Dry Needling: Current Evidence and Clinical Application

KAISER PERMANENTE ORTHOPAEDIC AND SPORTS REHABILITATION FELLOWSHIP
Objectives

• What is dry needling?
• Types of needling?
• Current evidence?
• Mechanisms of action?
• Clinical application?
• Demonstration
What is Dry Needling?

• Use of thin-filiform needle for tissue manipulation
  • Typically muscle or fascia, but can be scar, nerve, tendon, etc.

• Aimed at increasing mobility, altering muscle activation and/or decreasing pain
  • Potentially through mechanical mechanisms, likely through neurophysiological mechanisms
What is Dry Needling?

• Acupuncture
  • Multiple schools of thought
  • Primarily follows eastern medicine meridians
    • Some western medicine acupuncture

• Dry needling
  • Multiple schools of thought
  • Superficial dry needling
  • Deep dry needling- best outcomes (Acupuncture vs. SDN vs. DDN)
    • Myofascial model, radiculopathy model, trigger point model, functional movement model, intermuscular stimulation model, etc.
    • Trigger point model- >70% overlap with eastern medicine acupoints
Does Dry Needling Work?

- Myofascial pain syndrome- also following lumpectomy or mastectomy
- Fibromyalgia
- Migraine/headache
- Low back pain- Cochrane Review
- Shoulder pain- muscle activation patterns, impingement, hemiparetic shoulder pain, etc.
- Neck pain
- TMD
- Chronic pelvic pain
- Abdominal pain
- Pelvic floor dysfunction
- Plantar heel pain
- Upper-quarter myofascial pain- systematic review and meta-analysis
- Carpal tunnel syndrome?
- Lateral elbow pain?
- Total knee arthroplasty?
- Reduced reliance on medications?

What are the limitations of the research?
How do we manipulate tissue?

- “Stick and leave”- endogenous opioids
- “Stick and twist (+/- leave)”- above + neuromechanical signaling
- “Stick and piston/sweep (typically without leave)”- above + altered neurochemical environment
The Needle Effect

• “Stick and leave” - endogenous opioids
  • The needle effect - immediate analgesia in 86.8% of cases (long-term relief?)
  • Predetermined points vs. clinically assessed points
• When do we do this?

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### TABLE 1

**STRUCTURES TREATED AND IMMEDIATE EFFECT OF DRY NEEDLING**

The Huneke phenomenon refers to subsidence of seemingly unrelated symptoms after needling of a scar, as described in the text.

<table>
<thead>
<tr>
<th>Needling site</th>
<th>Analgesia</th>
<th>Huneke phenomenon</th>
<th>No effect</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Posterior arch of C1</td>
<td>55</td>
<td>-</td>
<td>6</td>
<td>61</td>
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<tr>
<td>Scars</td>
<td>33</td>
<td>22</td>
<td>2</td>
<td>35</td>
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<tr>
<td>Pelvic ligaments</td>
<td>23</td>
<td>-</td>
<td>3</td>
<td>26</td>
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<tr>
<td>Ribs</td>
<td>18</td>
<td>-</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Spinous process of axis</td>
<td>16</td>
<td>-</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Other spinous processes</td>
<td>18</td>
<td>-</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Levator scapulae</td>
<td>16</td>
<td>-</td>
<td>3</td>
<td>19</td>
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<td>Ischial tuberosity</td>
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<td>-</td>
<td>1</td>
<td>14</td>
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<tr>
<td>Interdigital fold</td>
<td>11</td>
<td>-</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Head of fibula</td>
<td>10</td>
<td>-</td>
<td>1</td>
<td>11</td>
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<tr>
<td>Biceps tendon</td>
<td>10</td>
<td>-</td>
<td>0</td>
<td>10</td>
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<tr>
<td>Rotator insertions</td>
<td>7</td>
<td>-</td>
<td>0</td>
<td>7</td>
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<tr>
<td>Collateral knee ligament</td>
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<td>-</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Trapezius muscle</td>
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<td>-</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Acromioclavicular joint</td>
<td>4</td>
<td>-</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Radial epicondyle</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>23</td>
<td>-</td>
<td>6</td>
<td>29</td>
</tr>
</tbody>
</table>

**Total**: 271 22 41 312
Needle Grasp

• “Stick and twist” (+/- leave)- above + neuromechanical signaling
  • Myofascial tissue manipulation/fibroblastic stimulation
    • Mechanically induced cytoskeletal reorganization
    • May modulate sensory input from mechanosensory and nociceptor afferent neurons within connective tissue
    • May stimulate A-delta fibers and activate inhibitory pathways
  • Typically clinically assessed points
  • When do we do this?
Trigger Point Needling

• “Stick and piston/sweep” (typically without leave)- above + altered neurochemical environment
  • Myofascial tissue manipulation/fibroblastic stimulation and trigger point needling
    • What are trigger points?
  • Typically clinically assessed points
  • When do we do this?
Where Does Dry Needling Fit in Practice?

