CRPS and surprising reactivity to dry needling

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Case Presentation - history

- 41 year-old woman
- Pain in her right palm and forearm
- 5 months after a fracture of her right distal radius
- S/P open reduction and internal fixation
Case Presentation-history

• After the cast was removed (4 months earlier)...
• She reports
  • Severe burning pain in the affected palm;
  • excessive sweating;
  • unable to use the hand.
• X ray showed full union of the fracture.
Case Presentation-examination 1
Case Presentation-examination 2

- Arm extensor muscles revealed reduced range of motion and severe tenderness on palpation and on resisted movement.
Case Presentation-diagnosis and plan

Budapest Diagnostic criteria for CRPS

continuing pain disproportionate to any inciting event

<table>
<thead>
<tr>
<th>category</th>
<th>signs</th>
<th>symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vascular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edema, sweating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor, trophic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Symptoms >1 of ≥3 categories
Signs >1 of ≥2 categories
Case Presentation-diagnosis and plan

Diagnosis

• CRPS of the right upper extremity
• Myofascial pain syndrome of the arm extensors.

Treatment program plan

• Analgesics, anti-neuropathic agents
• Physical and occupational therapy.
• Course of dry needling for the myofascial
• Involvement of the arm extensors
Case Presentation-treatment 1

Dry needling

• extensor carpi radialis
• extensor carpi ulnaris
• extensor digitorum

Surprisingly, within minutes after needling, both palmar sweating and allodynia improved significantly

After 1 week
Case Presentation - treatment 2

- She did not take medications
- 2 more sessions of dry needling
- Follow up after 1 month - pain free
<table>
<thead>
<tr>
<th>patient</th>
<th>age</th>
<th>gender</th>
<th>Limb involved</th>
<th>Precipitating event</th>
<th>Duration of symptoms</th>
<th>Budapest criteria</th>
<th>Number of dry needling treatments</th>
<th>Degree of improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>43</td>
<td>F</td>
<td>Rt arm</td>
<td>Distal radius fracture</td>
<td>4 months</td>
<td>yes</td>
<td>3</td>
<td>complete</td>
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<tr>
<td>2</td>
<td>35</td>
<td>F</td>
<td>Rt arm</td>
<td>Blunt trauma</td>
<td>12 months</td>
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<tr>
<td>3</td>
<td>51</td>
<td>F</td>
<td>Rt arm</td>
<td>Distal radius and ulna fracture</td>
<td>6 months</td>
<td>yes</td>
<td>6</td>
<td>moderate</td>
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<tr>
<td>4</td>
<td>44</td>
<td>F</td>
<td>Rt arm</td>
<td>Distal radius fracture</td>
<td>3 months</td>
<td>Yes</td>
<td>12</td>
<td>complete</td>
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<tr>
<td>5</td>
<td>34</td>
<td>M</td>
<td>Lt forearm</td>
<td>Fracture scaphoid</td>
<td>45 months</td>
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<td>6</td>
<td>moderate</td>
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<tr>
<td>6</td>
<td>50</td>
<td>F</td>
<td>Rt Hand</td>
<td>Fracture hamate</td>
<td>3 months</td>
<td>Yes</td>
<td>10</td>
<td>none</td>
</tr>
</tbody>
</table>
What is known about CRPS?

- Complex Regional Pain Syndrome (CRPS) is a severe chronic pain disorder.
- Patients with CRPS display an exaggerated nervous system response to injury.
What is known about CRPS?

• pain and an autonomic nervous system response that is generally disproportionate in degree to the inciting trauma.

• characterized primarily by pain

• manifested by
  
  alldynia, hyperesthesia, hyperalgesia and motor dysfunction

  Swelling, trophic skin changes, sweating and abnormal blood flow
What is known about MPS?

• Myofascial Pain Syndrome (MPS) is a very common musculoskeletal pain syndrome affecting up to 85% of the population in their lifetime.

• Characterized by exquisitely tender trigger points located in a taut or tight band of muscle.

