

**Dry Needling Applications: Matching Technique with Intent  
Combined Sections Meeting 2016  
Anaheim, California, February 17 -20, 2016**

**Presenters:**

Tamer Issa, PT, DPT, OCS  
ISSA Physical Therapy, Rockville, MD

Edo Zylstra PT, DPT, OCS  
Kinetacore, Brighton, CO  
Regis University, Denver, CO

**Disclosures:**

Tamer Issa- No relevant financial relationship exists.  
Edo Zylstra- No relevant financial relationship exists.

**Learning Objectives:**

1. Explain the different aims of dry needling utilization by various conceptual models for neuromuscular conditions.
2. Evaluate the possible effects of various methods of dry needling treatment applications.
3. Assess the advantages and disadvantages of various dry needling treatment applications for various clinical conditions.
4. Discuss ideas for future clinical studies that may help accurately answer remaining questions regarding dry needling treatment applications.

**Background:**

**Defining Dry Needling**

- What is Dry Needling?
- Well it depends on whom you ask. You will get a variety of different answers from: a patient who has experienced it, a PT with training, a PT without training, an acupuncturist, a knowledgeable physician, an unformed physician, etc.

**Various Names Utilized in the Literature and Continuing Education Course Materials**

- Dry Needling, Trigger Point Dry Needling, Superficial Dry Needling, Deep Dry Needling, Intramuscular Stimulation, Trigger Point Acupuncture, Ashi Acupuncture, Biomedical Acupuncture

**Various Definitions**

- According to Wikipedia<sup>1</sup>
  - Dry needling (Myofascial Trigger Point Dry Needling) is the use of either solid filiform needles (also referred to as acupuncture needles) or hollow-core hypodermic needles for therapy of muscle pain, including pain related to myofascial pain syndrome.
- According to Travell and Simons<sup>2</sup>
  - Travell and Simons described Dry Needling as one of three different approaches to the needle-inactivation of TrPs and described it as the mechanical disruption and inactivation of the active loci in a TrP without the use anesthetics.

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- The other two being injection of local anesthetic without corticosteroid or adrenalin and injection of Botulinum toxin A under special circumstances.
- Stated that DN is as effective as injection of anesthetic for relief of TrP symptoms, if needle elicits LTR's. Conversely, if no LTR was elicited DN and injection were equally ineffective.
- Reported post-injection soreness is more likely to be more severe and last longer following DN.
- According to the APTA<sup>3</sup>
  - "Dry needling is a skilled intervention that uses a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points, muscular, and connective tissues for the management of neuromusculoskeletal pain and movement impairments. [It] is a technique used to treat dysfunctions in skeletal muscle, fascia, and connective tissue, and to diminish persistent peripheral nociceptive input, and reduce or restore impairments in body structure and function, leading to improved activity and participation."
- According to the Federation of State Boards of Physical Therapy<sup>4</sup>
  - "Dry needling is a skilled technique performed by a physical therapist using filiform needles to penetrate the skin and/or underlying tissues to affect change in body structures and functions for the evaluation and management of neuromusculoskeletal conditions, pain, movement impairments, and disability."

### **Dry Needling and Physical Therapy**

- Origins
  - Karl Lewit, a Czech physician, was one of the first to advocate deep dry needling of muscle in order to penetrate TrPs and described the benefits as 'the needle effect'. Lewit states that the effectiveness of deep dry needling is related to the intensity of the pain produced at the trigger zone and aimed to find the location of maximal tenderness.<sup>5</sup>
- Historical Perspective
- Acceptance in the USA

### **Dry Needling Use in Clinical Practice**

The use of dry needling has grown significantly in the world of physical therapy in past 15 years.

- PubMed Search of Dry Needling and Physical Therapy
- 2001-2015 resulted in 93 articles (of which 26 Clinical Trials, and 19 Reviews)
- 1950 through 2000 resulted in 8 articles (3 of which designated as Clinical Trials, 0 Reviews)

### **Within the clinical trials and case studies (n=59), we specifically looked at:**

- Conceptual Model or Diagnostic Criteria Used
- Neuromuscular Conditions Treated
- Tissues Targeted
- Techniques Used
- Outcomes

### **The Conceptual Models Used Included:**

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- Trigger Point Dry Needling Model (46 out of 59)
- Intramuscular Stimulation/Radiculopathic Model (3 out of 59)
- Superficial Dry Needling (1 out of 59)
- Ultrasound Guided Tendon Dry Needling (1 out of 59)
- Unclear (8 out of 59)
- Other models have been proposed but were not found in clinical studies

