شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

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Introduction

Pain during labor is one of the most painful experiences that women could attain throughout the life. Several obstetric and fetal adverse effects may arise during the vaginal delivery without adequate pain control including neuroendocrine dysregulation, fetal bradycardia and vaginal tears ***(Hoque, 2011)***. Additionally, inefficient analgesia during labor contributes to increased requests for cesareans ***(Zheng et al., 2020)***. In Egypt, the estimated rate of C-sections was about 40% of deliveries (further increased to 52% in 2014) ***(Abdel-Tawab et al., 2018)*** which is much higher than the ideal rates accepted by WHO ranging between 10-15% ***(Ebrashy et al., 2011)***.

Therefore, the introduction of pain relief strategies comprises a paramount importance. Beyond the physiological modifiers, labor pain is influenced by many cultural and psychosocial factors ***(Beigi et al., 2019)***.

The multidimensionality of pain perception resulted in considering the women self-assessment to labor analgesia is the gold standard in assessing the efficacy of different analgesics, and shifted the process of labor analgesia to patient-centered care with both clinical and humanistic outcomes ***(Tan et al.,***

2018). The traditional modalities of labor pain relief depend on pharmacologic agents including opioids and non-steroidal anti-inflammatory drugs (NSAIDs). Due to the association with dose-dependent adverse effects, the drug-centered analgesia has limited patient self-titration and less flexible schedules. Paracetamol is a COX-III inhibitor with the advantage of high tolerability, safety and low costs. Nevertheless, the efficacy of paracetamol in reducing labor pain associated with vaginal deliveries still controversial ***(Abdollahi et al., 2014)***.

On the contrary, Pethidine is an opioid analgesic with better efficacy compared to paracetamol; however, the application of pethidine in labor is limited by its adverse effects including fetal and maternal bradycardia and respiratory depression ***(Omotayo et al., 2018)***.

The limitations of drug therapy and the humanistic concepts in labor analgesia structured the way for safer and possibly more effective non-pharmacologic therapies including Yoga, acupuncture, acupressure, massage therapy, music therapy and transcutaneous nerve stimulation (TENS) ***(Arendt and Tessmer-Tuck, 2013)***. Among the proposed non-pharmacologic analgesia, TENS has gained much concern due

to the available evidence of efficacy, safety and tolerability ***(Dowswell et al., 2009)***.

The principle of using TENS depends on delivering a low-intensity electric current through the skin surface, resulting in blockade of nociceptive transmission to CNS with associate stimulation of descending inhibitory pathways of pain, a mechanism consistent with the pain gate theory ***(Van der Spank et al., 2000)***.

So far, the evidence of the application of TENS as a labor analgesic strategy is sparse ***(Báez-Suárez et al., 2018)***. Additionally, the factors affecting the individual analgesic response to TENS are unclear.

Aim of the Work

The current work aimed at:

1. Compare the effectiveness of TENS as a labor analgesic modality to the commonly used labor analgesics, namely, paracetamol and pethidine.
2. Define the patient intrinsic factors affecting response to TENS stimulation to aid personalizing TENS therapy for each individual woman.
3. Identify the possible maternal and fetal adverse effects associated with TENS application relative to both paracetamol and pethidine.

Labor Pain

The experience of labor is complex and subjective. Several factors affect a woman's perception of labor making each experience unique. However, as a consistent finding, labor pain is ranked high on the pain rating scale when compared to other painful life experiences. This chapter will discuss the nature, mechanisms, pathways, maternal and fetal consequences, genetic and psychological determinants of labor pain.

Nature of labor pain:

Childbirth is regarded as one of the most painful experiences during women's life ***(Kafshdooz et al., 2019)***. Perceptions of labor pain intensity vary along wide scale; from rarely feeling no pain at all to extreme pain seldomly experienced in women's life ***(Aksoy et al., 2016)***. In a study which conducted on 288 Swedish women, 28% of them evaluated labor pain as a positive condition and 41% of them considered it as the worst experience that they have ***(Yerby, 2000)***.