• When stimulated, these trigger points may effect a reflex local twitch response (LTR) resulting in a sharp muscle contraction.
CRPS patients have MPS

- Trigger points, the hallmark of myofascial pain syndrome, have been described in patient suffering from CRPS.

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients with TrPs (%)</th>
<th>Upper limb(%)</th>
<th>Lower limb(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rashiq¹</td>
<td>61</td>
<td>70</td>
<td>40</td>
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<tr>
<td>Allen²</td>
<td>56</td>
<td>69</td>
<td>42</td>
</tr>
</tbody>
</table>

MPS can induce autonomic changes?

• MTrPs when compressed cause referred pain, local tenderness, and autonomic changes\(^3\)

• Introducing a recording electrode adjacent to a trigger point causes pain characteristic of the myofascial pain and often causes associated autonomic symptoms such as light headedness, diaphoresis and nausea\(^4\)

4. Hubbard DR. Spine. 1993
• Abnormal autonomic responses in the myofascial pain area are either essential to (3.3%) or associated with (51.8%) MPS

• Autonomic changes are essential (3%) and associated with (47%) MPS in 50% of the cases

6. Rivers WE. Pain medicine 2015
The etiology of CRPS?

Three important pathophysiological pathways:

1. aberrant inflammatory mechanisms
2. vasomotor dysfunction
3. maladaptive neuroplasticity
Immobilization of the injured limb might be a risk factor in the development of CRPS

• Immobilization of healthy limbs can induce changes in temperature, mechanosensitivity, and thermosensitivity\(^7\)

• Physician induced limb immobilization has been recognized as a risk factor for the development of CRPS \(^8\)

• Animal models in rats have shown that cast immobilization of limbs induces ischaemia/reperfusion injury

\(^7\) Terkelsen AJ. Anesthesiology. 2008
\(^8\) Schwartzman RJ. Neurology. 1990
Immobilization of the injured limb might be a risk factor in the development of CRPS

• Animal models in rats have shown that cast immobilization of limbs induces ischaemia/reperfusion injury\(^9\)
• phenotypic changes occur in calcitonin gene related protein expression in the dorsal root ganglion and spinal deep layers\(^{10}\)

Botox Treatment of MPS reduces CRPS

- Botulinum Toxin injections into proximal muscles displaying MPS phenomena including trigger points.
- Intramuscular and not intradermal botulinum injection into dystonic muscles has an alleviating effect on pain and dystonia in CRPS patients.

Dry needling Treatment of MPS reduces CRPS

Dry needling into proximal muscles displaying MPS phenomena including trigger points.
Mechanism of Action?
Mechanism of Action

Chance?

Some (perhaps most) CRPS patients recover spontaneously.

Unlikely:

- Most recovery takes part in the acute phase. Our patients experienced symptoms for months.
- The effect of dry needling was observed minutes after treatment.
- Improved limb mobility?

- Mobilization of CRPS limbs is a part of every treatment plan and known to be efficacious.

- Improvement observed immediately after treatment, even before mobilization resumed.

Mechanism of Action

- Trauma
- Immobilization
- Myofascial pain
- Autonomic+nociceptive changes
Could dry-needling inhibit not only the motor tone but also the sympathetic tone?

In animal studies dry-needling:
- Drives a reflex arc activating inhibitory interneurons in the spinal cord...
- leading to a decreased firing rate of motor neurons.

Could it similarly affect the sympathetic tone and nociceptive pathways?
A proposed mechanism

Initial injury

Immobilization

Peripheral sensitization

Inflammatory response

Avoidance of movement

Central sensitization

Motor Dysfunction

Myofascial Pain Syndrome

Pain

Autonomic Phenomena
A proposed mechanism

Initial injury

Inflammatory response

Peripheral sensitization

Pain

Central sensitization

Myofascial Pain Syndrome

Motor Dysfunction

Avoidance of movement

Autonomic Phenomena

Immobilization

Motor Dysfunction
A proposed mechanism

Central sensitization

Pain
Thank you