

# TENS

**Transcutaneous Electrical Nerve Stimulation (TENS)** is the application of electrical current through the skin to stimulate nerve trunks and fibers, leading to relief of pain. These are low energy pulses (frequency 1-200 Hz) produced by a low frequency oscillator. The pulses emitted by the oscillator can be of different shapes and are shorter than 1 ms (typically 10–750  $\mu$ s). The duration of the impulse should be as short as possible, but it should still produce the necessary intensity. As the intensity of the impulse increases, subjective discomfort for the patient increases. During electrical stimulation at the site of the electrodes, the patient feels skin sensations (tingling).

Pulses can be:

- **symmetrically biphasic** - rectangular pulses - positive and negative - follow immediately
- **alternating biphasic** - rectangular pulses - positive and negative - follow each other with a time gap
- **asymmetrically biphasic** - a positive rectangular pulse immediately followed by an exponential negative pulse (they have a different area and half-wave shape and therefore have galvanic effects)

The most effective are asymmetrical biphasic pulses, which, however, must not be used for a long time due to their galvanic effects (corrosion).

TENS is one of the simple non-pharmacological means, combines psychological and somatic effects and helps reduce the need for analgesics. Back pain is relieved the most, with less relief in the suprapubic and perineal areas. It also induces a *placebo* effect. The only contraindication to TENS is a cardiac pacemaker.

## Types

### TENS conventional (continuous):

- pulse intensity above threshold sensitive,
- duration 70 to 300  $\mu$ s,
- frequency 50 to 200 Hz.

### TENS salvos (burst):

- individual pulses with an adjustable frequency, most often around 100 Hz,
- duration 10 to 100  $\mu$ s,
- about 5 pulses are grouped into a group - salvo. There are then 1 to 10 volleys every second depending on the patient's needs.

### TENS waves (surge):

- amplitude modulated current, for which it is possible to set the length of pulses (1 to 60 s) and the time between individual pulses (1 to 99 s). However, the time between individual impulses must be long enough for muscle contraction to occur.

### TENS low frequency:

- intensity at the threshold of tolerance,
- it is used to stimulate inserted acupuncture needles or to stimulate acupuncture points.

## Effects, treatment, application

The main effect of TENS is pain relief, based on the gateway theory of pain relief or the endorphin theory pain relief. **Gateway Theory of Pain Relief**

- According to this theory, pain is suppressed by stimulating a peripheral nerve, which causes the human consciousness to focus on the stimulated area (tingling, tingling) and forgets about the pain.

### The Endorphin Theory of Pain Relief

- According to this theory, during pain and stress, opiate-like substances are released, which help us to dull the pain. The application takes place with the help of two electrodes, which are placed at the place of pain, in the limbs or above the nerve that causes the pain.

TENS has strong analgesic effects, which, among other things, are also used to reduce itching accompanying the healing of burns. Furthermore, TENS is used to maintain constant tension of injured muscles or to prevent atrophy under a plaster cast. The use of TENS was also found in labor analgesia (safety for the mother and the fetus was tested, where increased placental perfusion was observed). For labor analgesia, paired electrodes are used in a precise location in the back area (glued with a patch in the places where the afferent nerves enter the spinal cord - for the first stage of labor in the area Th10-L1, for the second stage of labor) S2-S4. TENS is more effective in I. than II. during childbirth, when it can be combined, for example, with pudendal blockade.

# Sources

## Literature

- NAVRÁTIL, Leoš and Jozef ROSINA. *Medicínská biofyzika*. Praha: Grada, 2005. ISBN 80-247-1152-4.
- PODĚBRADSKÝ, Jiří and Ivan VAŘEKA. *Fyzikální terapie*. Praha: Grada, 1998. ISBN 80-7169-661-7.
- PORODNICE.cz. *Transkutánní elektrická nervová stimulace (TENS)* [online]. [cit. 2011-01-21]. <<http://lekari.porodnice.cz/transkutanni-elektricka-nervova-stimulace-tens>>.

## External links

- Transcutaneous electrical nerve stimulation (WIKI eng) ([https://en.wikipedia.org/wiki/Transcutaneous\\_electrical\\_nerve\\_stimulation](https://en.wikipedia.org/wiki/Transcutaneous_electrical_nerve_stimulation))
- Electrotherapy
- Electrostimulation methods