**The tissues targeted included:**

- Active TrPs in muscles
- Latent TrPs in muscles
- Deep Paraspinals (Multifidi) of the cervical, thoracic, and lumbar spine
- Tendon (1)
- Bursa (1)

**There are a variety of methods of dry needling applications, including:**

- In and Out Technique (Pistoning)
- Eliciting a LTR
- Superficial DN
- Deep DN
- Use of Electrical Stimulation
- Twisting, Rotating, Pulling
- Leaving Needles In Situ
- Use of Heat through the Needle

**Considerable advancements in the research regarding trigger point basic science, diagnostic assessments, and clinical utilization of dry needling.**

- Diagnostic ultrasound sonoelastography has enabled the visualization of TrPs from surrounding tissue<sup>6</sup> and magnetic resonance elastography has been used to identify and quantify the myofascial taut band<sup>7</sup>.
- Latent TrPs have been shown to be related to increased EMG activity at rest and during movement, and can alter motor control.<sup>8,9</sup>
- Active TrPs have a distinct biochemical environment associated with pain, inflammation and intercellular signaling that appears to change with the occurrence of a LTR.<sup>10,11</sup>
- Spontaneous electrical activity found in TrPs can induce and maintain pain.<sup>12</sup>
- DN has been shown to reduce the TrP sensitivity and spontaneous electrical activity associated with trigger points.<sup>13, 14</sup>
- DN of TrPs have been shown to have a segmental anti-nociceptive affect (increase in pain pressure threshold).<sup>15</sup>

**Common questions heard after 10 years of teaching dry needling to PTs and other health care professionals.**

- How many muscles do you treat in a session?
- How do you decide which muscles to treat?
- How many times do you dry needle a particular muscle within a session?
- How long do you leave the needle in for?
- How many LTR's should you try to elicit?
- How many times per week can you incorporate dry needling?
- Do you only needle active TrPs?
- How long do the benefits last?

- What is the underlying cause as to why trigger points exist?
- What are the post-care instructions?

**Despite the prevalence of numerous case studies and clinical trials describing the clinical utilization of dry needling, questions still remain.**

- What is the efficacy of the proposed conceptual models?
- How does the clinician decide what model to use, what tissues to target, what is the aim in using dry needling or when to integrate it in a therapeutic intervention?
  - These questions are about the What, Where, Why and When?
- What are dosage parameters in regards to various methods and techniques as they relate to treatment duration, frequency, intensity, variability, etc.
  - These questions are about the he How?

**Conceptual Models:**

**Trigger Point Dry Needling Model**

- Originally developed by Travell & Simon's. Continued by the work of Jan Dommerholt, PT and Dr. Robert Gerwin, MD in the USA and others abroad.
- Based on the understanding of myofascial pain and the assessment and treatment of trigger points (TrPs).<sup>16</sup>
- Treatment is focused on the elimination of TrPs, because of their:
  - influence as a source of constant peripheral nociceptive input that can contribute to or maintain central sensitization.<sup>17</sup>
  - contribution to altered muscle activation and abnormal movement patterns.<sup>8,9</sup>
- State that TrP Dry Needling must be considered in a broader biopsychosocial model and that it must be approached from a pain science perspective.<sup>17</sup>
- Trigger Point Diagnostic Essential Criteria<sup>2</sup>
  1. Taut band (if muscle is accessible).
  2. Exquisite spot tenderness of a nodule in a taut band.
  3. Patient's recognition of current pain complaint by pressure on the tender nodule (identifies active trigger point)
  4. Painful limit to full stretch range of motion.
- Emphasizes the importance eliciting a local twitch response (LTR). The LTR is thought to be important with clinical efficacy.<sup>18-21</sup>

**Intramuscular Stimulation (IMS) or the Radiculopathic Model<sup>22</sup>**

- Developed by Dr. Chan Gunn, MD- Vancouver, Canada
- Premise: Chronic myofascial pain is always the result of peripheral neuropathy or radiculopathy
  - Shortening of the multifidi muscles leads to disc compression, narrowed intervertebral foramina, and direct nerve root pressure leading to neuropathy
  - Muscle shortening, autonomic changes and sometimes pain are normal occurrences of radiculopathy.

