Current concepts in clinical reasoning for MTrPs: pain mechanisms and motor control deficits

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Myofascial pain syndrome (MPS)

Cluster of signs and symptoms caused by/associated with myofascial trigger points (MTrPs)

A prevalent source of (regional) pain in patients presenting to primary care or pain clinics

Lluch et al., 2015; Chiarotto et al., 2015
Management options for MTrPs
Management options for MTrPs

Which patients are likely to benefit from MTrPs interventions?

Clinical guidelines for MTrPs?

Let me know
A clinical algorithm for treating MTrPs

Based on a non-systematic analysis and review of the literature

Envision MTrPs using a wide perspective

Consideration of motor control issues and pain mechanisms
The importance of clinical reasoning
The importance of clinical reasoning

The thinking and/or decision-making processes that are used in the clinical practice

Higgs and Jones 2000, Edwards 2004
MYOFASCIAL TRIGGER POINT (MTrP)

Which is the patient dominant pain mechanism(s)?
Mechanisms-based classification of pain

Underlying neurophysiological mechanisms responsible for generation and/or maintenance of pain

Gifford and Butler, 1997;
Gifford, 1998
Mechanisms-based classification of pain
Which is the patient dominant pain mechanism(s)?

- INPUT
  - PERIPHERAL NEUROGENIC
  - NOCICEPTIVE

- PROCESSING

- OUTPUT
CAN YOU REALLY KNOW THE MECHANISM OF PAIN?
Mechanisms-based classification of pain

NO GOLD STANDARD: recognition of symptoms (interview) and signs (physical examination) characteristic to each pain mechanism

Smart et al 2010, 2012
Mechanisms-based classification of pain

(Discriminative and construct) validity and classification accuracy in people with low back and leg pain

Smart et al., 2011, 2012
Schäfer et al., 2014

Better results with treatment if matched to the dominant pain–mechanism

Schäfer et al., 2011
Mechanisms-based classification of pain

No application to myofascial pain research

Really?
MYOFASCIAL TRIGGER POINT (MTrP)

Which is the patient dominant pain mechanism(s)?

INPUT

PERIPHERAL NEUROGENIC

PROCESSING

NOCICEPTIVE

OUTPUT
Is the pain nociceptive?

- Pain localised to the area of injury/dysfunction
- Clear, proportionate mechanical/anatomical nature to aggravating and easing factors
- Usually intermittent and sharp pain with movement/mechanical provocation
- Absence of:
  - Pain in association with other dysesthesias
  - Night pain/disturbed sleep
  - Antalgic postures/movement patterns
  - Pain variously described as burning, shooting, sharp or electric

Smart et al., 2012
Techniques for peripheral tissues (MTrPs) would be justified if dominant pain mechanism is nociceptive

Gifford and Butler 1997
MYOFASCIAL TRIGGER POINT (MTrP)

Which is the patient dominant pain mechanism(s)?

INPUT
- PERIPHERAL NEUROGENIC
- NOCICEPTIVE

PROCESSING

OUTPUT

Poor prognosis with locally-applied techniques if altered pain processing mechanism (central sensitization) is dominant

Sterling et al., 2003; Jull et al., 2007; Coombes et al., 2015
Which is the patient dominant pain mechanism(s)?

- INPUT
  - PERIPHERAL NEUROGENIC
  - NOCICEPTIVE

- PROCESSING

- OUTPUT
Is the pain (peripheral) neurogenic?

- Pain referred in a dermatomal or cutaneous distribution
- History of nerve injury, pathology or mechanical compromise
- Pain/symptom provocation with mechanical/movement tests (e.g. Active/Passive, Neurodynamic) that move/load/compress neural tissue

Smart et al., 2012
Which is the patient's dominant pain mechanism(s)?

- Peripheral neurogenic pain
- Nociceptive pain

Treat peripheral neurogenic pain
Consider concurrent MTrPs to solve localised musculoskeletal pain
Which is the patient dominant pain mechanism(s)?