Dry needling can:
- Alter chemical environment of trigger points
- Reduce local and referred pain
- Can reverse some aspects of central sensitization
- Improve range of motion and muscle activation pattern

Pain

Performance
Clinical Application

• For pain
  • Local pain
  • Referred pain
  • Centrally sensitized pain

• For performance
  • Muscle inhibition
  • Muscle facilitation
  • Mobility, mobility-activation, activation, activation-strength
  • Reset, reinforce, reload
Clinical Experiences- Trigger Point Needling

- 17 y/o male football player with left shoulder pain x2 days
- 35 y/o male with localized neck pain and stiffness x5 years
- 40 y/o female with neck pain with radiating symptoms x6 months
- 51 y/o female with left shoulder pain x5 months diagnosed as frozen shoulder
- 15 y/o female soccer player with localized low back pain x3 months
- 29 y/o male with right lateral elbow pain x4 months diagnosed as lateral epicondylalgia
- 22 y/o female with groin pain x3 months
Trigger Points

- Active myofascial trigger points are one of the major peripheral pain generators for regional and generalized musculoskeletal pain
  - Can be locally or globally perpetuated
    - Local muscle overuse vs local/regional joint dysfunction vs nervous system sensitivity
- Local pain and tenderness at myofascial trigger points are largely due to nociceptor sensitization
- Related to process of muscle ischemia associated with sustained focal muscle contraction
How do trigger points form?

• Ectopic nerve impulses and/or unregulated release of Ach
• Cinderella hypothesis- repeated motions/sustained positions
  • Chronic vs sub-acute vs acute changes?
• Exercise under conditions that limit availability of oxygen
• Development of high pressures within contracting muscles
  • Vascular constriction/closure
Why are Trigger Points Painful?

- Low O2 – Low pH
- Altered SP, CGRP, bradykinin, serotonin, norepinephrine, etc.- measured through microdialysis
- Increase in CGRP that occurs with ischemia can result in
  - Increase in AChR activity
  - Inhibition of AChE activity
  - *Perpetuation of muscle contraction and pain*
- Activation of ASIC1/ASIC3 muscle nociceptors
Integrative Trigger Point Hypothesis

Does treating muscle overload sound familiar?
Referral pain

Fig. 1: Referred pain patterns from trigeminal (A), infraorbitalis (B), scapularis major (C), and trapezius (D) muscle trigger points described by Simmons et al. (1999).

- Normal pathway of nociception (local pain)
- Additional pathway for referred pain

Diagram showing pain patterns and the pathways involved in referred pain.

Graph showing pain intensity over time and distance from injection site.

Local pain
- Trigger point

Week 1, Week 2, Week 3, Week 4
Central sensitization: Implications for the diagnosis and treatment of pain

Clifford J. Woolf

Clinical pain is not simply the consequence of a “switching on” of the “pain system” in the periphery by a particular pathology, but instead reflects to a substantial extent, the state of excitability of central nociceptive circuits.

The induction of activity-dependent increases in synaptic function in these circuits triggered and maintained by dynamic nociceptor inputs, shifts the sensitivity of the pain system such that normally innocuous inputs can activate it and the perceptual responses to noxious inputs are exaggerated, prolonged and spread widely.
Centrally Sensitized Pain

• “Where possible, nociceptive mechanisms that contribute to threatening information should be treated.”

• “Any strategy that has an inhibitory effect on nociceptive input is probably appropriate in the short term unless it simultaneously activates non-nociceptive threatening inputs.”
Where Does Dry Needling Fit in Practice?

Dry needling can:
- Alter chemical environment of trigger points
- Reduce local and referred pain
- Can reverse some aspects of central sensitization
- Improve range of motion and muscle activation pattern

Pain

Performance
Dry Needling for Pain

- Maintenance of referred muscle pain depends on ongoing noxious inputs from the site of primary muscle pain
- Is the pain coming from proximal or distal or both (distal-proximal-distal)
  - Would you treat them differently?
  - Gunn method vs trigger point needling
- Peripheral vs. central pain generators
  - Would you treat them differently?

Pain referral from a myofascial trigger point (MTrP) in the soleus muscle to the sacroiliac (SI) joint. As shown in figure 2, referral of pain to the SI joint can be explained as follows: first, nociceptors in the trigger point induce local pain. The nociceptive impulses arising from the trigger point are then carried over spinal cord neurons belonging to the segments L5–S1, which are the normal relay stations for impulses from the soleus muscle. As excitation spreads in the spinal cord (in this case, mainly in the caudal direction), the normally ineffective connections between the soleus muscle and the neurons of the S2–S4 segments become effective. Impulses from the trigger point nociceptors can now activate neurons in S2–S4 that otherwise provide sensory innervation to the SI joint. The individual therefore feels pain referred to the SI joint.
Dry Needling for Muscle Activation/Performance

• Latent trigger points in scapular rotator muscles change muscle activation patterns with overhead reaching

• Treatment (dry needling and stretching) to remove latent trigger points normalized muscle activation patterns
• Mobility, mobility-activation, activation-strength
• Reset, reinforce, reload
• Examples:
  • QL to improve gluteus medius strength
  • Thoracic paraspinals to improve overhead reach
  • Levator scapulae to improve scapular upward rotation
  • Etc.