

Role of Transcutaneous Electrical Nerve Stimulation in First Stage Of Labor

THESIS

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BY

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Abstract

The apparatus produces a modified biphasic asymmetric pulse. The duration of the pulse was fixed at 275 μ s and the amplitude was variable between 0 and 50 mA. As the compact and portable apparatus was a dual channel unit, simultaneous use of two pairs of electrodes was possible.

Key word:

CEI

Lsp

PCB

Stimulation

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List of Abbreviations:

- **ACOG:** American College of Obstetricians and Gynecologists.
- **AL-TENS:** acupuncture like transcutaneous electrical nerve stimulation.
- **AP:** antero-posterior.
- **BC:** Before Century.
- **CEI:** continuous epidural infusion.
- **Cm:** centimetres.
- **CSEA:** combined epidural analgesia.
- **DC:** direct current.
- **Hrs.:** hours.
- **L:** lumbar vertebrae.
- **LSP:**lumbar sympathetic block.
- **m A:** milliampere .
- **Min.:** minutes.
- **mm:** millimetres.
- **MOD:** mode of delivery.
- **NS:** statistically non-significant.
- **PAG :** peri aqueductal grey region of the mid brain.
- **PCA :**patient controlled intravenous anathesia.
- **PCB:** paracervical block
- **PCEA:**patient controlled epidural analgesia.
- **PNP:**pudendal nerve block.
- **pps:** pulses per seconds.
- **RCTs:** randomized controlled clinical trials.
- **ROM:** Rupture of membrane.
- **S:** Sacral vertebrae.
- **SS:** statistically significant.
- **T:** Thoracic vertebrae.
- **TENS:** transcutaneous electrical nerve stimulation.
- **TSE:** transcutaneous spinal electroanalgesia.
- **UK:** united kingdom.

- α :Alpha.
- β : Beta.
- δ : Delta.
- μs : micro-seconds.
- Ω :Omega.
- $\pounds$: British Pound.

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Introduction

Giving birth is the only physiological process in nature that causes pain, and the reasons for this have been “explained” with philosophical and religious arguments. Even so, the biological functions of pain in childbirth are clear: pain provides the warning sign to search for a safe birth environment, and endorphins promote effective and mutual mother–child bonding. (*Lowe et al., 2002*).

Labor pain is due to cervical and lower uterine segment dilatation, uterine contraction and distension of the structures surrounding the vagina and pelvic outlet. Initially the pain is felt in the lower abdomen but as labor progresses the distension of the birth canal by the descending fetal part causes back, perineal and thigh pain. Uterus and cervix - afferent impulses are transmitted via the A δ and C fibres which travel with sympathetic nerves via the hypogastric plexus to enter the lumbar and lower thoracic parts of the sympathetic chain. Central connection to the spinal cord is via the dorsal root ganglion and lateral division of the posterior roots of T10-L1. Labor pains are therefore referred to the areas of skin supplied by these nerves i.e. the lower abdomen, loins and lumbo-sacral region. (*Lowe et al., 2002*).

Vagina and pelvic outlet - afferent transmission is also via A δ and C fibres but with the parasympathetic bundle in the pudendal nerves (S2,3,4). There is also a minor contribution from the ilio-inguinal, genito-femoral and the perforating branch of the posterior cutaneous nerve of thigh.

It is important to appreciate that pain sensitive structures in the pelvis are also involved, i.e. the adnexi, the pelvic parietal peritoneum, bladder, urethra, rectum and the roots of the lumbar plexus. Therefore L2 to S5 must be blocked. There is

an overlap and pain relief is not a simple matter of blocking T10 to L1 for the first stage and S2, 3, 4 for the second stage of labor. (*Lowe et al., 2002*).

Previously, pethidine was widely used for analgesia in the first stage of labor, and was the popular choice for pain relief among the women in labor. Unfortunately, the analgesic effect of pethidine is variable and the overall effect reflects the general systemic effect of the drug. The side-effects of pethidine are well known—restriction of mobilization of the woman; nausea & vomiting; affecting breastfeeding after delivery; as well as neonatal respiratory depression. Nevertheless, it has become a common practice to prescribe pethidine for all laboring women as the initial measure for pain relief in the early stage of labor. (*Lai Fong et al., 2008*).

