Evidence and Applications of Instrument-Assisted Soft Tissue Mobilization in Physical Therapy

Presenter:
Shane McClinton, PT, DPT, OCS, FAAOMPT, CSCS

Moderated by: Calista Kelly, PT, DPT, Cert MDT, Managing Editor, PTsource.com

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Evidence and Applications of Instrument-assisted Soft Tissue Mobilization in Physical Therapy

Shane McClinton, PT, DPT, OCS, FAAOMPT, CSCS
Objectives

- List the level of evidence for conditions in which instrument-assisted soft tissue mobilization (IASTM) has been utilized in the published literature.
- Describe the histological changes associated with IASTM in animal studies.
- Describe potential mechanisms by which IASTM can produce a treatment effect.
- Discuss applications of IASTM in clinical practice.
- Identify limitations of IASTM theory and applications.

Outline

- IASTM treatment theory, tools, & “brands”
- Histological basis of IASTM
- Review of published literature using IASTM as treatment
  - Hierarchy of evidence
  - Conditions studied
  - Treatment parameters
- Treatment example
- Considerations & conclusions

IASTM – What is it?

- Manual therapy technique: Soft-tissue biased
- Involves the use of an instrument or tool
IASTM “Brands”

- ASTYM (Performance Dynamics, www.astym.com)
- Graston (Therapy Care Resources Inc., www.grastontechnique.com)
- Gua Sha
- SASTM (Carpal Therapy Inc., www.sastm.com)

IASTM Tools

- ASTYM (Performance Dynamics, www.astym.com)
- Fibroblaster (Fibroblaster LLC, www.fibroblaster.com)
  - Jack
- Fuzion (Soft tissue therapy tools Inc., http://fuziontherapytools.com/)
- Graston (Therapy Care Resources Inc., www.grastontechnique.com)
- Gua Sha
- SASTM (Carpal Therapy Inc. www.sastm.com)
- STARR Tool (www.starrtool.com)
- The Edge (http://www.themanualtherapist.com/p/for-sale-is-300-grade-stainless-steel.html)

Examples of IASTM tools

http://guashatools.com*  www.sastm.com*
www.starrtool.com*  the-edgetool.com*
*with permissions
Aims of IASTM

- Assessment
  - Detect irregularities in the soft tissue texture through the undulation of the gliding tools. (Sevier TL, et al. Sports Medicine. 1999.)

- Treatment Effects
  - Biomechanical
  - Neuropsychological
  - Psychological

Proposed IASTM Treatment Effects

**BIOMECHANICAL EFFECTS**

- Stimulates healing and strengthens new collagen (www.astym.com)
- Break down scar tissue (including collagen cross links) and fascial restrictions (www.graston.com)
- Removal of blood and metabolic waste, promotes normal circulation and metabolic processes (Chiu et al. J Nurs Research. 2010.)

Observed Responses to Treatment

- BRUISING
- PETECHIAE
Rat tendon morphologic and functional changes resulting from soft tissue mobilization (Davidson et al. Med Sci Sports Exerc. 1997)


Increased fibroblast proliferation with ASTM in rats

<table>
<thead>
<tr>
<th>Group</th>
<th>Fibroblast count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No injury + no ASTM</td>
<td>223</td>
</tr>
<tr>
<td>Injury + no ASTM</td>
<td>1047*</td>
</tr>
<tr>
<td>Injury + ASTM</td>
<td>5512*</td>
</tr>
<tr>
<td>No injury + ASTM</td>
<td>442</td>
</tr>
</tbody>
</table>

* Significant difference between injury + ASTM and all other groups...

Increased stride length/decreased stride frequency

9 sessions over 4 weeks

30 sessions over 12 weeks

Injured + no Rx

Injury + IACFM

Non-injured Control

*Injured + IACFM greater than Injured + no Rx (P < .05)


From the bench to the plinth

Can you alter healing of my injured Achilles/MCL using IASTM?

Yes, studies show...

Does that mean you can alter healing of my Achilles/MCL injury?