- States that treating peripheral muscles alone was not enough and that is necessary to treat the paraspinal muscles segmentally in order to decompress the nerve root and to alleviate the ill-effects of radiculopathy.
- The needling of shortened paraspinal as well as distal muscles innervated by the affected myotome distinguishes Gunn's technique from other dry needling techniques.
- Claims that use of a fine solid needle (.30mm or less) is less traumatic and more flexible as compared to the beveled cutting edge of the hypodermic needle. The use of this fine solid needle better transmits the nature of the tissue being penetrated.
- Described the different sensations that are perceived through the needle
  - A spasm in muscle will feel like the muscle has "grasped" the needle.
  - Fibrotic tissue will feel like grating resistance.
  - Extremely fibrotic tissue may require multiple pecking of the tissue.
  - Penetration of muscle could induce fasciculation that will result in almost immediate muscle relaxation.
  - Believed that penetration of the needle in any part of the muscle could lead to relaxation, but it will happen more often at motor points and at musculotendinous junctions.
  - Claims that these points correlate with acupuncture points.

### **Superficial Dry Needling Model<sup>23</sup>**

- Developed by Dr. Peter Baldry
- Initially influenced by deep dry needling (DDN) approach advocated by Lewit in the 1970s. Baldry was concerned about DDN in muscle with surrounding safety concerns (for example DN the scalene with the concern of the apex of the lung beneath the muscle).
- Found that leaving the needle in the subcutaneous tissues immediately overlying the TrP in the deeper muscle for 30sec was found by him to be equally efficacious.
- SDN Technique as describe by Baldry<sup>23</sup>
  - Palpate for active TrPs in a muscle with firm pressure to find a location of exquisite tenderness that results in a jump sign or a withdrawal response.
  - Insert a needle (recommended 0.3 mm in diameter and 30mm long) into the tissue overlying the TrP to a depth of about 5-10mm.
  - Leave in place for 30 secs.
  - Remove the needle and re-palpate in the same way as before.
  - If the initial response is not abolished, re-insert the needle for another 2-3 minutes.
  - May need to intermittently twirl it.
- SDN Efficacy- only one clinical trial could be found in a PubMed
  - SDN followed by active stretching is more effective than stretching alone in deactivating TrPs (reducing their sensitivity to pressure), and more effective than no treatment in reducing subjective pain.<sup>24</sup>

### **Dry Needling with the Use of Electrical Stimulation**

- It has been proposed that low intensity, low frequency electrical stimulation induces central pain modulation by activation of the peri-aqueductal grey (PAG) in the brain.<sup>25</sup>

- The main findings were:<sup>25</sup>
  1. Intervention modulated PAG activity to painful stimuli more in responders than in non-responders
  2. Change in PAG activity from the whole patient population correlated with change in pressure pain threshold
  3. A network known to regulate affective qualities of the pain experience was (subsignificantly) engaged more in responders than in non-responders.
- The applied intervention most likely involves supraspinal pain control mechanisms related to both anti-nociception and regulation of pain affect.<sup>25</sup>
- No evidence-based clinical guidelines of the optimal treatment parameters as it pertain to frequency type, duration and amplitude.
- Little evidence to support the ideal needle placement for use of DN with e-stim.
- Questions remain as to whether it should be placed in the skin within a specific dermatomal level, in and around a trigger point area, in the taut band, or at the location of an elicited LTR.
- Frequencies between 2-4 hz of trigger points are thought to trigger the release of endorphins and enkephalins. Frequencies between 80-100 hz may release gamma-aminobutyric acid, galanin and dynorphin.<sup>16</sup>

#### Other Dry Needling Methods<sup>16</sup>

- Tendon Needling for Tendinopathy
- Fu's Subcutaneous Needling
- Needling of other Connective Tissues
- Acupuncture Needling

### **Dry Needling Methods & Treatment Techniques**

#### **Pistoning**

- Technique where the practitioner utilizes rhythmic and multidirectional passes of the needle into the target tissue. Mainly to elicit a LTR but in some cases to cause a proliferate response secondary to the micro trauma to the tissue. This is a typical technique utilized with the trigger point theoretical model.

