

ACPWH guidance on the safe use of Transcutaneous Electrical Nerve Stimulation (TENS) for musculoskeletal pain during pregnancy

1.0. Introduction

TENS has been used by pregnant women for many years without any reported side effects for either the mother or baby. In fact, it has been suggested that TENS enhances placental blood flow (Enzelsberger et al. 1991). More recently there has been debate about the theoretical risk to the foetus by the electrical field produced by a TENS unit.

In order to clarify current thinking in this area the ACPWH brought together a panel of experts who reviewed the literature surrounding this area and together with clinical experience developed these statements. The expert panel consisted of:-

Yvonne Coldron
Elizabeth Crothers
Jeanette Haslam
William Notcutt
Daphne Sidney
Ros Thomas
Tim Watson

(Brief resumé and contact details of the team are in appendix 1)

2.0. Reasons for use

When a pregnant women presents with low back pain (LBP) and/or, pelvic girdle pain and including Symphysis Pubis Dysfunction a musculoskeletal assessment should be undertaken. **The first treatment options should be:-**

- **advice on activities of daily living**
- **exercises to improve the muscular control of a body which is structurally and dynamically challenged**
- **manual therapy as appropriate**

If pain persists or is a hindrance to further improvement then TENS may be beneficial especially where the alternative is medication that would cross the placental barrier.

3.0. Consideration of possible areas of risk

When TENS has been used during pregnancy no side effects have been reported in the literature (Walsh, 1997). This is supported by the experience of those on the panel. TENS has been used to increase placental blood flow (Resnik, 2002), and there were no negative effects. Enzelsberger et al. (1991) suggested that where TENS was used in pregnancy to increase placental blood flow the peri-natal outcome for women who had placental insufficiency was improved.

Specific potential areas of concern are the induction of uterine contractions, the effects on the foetal heart conduction and the possibility of teratogenic effects induced in the foetus. These will be dealt with individually.

3.1. Induction of uterine contractions

There is concern that if TENS is used over specific acupuncture points that uterine contractions may be stimulated and labour induced. Dunn et al. (1989), tried to induce labour using acupuncture in women who were post term. The points used were Spleen 6 and Liver 3 points. Although there were methodological flaws

with this paper it was clear that although uterine contractions were stimulated they stopped when acupuncture stimulation stopped. Smith & Crowther (2004) carried out a Cochrane review as to the efficacy of acupuncture for the induction of labour. The limited observational studies found that 'acupuncture for induction of labour appears safe, has no known teratogenic effects, and may be effective. The evidence regarding the clinical effectiveness of this technique is limited'. Elden et al. (2005), used acupuncture over contraindicated points (in particular LI 4) without harm to the mother or foetus.

However, caution should be exercised if using a TENS unit over acupuncture points that could induce labour. If contractions are induced the stimulation should be stopped. The evidence suggests that then the contractions would also stop (See section 5.0).

3.2. Induction of changes to foetal development

Where TENS has been used by mothers for treatment of musculoskeletal pain (Walsh, 1997) or placental insufficiency (Enzelsberger et al. 1991; Resnik, 2002) no foetal abnormalities have been reported in the literature.

3.3. Effects on the electrical conduction within the foetal heart.

The suggested safety precautions when considering any direct effect by application of TENS on the foetus originate from Bundsen et al. (1982). Since which time there has been no further work in this area. The main points to consider should be the current density at the skin, the estimated depth of fat under the electrodes and the position of the baby in utero.

Bundsen et al. (1982), states that when using electrical stimulation for pain relief during labour there are two safety precautions that should be adhered to.

3.3.1. The current density should not rise above 0.5 microamperes (μA) per square millimetre. (This is worked out by dividing the output of the unit being used by the surface area of the electrode pad used)

3.3.2. The electrodes should not be placed supra-pubically if the mother is thin i.e., likely to have less than 1 inch of fat and the foetus is occipito-posterior (OP) in presentation. This does imply that if the woman is fatter and the baby not OP that there is more room for safety. **However the placement of electrodes is more likely to be effective for spinal and pelvic girdle pain when applied posteriorly over the lumbo-sacral nerve roots.**

If the large 10cm x 5cm electrodes are used and 20 milliamperes (mA) is the average output from any standard TENS machine, the current at the skin's surface would be 4 microamperes (μA) per square millimetre.

Method of calculation

Assume 10cm X 5 cm electrode with a surface area of 5000mm²

Assume the current at surface is typically 20 mA (this is not an unusual figure when using the TENS unit on the lumbo sacral spine)

20 mA = 20,000 μA .

Therefore the current density at the skin surface is
20,000/5000 μA per mm² = 4 μA per mm²

It is most likely that the current density at the skin will be considerably less by the time that it reaches the uterus due to dispersal within conducting tissues.

4.0. The balancing of potential risks against the use of strong medication.

We cannot find any reports that suggest negative effects have been produced when TENS has been used during pregnancy. However, in clinical practice TENS is not the first treatment of choice for a woman presenting with musculoskeletal pain during pregnancy. Initial treatment should be aimed at correcting any joint or muscle dysfunction and devising a rehabilitation programme. However, if pain remains a significant factor then TENS or acupuncture would be preferable to the use of strong medication that could cross the placental barrier and affect the foetus. The risk from intervention with strong medication during the first trimester is slightly higher than in the later stages of pregnancy and therefore TENS as a method of pain relief

during the first trimester should be more carefully considered. However, as stated previously no negative effects have been reported following from the use of TENS during any of the stages of pregnancy. TENS presents with lower risk than strong medication for the relief of pain and is therefore preferable.

