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# What is the effectiveness and adverse event data of transcutaneous electrical nerve stimulation (TENS) in reducing pain in adults with chronic pain? An overview of Cochrane Reviews summary with commentary

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The aim of this commentary is to discuss in a rehabilitation perspective the recently published Cochrane Review entitled "Transcutaneous electrical nerve stimulation (TENS) for chronic pain - an overview of Cochrane Reviews" by Gibson et al.,[1] under the direct supervision of Cochrane Review Group. This Cochrane Corner is produced in agreement with the *Turkish Journal of Physical Medicine and Rehabilitation* by Cochrane Rehabilitation.

Chronic pain, defined as pain lasting longer than three months is an important health condition with serious adverse impacts on quality of life, social and working lives of individuals, if inadequately managed. Transcutaneous electrical nerve stimulation (TENS), an electrical nerve stimulation applied through the skin, is a commonly used adjunct therapy to control pain in chronic pain conditions. The mechanisms of analgesia induced by TENS is thought to be multifactorial including peripheral, spinal, and supraspinal mechanisms. The TENS is commonly delivered in either high- (greater than 50 Hz) or low- (10 Hz or less) frequency modes, usually at lower and higher intensities, respectively. The perceived intensity of stimulation is thought to be a key factor in optimizing the potential TENS effect. Intensity has been recommended as being set at a level which produces a strong and non-painful sensation, and ideally titrated during application to maintain a constant level of perception (regardless of TENS frequency).[2] It is thought that TENS-induced analgesia peaks during or immediately after application[2] and, therefore, timing of outcome evaluation in TENS studies is critical.

Despite its clinical use for many years as an adjunct therapy in chronic pain conditions, the effectiveness of TENS still remains unclear. To date, a number of Cochrane Reviews have assessed the effectiveness of TENS in chronic pain. A systematic synthesis of the evidence from these reviews is needed to provide a brief summary to patients, clinicians, and commissioners and to identify the sources of discrepancies in the approaches of these studies. This Cochrane overview evaluated the Cochrane reviews involving studies regarding the effectiveness and adverse events of TENS to reduce pain in adults with chronic pain conditions.

Transcutaneous electrical nerve stimulation (TENS) for chronic pain - an overview of Cochrane Reviews (Gibson et al., 2019).[1]

### *What is the aim of this Cochrane review?*

The primary aim of this Cochrane Review was to present an overview of Cochrane Reviews on the effectiveness and adverse events of TENS to reduce pain in adults with chronic pain. The secondary aim was to identify inconsistent approaches in evaluating

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*[a]This summary is based on a Cochrane Review previously published in the Cochrane Database of Systematic Reviews 2019, Issue 2, Art. No.: CD011890. doi: 10.1002/14651858.CD011890.pub3 (see www.cochranelibrary.com for information). Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, and Cochrane Database of Systematic Reviews should be consulted for the most recent version of the review.*

*The views expressed in the summary with commentary are those of the Cochrane Corner authors and do not represent the Cochrane Library or Wiley.*

the evidence in Cochrane Reviews of TENS for chronic pain and to propose strategies to reduce uncertainty in defining the effectiveness of TENS in chronic pain.

**What was studied in the Cochrane overview?**

The reviews were included, if they met the following inclusion criteria:

- The Cochrane reviews examining the effectiveness of TENS in patients with chronic pain of any origin, excluding headache or migraine in adults aged 18 years or older
- The reviews of all standard methods of TENS delivery in which the TENS device delivered a clearly perceptible sensation, except for the non-portable electrical stimulation devices and percutaneous stimulation devices
- The reviews in the following format of comparisons:

  TENS versus sham

  TENS versus usual care or no treatment or waiting list control

  TENS plus active intervention versus active intervention alone

  Comparisons between different types of TENS or TENS delivered using different stimulation parameters.

The primary outcomes were the pain intensity measured using a Visual Analog Scale, Numerical Rating Scale, Verbal Rating Scale or Likert scale and the incidence/nature of adverse effects. The secondary outcomes were disability measured by validated self-report questionnaires or functional testing protocols, health-related quality of life using any validated tool, analgesic medication use, and patient global impression of change scales.

**Search methodology and up-to-dateness of the Cochrane review?**

The authors searched the Cochrane Database of Systematic Reviews (CDSR) in the Cochrane Library for Cochrane Reviews of randomized-controlled trials (RCTs) which were published up to Issue 11 of 12, 2018.

**What are the main results of the Cochrane review?**

This review evaluated nine high-quality Cochrane reviews related to chronic pain including spinal cord injury-related pain, rheumatoid arthritis of the hand, neuropathic pain, cancer related pain, phantom/stump pain, fibromyalgia, low back pain, neck pain, and knee osteoarthritis. The review investigating phantom or stump pain following amputation had no included studies. Therefore, 51 RCTs from eight Cochrane reviews with 2,895 TENS-comparison participants were included in the studies.