2/8/2012
Chronic ankle pain and fibrosis successfully treated with ASTYM (McNitt et al. Med Sci Sports Exerc. 2009)

- Rx: ASTYM (2x/wk x 7 weeks), ice stretching and a HEP
- Outcomes
  - ROM - improved in all directions
  - Pain – reduced from 6/10 to 0/10 with activity
  - NSAIDS – stopped use after treatment
  - MRI: baseline, 4 and 6 weeks post-treatment
    - Extensive scar formation – no change with treatment.
  - Photographs: Before and after treatment
    - Scar maturation and reduced soft tissue

Proposed IASTM Treatment Effects

NEUROPHYSIOLOGICAL EFFECTS

- Alteration of the pain experience - hypoalgesia
- Sympathetic response: blood flow, skin temperature
- Peripheral inflammatory mediators
- Muscle reflexogenic


PSYCHOLOGICAL EFFECTS

- Neuropsychological
  - Desire for pain relief
  - Pt. expectations (Bialosky et al. BMC Musculoskelet Disord. 2008)
  - Psychosocial context of treatment (context bias)
    - Fear, avoidance, catastrophization, kinesiophobia?
- Placebo effect (George and Robinson, J Orthop Sports Phys Ther. 2010)
  - Complex and dynamic
    - Neurophysiological
    - Neuropsychological
  - Study design with 3 arms (active treatment, placebo, control)
Contraindications

- Compromised tissue integrity (open wound, infection, tumor)
- Active implants (pacemaker, internal defibrillator, picc/pump lines)
- DVT
- Cervical carotid sinus

Precautions

- Bleeding disorders
- Inflammatory/irritable conditions (RA, lupus, Fibromyalgia, Complex Regional Pain Syndrome)
- Cancer
- Pregnancy
- Psychological state

Hierarchy of Evidence:

<table>
<thead>
<tr>
<th>Number of IASTM studies *</th>
<th>Level 1: 0</th>
<th>Level 2: 5</th>
<th>Level 3: 0</th>
<th>Level 4: 15</th>
<th>Level 5: 3 - ?</th>
</tr>
</thead>
</table>

*as of February 2012

www.cebm.net
**Studies per condition using IASTM**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total</th>
<th>RCT</th>
<th>Case Series</th>
<th>Case Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral epicondylalgia</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Plantar heel pain</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Carpal tunnel syndrome</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Patellar tendinopathy/TKA</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mastectomy</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Neck Pain</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chronic ankle sprain pain</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Acute PTTD</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Costochondropathy</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>LBP</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Trigger thumb</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Proximal HS tendinopathy</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Effectiveness of traditional Chinese Gua sha therapy in patients with chronic neck pain: A randomized controlled trial**

<table>
<thead>
<tr>
<th>NDI</th>
<th>Mean pain with motion</th>
<th>Max pain with motion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Guasha</td>
<td>Thermal</td>
</tr>
<tr>
<td>Baseline</td>
<td>32.8</td>
<td>35.6</td>
</tr>
<tr>
<td>Post-Rx</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7d post-Rx</td>
<td>21.8</td>
<td>32.8</td>
</tr>
</tbody>
</table>

Drop off baseline to 7d post-Rx: -8.4 (95% CI -13.6, -3.2)* -23.5 (95% CI -34.5, -12.5)* -19.1 (95% CI -31.7, -6.5)*

* *p<.003. NDI MCID = 10 points (Young et al. Spine. 2009). VAS MCID: if baseline 50-65 mm, then 19-27 mm. If baseline >65 mm, then 29-37 mm (Stauffer, Inj J Inflam. 2011).

