

Transcutaneous electrical nerve stimulation (TENS)

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This chapter introduces the concepts of transcutaneous electrical nerve stimulation (TENS). It describes the advantages of TENS and its use during labour and discusses the criteria relevant when selecting a particular unit.

Transcutaneous electrical nerve stimulation (TENS or TNS) has been used as a method of pain relief for many years and is widely used today, particularly for chronic pain and pain associated with terminal illness. More recently it has been used for more acute pain and found to be of advantage (Woolf 1999). In 1983 Spembly manufactured a TENS unit especially designed for use in labour. This was the first unit of its type in the UK and is called the Obstetric Pulsar (see Figure 7.1). Since then, other manufacturers have adapted existing models with varying degrees of success. Criteria for selection of an effective unit appear later in the chapter.

TENS is a low-frequency current applied to the skin via pairs of electrodes. These can be placed over the painful area or over the nerve routes supplying the area of pain. The current produces a tingling sensation, the intensity (strength) of which can be altered by the individual. The pulsed low-frequency modality encourages the release of cerebrospinal endogenous opiates (endorphins and enkephalins) which are the body's own natural pain-relieving agents and these raise the individual's pain threshold (Thompson 1989). The obstetric model differs in that it has a high-frequency modality which, when activated, brings in a continuous high-frequency current to boost the low-frequency current to give added pain relief. It is thought that this higher frequency current works on the pain-gate theory and lessens the pain impulses received by the brain (Wall, 1985). The high-frequency modality is brought into play by pressing a patient-demand switch and stopped by pressing it once more.



Figure 7.1 A Tens unit (Courtesy of Spembly Medical Limited).

ADVANTAGES OF TENS IN LABOUR (see Box 7.1)

There are no side effects from TENS and no depression of respiration (Woolf 1999) – a pacemaker in situ being the only contraindication to its use. It is a safe, non-invasive therapy which, if required, can be used in conjunction with other forms of pain relief as labour progresses. TENS does not give a pain-free labour and this fact must be stressed to the woman and her partner. However, for the woman who wishes to be in control of her pain relief it is a useful addition to other available analgesia. The general feeling among midwives is that TENS users who choose to have additional analgesia require lower doses than those who are not using TENS. This is supported by Kaplan et al (1998) who described TENS as being

Box 7.1 Advantages of TENS in labour

- self-regulated/self-administered
- releases the body's own pain-relieving agents
- non-invasive, drug-free
- no drowsiness – user remains alert and co-operative
- no known side effects
- allows freedom of movement and any position
- does not alter the course of labour
- can be stopped at any time
- can be used in conjunction with other forms of pain relief.

an effective non-pharmacological and non-invasive adjuvant pain relief modality for use in labour and delivery. They claimed that not only did the use of TENS reduce the amount of analgesic drugs, but also slightly reduced the duration of the first stage of labour. However Carroll et al (1997) claimed that randomised controlled trials provided no compelling evidence for TENS having an analgesic effect during labour. TENS can be used during suturing and to relieve afterpains as well as during labour itself.

TENS works best for women who apply it early in labour as it takes about 40 minutes for the endorphins to be maximally released (Salar et al 1981). It can help the woman to cope in the early latent phase before labour is fully established. It has been shown that the levels of pain and distress-related thoughts experienced during the latent phase of labour were predictive of the length of labour and obstetric outcomes (Wuitchik et al 1989). If a woman is going to have labour induced, it is suggested that she activates the TENS unit on the low-frequency mode 30–40 minutes before the procedure is commenced. When she feels in need of further pain relief, she can activate the high-frequency mode at the start of the contraction and use for the duration of the contraction, returning to the low-frequency mode at the end.

ELECTRODES

For labour, four electrodes, which are of sufficient length to cover the nerve roots supplying the uterus and cervix (T10 – L1) and the birth canal and pelvic floor (S2 – S4), are required. The recommended size of the electrodes is 10 cm × 4 cm, and they can be of different materials. The original and most economical electrodes are made of carbon-impregnated rubber, which needs a coupling medium of gel under the complete surface to ensure continuous contact with the skin. More recently, disposable electrodes have been introduced which are applied to a wet skin and are self-adherent. A third type (supplied with hire units) has a very sticky self-adhesive surface and in theory can be re-used a few times, but in practice this is not recommended for reasons of hygiene and because the electrodes become less adhesive.