5.0. Clinical Application, Cautions and Pre-cautions.

Although this statement declares that TENS is of lower risk to the foetus than strong medication careful consideration of the appropriate use of TENS must be given. When applying TENS to the pregnant woman;

- the usual contraindications and precautions should be observed
- extra caution should be taken if the woman has epilepsy or has a very irritable uterus or has had a history of early miscarriage or abortion. In these situations the patient should be fully informed and in conjunction with the appropriate medical practitioner a clinical judgement should be made so that consent to the TENS treatment can be given or withheld
- the current density should be kept low. If the large 10 x 5 cm electrodes are used with a standard TENS machine this should not be a problem
- caution should be taken when placing TENS electrodes over acupuncture points that are considered to be the most likely to induce labour. Grant & Ma (2004) suggest that the points that should be considered with care for use during pregnancy are; LI-4 (dorsal aspect thumb web*); SP-6; BL60 and BL67 (all around the lower half of the leg and ankle*). West (2000) also includes GB21 (middle fibre of trapezius*) which is used very commonly for shoulder pain. However in a retrospective study by Ternov et al. (2001), of 167 consecutive women who had acupuncture for low back pain in pregnancy and using LI-4; ST36 (around the head of fibula*); GB34 (around the head of fibula*); BL-60 (ankle*); GV20 (top of head*) and other tender points on the back only one potentially serious side effect was observed. With this patient the risk of side effects from acupuncture were low compared to the side effects of medication. This author seems to have used a large number of the contraindicated points with no serious side effects. We also know from Dunn et al. (1989), that should uterine contractions be stimulated that they will stop if the machine is turned off

Before using acupuncture or TENS on acupuncture points when the patient is pregnant the therapist should make sure that he/she is fully compliant with Rule 1 of the CSP Standards of Practice.

* These are general descriptions of the areas involved so that those not versed in acupuncture can be aware of the areas that are under discussion. For more accurate descriptions of these points consultation of an acupuncture text is recommended.

- in the rare circumstances where a patient has an implant such as a pacemaker or defibrillator then the use of TENS should be considered and monitored by a specialist Pain clinic or Cardiology clinic. It is not impossible for patients to use a TENS unit and be fitted with an implant of this type but there is substantial risk of interference and this is out of the physiotherapist's realm. There would need to be a team approach to the treatment, needs of a patient with implanted stimulators. Sometimes the implants may be neurogenic stimulators and any prospective use of TENS should not be tried until discussions with the appropriate consultant/s have taken place. In any case where a patient has implanted stimulators, the first time TENS is tested it should be in an acute setting where resuscitation facilities are available.

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Appendix 1

Yvonne Coldron completed a PHD in 2006 in neuromuscular physiology examining abdominal and spinal muscle function in postnatal women. She has published several papers on symphysis pubis dysfunction and pelvic girdle pain. She has taught electrotherapy to undergraduate physiotherapy students at two universities. Currently she is a musculoskeletal clinical specialist physiotherapist at Mayday University Hospital, Surrey, specialising in antenatal and postnatal musculoskeletal disorders.
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Dr Elizabeth Crothers completed a PhD in 1993 examining the use of TENS for the relief of pain in labour and has published a literature review examining the effects of TENS on the mother and baby during pregnancy. She works in Aberdeen in the NHS as both a musculoskeletal physiotherapist and as a Continence Specialist Physiotherapist. She also has a private practice.
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Jeanette Haslam qualified as a physiotherapist in 1971, completed a MPhil in 1999 concerning pelvic floor muscle assessment. She is Chairman of the ACPWH education subcommittee. She works as a self employed lecturer for University courses, ACPWH workshops and independent courses. She has written extensively in journals, contributed chapters and co-edited text books.
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Dr William Notcutt qualified in 1970; FRCA 1976; and became a Consultant Anaesthetist specialising in Pain management, James Paget Hospital, Great Yarmouth, Norfolk 1982; Hon. Senior Lecturer, School of Medicine at UEA, Norwich 2000. Full time clinician in both acute & chronic pain and anaesthesia with extensive experience in use of TNS for pain, including use in pregnancy. Research into patient controlled analgesia, pain services and clinical use of medicinal cannabis.
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Daphne Sidney is a full member of ACPWH having completed both the Obstetric and Gynaecology and the Management of Continence courses. Having worked for over 20 years in the NHS as a superintendent physiotherapist in women's health, she now works in private practice and is an associate lecturer at Sheffield/Hallam university.

Ros Thomas is working in the NHS as an extended scope practitioner in both obstetrics and gynaecology. She has set up a women's health service in the private sector and has recently served as Chairman of the ACPWH executive committee; is currently a member of the education sub committee and Editor of the bi-annual ACPWH professional journal. She has lectured on the ante/post natal modules of training courses for Fitness professionals and of ACPWH workshops and contributed to several books and publications.
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Professor Tim Watson qualified as a physiotherapist in 1970 and has been lecturing since the early 1980's. Main interest areas are in tissue repair and electrotherapy. BSc in Biomedical Science in 1989 and PhD in Bioelectronics (1994). Currently Professor of Physiotherapy and Director of Research in the School of Health & Emergency Professions, University of Hertfordshire. In addition to teaching and research at the University, runs a series of post graduate programmes in electrotherapy and tissue repair around the UK, Europe and Asia.
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