- SF-36: Gua sha resulted in greater physical function by 4.2 pts (95% CI 2.1, 6.3) and social function by 6.5 (95% CI 2.1, 10.9). No difference in vitality, general health perception and mental health.
- Greater satisfaction with Gua sha
- Higher outcome expectation not associated with outcome
No statistically significant differences between groups in PRTEE, VAS, and PFG

Sample estimation for power= 0.8, 58 in each group

<table>
<thead>
<tr>
<th>PRTEE</th>
<th>GISTM</th>
<th>Control</th>
<th>VAS</th>
<th>GISTM</th>
<th>Control</th>
<th>PFG</th>
<th>GISTM</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>37</td>
<td>30</td>
<td>46</td>
<td>39</td>
<td>25</td>
<td>26</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>6 wk</td>
<td>15*</td>
<td>25</td>
<td>16*</td>
<td>21</td>
<td>27*</td>
<td>28</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3 mo</td>
<td>16*</td>
<td>22*</td>
<td>17*</td>
<td>21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* p < .05 compared to baseline for the respective group

<table>
<thead>
<tr>
<th></th>
<th>ASTYM (N=10 + 4 crossover)</th>
<th>Traditional (N=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline  0 wks 6 wks 12 wks</td>
<td>Baseline  0 wks 6 wks 12 wks</td>
</tr>
<tr>
<td>Resolution*</td>
<td>- 10 10 (1/4 crossover) 6 6</td>
<td></td>
</tr>
<tr>
<td>PIES (x/100)</td>
<td>74 85 91 64 89 90</td>
<td></td>
</tr>
<tr>
<td>Blazina</td>
<td>2.0 1.1 1.0 (1/4 crossover) 2.4 2.4 1.0</td>
<td></td>
</tr>
</tbody>
</table>

- Greater percentage improvement in "impairment scale" in ASTYM group (p=.04)
- Pain values not provided: ASTYM group improved from baseline to 6 & 12 weeks (p<.05), traditional group not significant

*Resolution criteria: 1) no swelling, 2) no pain with palpation, 3) <3/10 pain with single leg hop, squat to thigh parallel, eccentric step down

Is there more evidence out there?

- Other studies lacking details (e.g. tool/instrument usage)
  - "transverse friction massage" (Mayer et al. Br J Sports Med. 2007)
- Language/terminology problem?

Proposed standardized terminology

1. Rate of force application
2. Direction of force
3. Target of force (ie, depth/pressure)
4. Location in range of available tissue length
5. Patient position
6. Relative structural movement

**Treatment Parameters**

<table>
<thead>
<tr>
<th></th>
<th>RCT</th>
<th>Case Series</th>
<th>Case Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of visits</td>
<td>1-10</td>
<td>3-15</td>
<td>5-16</td>
</tr>
<tr>
<td>Treatment frequency &amp; duration</td>
<td>2x/wk x 4-5 wks; 3x/wk x additional 3 wks</td>
<td>2x/wk; 3x/wk, 2-32 wks</td>
<td>2x/wk – 3x/wk, 3-8 wks</td>
</tr>
<tr>
<td>IASTM Intervention duration</td>
<td>7, 2-30 min</td>
<td>9-2 min/area, 15 min total</td>
<td>30-60 s bouts, 5-10 minutes</td>
</tr>
<tr>
<td>Concurrent treatment</td>
<td>None - exercise (stretch/strengthen/strengthen)</td>
<td>Exercise, ice, MLD, HVLA</td>
<td>Exercise, ice, heat/ice, mobil, HVLA, e-stim, US, ART, kinesiotape</td>
</tr>
</tbody>
</table>

**Treatment Example**

- 36 y/o female runner with PFP with dynamic valgus motion tendency
- Rx: Education + exercise + neuro re-education + manip/mob + IASTM (medial lower leg, ant knee/patella, quad, HS, ITB, TFL, glutes)

**Summative Points**

- Interdependence
- Intervention
- Regional
- Treatment effects
- Treatment description (terminology)
- Limitations
Questions

- Tool vs. no-tool?
- Does the type of tool matter?
- Who is most likely to benefit?
- Does the intent (i.e. treatment paradigm) matter?
- How much pressure?
  - Different pathology (MLD vs tendinopathy)
  - Recurrence/retention/histology?
- Patient preference/expectations?

Thank you!