- INPUT
  - PERIPHERAL NEUROGENIC
  - NOCICEPTIVE

- PROCESSING

- OUTPUT

Treat peripheral neurogenic pain
Consider concurrent MTrPs to solve localised musculoskeletal pain
High prevalence of MTrPs in the infraspinatus muscle in patients with carpal tunnel syndrome
Querama et al., 2009

More active and latent MTrPs in patients with cervical and lumbar radiculopathy compared to healthy controls
Sari et al., 2012; Adelmanesh et al., 2015

Decrease in pain and neuropathic signs (SLR) after MTrPs treatment in patients with lumbar radiculopathy
Saeidian et al., 2014

Treat peripheral neurogenic pain
Consider concurrent MTrPs to solve localised musculoskeletal pain
MYOFASCIAL TRIGGER POINT (MTrP)

Neural Tissue Dysfunction

MTrPs

PERIPHERAL NEUROGENIC
Which is the patient dominant pain mechanism(s)?

Are MTrPs a peripheral or central phenomenon??

De–Las–Peñas and Dommerholt 2014
Which is the patient dominant pain mechanism(s)?

- **INPUT**
  - Peripheral neurogenic
  - Nociceptive

**OUTPUT**

MTrPs treatment can modulate central sensitization pain

Freeman et al., 2009; Affaitati et al., 2011; Giamberardino et al., 2011
Which is the patient dominant pain mechanism(s)?

- **Peripheral Neurogenic**
- **Nociceptive**

Referred pain of MTrPs simulates regional pains of patients with central sensitization pain.

*Ge et al., 2009*
*Alonso-Blanco et al., 2011*
MTrPs are an epiphenomenon in patients with CS

Srbely & Dickey, 2007; Srbely 2008, 2010

Capsaicin-Induced Central Sensitization Evokes Segmental Increases in Trigger Point Sensitivity in Humans

John Z. Srbely,* James P. Dickey,† Leah R. Bent,* David Lee,‡ and Mark Lowerison§

*Human Health and Nutritional Sciences, University of Guelph, Guelph, Ontario, Canada.
†School of Kinesiology, University of Western Ontario, London, Ontario, Canada.
‡Clinical Education, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.
§Comparative Orthopedic Research Lab, Clinical Studies, University of Guelph, Guelph, Ontario, Canada.
MYOFASCIAL TRIGGER POINT (MTrP)

Which is the patient dominant pain mechanism(s)?

PROCESSING

Avoid further nociceptive triggering during MTrPs treatment: endogenous analgesia might be impaired!

Nijs and Van Houdenhove, 2009
Nijs et al., 2009

Excessive focus on treating MTrPs might strengthen biomedical beliefs
MYOFASCIAL TRIGGER POINT (MTrP)

Which is the patient dominant pain mechanism(s)?

INPUT

PROCESSING

OUTPUT

START WITH gentle and pain-free techniques after explaining pain and central sensitization

PROGRESS to more aggressive techniques (i.e. SDN, then DDN)
MYOFASCIAL TRIGGER POINT (MTrP)

Which is the patient dominant pain mechanism(s)?

**INPUT**
- PERIPHERAL NEUROGENIC
- NOCICEPTIVE

**PROCESSING**

**OUTPUT**

Desensitize central nervous system
Treat MTrPs to solve localized musculoskeletal pain problems
Balancing “hands-on” with “hands-off” physical therapy interventions for the treatment of central sensitization pain in osteoarthritis

E. Lluch Girbè, M. Meeus, I. Baert, J. Nijs
12 patients with mechanical low back pain

TrP–DN or TrP–DN + Neuroscience Education

Outcome measures: pain, disability, kinesiophobia and pressure pain sensitivity
Similar improvements in pain and disability in both groups

Greater improvements in kinesiophobia in the TrP–DN + Neuroscience Education
Which is the patient dominant pain mechanism(s)?

INPUT

PERIPHERAL NEUROGENIC

NOCICEPTIVE

Address to factors leading to dominant motor output

OUTPUT

Motor control retraining

Faulty movement patterns
Which is the patient dominant pain mechanism(s)?

PERIPHERAL NEUROGENIC

NOCICEPTIVE

Input

Output

Danneels et al., 2011

Figure 1. The planetary model.
Which is the patient dominant pain mechanism(s)?

Recognize MTrPs related to the current patient complaint

Analyze MTrPs interaction with other possible nociceptive sources (articular, neural)

Consider provocative or perpetuating factors
MYOFASCIAL TRIGGER POINT (MTrP)

Which is the patient dominant pain mechanism(s)?

