Dexamethasone and Lidocaine Iontophoresis Efficacy in Relieving Labour Pain

HALA M. HANAFY, Ph.D.*; MOHAMED A. AWAD, Ph.D.*; HOSSAM EL-DIN H. KAMEL, M.D.** and MARINA A. DAWOD, M.Sc.*

The Department of Physical Therapy for Gynecology & Obstetrics, Faculty of Physical Therapy, Cairo University* and The Department of Gynecology & Obstetrics, Faculty of Medicine, Al-Azhar University**

Abstract

Aim of the Study: This study was conducted to investigate the effect of Lidocaine and Dexamethasone Iontophoresis on labour pain.

Material and Methods: Forty pregnant women participated in this study. They were selected randomly from Bab El-Shariah University Hospital in Cairo, Al-Azhar. Their ages were ranged from 20 to 40 years old. All pregnant women were deliver normal labour. All pregnant women were primi and multigravida. They were divided into two equal groups, Group A (control group) 20 pregnant women were delivered in a traditional method without analgesic while Group B (study group) 20 pregnant women received Lidocaine and Dexamethasone Iontophoresis in the 1st & 2nd stage of labour. Degree of pain was evaluated by visual analogue scale for both Groups (A & B) before and after delivery.

Results: There was statistically significant decrease in pain in Group (B) which treated by lidocaine and Dexamethasone iontophoresis and on the other hand there is significantly increasing in pain in Group (A).

Conclusion: The obtained results suggest that Lidocaine and Dexamethasone Iontophoresis is effective in relieving labour pain and it provides a simple, realistic, inexpensive, and successful treatment.

Key Words: Labour pain – Lidocaine – Dexamethasone – Iontophoresis.

Introduction

LABOUR is a physiologic process during which the products of conception the (fetus, membranes, umbilical cord and placenta) are expelled outside of the uterus [1].

Labour is defined as an increase in myometrial activity or, more precisely, a switch in the pattern of myometrial contractility from irregular contractions (long-lasting, low frequency activity) to regular contraction (high intensity, high frequency activity) resulting in effacement and dilatation of the uterine cervix [2].

Normal labour 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. First stage of labour begins with regular uterine contractions and ends with complete cervical dilatation at 10cm [3].

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Acute pain such as labour pain has two dimensions: A sensory or physical dimension, with the transmission of information, the pain stimuli, to the brain, and an affective dimension due to interpretation of these stimuli through the interaction of a wide variety of emotional, social, cultural and cognitive variable unique to the individual [4].

Labour pain differs from other forms of pain in that no actual trauma or tissue damage occurs. Chapman describes labour pain as stimuli of receptive neurons arising from contractions of the uterine muscles, which referred to as the visceral, pelvic and lumbar-sacral areas. To date, labour pain management studies have focused on use of drugs that affect sensory awareness of pain, which may have the additional effect sensory awareness of pain,
which may have the additional effect of impeding women's active participation in giving birth [5].

Labour pain may cause anxiety and exhaustion to laboured mothers and can cause a negative influence on the progress of labour process if more oxygen is administered then a high level of catecholamines may be observed in the placenta [6].

During the first stage of labour, pain located in the region of the uterus and its adnexae as a result of (A) Dilatation of the cervix and lower uterine segment, (B) Traction and pressure of the adnexae and parietal peritoneum and the structure 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 lumbo sacral plexus and (E) Reflex skeletal muscle spasms. Several hypotheses suggested 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 [7].

Even though delivery is a natural phenomenon, it has been demonstrated that the accompanying pain is considered severe or extreme in more than half of cases. Besides conventional approaches, such as epidural analgesia, many complementary or alternative methods have been reported to reduce pain during labour and delivery. Complementary or Alternative Medicine (CAM) can be defined as theories or practices that are not part of the dominant or conventional medical system. Complementary and alternative methods applicable to labour pain can be divided into mind-body interventions, alternative systems of medical practice, manual healing, and physical methods [8].

Iontophoresis: The skin has been investigated for several decades as a route of drug administration and so far many drug delivery techniques which utilize alternative form of energy have been explored to facilitate permeation of drugs across the skin. Amongst these, iontophoresis, which is the facilitated movement of ions across a membrane under the influence of an externally applied small electrical potential difference (0.5mA/cm² or less). Is one of the most promising novel drug delivery system, which has proved to enhance the skin penetration and the release rate of a number of drugs having poor absorption/permeation profile through the skin [9].

Lidocaine: The efficacy profile of lidocaine as a local anesthetic is characterized by a rapid onset of action and intermediate duration of efficacy. Therefore, lidocaine is suitable for infiltration, block and surface anesthesia. Longer-acting substances such as bupivacaine are sometimes given preference for subdural and epidural anesthesia [10].

Dexamethasone is used to treat many inflammatory and autoimmune conditions [11].

Material and Methods

This study was conducted on forty pregnant women were selected randomly from Bab El-Shariah University Hospital in Cairo, Al-Azhar. The study was conducted from February 2015 to August 2016. Their ages were ranged from 20 to 40 years old. All pregnant women were deliver normal labour. All pregnant women were primi and multigravida. They were divided randomly into two equal groups, Group A (control group) 20 pregnant women were delivered in a traditional method without analgesic while Group B (study group) 20 pregnant women received Lidocaine and dexamethasone Iontophoresis in the 1st & 2nd stage of labour.

