The Janet G. Travell, MD Seminar Series™

Myofascial Pain & Intramuscular Manual Therapy

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Based on the work of
- Janet Travell
- David Simons
- Karel Lewit
- Chan Gunn
- Peter Baldry
- Beat Dejung
- Robert Gerwin
- Jan Dommerholt
- among others
“Re-Discovery” of Trigger Points
Janet Travell (1901-1997)
David Simons (1922-2010)

Travell & Simons’ Myofascial Pain and Dysfunction: The Trigger Point Manual

- Comprehensive myofascial trigger point reference (translated into >10 languages)
- Vol. I: Upper Half of Body
- Vol. II: Lower Half of Body
- Worldwide interest of researchers and clinicians in a wide range of specialties
- Rapidly increasing number of basic research studies and clinical trials in the field of myofascial pain

Orthopedic Manual Therapy

- a specialized area of physiotherapy / physical therapy
- for the management of neuro-musculo-skeletal conditions,
- based on clinical reasoning, using highly specific treatment approaches including manual techniques and therapeutic exercises

www.ifomt.org/ifomt/about/standards
IFOMT - Educational Standards

a high level of skill in other manual and physical therapy techniques is required to mobilize the articular, muscular or neural systems

www.ifomt.org/ifomt/about/standards

IFOMT - Educational Standards

knowledge of various manipulative therapy approaches as practised within physical therapy, medicine, osteopathy and chiropractic

www.ifomt.org/ifomt/about/standards

Muscle Dysfunction

Few articles about muscle dysfunction in the medical literature
Few lectures about muscle dysfunction at this conference
Focus on muscle injury, muscle repair mechanisms, motor control, or on muscle recruitment
Manual Therapy Training

Manual therapy educational programs place a strong emphasis on:

- Joint Dysfunction
- Mobilizations & Manipulations

with limited classroom education devoted to muscle pain and muscle dysfunction

Structural Lesion Model of musculoskeletal pain

Immobilization: shortened sarcomeres, los of total protein, mitochondria, soluble enzymes, loss of extensibility

Muscle pain follows joint injury or dysfunction

Nerve pain follows nerve injury or dysfunction

This philosophical model is based on assumptions that are not necessarily supported by scientific evidence

If pain is a puzzle, we should not throw away pieces of the jigsaw just because we are obsessed with a preconceived single solution

Patrick Wall
Muscle Pain in History

• French physician Guillaume de Baillou (1538 – 1616) published “Liber de Rheumatismo:” “muscular rheumatism”
• Thomas Sydenham (1624 – 1689), the “Father of English Medicine” published “Observations Medicæ” in 1676: “Rheumatism”

Muscle Pain in History

• British physician Balfour (1816): “patients as having a large number of nodular tumours and thickenings which were painful to the touch, and from which pains shot to neighbouring parts”

Muscle Pain in History

• French physician François Valleix (1841) published “Traité des Neuralgies; ou Affections Douloureuses des Nerfs:” “it is only with the aid of pressure ..... that one discovers exactly the extent of the painful points”

Valleix's points: painful pressure points in the course of nerves
Muscle Pain in History

- German physician Strauss (1898) described "small, tender and apple-sized nodules and painful, pencil-sized to little-finger-sized palpable bands."

Muscle Pain in History


Myofascial pain is a distinct clinical entity (according to 88.5% of physician members of the American Pain Society)
How common are MTrPs?

- Research has shown that MTrPs are commonly associated with facet joint dysfunctions, disc herniation, osteoarthritis, tension type headache, etc. Dommerholt, J. and T. Issa, Differential diagnosis: myofascial pain, in Fibromyalgia syndrome: a practitioner’s guide to treatment, L. Chaitow, Editor, 2003, Churchill Livingstone Edinburgh, p. 169-177.


Muscle Pain in History

Vecchiet et al: acute pain following exercise or sports participation is often due to painful MTrPs (1993)

Myofascial pain is the most commonly overlooked diagnosis in chronic pain patients (Hendler & Kozikowski, 1993)

Myofascial Pain and Whiplash

100% of chronic whiplash patients have myofascial pain

Gerwin and Dommerholt, 1998
MTrPs have been identified with

- radiculopathies
- joint dysfunction
- disk pathology
- tendinitis
- temporomandibular dysfunction
- migraines
- tension-type headaches
- carpal tunnel syndrome
- computer-related disorders
- whiplash-associated disorders
- spinal dysfunction

pelvic pain and other urologic syndromes
most pain syndromes
post-herpetic neuralgia
complex regional pain syndrome
nocturnal cramps
phantom pain
Barré Liéou syndrome
neurogenic pruritus
etc. etc.