INPUT

PERIPHERAL NEUROGENIC

PROCESSING

NOCICEPTIVE

OUTPUT

Is MTrP located in a STABILIZING or MOBILIZING MUSCLE?
FUNCTIONAL MUSCLE CLASSIFICATIONS

<table>
<thead>
<tr>
<th>STABILIZERS</th>
<th>MOBILIZERS</th>
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<tbody>
<tr>
<td>MONO-ARTICULAR</td>
<td>BI-ARTICULAR / MULTI- ARTICULAR</td>
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<tr>
<td>DEEP, WITH SEGMENTAL ATTACHMENTS</td>
<td>SUPERFICIAL, LACK SEGMENTAL INSERTIONS</td>
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<td>CONTRACTION INDEPENDENT OF THE</td>
<td>CONTRACTION DEPENDENT OF DIRECTION OF MOVEMENT</td>
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<td>DIRECTION OF MOVEMENT.  ANTICIPATORY ACTION TO LOAD/MOVEMENT</td>
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<tr>
<td>STABILITY ROLE (CONTROL EXCESSIVE PHYSIOLOGICAL</td>
<td>SPEED AND LARGE RANGE OF MOVEMENT (MOBILITY ROLE)</td>
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<td>AND TRANSLATIONAL MOTION)</td>
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<tr>
<td>BECOME INEFFICIENT (INHIBITED/OVER-ELONGATED)</td>
<td>BECOME DOMINANT/ OVER-RECRUITED/SHORT WHEN DYSFUNCTIONAL</td>
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<td>WHEN DYSFUNCTIONAL</td>
<td></td>
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<tr>
<td>DEEP CERVICAL FLEXORS</td>
<td>SCOM, ESCALENI</td>
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<tr>
<td>TRANSVERSUS ABDOMINIS</td>
<td>EXTERNAL OBLIQUE</td>
</tr>
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<td>MULTIFIDII</td>
<td>ERECTOR SPINAES (ILIACOSTALIS, LONGISSIMUS)</td>
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<tr>
<td>VASTUS MEDIALIS OBLIQUE,...</td>
<td>VASTUS LATERALIS,...</td>
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Motor control dysfunction

- Presence of aberrant or uncontrolled movements
- During functional activities and/or prescribed active movements in specific directions
- Lack of efficient active recruitment of (stabilizing) muscles controlling motion

Comerford and Mottram, 2012
Motor control dysfunction

Physical therapists can reliably assess motor control dysfunction

Segarra et al., 2015
Interaction between MTrPs and motor control dysfunction

MTrPs can alter motor recruitment patterns

Lucas et al., 2004; 2010

Not much investigation on the relationship between motor control dysfunction and MTrPs

Not much consideration of MTrPs in current theories about motor adaptation to pain

Hodges and Tucker, 2011; Nijs et al., 2012
Interaction between MTrPs and motor control dysfunction

Effects of Deep Cervical Flexor Training on Pressure Pain Thresholds Over Myofascial Trigger Points in Patients With Chronic Neck Pain

Enrique Lluch, PT, a Maria Dolores Arguisuelas, PT, b Pablo S. Coloma, PT, b Francisco Palma, PT, b Alejandro Rey, PT, b and Deborah Falla, PT, PhD c
Interaction between MTrPs and motor control dysfunction

Cranio–cervical flexion exercise

Jull et al., 2008

DOSE: 6 weeks (2 sessions/week) + home training (twice a day)
Interaction between MTrPs and motor control dysfunction

Less neck pain and disability

No changes on PPTs over MTrPs of superficial neck extensors
Interaction between MTrPs and motor control dysfunction

Combine motor control dysfunction training and MTPs if both appear together

NO CONTROL GROUP!!!
Interaction between MTrPs and motor control dysfunction

No effects on pain sensitivity over MTrPs of the superficial neck flexors (anterior scalene, sternocleidomastoid) after both treatments
Interaction between MTrPs and motor control dysfunction

Does lumbar multifidus muscle function change after dry needling in patients with low back pain?