Additional Slides/References

- Hierarchical evidence summary of IASTM
- References
## RCT (GISTM & ASTYM)

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Study Population</th>
<th>N</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcome Measures</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchette et al. 2011</td>
<td>Lateral epicondylalgia</td>
<td>27</td>
<td>IASTM (Graston tools/training?)</td>
<td>Education on self-treatment/ exercise</td>
<td>PRTEE, VAS, PFG at 6 &amp; 12 wks</td>
<td>Both groups improved at PFF at 6 and 12 wks, although only IASTM sig diff from baseline at 6 wks. PFF at 6 &amp; 12 wks but not sig b/w groups in any measures, all in 12 wks.</td>
</tr>
<tr>
<td>Burke et al. 2007</td>
<td>Carpal tunnel syndrome</td>
<td>22</td>
<td>GISTM + CKC</td>
<td>UE stretching &amp; strengthening</td>
<td>Median n. Sensory &amp; motor NCT, VAS, wrist ROM, grip strength, SSS, FSS at 6 &amp; 12 wks</td>
<td>Improved nerve conduction veloc., function, strength and ROM in both groups — only slight differences found favoring GISTM for SSS and FSS but less than 1/5 scale difference. Equal pt. satisfaction at 12 wks.</td>
</tr>
<tr>
<td>Wilson et al. 2000</td>
<td>Patellar tendonitis</td>
<td>20</td>
<td>ASTYM + exercise + ice</td>
<td>Cross fxn massage + exercise + ice</td>
<td>PJES, Blazina Scale, % pain improvement, “impairment scale” at 6 &amp; 12 wks</td>
<td>No group differences in PJES or Blazina. Greater pain and “impairment scale” improvement with ASTYM vs standard care. 100% resolution in ASTYM vs 60%. 4 crossed to ASTYM and 2 achieved resolution.</td>
</tr>
<tr>
<td>Braun et al. 2011</td>
<td>Neck pain</td>
<td>48</td>
<td>Gua Sha x 1 visit</td>
<td>Ginger heat pad</td>
<td>VAS, NDI, SF-36</td>
<td>Greater pain and NDI score reduction with Gua Sha. Trend towards greater benefit of Gua Sha with SF-36, but not significant, higher pt. satisfaction with Gua Sha</td>
</tr>
<tr>
<td>Chiu et al. 2010</td>
<td>Postpartum breastfeeding women with breast engorgement</td>
<td>54</td>
<td>Gua Sha x 1 visit</td>
<td>Hot pack + massage</td>
<td>0-10 VAS for engorgement, pain, &amp; discomfort, body &amp; breast temperature</td>
<td>Lower breast temperature, and improved breast engorgement &amp; discomfort more than comparison group at both 5 and 30 minutes.</td>
</tr>
<tr>
<td>White. 2011</td>
<td>Proximal hamstring tendinopathy (runners)</td>
<td>3</td>
<td>GISTM + manipulation + MTrP</td>
<td>Exercise + ice + massage (10-16 Rx’s in 5-11 wks)</td>
<td>Self-reported pain/function, MMT</td>
<td>Pain free, able to return to usual running/exercise level. 1 still had episodic pain yet did not limit function.</td>
</tr>
<tr>
<td>Looney et al. 2011</td>
<td>Plantar heel pain</td>
<td>10</td>
<td>GISTM + stretching + ice</td>
<td>8 Rxs (1-2x/wk x 3-8 wks)</td>
<td>GROC, NPRS, LEFS</td>
<td>7/10 ≥5 on GROC. Average decrease in pain of 3.1, LEFS improved 12.2.</td>
</tr>
<tr>
<td>Davies et al. 2010</td>
<td>Women s/p single or bilateral mastectomy*</td>
<td>18</td>
<td>MLD  ASTYM  MLD + exercise + ice PRN</td>
<td>3-15 visits over 2-32 wks</td>
<td>Shoulder flexion &amp; abduction AROM, ODI</td>
<td>Improved shoulder ROM (12° * Revisited) and ODI (3 points). Both significant relative to baseline.</td>
</tr>
<tr>
<td>McCrea &amp; George. 2010</td>
<td>Knee tendinopathy</td>
<td>8</td>
<td>ASTYM + exercise</td>
<td>LEFS, NPRS</td>
<td>Pain decreased 2.9, LEFS improved 7.3. MCID exceeded in 50% for pain, 62.5% for LEFS.</td>
<td></td>
</tr>
</tbody>
</table>

*Has been used in acute/inflammatory conditions.