Definitions

- Latent MTrP: Pain only with excessive stimulation

- Active MTrP: Pain with physiologic stimulus

- Satellite MTrP: In the referred pain region

Since no specialty claims skeletal muscle as its organ, it is often overlooked

David G. Simons, MD
“In this age of specialization, few clinicians are broad enough to see the whole patient and his/her problem .... understanding with the delicate interplay between the patient's mind, body, environment is a paramount importance in helping a patient overcome an illness.”

Janet G. Travell, MD (1901 - 1997)

Misconceptions...
– Often characterized as chronic
– Regional or Widespread
– Confused with Fibromyalgia
– Psychological

Contractile Activity
1. Electrogenic stiffness: muscle tension coming from electrogenic muscle contraction, based on observable EMG activity in normals who are not completely relaxed

The term electrogenic refers to the fact that the e-motor neuron and the neuromuscular endplate are active under these conditions.
2. Electrogenic spasm that specifically identifies pathological involuntary electrogenic contraction

3. Contracture arising endogenously within the muscle fibers independent of EMG activity


Dysfunctional Motor Endplate
Myofascial Trigger Points

Acetylcholine
- Excess acetylcholine
- Insufficient acetylcholinesterase
- More and more sensitized acetylcholine receptors (i.e. the ryanodine receptor)
- Excess calcitonin-gene-related peptide
- Low pH

Tissue O₂ – measurements in MTrPs


Trigger Point Endplate Noise
Evidence of neuroaxonal degeneration in myofascial pain syndrome: A study of neuromuscular jitter by asonal microstimulation

Neuromuscular jitter is produced by fluctuations in the time for endplate potentials at the neuromuscular junction to reach the threshold for action potentials. With a dysfunctional neuromuscular junction, muscle fibers of the same motor unit may not always fire in the same sequence causing jitter.

Patients with MTrPs had a significantly increased mean consecutive difference (MCD = jitter) in the trapezius and levator scapulae muscles compared to controls. At least part of endplate dysfunction may be the result of disintegration of spinal motor neurons.

Positive correlation between jitter and the duration of myofascial pain supports the development of progressive neuronal degradation with axonal neuropathy in more chronic cases of MTrPs.
Microdialysis System


Microdialysis of MTrPs with 0.3 mm Acupuncture Needle


• Norepinephrine
• TNG – α
• Interleukin 1, 6, 8, 12
• Substance P
• Serotonin
• Calcitonin Gene Related Peptide


increased skill in identifying and eliminating relevant trigger points: better outcome

Three Interrater Reliability Studies


Interrater Reliability

![Graph showing interrater reliability for various aspects such as Taut Band, Referred Pain, Local twitch, Pain Rec., Tenderness, Trigger Point. Credit: Gerwin, R.D. et al., Interrater reliability in myofascial trigger point examination. Pain, 1997; 69(1-2): p. 65-73.]
Clinical precision of myofascial trigger point location in the trapezius muscle

Excellent precision in manually diagnosing and locating a latent myofascial trigger point in the trapezius muscle


Interrater Reliability of Palpation of Myofascial Trigger Points in Three Shoulder Muscles

Carol Brown, PT, MPT
Jo Freeman, PT
Michael Wasing, PhD
Bob Joll, Osteopaths, PhD, PT, MPT

The Journal of Manual & Manipulative Therapy
Vol. 13 No. 3 (2005): 205-223

Experienced physical therapists can reach acceptable agreement in the diagnosis of MTPs in three shoulder muscles


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**Characteristics of Myofascial Trigger Points**

- disturbed motor function
- muscle stiffness
- muscle weakness
- restricted range of motion

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**Novel Applications of Ultrasound Technology to Visualize and Characterize Myofascial Trigger Points and Surrounding Soft Tissue**

Katharina Stahle, PhD; Jay P. Skal, MD; Theodore Gelles, BA; Rebecca Yen, BS; Elizabeth Gilhans, BS; James Band, PhD; Linda R. Carter, MD
Characteristics of Myofascial Trigger Points

- vasoconstriction
- vasodilatation
- goose bumps
- local tenderness

Referred Pain
Peripheral Sensitization
Central Sensitization

Peripheral Sensitization

Myofascial TrPs (referred pain pattern)
Liberation of algogenic mediators
Aδ and C fibers
Aβ fibers

Central Sensitization

Sensitization of 2nd order neurons in the dorsal horn and trigeminal nucleus caudalis
Increased pain transmission
Sensory cortex and thalamus
Unique Characteristics of Muscle Pain

- Aching, cramping pain, difficult to localize and referred to deep somatic tissues
- Muscle pain activates *unique* cortical structures
- Inhibited more strongly by descending pain-modulating pathways
- Activation of *muscle* nociceptors is much more effective at inducing *neuroplastic* changes in dorsal horn neurons

Strong activation of the anterior cingulate cortex and periaqueductal gray (PAG)

**Myofascial Pain:**
activates anterior cingulate cortex/periaqueductal gray (PAG)

→ associated with affective-emotional pain component and with heightened attention to painful stimulus

**Cutaneous Pain:**
No involvement of ant. cing. cortex.

Muscle Nociceptors

Mense: The Pathogenesis of Muscle Pain
Current Pain & Headache Reports 2003, 7:419-425
Radiculopathy? MTrP referred pain? Both?