This review revealed that:

- For pain intensity:

*TENS versus sham*

One Cochrane review [TENS for neuropathic pain[3] (5 studies, n=207, mean difference -1.58, 95% CI: -2.08 to -1.09, p<0.001, IO=29%, p=0.22)] was considered for evaluation of TENS versus sham. It is not possible to conclude whether TENS effectively reduces pain intensity compared to sham in patients with chronic pain due to the very low quality of the evidence across all reviews/conditions.

*TENS versus usual care or no treatment or wait list control*

Three Cochrane reviews (TENS for neuropathic pain,[3] TENS for fibromyalgia,[4] and TENS for neck pain[5]) provided unsatisfactory evidence for the effectiveness of TENS on relieving pain, compared to usual care or no treatment or wait list control. Data were also limited and the quality of evidence was very low, indicating that it is not possible to conclude whether TENS is superior to no treatment or waiting list control.

*TENS plus active intervention versus active intervention alone*

One Cochrane review (TENS for neck pain[5]) reported no benefit and one review (TENS for fibromyalgia[4]) reported controversial results for the effectiveness of TENS plus active intervention, compared to active intervention alone. Data were limited and the quality of evidence was very low, indicating that it is not possible to draw a conclusion whether TENS is effective, when used as an adjunct to active intervention.

*Comparisons between different types of TENS or TENS using different stimulation parameters*

Two Cochrane reviews (TENS for rheumatoid arthritis of the hand[6] and TENS for neck pain[5]) reported no significant difference between the various types and modes of TENS, respectively. However, it is not possible to conclude about the effectiveness of TENS on pain intensity for these comparisons, due to very low quality of the evidence across both reviews/conditions.

- **For adverse events:** Three Cochrane reviews (TENS for spinal cord injury related pain,[7] TENS for rheumatoid arthritis of the hand[6] and TENS for neck pain[5]) reported no adverse events, while two reviews (TENS for neuropathic pain[3] and TENS for fibromyalgia[4]) reported minor skin irritation. However, it is not possible to make any conclusions regarding adverse events due to very low quality of the evidence and lack of data/reporting in all reviews/conditions.
- **For disability:** Two reviews about the comparison of TENS versus sham (TENS for low back pain[8] and TENS for knee osteoarthritis[9]) reported disability measures, but was unable to draw any conclusions due to very low quality of the evidence and lack of data on the effect of TENS, compared to sham. The other reviews did not provide any data or evidence for this outcome measure. It is not possible to make any conclusions for disability due to very low quality of the evidence and lack of data/reporting across reviews/conditions.
- **For health-related quality of life:** Only one review (TENS for fibromyalgia[4]) reported no convincing evidence for the effectiveness of TENS plus active interventions, compared to active intervention alone. However, the results are controversial and it is not possible to conclude that TENS has an effect on the health-related quality of life due to the very low quality of the evidence and lack of data across both reviews/conditions.
- **For analgesic medication use:** None of the reviews provided any useable data or evidence for effect of TENS on analgesic medication use for all four comparisons. It is not possible to make conclusions regarding the use of analgesic medications due to very low quality of the evidence and lack of data across reviews/conditions.
- **For patient global impression of change:** Only one review (TENS for rheumatoid arthritis of the hand[6]) included a study evaluating outcome with no useable data or evidence on the effectiveness of TENS for comparison between different types or modes of TENS. It is not possible to make any conclusions regarding this outcome due to very low quality of the evidence and lack of data across both reviews/conditions.
- **For inconsistencies in reviews:** There are two key area of inconsistency in reviews which may influence the conclusion: 1) blinding and risk of bias, and 2) adequacy of TENS interventions. Some reviews did not report the minimum dose of TENS, raising the potential issue of including studies which applied suboptimal doses of TENS.

**How did the authors conclude?**

The authors concluded that there was insufficient evidence about effectiveness and safety of TENS to reduce pain in adults with chronic pain. They were unable to make a conclusion regarding the effectiveness of TENS on disability, health-related quality of life, use of pain-relieving medications, and patient global impression of change in adults with chronic pain. The authors found no evidence of either a beneficial or harmful effect of TENS, as the quality of evidence was assessed as very low.

**What are the implications of the Cochrane evidence for practice in rehabilitation?**

The authors of the Cochrane review1 make the following inferences in the light of the evidence from Cochrane reviews on TENS for clinical practice and research persons:

- **For the patients:** There is no confident statement about the effectiveness of TENS on reducing pain in adults with chronic pain. Regarding the adverse events of TENS, although a few reviews reported minor skin irritation at the site of application, the authors were unable to make any definitive comment due to the included studies which reported either no adverse events or did not report any adverse events.
- **For clinicians:** There is no evidence demonstrating the effectiveness of TENS compared to sham TENS, usual care, no treatment, waiting list control or active intervention in patients with chronic pain for pain intensity, disability, health-related quality of life, analgesic medication use or patient global impression of change. Besides, there is no evidence demonstrating effectiveness, when different types or different stimulation parameters of TENS are compared. The absence of evidence is highly related to methodological limitations of the studies such as small sample size, incomplete outcome measures, allocation concealment, and blinding of participants, personnel, and outcome assessors.

- **For policy makers and funders:** There is no evidence to either support or disprove the use of TENS in chronic pain due to methodological limitations of studies.

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