#### **Eliciting a Local Twitch Response (LTR)**

- Reaction of the local muscle from the influence of the needle into the loci of tenderness. Causes the muscle to twitch and is most likely associated with the muscle spindle and a reflex arch with the segmental level of innervation of that muscle in which the twitch was elicited.<sup>25</sup>

#### **Superficial versus Dry Needling**

- Baldry: Superficial dry needling is preferred over deep dry needling but DDN will be used when there is apparent nerve root or peripheral nerve compression. The emphasis on SDN is to reduce or eliminate post treatment soreness.<sup>26</sup> □

#### **Trigger point model**

- The trigger point model is based on the theory that trigger points can exist in muscular tissue causing local or widespread myofascial pain. Popularized by Dr's Janet Travell and David Simons in their textbooks, Travell & Simons' myofascial pain and dysfunction. Likely the most researched model. Tx techniques mostly utilize the "pistoning", "sparrow pecking", and other variations to elicit the LTR in the desired target tissue causing the patient's

reported pain and only stopping when the trigger point stops twitching, the practitioner feels that the optimal result has been achieved, or the patient requests for the practitioner to stop.

### **Neurofunctional**

- a relatively new concept of dry needling where the focus is on how the nervous system drives function and dysfunctional movement and behavioral patterns resulting in specific diagnoses. The goal seems to be very similar to the trigger point method, as the “trigger point” is generally near the most specific attachment of the nerve to the muscle (possibly a motor point) but the technique will likely not use the multiple passes of the needle into the tissue but will instead incorporate leaving the needles indwelling/in situ for periods of time or may include electric stimulation while the needles are in situ for some type of response, be it sensory or motor.

### **Perineurial**

- All types of needling could be considered perineurial, as we are always impacting the nervous system with dry needling.<sup>27</sup>

□

### **Tendon or ligament**

- One systematic review supported the use of dry needling of tendinous structures with statistically positive outcomes in subjective VAS in two studies, an improvement in the Victorian Institute of Assessment-Achilles in another, and improvement in subjective pain and shoulder disability index in yet another.<sup>28</sup>

□

### **Stim or no e-stim**

- Many studies have evaluated electroacupuncture with varied results. In the last few years, electrical stimulation has become a popular addition to dry needling secondary to:<sup>29,30</sup>
  - Ease of eliciting multiple twitch responses
  - Decreasing soreness from other techniques that do not include electrical stimulation but utilize only manual manipulation of the needle to elicit the desired response.
- Stimulation can be done in many ways but has yet to be researched for efficacy in more than case reports and case series. Some examples of such stimulation protocols may include:
  - Unilateral segmental stimulation
  - Bilateral segmental stimulation
  - Myotomal stimulation (could consider dermatomal if staying superficial)
  - Spinal segmental/myotomal circuit
  - And others

### **Does it differ from Acupuncture? What is the main point?**

- The main difference from acupuncture can be reduced to two main points:
  1. Education: Comparison of education is the obvious differentiation of the two professions using similar needles.
  2. Application: Physical Therapists focus on movement behaviors and are not generally looking to impact systemic disease processes as a direct result in applying Dry Needling to the body.
- The definition of dry needling is very clear in its distinction from other professions utilizing any form of needling.
- There is definite overlap, as patients needs tend to affect the treatment patterns of professions.

## **Advantages/Disadvantages of various DN techniques for Various Clinical Applications**

### **Pistoning**

- Apparent increased soreness

### **LTR**

- no known

### **Superficial vs deep**

- May not have the desired effect if only maintaining a superficial technique and possibly exposing the patient to greater risk the more needles inserted for desired response.

### **Trigger point model**

- May miss the cause of the muscular dysfunction. Could it be segmentally mediated, Centrally, or other?

### **Neurofunctional**

- May miss the peripheral or local dysfunction if treating too globally

### **Perineural**

- Increased risk to neural structures? Case studies only at this point

### **Tendon and ligament**

- Rat model demonstrated induced tendonopathy with needling and treadmill activity

### **Neural reset model**

- No support for or against, relatively new thought process with use of electric stimulation and circuiting with peripheral structure.

### **Stim or no e-stim**

- Seems to have a positive trend and clinically can be much more comfortable for the patient.

## **Recommendations for Future Studies**

- DN effect on peripheral and central sensitization
- DN effect on muscle function and coordination of movement patterns
- DN effects on the anterior cingulate cortex, the limbic system, descending inhibitory system
- Incorporation of DN for specific conditions

## **Video Demonstration of DN techniques Discussed**

## **Q&A / Open Discussion**



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