Siting the electrodes

The woman should sit on the edge of the bed whilst her partner stands behind on the other side of the bed. She should have her arms relaxed by her side and her back exposed down to the gluteal cleft. The area from the level of the bra strap down to the gluteal cleft should be washed and dried to remove any natural skin grease that could impede the electrical current. The electrodes are attached to the leads making sure no metal is exposed. To site the upper two electrodes, the T10 vertebra is palpated. The easiest

way of locating this is to feel for the inferior angle of the scapula with the little fingers of each hand, then reach across to the spine at the same level with the thumbs. The vertebra palpated by the thumbs will be T7, count three vertebrae down to find T10. (A good guide is the lower border of the bra clips in most women). The upper borders of one set of electrodes should be fixed at the level of T10 about 2 cm either side of the thoracic spine (approx 5 cm apart), with the leads hanging downwards (see Figure 7.2). If the re-usable carbon electrodes are being used, they should be thoroughly covered with the conducting gel supplied and held in place with a piece of Mefix, large enough to cover both electrodes. The top of the second pair of electrodes is placed at the level of the sacral dimples (S2) with the lower borders reaching down to just above the gluteal cleft. The leads should point upwards (see Figure 7.2).

The electrodes should not be placed on the abdomen as there may be a slight chance of interference on the fetal monitor if a scalp electrode is in use. It has been reported that interference has been noted occasionally when both sets of electrodes are placed dorsally, but this has been with older monitors and disappears when the intensity of the TENS is reduced. With both sets of electrodes in place and checked and the unit switched off, the plug end of each lead is inserted into the sockets on the top of the TENS unit. The woman should know which electrodes are attached to which control so she can increase the intensity of each channel independently. A much better effect is achieved if the woman is in complete control of the unit from the start. Once the electrodes are in place, the TENS unit can be clipped on to her clothes and she can remain active or adopt any position she wishes.

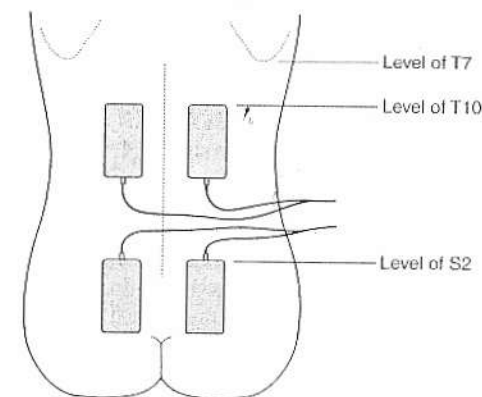


Figure 7.2 Position of TENS electrodes for pain relief in labour.

The intensity (strength) of the two channels can be increased as required using the relevant intensity control (see Figure 7.1). The frequency of the pulses, which is a personal choice, can also be varied by altering the rate control (see Figure 7.1). This does not affect the intensity of the output, only the rate of the pulses. The manufacturers of the Spembly Pulsar unit advise an initial frequency of 7 on the dial, then further adjustment to meet the personal needs of each individual. However, some TENS units have a pre-set unalterable frequency.

Ideally women and their partners should be introduced to the TENS unit during the antenatal classes. Then if they are interested in trying or applying it, a group or individual session can be arranged where the women can experience its sensation on their backs and their partners practise siting the electrodes (see Ch. 10). The sensation on the back is usually preferred to that on the forearm and women like to feel it before going to the expense of hiring a unit.

TENS HIRE

Unless a delivery suite has sufficient units to allow women to take one home just prior to their expected delivery date, hiring their own is often preferred. The hired units will include the easy-to-apply, self-adhesive electrodes which do not require gel. There will be two pairs for use in labour and generally, depending on the company, an additional pair for practice in the two weeks prior to birth. Various companies supply units for hire and costs depend on the package offered. Hire contracts vary between four and six weeks with nearly all companies offering a free extension period as long as they are notified in advance. The more expensive hire charges include a demonstration video, spare batteries and pre-paid return packaging (see Figure 7.3). Obstetric TENS units are for use in labour only and should not be used for anything else. Their use is contraindicated before 37 weeks of pregnancy because of the slight risk of preterm labour. Some delivery suites hire out their own units, but this can be an onerous undertaking. A new battery and electrodes are needed for each user and the unit should be checked after its return to the labour suite before being re-issued.