Do those changes differ in patients exhibiting improved disability (responders) compared to those that not (non-responders)?
Interaction between MTrPs and motor control dysfunction

Lumbar multifidus contraction improved after deep dry needling

Larger improvements in lumbar multifidus contraction of responders than non-responders
Interaction between MTrPs and motor control dysfunction

Lumbar multifidus contraction improved after deep dry needling.

Larger improvements in lumbar multifidus contraction of responders than non-responders.

AUTHORS DIDN’T SEARCH FOR MTrPs
Interaction between MTrPs and motor control dysfunction

28 healthy subjects

13 received dry needling multifidus; 15 no intervention

Needles left in situ for 10 minutes

Outcome measure: Multifidus thickness at rest and during contraction pre and post-intervention

Dar et al 2015
Interaction between MTrPs and motor control dysfunction

Increase in multifidus activity on some levels (i.e. L4–L5) in the dry needling group compared to control group

Dar et al 2015
Interaction between MTrPs and motor control dysfunction

CASE SERIES
TREATMENT OF NONSPECIFIC THORACIC SPINE PAIN WITH TRIGGER POINT DRY NEEDLING AND INTRAMUSCULAR ELECTRICAL STIMULATION: A CASE SERIES
Jodie M. Rock, PT, DPT, OCS, FAAOMPT
Charles E. Rainey, PT, DSc, DPT, OCS, SCS, FAAOMPT

CASE REPORT
THE USE OF TRIGGER POINT DRY NEEDLING AND INTRAMUSCULAR ELECTRICAL STIMULATION FOR A SUBJECT WITH CHRONIC LOW BACK PAIN: A CASE REPORT
Charles E. Rainey, PT, DSc, DPT, OCS, FAAOMPT
MYOFASCIAL TRIGGER POINT (MTrP)

MTrP IN A DYNAMIC MUSCLE

MTrP IN A STABILIZING MUSCLE
MYOFASCIAL TRIGGER POINT (MTrP)

MTrP IN A DYNAMIC MUSCLE

MTrP IN A STABILIZING MUSCLE
MYOFASCIAL TRIGGER POINT (MTrP)

MTrP IN A DYNAMIC MUSCLE

Is the (functionally-related) stabilizing muscle weak?

- NO: Treat dynamic MTrP
- YES: Motor retraining

If dynamic MTrP persist

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CLINICAL ASSESSMENT OF THE DEEP CERVICAL FLEXOR MUSCLES: THE CRANIOCERVICAL FLEXION TEST

Gwendolen A. Jull, PT, PhD; Shaun P. O’Leary, PT, PhD; and Deborah L. Falla, PT, PhD
MYOFASCIAL TRIGGER POINT (MTrP)

MTrP IN A DYNAMIC MUSCLE

Is the (functionally-related) stabilizing muscle weak?

YES

Motor control retraining

If dynamic MTrP persist

NO

Treat dynamic MTrP
MYOFASCIAL TRIGGER POINT (MTrP)

MTrP IN A DYNAMIC MUSCLE

Is the (functionally-related) stabilizing muscle weak?

- NO

Treat dynamic MTrP

Is the muscle shortened?
Is the muscle lengthened?
Is the muscle shortened?

Muscle length tests

Struyf et al., 2014; Borstad and Briggs, 2010; Cejudo et al., 2015
Is the muscle lengthened?
– Emphasis on stretching muscles as part of MTrPs management

– The sole presence of a MTrP in a dynamic muscle does not guarantee that it is shortened
Stretching for everybody?
Stretching for everybody?
Stretching for everybody?

Castelein et al., 2016

Watson et al., 2009
Stretching for everybody?

Tonley et al., 2010
Stretching for everybody?

Tonley et al., 2010
Stretching for everybody?
MYOFASCIAL TRIGGER POINT (MTrP)

MTrP IN A DYNAMIC MUSCLE

Is the muscle shortened?

- NO: Treat dynamic MTrP
- YES: Locally focused MTrPs techniques + muscle stretching (consider neural tissue involvement)
MYOFASCIAL TRIGGER POINT (MTrP)

MTrP IN A DYNAMIC MUSCLE

Is the (functionally-related) stabilizing muscle weak?

No → Treat dynamic MTrP

Is the (dynamic) muscle shortened?