Although there are interindividual differences in pain intensity, reported pain experiences can be influenced and

modified by psychological factors (anxiety, depression, pain coping behavior), clinical factors (high-risk pregnancies), and genetic factors that predispose some women to higher pain severity and protect others from severe or persistent pain ***(Siyoum and Mekonnen, 2019)***.

Pain is often described as the fifth vital sign and health care professionals are encouraged to regularly document the patient's pain alongside other regular measurements that chart the patient's course ***(Levy et al., 2018)***. The word "pain" encompasses multidimensional attributes well beyond a single sensation varying only in intensity. However, the European Palliative Care Research Collaborative, and scores of others charged with pain measurement, agree that pain intensity (PI) is the most clinically relevant dimension to pain assessment, regardless of disease or condition ***(Reed and Van Nostran, 2014)*** i.e. pain in labor is affected by the interaction of multiple physiological , psychosocial factors and biobehavioral processes ***(Howard, 2017).*** The pain associated with labor is considered a very dynamic and complex process. The dynamicity of labor pain is related to the dynamic nature of intermittent uterine contractions associated with labor characterized by increasing pain as labor progresses, which

normally resolves immediately after delivery ***(Conell-Price et al., 2008)***.

Elucidation of labor pain associated risk factors has significant relevance for clinical practice, as it could identify women who might benefit from different pain management strategies and allow tailored management of labor-related pain ***(Whitburn et al., 2017)***.

Pattern of Labor pain

The pattern of labor pain is highly variable and differs between nulliparous and multiparous women and it is well documented that pain scores are higher in the nulliparous compared to the multiparous woman especially if there has been no antenatal education. Consistent findings also indicate that nulliparous women on average experience greater sensory pain during early labor (before 5 cm dilatation) compared to multiparous women who seem to experience more intense pain during the pelvic phase of labor as a result of sudden stimulation of nociceptors surrounding the vaginal vault, vulva and perineum and rapid descent of the fetus ***(Capogna et al., 2010)***.

Pain originates from different sites during labor and birth. In the first stage of labor, defined as the period from the onset of labor to the complete dilatation of the cervix ***(Sameshima, 2020)***, pain occurs during contractions, is visceral or cramp-like in nature, originates in the uterus and cervix, and is produced by distension of uterine tissues and dilation of the cervix. In the first stage, pain is transmitted via spinal nerves T10-L1. Labour pain can be referred to the abdominal wall, lumbosacral region, iliac crests, gluteal areas, and thighs, pain occurs from distension of the vagina, perineum, and pelvic floor ***(Jones et al., 2011)***.

In the second stage, pain is transmitted via the pudendal nerves, entering the spinal cord via nerve roots S2-S4. Stretching of the pelvic ligaments is the hallmark of the second stage of labor. Second stage pain is characterized by a combination of visceral pain from uterine contractions and cervical stretching and somatic pain from distension of vaginal and perineal tissues. In addition, the woman experiences rectal pressure and an urge to 'push' and gives birth to her baby as the presenting part descends into the pelvic outlet ***(Kopas, 2014)***. The positions adopted by women and the extent of their

mobility during labor may also significantly affect the perception of pain ***(Walker et al., 2018)***.