CRITERIA FOR SELECTION OF A TENS UNIT

Midwives and health visitors should be aware of the different models on the market before giving out literature to couples. The cheapest deal is not necessarily the best option. Crothers (1992) tried out two different units during her own labour and decided that certain criteria were important. She was a member of the working party of The Association of Chartered



Figure 7.3 A TENS hire package (Courtesy of Promedics Limited, UK).

Physiotherapists in Obstetrics and Gynaecology (now Women's Health) who devised the following criteria for the suitability of TENS equipment for use in labour:

- sufficient intensity/amplitude to relieve pain
- scope to alter the frequency
- both pulsed and continuous mode
- additional amplitude with continuous mode
- simple and easy to apply and operate
- correct instructions for placing the electrodes
- press/release booster button, not press/hold
- electrodes to measure a minimum of 10 cm x 4 cm
- separate intensity control for each pair of electrodes
- durable electrodes, leads and attachments
- transmission gel must be suitable for adequate conduction with carbon electrodes.

All units should conform to safety standard BS 5724.

TENS FOR POST-CAESAREAN DELIVERY

Following caesarean section, where the mother is not offered self-administered pain relief via Cardiff pump or an epidural, TENS may be used for post-operative pain relief. It has been found that women who used TENS after caesarean births required less narcotic analgesia and so were better able to cope with their babies (Hollinger 1986). The electrodes are usually placed above a Pfannenstiel incision towards the outer sides of the abdomen as this is where most pain is felt (see Figure 7.4).

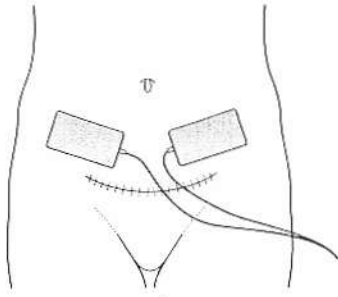


Figure 7.4 Position of TENS electrodes for relief of post-caesarean wound pain.

One set of electrodes only may be applied, or a second pair may be placed either side of the first and second lumbar vertebrae. The low-frequency mode is all that is necessary at rest, but, if the mother needs to cough or move about, the high-frequency can be used as during contractions.

The UKCC's advice with regard to midwives using TENS is contained in the following Registrar's Letter 8/1991:

"The Council has accepted the recommendation of its Midwifery Committee that midwives may, on their own responsibility, manage pain relief in labour by the use of transcutaneous nerve stimulation (TNS) provided that:

1. they have received adequate and appropriate *instruction*, which is a matter to be determined by agreed local policy and
2. *safety standards* conform to those laid down by the Department of Health Medical Devices Directorate in England, or equivalent body in Scotland, Wales or Northern Ireland. The current standard for all medical equipment is set out in British Standard specification BS 5724 Part 1 1989".

REFERENCES

- Carroll D, Tramer M, McQuay H et al 1997 Transcutaneous electrical nerve stimulation in labour pain: a systematic review. *British Journal of Obstetrics and Gynaecology* 2:169-175
- Crothers E 1992 TENS in labour. *Journal of the Association of Chartered Physiotherapists in Obstetrics and Gynaecology* 70:26
- Hollinger J L 1986 Transcutaneous electric nerve stimulation after caesarean birth. *Physical Therapy* 66:36
- Kaplan B, Rabinerson D, Lirie S et al 1998 Transcutaneous electric nerve stimulation (TENS) for adjuvant pain-relief during labour and delivery. *International Journal of Gynaecology and Obstetrics* 60(3):251-255
- Salar G, Job I, Mingrino S et al 1981 Effect of transcutaneous electrotherapy on CSF beta endorphin content in patients without pain problems. *Pain* 10:169-172

- Thompson J W 1989 Pharmacology of Transcutaneous Electrical Nerve Stimulation (TENS). *Journal of the Intractable Pain Society of Great Britain and Ireland* 7:33-40
- Wall P D 1985 The discovery of transcutaneous electrical nerve stimulation. *Physiotherapy* 71:348-350
- Woolf C J 1999 Transcutaneous and implanted nerve stimulation. In: Wall P D, Melzack R (eds) *Textbook of Pain*. Churchill Livingstone, Edinburgh
- Wuitchik M, Bakal D, Lipshitz J 1989 The clinical significance of pain and cognitive activity in latent labour. *Obstetrics and Gynecology* 73:35-42

FURTHER READING

- Wall P D, Melzack R (eds) 1999 *Textbook of Pain*. Churchill Livingstone, Edinburgh