No → Locally focused MTrPs techniques

Yes → Locally focused MTrPs techniques + muscle stretching (consider neural tissue involvement)
MYOFASCIAL TRIGGER POINT (MTrP)

MTrP IN A DYNAMIC MUSCLE

Treat MTrP

If stabilizing muscle weakness persists

Motor control retraining

MTrP IN A STABILIZING MUSCLE

Is the stabilizing muscle weak?

YES

Treat stabilizing MTrP

NO

Treat stabilizing MTrP
Fig. 7. Diagram of referred pain patterns that arise from a trigger point in the lower lumbar multifidus. (Adapted from Simons and Travell, 1983.)
Clinical Study

The evaluation of lumbar multifidus muscle function via palpation: reliability and validity of a new clinical test

Jeffrey J. Hebert, DC, PhD\textsuperscript{a,\*}, Shane L. Koppenhaver, PhD, PT\textsuperscript{b,\*}, Deydre S. Teyhen, PhD, PT\textsuperscript{b,\*}, Bruce F. Walker, DC, MPH, DrPH\textsuperscript{d}, Julie M. Fritz, PhD, PT\textsuperscript{e}

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\textsuperscript{d}School of Health Professions, Murdoch University, 90 South St, Perth, Western Australia, Australia
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Received 6 January 2012; revised 15 April 2013; accepted 26 August 2013
MYOFASCIAL TRIGGER POINT (MTrP)

Which is the patient dominant pain mechanism(s)?

INPUT

PERIPHERAL NEUROGENIC

Treat peripheral neurogenic pain
Consider concurrent MTrPs to solve localized musculoskeletal pain

NOICEPTIVE

Recognize MTrPs related to the current patient complaint
Analyze MTrPs interaction with other possible nociceptive sources and consider provocative or perpetuating factors

OUTPUT

PROCESSING

Desensitize central nervous system
Treat MTrPs to solve localized musculoskeletal pain problems

Motor control retraining

Is the (functionally-related) muscle weak?

MTrP IN A DYNAMIC MUSCLE

If dynamic MTrP persists

Treat dynamic MTrP

Is the dynamic muscle shortened?

Locally focused MTrPs techniques
Locally focused MTrPs techniques + muscle stretching (consider neural tissue involvement)

Motor control retraining

MTrP IN A STABILIZING MUSCLE

Is the stabilizing muscle weak?

If stabilizing muscle weakness persists

Treat stabilizing MTrP

Treat stabilizing MTrP

Address to factors leading to dominant motor output
MYOFASCIAL TRIGGER POINT (MTrP)

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PROCESSING

Desensitize central nervous system
Treat MTrPs to solve localized musculoskeletal pain problems

OUTPUT

Address to factors leading to dominant motor output

MTrP IN A DYNAMIC MUSCLE

Is the (functionally-related) stabilizing muscle weak?

YES

Motor control retraining

NO

MTrP IN A STABILIZING MUSCLE

Is the stabilizing muscle weak?

YES

Treat stabilizing MTrP

NO

Treat stabilizing MTrP

If stabilizing muscle weakness persists

Treat stabilizing MTrP

Locally focused MTrPs techniques + muscle stretching (consider neural tissue involvement)

Is the dynamic muscle shortened?

YES

Motor control retraining

NO

If dynamic MTrP persists

Treat dynamic MTrP

Locally focused MTrPs techniques
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PROCESSING

Desensitize central nervous system
Treat MTrPs to solve localized musculoskeletal pain problems

OUTPUT

If dynamic MTrP persists
Motor control retraining

Is the dynamic muscle shorted?

Locally focused MTrPs techniques + muscle stretching (consider neural tissue involvement)

Is the (functionally-related) stabilizing muscle weak?

YES
Treat stabilizing MTrP

NO

Treat dynamic MTrP

If stabilizing muscle weakness persists
Motor control retraining

NO

YES

LOCALIZED MTrPs techniques

Motor control retraining
Clinical algorithm: conclusions

– Looking at patients with MTrPs from a “pain mechanism–based” approach

– May provide a useful guideline for treatment
Future research...

- Validation of this clinical algorithm before using it confidently

- Cause–effect relationship of MTrPs and motor control dysfunction

- Effectiveness of treating MTrPs in subgroups of patients with different pain mechanisms
THANK YOU