## RCT (GuaSha)

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Study Population</th>
<th>N</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcome Measures</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bu &amp; et al. 2011</td>
<td>Postpartum breastfeeding women with breast engorgement</td>
<td>34</td>
<td>Gua Sha x 1 visit</td>
<td>Hot pack + massage</td>
<td>0-10 VAS for engorgement, pain, &amp; discomfort, body &amp; breast temperature</td>
<td>Lower breast temperature, and improved breast engorgement &amp; discomfort more than comparison group at both 5 and 30 minutes.</td>
</tr>
</tbody>
</table>

## Case Series

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Study Population</th>
<th>N</th>
<th>Intervention</th>
<th>Outcome Measures</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murray et al. 2005</td>
<td>Plantar heel pain</td>
<td>14</td>
<td>GISTM + stretching + ice</td>
<td>8 Rxs (1-2x/wk x 3-8 wks)</td>
<td>GROC, NPRS, LEFS</td>
</tr>
<tr>
<td>Pivac et al. 2004</td>
<td>Women s/p single or bilateral mastectomy*</td>
<td>18</td>
<td>MLD  ASTYM  MLD + exercise + ice PRN</td>
<td>3-15 visits over 2-32 wks</td>
<td>Shoulder flexion &amp; abduction AROM, ODI</td>
</tr>
<tr>
<td>Pivac &amp; et al. 2005</td>
<td>Knee tendinopathy</td>
<td>8</td>
<td>ASTYM + exercise</td>
<td>LEFS, NPRS</td>
<td>Pain decreased 2.9, LEFS improved 7.3. MCID exceeded in 50% for pain, 62.5% for LEFS.</td>
</tr>
</tbody>
</table>

*Has been used in acute/inflammatory conditions.
## Case Studies

<table>
<thead>
<tr>
<th>Author(s/Year)</th>
<th>Case condition</th>
<th>Visit</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black et al. 2001</td>
<td>Knee patellar tendon repair</td>
<td>5</td>
<td>Manual A.T.M. + Corti stimulation + exercise + NMES + IFC + s/p + MEP</td>
</tr>
<tr>
<td>Hissett et al. 2009</td>
<td>Achilles tendon - strain</td>
<td>6</td>
<td>Acupuncturew/ct, US, ART, GISTM, ice, graded strengthening programme</td>
</tr>
<tr>
<td>Kasko et al. 2012</td>
<td>Cervical vertebrae (lumbar)</td>
<td>1A</td>
<td>thoracic and iliac GISTM + stretching + exercise + mobilization</td>
</tr>
<tr>
<td>Howitt et al. 2005</td>
<td>Acute patellar stress syndrome</td>
<td>Cl</td>
<td>astym stroke + resistance ex + ice</td>
</tr>
<tr>
<td>Henry et al. 2000</td>
<td>Post-surgical patella fracture</td>
<td>8</td>
<td>astym stroke + stretching + resistance ex + ice</td>
</tr>
<tr>
<td>Black et al. 2000</td>
<td>Acute patellar stress syndrome</td>
<td>Cl</td>
<td>astym stroke + resistance ex + ice</td>
</tr>
<tr>
<td>Henry et al. 2000</td>
<td>BTSA</td>
<td>6</td>
<td>astym stroke + resistance ex + ice</td>
</tr>
<tr>
<td>Lefevre et al. 1999</td>
<td>Ultrasound-osteodensitometry</td>
<td>Cl</td>
<td>astym stroke + resistance ex + ice</td>
</tr>
<tr>
<td>McKechnie et al. 1998</td>
<td>Chronic ankle pain</td>
<td>14</td>
<td>astym stroke, stretching, and ROM</td>
</tr>
</tbody>
</table>

## References


