TENS and acupuncture therapy for soft tissue pain
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Abstract
Acupuncture and transcutaneous electrical nerve stimulation (TENS) are two commonly used physical therapies in the management of soft tissue pain. Stimulation is used to provide analgesia in the treatment of both acute and chronic soft tissue pain.

Keywords acupuncture; acute; chronic; electrotherapy; physical stimulation; soft tissue pain; TENS

Royal College of Anaesthetists CPD matrix: 2E03, 3E00

TENS
Transcutaneous electrical nerve stimulation (TENS) is a relatively inexpensive method of delivering treatment for mild-to-moderate pain. Pulsed electrical currents generated by the TENS device are delivered across intact skin via the self-adhesive, conducting electrode pads.

The internal electronics of the TENS device allows for variable programming (Table 1). Dials located on the TENS device allows the user to increase the intensity of stimulation to the desired effect. It is recommended that stimulation is strong enough to produce paraesthesia, but not too strong to avoid exacerbating pain.

Electrode placement can be varied and is ultimately determined by clinical effect. Different placements may need to be trialled before success is achieved. To be effective the TENS needs to affect conducting afferent nerves.

Electrode placement should:
- be close to the area of pain
- be placed within the same dermatome, myotome or sclerotome
- be acupuncture points or trigger points
- stimulate the peripheral nerve for the treatment of neurogenic pain
- be placed at the spinal nerves close to vertebral column

TENS should not be applied:
- over the carotid sinus as this could lead to cardiac arrhythmias
- to patients with pacemakers
- over the pharyngeal region as this could lead to interference with breathing

Acupuncture
The term ‘acupuncture’ refers to the insertion of dry needles into the body. Traditional Chinese medicine (TCM) teaches acupuncture as a treatment to regulate the body’s imbalance of the cosmic energy ‘Yin and Yang’. Insertion points are along meridians. ‘Qi’ is the vital life energy that flows along meridians. The analgesia provided by acupuncture is postulated to occur from the release of spinal dynorphin and encephalins, through increased local blood flow and from the relaxation of muscle fibres. Needling of distal points is thought to modulate the sympathetic nervous system. Segmental acupuncture modulates pain at the dorsal horn by needling an area innervated by the spinal segment.

The correlation between local acupuncture points for pain and trigger points represents a major convergence of Western and Eastern knowledge (Figure 1). The traditional Chinese ‘Ah Shi’ (translates to ‘Oh yes’) points are equivalent to trigger points. Key characteristics of a trigger point include ‘Ah Shi’, painful compression exhibiting referral pattern of pain or autonomic dysfunction, and a twitch response.

Serious side effects are rare — less than one per 10,000 treatments. Minor bleeding or bruising occurs in about 3% of treatments. Pain during treatment occurs in about 1% of treatments. For some patients their existing symptoms can get worse after treatment. Some patients may faint, particularly at the first treatment. Acupuncture is not recommended:
- for patients with pacemakers
- for patients with damaged heart valves

Learning objectives
After reading this article you should be able to:
- explain the different modes of action of conventional transcutaneous electrical nerve stimulation (TENS) and acupuncture-like TENS
- list the contraindications of TENS
- describe two of the postulated pain mechanisms of action of acupuncture
- identify the key characteristics of a trigger point

- to skin with no cutaneous sensation
- in pregnancy.

TENS is thought to provide analgesia by stimulating larger afferent fibres. This neuro-modulation technique is described by Melzack and Wall’s ‘Gate Control Theory’ (1965). TENS selectively activates low-threshold peripheral afferents (A–ß) reducing on-going nociceptive transmission from C-fibre afferents (Table 1).

Other postulated mechanisms of the pain relief mediated by TENS include the promotion of endorphin release in the brain and local dilatation of blood vessels in injured tissue.

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Different types of stimulation that can be applied when acupuncture and TENS are used as a physical therapy in the treatment of soft tissue pain

<table>
<thead>
<tr>
<th>Physical therapy</th>
<th>Mode of action</th>
<th>Pain mechanism</th>
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<tbody>
<tr>
<td>Conventional TENS</td>
<td>High-frequency, low-intensity stimulation: short pulses 50 μs at 40–150 Hz — produces a tingling sensation and paraesthesia to the area of application</td>
<td>Stimulates the large low-threshold Aβ fibres to produce pain inhibition by the pain gate mechanism. Effects are almost immediate following application and can provide benefit to pain whilst switched on</td>
</tr>
<tr>
<td>Acupuncture-like TENS</td>
<td>Low-frequency, high-intensity: Pulses at 2 Hz — produces a muscle contraction</td>
<td>Stimulates the high-threshold Aδ and C fibres releasing endogenous opioids as well as producing sensory input from muscle spindle afferents. Effects for pain reduction can take up to 2 weeks of regular stimulation</td>
</tr>
<tr>
<td>Burst TENS</td>
<td>Series of pulses. Bursts of stimulation at conventional TENS frequency of increased intensity</td>
<td>Combines benefits of both conventional TENS and Acupuncture-like TENS</td>
</tr>
<tr>
<td>Modulation TENS</td>
<td>The pulse length, frequency and amplitudes are automatically varied</td>
<td>Cycle variation prevents adaptation of the nerves to the current, especially appropriate when TENS is used over long periods</td>
</tr>
<tr>
<td>Electro-acupuncture</td>
<td>Low-frequency, high-intensity electrical current. Treatment duration limited to 20 minutes. Opioid antagonists cholecystokinin (CCK-8) produced if stimulation prolonged</td>
<td>Stimulation of Aδ nerve fibres. The intense effect of electro-analgesia is mediated through the central release of endogenous opioids. Effects occur after 20 minutes and can last for days</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>Dry needling — insertion of needle to traditional Chinese acupuncture points, segmental, dermatomal or distal points</td>
<td>Segmental/dermatomal — pain modulation at dorsal horn. Stimulates Aδ and Aβ fibres to produce pain inhibition by the pain gate mechanism. Distal — modulation of sympathetic nervous system. Traditional Chinese acupuncture points — promote flow of Qi</td>
</tr>
<tr>
<td>Trigger point needling</td>
<td>Insertion of needle to trigger point in muscle, tendons, ligaments, joint capsules, periosteum and subcutaneous tissues</td>
<td>Release spinal dynorphin and encephalins. Increased flow of blood relaxes the muscle fibres</td>
</tr>
</tbody>
</table>

Table 1

Trigger point pain referral patterns and meridians

Figure 1 As illustrated by White A, Ernst E in Acupuncture: A Scientific Appraisal. 1999.
• in pregnancy
• when anticoagulant drugs are prescribed
• for patients with bleeding disorders
• for patients with increased risk of infection.

Conclusion

There is a need for more scientific evidence for both treatment modalities. Acupuncture and TENS have historically been used in the management of soft tissue pain without robust scientific evidence to support their therapeutic value. Current evidence neither supports nor disproves the use of TENS in chronic pain. There are non-randomized trials that report enhanced treatment effects in postoperative pain. Current evidence supports the use of acupuncture in the management of knee osteoarthritis, chronic neck pain and low back pain.⁹

REFERENCES


FURTHER READING