Transcutaneous electrical nerve stimulation (TENS) is widely used as a pain-relief method especially in patients with chronic pain. It is claimed to be useful because it can block the pain messages at the spinal cord by passing mild electrical impulses through the skin via electrode pads into the nerve fibres which lie below, and block the impulses to the brain (*the gate theory of Melzack and Wall 1965*). It also helps stimulate the production of painkilling chemical such as endorphins (*SALAR et al., 1981*).

The TENS machine has been advocated to be an effective and non-invasive method of pain relief during early first stage of labor, since it stimulates the body to produce endorphins and block the pain messages at the spinal cord as the same way as in non-pregnant patients. (*Lai Fong et al., 2008*).

Aim of the work:

To assess the effectiveness of TENS on control of pain during first-stage of labor.

Chapter 1

Normal Labor and Delivery

Labor is a physiologic process during which the products of conception (ie, the fetus, membranes, umbilical cord, and placenta) are expelled outside of the uterus. Labor is achieved with changes in the biochemical connective tissue and with gradual effacement and dilatation of the uterine cervix as a result of rhythmic uterine contractions of sufficient frequency, intensity, and duration. (*Norwitz et al., 2003*)

Labor is a clinical diagnosis. The onset of labor is defined as regular, painful uterine contractions resulting in progressive cervical effacement and dilatation. Cervical dilatation in the absence of uterine contraction suggests cervical insufficiency, whereas uterine contraction without cervical change does not meet the definition of labor.

Stages of Labor

Obstetricians have divided labor into 3 stages that delineate milestones in a continuous process.

First stage of labor

The first stage begins with regular uterine contractions and ends with complete cervical dilatation at 10 cm. In Friedman's landmark studies of 500 nulliparas, he subdivided the first stage into an early latent phase and an ensuing active phase. The latent phase begins with mild, irregular uterine contractions that soften and

shorten the cervix. The contractions become progressively more rhythmic and stronger. This is followed by the active phase of labor, which usually begins at about 3-4 cm of cervical dilation and is characterized by rapid cervical dilation and descent of the presenting fetal part. The first stage of labor ends with complete cervical dilation at 10 cm. According to Friedman, the active phase is further divided into an acceleration phase, a phase of maximum slope, and a deceleration phase. (*Friedman et al., 1961*)

Characteristics of the average cervical dilatation curve is known as the Friedman labor curve, and a series of definitions of labor protraction and arrest were subsequently established. However, subsequent data of modern obstetric population suggest that the rate of cervical dilatation is slower and the progression of labor may be significantly different from that suggested by the Friedman labor curve. (*Friedman et al., 1961*).

Second stage of labor

The second stage begins with complete cervical dilatation and ends with the delivery of the fetus. The American College of Obstetricians and Gynecologists (ACOG) has suggested that a prolonged second stage of labor should be considered when the second stage of labor exceeds 3 hours if regional anesthesia is administered or 2 hours in the absence of regional anesthesia for nulliparas. In multiparous women, such a diagnosis can be made if the second stage of labor exceeds 2 hours with regional anesthesia or 1 hour without it.

Studies performed to examine perinatal outcomes associated with a prolonged second stage of labor revealed increased risks of operative deliveries and maternal morbidities but no differences in neonatal outcomes. Maternal risk factors

associated with a prolonged second stage include nulliparity, increasing maternal weight and/or weight gain, use of regional anesthesia, induction of labor, fetal occiput in a posterior or transverse position, and increased birth weight.

Third stage of labor

The third stage of labor is defined by the time period between the delivery of the fetus and the delivery of the placenta and fetal membranes. During this period, uterine contraction decreases basal blood flow, which results in thickening and reduction in the surface area of the myometrium underlying the placenta with subsequent detachment of the placenta. Although delivery of the placenta often requires less than 10 minutes, the duration of the third stage of labor may last as long as 30 minutes.

Expectant management of the third stage of labor involves spontaneous delivery of the placenta. Active management often involves prophylactic administration of oxytocin or other uterotonics (prostaglandins or ergot alkaloids), early cord clamping/cutting, and controlled cord traction of the umbilical cord. A systematic review of the literature that included 5 randomized controlled trials comparing active and expectant management of the third stage reports that active management shortens the duration of the third stage and is superior to expectant management with respect to blood loss/risk of postpartum hemorrhage; however, active management is associated with an increased risk of unpleasant side effects. (*Prendiville et al., 2000*).