was reintroduced in the late part of the last century, particularly during 1990s. The procedure afterwards rapidly grew in popularity and evolved into techniques that suit with the way manual therapy practitioners think and work. Today IASTM has its own indications and limitations, and practitioners of this therapy can be found in clinics, gyms as well as sports teams (Baker et al., 2013).

Principles

In general, IASTM has similar principles and rationales as conventional soft tissue mobilisation. It views the human being in a holistic manner and believes that the body has its own ways to self-heal and self-regulate. The purpose of this therapy is to make an ideal environment for the body's self-maintenance mechanisms, by either altering physiologic responses to injury or encouraging normal function in the musculoskeletal system. The approach involves through evaluation of the altered tissue properties and application of specifically directed techniques to encourage normalisation of the soft tissue dysfunctions.

Theoretically, IASTM is based upon the concept of deep friction massage as proposed by Cyriax and Russell (1980). The authors introduced a deep massage technique, which must be applied transverse to the direction of specific tissue involved, to reach the soft tissue structures of tendon, ligament, and muscle. They hypothesised that the application of this technique could induce a therapeutic movement within the affected tissue and help maintain the mobility, preventing adhesions of scars by evoking local hyperemia (Chamberlain, 1982).

IASTM adheres to the same the rationale for traditional cross friction or transverse friction massage, but the difference is that it is performed with specially designed instruments. It has been hypothesised that the use of instruments provides the clinician with a mechanical advantage, which allows deeper penetration, rapid localisation and more effective treatment (Baker et al., 2013). It also helps to apply longitudinal

pressure along the course of muscle fibres and minimise the imposed stress on the clinician's hands (Laudner et al., 2014).

Another advantage of using IASTM is that both the clinician and patient perceive an increased vibration sense, which is believed to be an indication of altered tissue properties. This elevated perception of vibration is thought to ease the clinician's task of evaluating structural and/or functional tissue changes. At the same time, it also increases the patient's consciousness of altered sensations within the affected tissues (Lee et al., 2014; Cheatham et al., 2016).

Indications and Contraindications

Table 1. Possible Indications of Instrument-Assisted Soft Tissue Mobilisation

Medial and lateral epicondylitis	Myofascial pain and restrictions
Carpal tunnel syndrome	Chronic & acute sprains/strains
Neck & back pain	Non-acute bursitis
Plantar fasciitis	RSD (reflex sympathetic dystrophy)
Rotator cuff tendinosis	IT-band syndrome
Patellofemoral disorders	Wrist tendinosis
de Quervain tenosynovitis	Reduced ROM due to scar tissue
Post-surgical & traumatic scars	Achilles tendinosis

Source: Stow (2011); DeLuccio (2006); Hammer (2008)

Table 2. Contraindications and Precautions of Instrument-Assisted Soft Tissue Mobilisation

Contraindications	Precautions
Open wound (unhealed suture site)	Acute inflammatory conditions
Uncontrolled hypertension	Rheumatoid arthritis
Thrombophlebitis	Anti-coagulant medications
Myositis ossificans	Cancer
Unhealed fractures (nonunion)	Kidney dysfunction
Patient intolerance/ non-compliance	Systemically unwell
Hematoma	Septic arthritis
Haemophilia	Varicose veins

Osteomyelitis

Burn scars

Generalised Infection

Pregnancy

Source: Stow (2011); Hammer (2008)

Mechanism of Action

IASTM has numerous effects on the body systems. It breaks down scar tissue and adhesions, increases fibroblast proliferation and releases fascial restrictions, thus facilitating the synthesis of collagen, reabsorption of inappropriate fibrosis, and maturation of the tissue. However, the mechanism of action behind these effects is not fully understood yet. Many theories have been proposed so far, but evidences to support these hypotheses are still limited. This part discusses some the important theories that are proposed up to now.

Remodelling of Scar Tissue and Adhesions

In patients with soft-tissue injuries, scar tissue and adhesions form if the body completes its own self-healing process. When they are formed, the range of motion within the affected area is limited and the precise lengthening of muscle or other tissues is inhibited. For this reason, it is of critical importance for clinicians to reinitiate the body's healing process so that remodelling of affected soft tissue structures can be done (Hammer, 2004).

IASTM is thought to introduce a localized microtrauma to the affected soft tissue structures, which causes capillary and microvascular haemorrhage, stimulating the body's inflammatory response. This, in turn, restarts the body's natural process of tissue repair and regeneration, initiating the reabsorption of excessive fibrosis and facilitating a cascade of healing activities (Melham et al., 1998). As a result, the amount of blood, nutrients, and fibroblasts to the affected area is enhanced and a remodelling of the soft-tissue structures is facilitated. This eventually results in breakdown of adhesions and scar tissue, allowing optimal restoration of the soft tissues in the affected area (Hammer, 2008; Laudner et al., 2014).

Increased Fibroblast Recruitment

Fibroblast is an important cell in connective tissue, which is responsible for producing the extracellular matrix (ECM) and collagen. ECM is the place where almost all the processes of repair and regeneration of soft tissue are done. Fibroblasts synthesise the ECM and are capable of serving as mechanotransducers (Chiquet et al. 2003). This means fibroblasts can not only sense biophysical strain (deformation) but also generate appropriate responses to mechanical stimuli.

IASTM has been shown to increase fibroblast proliferation and promote collagen repair. Gehlsen et al. (1999) reported that in rats with enzyme-induced tendinitis, the application of IASTM therapy greatly improved the healing process. The authors suggested that the rate of fibroblast proliferation correlate with the applied heavy pressure by IASTM. In another study on a rat model, Davidson et al. (1997) also concluded that soft tissue mobilisation techniques might promote healing of damaged tissues by increasing fibroblast recruitment. Similarly, they also observed increased fibroblast production in the tendinitis. Taken together, it can be said that IASTM treatment may induce repair and maintenance of soft tissues influencing fibroblast recruitment.