Recently, Cochrane systematic review found a reduction in the reporting of severe pain during the second stage of labor for women using any upright or lateral position as compared with women lying on their back during labor ***(Huang et al., 2019)***. Women may also experience induced labor as being more painful than spontaneous labor ***(Kim et al., 2019).***

Physiology of pain in labor:

During the first stage of labor (dilatation phase), pain is usually located in the region of the uterus and its adnexa as a result of (a) dilatation of the cervix and lower uterine segment; (b) traction and pressure on the adnexa and parietal peritoneum and the structures they envelop; (c) pressure and stretching of the bladder, urethra, rectum, and other pain-sensitive structures in the pelvis; (d) pressure on one or more roots of the lumbosacral plexus; and (e) reflex skeletal muscle spasms ***(Shnol et al., 2014)***. At this stage, several hypotheses suggest that pain intensity is related to fetal position, ischemia of the uterus, myometrial blood flow, inflammatory processes of the uterine muscles, psychological aspects, and, probably,

contractions of the uterus under isometric conditions ***(N., Yvonne and Ghosh, 2012)***. The stimuli of the dilatation phase are predominantly transmitted to the T10 to L1 posterior nerve root ganglia.

Women may practice pain in one or plentiful body sites including pelvic, spinal (not only lumbar but also cervical and even thoracic,) and genital areas. Sporadic abdominal or pelvic discomfort is a common pregnancy complaint. It may be caused by the uterine expansion, ovarian cysts, ligament gives, uterine fibroid and pressure from increasing kicking fetus ***(Close et al., 2016)***.

Serious problem can cause severe or persistent pain such as ectopic pregnancy or miscarriage. However, in some cases there is no clear cause for pain that may persist or even increase during pregnancy. For example, significant pelvic girdle and/or low back pain occurs in approximately 50% of pregnant women in the late months of pregnancy ***(Gutke et al., 2018)***.

Pain during pregnancy may have significant long-term consequences: such as backache during pregnancy correlated with bad health status extending for many years postpartum, up to 50% of women complain from low back pain 3 months after

delivery ***(Katonis et al., 2011).*** A Canadian report indicated that 20 to 24% women still complain from low back pain (LBP), pelvic girdle pain (PGP), and/or combination pain (COMBO pain 1, 3, and 6 months postpartum in a Canadian population ***(Weis et al., 2018)***.

First pregnancies in older women frequently also result in greater pain than in younger nullipara. On other hand, pain intensity differs in the same person during the different stages of labor in correlation to the cervical dilatation during the process of delivery and correlates well with the intensity, duration and frequency of uterine contractions ***(Labor and Maguire, 2008)***. Other factors associated with stronger pain intensity are dysmenorrhea and maternal exhaustion ***(Heesen and Veeser, 2012)***.

Labor pain mechanisms:

The neuro-physiological mechanisms of labor pain include two main components; A-delta and C-nerve fibers ***(Rowlands and Permezel, 1998)***. During first stage of labor (onset of labor until full cervical dilatation), visceral pain is generated largely from distension originating from rhythmic uterine contractions, progressive dilatation of the lower uterine

segment and cervix, and activation of mechanoreceptors ***(Labor and Maguire, 2008)***. Due to uterine contractions myometrial ischemia occurs, causing the release of potassium, bradykinin, histamine, and serotonin, which stimulate chemoreceptors ***(Whitburn et al., 2019)***.

Visceral afferent impulses are transmitted mainly via the A-delta and C fibers, which travel with the sympathetic nerves via the hypogastric plexus to enter the lumbar and lower thoracic parts of the sympathetic chain ***(Shnol, Paul et al., 2014)***. Central connection to the spinal cord is via the dorsal root ganglion (Figure 1) and lateral division of the posterior roots of T10-L1. In early labor, visceral afferents pass primarily T11 and T12 dermatomes. With progressing labor, pain is also referred to T10 and L1 dermatomes. Somatic labor pain, primarily related to direct pressure of fetal descent, is caused by distension of the vagina, the pelvic floor, and the perineum. Pain is transmitted also via the A-delta and C fibers but with the parasympathetic bundle in the pudendal nerves, entering the spinal cord via nerve roots S2-S4 . The perineum is also innervated by the ilioinguinalis nerve, the genital branch of the genitofemoral nerve, and the posterior femoral cutaneous nerve ***(Heesen and Veeser, 2012)***. Labor pain has many complex