Recommended Criteria

- Taut band palpable (if muscle is accessible)
- Exquisite spot tenderness of a nodule in a taut band
- Patient's recognition of current pain complaint by pressure on the tender nodule (identifies an active trigger point)
- (Painful limit to full stretch range of motion)

Additional Criteria

- Local Twitch Response
- Referred Pain
- Autonomic signs and symptoms
Referred Pain


Studied pain phenomena by injecting various substances in muscles, tendons and periosteum

John H. Kellgren (1936)

Referred Pain

myopain seminars
Etiology of Myofascial Trigger Points

- Acute Overuse
- Direct Trauma
- Persistent Muscular Contraction (emotional or physical cause), i.e.: poor posture, repetitive motions, stress response
- Prolonged Immobility
- Systemic Biochemical Imbalance

Etiology of MTrPs

- Low level muscle contractions
- Uneven intramuscular pressure distribution
- Direct trauma
- Unaccustomed eccentric contractions
- Eccentric contractions in unconditioned muscle
- Maximal or submaximal concentric contractions

Other Contributing Factors

- Associated MTrP
- Afferent Input from Joints
- Afferent Input from Internal Organs
- Stress / Tension

Treatment Options: Manual Techniques

- Trigger Point Compression with Active Contraction
- Manual Stretching of the MTrP
- Myofascial Release
- Muscle Play (Fascial Manipulation)
- Therapeutic Stretching (with or without cold spray)
- Autostretching (Home Program)

Spray & Stretch Method

- Travell (1901-1997) promoted the Spray & Stretch method
- Preferred fluori-methane
- Ozone depleting

Spray & Stretch Method

- The new Spray & Stretch product consists of hydrofluorocarbons with a carbon dioxide equivalent of 1,300
- Or a 1,300 greater greenhouse effect than carbon dioxide

Trigger Point Compression
Myofascial Release
Muscle Play
Therapeutic Stretching
Strain/Counterstrain
Post-isometric Relaxation
Dry Needling

Intramuscular Manual Therapy
(aka PT Dry Needling)

Fine solid filament are used to release trigger points in muscle
Based on Western anatomical and physiological principles

Treatment Specificity

Efficient and effective treatment method

Dry Needling Targets
Myofascial Trigger Points
### Differences between trigger point injections and dry-needling/intramuscular stimulation

<table>
<thead>
<tr>
<th>Injections</th>
<th>Dry Needling</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Beveled hypodermic needle</td>
<td>• Fine solid filament needle</td>
</tr>
<tr>
<td>• Substances injected (analgesics, Botox)</td>
<td>• No substances injected</td>
</tr>
<tr>
<td>• Often higher gauge needle size</td>
<td>• Usually lower gauge needle size</td>
</tr>
</tbody>
</table>

### How does dry needling work?

**Exact mechanisms unknown**

**Mechanical**
Results in disruption of muscle fiber adhesions and increases circulation to the region

**Neurophysiological**
Local twitch response is a spinal cord reflex that results in immediate release in muscle hypertonicity

**Biochemical**
Local twitch response results in favorable biochemical effects (based on Shah’s research at NIH) which reduce pain
Possible Adverse Side Effects

- Soreness (typically 1-2 days)
- Slight bleeding/Hematoma
- Fatigue
- Lightheadedness or fainting due to anxiety, hunger or lack of sleep
- Pneumothorax

Benefits of Trigger Point Dry Needling

- Relief of acute and chronic muscle pain
- Release of muscle tension
- Maximizes muscle function
- Immediate improvement often noted, otherwise 2-3 visits necessary for initial improvement

Maximize Benefits

Dry needling is never used in isolation
- Technique followed by soft tissue work, myofascial release and cold/hot pack to minimize soreness and maximize connective tissue flexibility
Maximize Benefits

Other contributing factors important to address
– Presence of joint or spinal dysfunction
– Postural imbalances
– Poor coordination of movement
– Poor posture and improper body mechanics with daily activities

Is it painful?

• The insertion of the needle through the skin is rarely painful
• Needling of healthy muscle tissue is not painful whatsoever
• Eliciting local twitch responses in the trigger point region does cause a cramping or aching pain and may refer pain to other parts of the body

But that could be a good thing!