Release of Fascial Restrictions

Fascia is an uninterrupted network of white fibrous tissue that extends over the whole body just below the skin. It tightens and loses its flexibility if stress is placed on the body or injury occurs. When fascial tightness or shortness occurs, stretching of fascia may result in faulty movement patterns in muscles and pain at distant sensitive areas of the body, e.g. blood vessels and nerves (Findley et al., 2012).

IASTM is thought to restore balance, motion and function by changing the mechanical properties of the fascia, such as density, tonus, arrangement and viscosity. It has been hypothesised that once fascial restrictions are released through appropriate application of IASTM techniques, pressure is eased from the distant sensitive areas and blood circulation returns to normal range (DeLuccio, 2006). Although scientific evidence to support this hypothesis is still limited, some studies have reported palpable tissue release after applying soft tissue mobilisation to dense fascial areas (Juhan, 1987; Ward, 1993; Stecco, 2004). These palpable sensations of tissue release have been attributed as a breaching of fascial cross-links, a transition from viscous gel state to less viscous sol state in the extracellular matrix.

Normalisation of Somatic Dysfunction

Somatic dysfunction in the connective tissue occurs due to internal or external trauma. O'Connell (2003) suggested that this dysfunction could be normalised by the application of myofascial release techniques. These techniques involve applying compressive and distraction forces into the stressed tissues. The author hypothesised that once the force is applied to the restriction, the fascia responds rapidly via its collagen fibres by creating microelectric potential changes. As a result, the fascial restrictions decrease and motion resumes. Because IASTM can be applied on dense fascial areas using both

compressive and distraction forces, it is plausible to say that IASTM may restore motion in the affected area and influence myofascial release.

Neurophysiological Effects

IASTM is thought to have some neurophysiological effects, as there have been reports of immediate and sustained fascial responsiveness following the therapy. Several theories have been proposed to explain these effects. However, there is very little scientific evidence in support of these hypotheses.

Stimulation of Golgi Receptors

One of the widely discussed theories is that soft tissue mobilisation may stimulate the sensory Golgi receptors within the fascial fibres (Cottingham, 1985). It has been presumed that during slow stretching of the myofascial tissues, these receptors respond by reducing the firing rate of specific alpha motor neurons, which ultimately leads to tonus changes in the affected tissues. Although it has been highly debated whether Golgi receptors could be activated with passive stretching, Schleip (2003a) suggested that deep tissue mobilisation could indeed influence these receptors, as 90% of them are located outside the Golgi tendon. Because IASTM allows depths of treatment at cellular level, there is a high possibility that it may activate Golgi receptors.

Activation of Mechanoreceptors

Another important theory that has been used to explain the neurophysiological mechanism of IASTM is fascial plasticity, which is proposed by Schleip (2003a, 2003b). Fascia is densely populated by mechanoreceptors, sensory receptors that respond to mechanical stimuli. Schleip suggested that the ruffini and interstitial mechanoreceptors might respond to slow myofascial techniques and trigger changes in sympathetic tone and local vasodilation. The author hypothesised that stimulation of these mechanoreceptors results in transmission of altered proprioceptive signals to the central nervous system (CNS). When these inputs are transmitted to the brain, the CNS responds by resetting the gamma motor system, which leads to changes in muscle tonus regulation. This ultimately results in release of myofascial pain and restrictions.

Research Outcome

Research evidence in support of the safety and efficacy of IASTM is still limited. However, over the last decade, a number of studies have reported therapeutic benefits of IASTM (see Table 3). These include improvements in overall healing process, range of motion, stride length and frequency, normal function, and pain perception.

Table 3. Studies Reporting Clinical Benefits of IASTM

Citation	Study group	Study type	Key results	Conclusion
Melham et al. (1998)	A male college football player	Case report	After 6 weeks of treatment with IASTM, the patient reported no pain and had significantly improved range of motion. In addition, scar tissue surrounding the patient's lateral malleolus was decreased and a structural remodelling was facilitated following the therapy.	IASTM demonstrated clinical effectiveness in treating excessive connective tissue fibrosis.
Wilson et al. (2000)	20 subjects (12 men and 8 women) were randomised into groups: traditional (n = 10) and IASTM (n = 10).	Randomised controlled trial	The IASTM group showed statistically significant ($P = .04$) improvement in pain reduction and functional-impairment ratings.	IASTM demonstrated greater clinical outcomes in the treatment of patellar tendinitis compared to traditional therapy.
Loghmani and Warden (2009)	51 rodents with bilateral knee MCL injuries; of these, 7 were kept as ligament-intact, control animals.	Controlled laboratory study	After four weeks, ligaments treated with IASTM therapy were 43.1% stronger ($P .05$) and 39.7% stiffer ($P .01$) than untreated ligaments. In addition, in electron microscope examination, the treated ligament seemed to have better collagen fiber bundle formation and orientation than nontreated ligaments.	IASTM showed clinically interesting outcomes in accelerating ligament healing.

White (2011)	3 female long distance runners	Case report	All three patients reported a complete resolution of hamstring pain and had regained full range of motion in an average of 13 treatments with IASTM, lumbopelvic manipulation, and electrical muscle stimulation.	Though other interventions were administered concurrently, IASTM appeared to promote faster healing of the injured tissue.
Baker et al. (2013)	3 collegiate student-athletes (2 male and 1 female)	Case report	All three patients had a full resolution of pain with activity and restoration of range of motion following treatment with IASTM for a few weeks.	IASTM demonstrated clinically significant outcomes in patient status.