Why have so many people sought this treatment despite the pain?

• If the technique reproduces your pain, then we are well on our way to relieving your pain because we have accurately identified the source
Why have so many people sought this treatment despite the pain?

• Most are relieved that finally the source of pain has been found

• Despite word-of-mouth testimonials, the fear of pain keeps many people from giving this treatment technique a chance

Tying It All Together

Incorporating Intramuscular Manual Therapy into an Orthopaedic Physical Therapy Approach
Physical Therapy- Case Study


• Purpose:
Describe the physical therapy diagnosis and management of a patient with chronic daily headache

48-year-old female

• Medical diagnosis
  – Migraine headache without aura
  – Chronic tension-type headache

• Exacerbation of these long-standing headache complaints had resulted in a chronic daily headache for the preceding eight months.

• Symptoms
  – Bilateral headache
  – Neck pain
  – Left facial pain
  – Tinnitus
  – Jaw Pain

• Outcome measures:
  – Henry Ford Hospital Headache Disability Inventory (HDI)
  – Neck Disability Index (NDI)
Physical Therapy- Case Study

- Examination revealed the following impairments of the head and neck region:
  - Myofascial
  - Articular
  - Postural
  - Neuromuscular

The International Classification of Functioning, Disability, and Health (ICF) Disablement Model

ICF- Health Condition

- Headaches
  - Chronic Tension-Type Headache Associated with Pericranial Tenderness
  - Cervicogenic Headache
  - Probable Migraine Headache

- Neck Pain
  - Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated With Connective Tissue Dysfunction
  - Impaired Posture
### ICF- Body Function & Structure (Impairments)

<table>
<thead>
<tr>
<th>Active MRPs Contributing To Myofascial Hypertonicity and Tenderness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral: Upper Trapezius, Sternocleidomastoid, Splenius Cephalis, and Suboccipitals</td>
</tr>
<tr>
<td>Left: Masseter and Temporals</td>
</tr>
<tr>
<td>Spinal Mobility Restrictions</td>
</tr>
<tr>
<td>Left C3/C4 for FB and SBL</td>
</tr>
<tr>
<td>Left C1/C2 for RR</td>
</tr>
<tr>
<td>U/T and M/T for BB and axial extension</td>
</tr>
<tr>
<td>Decreased Muscle Flexibility</td>
</tr>
<tr>
<td>Bilateral: Upper Trapezius, Sternocleidomastoid, Cervical/Thoracic Paraspinals and Suboccipitals</td>
</tr>
</tbody>
</table>

### ICF- Body Function & Structure (Impairments)

<table>
<thead>
<tr>
<th>Postural Dysfunction</th>
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</thead>
<tbody>
<tr>
<td>Forward head posture with craniocervical extension</td>
</tr>
<tr>
<td>Stress/Tension</td>
</tr>
<tr>
<td>Related to busy home and work life, and possible grieving over death of her mother earlier in the year</td>
</tr>
<tr>
<td>Craniofacial Disorder</td>
</tr>
<tr>
<td>Myofascial Pain</td>
</tr>
<tr>
<td>Left Condylar Hypermobility</td>
</tr>
</tbody>
</table>

### ICF- Activity (Limitations)

<table>
<thead>
<tr>
<th>Functional limitations with:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine daily activities, personal care, lifting, work activities, concentration, reading, recreational activities, driving</td>
</tr>
<tr>
<td>Emotional feelings of being:</td>
</tr>
<tr>
<td>Handicapped, isolated, angry, tense, irritable, frustrated, insane, desperate, unable to maintain control</td>
</tr>
</tbody>
</table>
ICF- Participation (Restrictions)

- Less likely to socialize
- Concerned about consequences on work, home, and relationships with others
- Perceived difficulty achieving life goals

Physical Therapy- Case Study

- Treatment
  - Myofascial trigger point dry needling
    - Head and Neck musculature
  - Orthopaedic manual physical therapy
    - Soft tissue mobilization, cervical and thoracic spine mobilization, TMJ mobilization
  - Exercise therapy
    - Self-stretch, motor control and postural strengthening
  - Patient education
    - Postural awareness/correction and self-management techniques

Physical Therapy- Case Study

Outcomes

- On the final visit, the patient reported no headaches during the preceding month
  - HDI
    - 31% improvement in the emotional score
    - 42% improvement in the functional score
    - 36% improvement in the total score
    - exceeding the minimal detectable change for the total score
  - NDI
    - At discharge showed an 18% improvement with a maximal improvement during the course of treatment of 26%
    - Both improvements exceeded the minimal clinically important difference for the NDI