Degree of pain was evaluated by visual analogue scale for both Groups (A & B) before and after delivery.

The following was done for every case:
1- Informed consent form.
2- Recording data sheet.
3- Iontophoresis device: It was used for entering the Lidocaine and dexamethasone substance to control the labour pain.
4- Dexamethasone and Lidocaine: It was used for controlling the labour pain.
5- Visual analogue scale: It was used for detection of level of labour pain for both Groups (A & B).

All pregnant women were given a full explanation of the protocol of the study and consent form was signed for each woman before participating in the study.

A- Evaluation procedures: Visual analogue scale: It was used for detection of degree of labour pain for both Groups (A & B) before and after delivery.

B- Treatment procedures: All women in Group (B) received Lidocaine and Dexamethasone Iontophoresis in the 1st & 2nd stage of labour.
Application of Lidocaine and Dexamethasone Iontophoresis:
Lidocaine and Dexamethasone used as a medium instead of the gel.

Patient position: Crock lying position.

Electrode placement:
1st stage of labour:
A- Top set is attached to either side of the vertebral column from the level of T10-L1 this corresponds to the area that provides the uterine nerve supply so is effective in reducing pain in the 1st stage of labour Fig. (2).

2nd stage of labour:
The distal (low) electrode are transferred to the anterior aspect of the lower abdomen in a V shape to relieve supra pubic pain. In some cases the proximal circuit is left on after delivery for additional comfort Fig. (3).

Parameters of Iontophoresis:
- Constant direct current.
- Current intensity: 0.5mA.
- Treatment duration: 5mins.
- Medication was 2% concentration of Lidocaine solution and dexamethasone.

Statistical analysis:
Comparison between the mean values of different variables using paired student \( t \)-test and unpaired student \( t \)-test which was used to compare between the two groups. Statistical Package for Social Science (SPSS) computer program (version 12 windows) was used for data analysis. \( p \)-value less than or equal to 0.05 was considered significant and less than 0.01 was considered highly significant.

Results

I- General characteristics of the two Groups (A & B):
Results are expressed as mean ± Standard Deviation (SD). There was no statistically significance difference between mean values of age, number of labour between Group A (25.70±6.23, 0.80±1.06) respectively and Group B (26.70±5.85, 1.30±1.34) respectively with \( t \)-value (–0.523, –1.310) respectively and \( p \)-value (0.604, 0.198) respectively (Table 1).

II- Visual analogue scale:
A- Within groups:
In Group A, there was a statistically highly significant increase in the mean value of VAS measured at second stage (9.10±0.79) when compared with its corresponding at first stage (7.35±0.99) with \( t \)-value=–10.925 and \( p \)-value=0.001. On the other hand in Group B, there was a statistically significant decrease in the mean value of VAS measured at second stage (6.55±2.50) when compared with its corresponding at first stage (7.65±...
The percentage increase in VAS in Group A was 23.81% while the percentage decrease in VAS in Group B was 14.38% (Table 2 & Fig. 4).

At first stage, there was no statistically significant difference between the mean value of VAS of Group A (7.35 ± 0.99) and Group B (7.65 ± 0.93) with t-value = 0.987 and p-value = 0.330. On the other hand at second stage there was a statistically highly significant decrease in the mean value of VAS of Group B (6.55 ± 2.50) when compared with its corresponding in Group A (9.10 ± 0.79) with t-value = 4.347 and p-value = 0.001 (Table 3 & Fig. 5).

Discussion

Labour is a physiologic process during which the products of conception (fetus, membranes, umbilical cord and placenta) are expelled outside of the uterus. Labour 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. Labour is a clinical diagnosis. The onset of labour is defined as regular, painful uterine contractions resulting in progressive cervical effacement and dilatation [1].

Even though delivery is a natural phenomenon, it has been demonstrated that the accompanying pain is considered severe or extreme in more than half of cases. Besides conventional approaches, such as epidural analgesia, many complementary or alternative methods have been reported to reduce pain during labour and delivery. Complementary or Alternative Medicine (CAM) can be defined as theories or practices that are not part of the dominant or conventional medical system. Complementary and alternative methods applicable to labour

Table 1: General characteristics of the two Groups (A & B).

<table>
<thead>
<tr>
<th></th>
<th>Group A (n=20)</th>
<th>Group B (n=20)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs.)</td>
<td>25.70 ± 6.24</td>
<td>26.70 ± 5.85</td>
<td>–0.523</td>
<td>0.604 (NS)</td>
</tr>
<tr>
<td>No. of labour</td>
<td>0.80 ± 1.06</td>
<td>1.30 ± 1.34</td>
<td>–1.310</td>
<td>0.198 (NS)</td>
</tr>
</tbody>
</table>

Data are expressed as mean ± SD.
NS: p>0.05: Not Significant.

Table 2: Mean value of VAS in the two Groups (A & B).

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<tbody>
<tr>
<td>First stage</td>
<td>7.35 ± 0.99</td>
<td>7.65 ± 0.93</td>
</tr>
<tr>
<td>Second stage</td>
<td>9.10 ± 0.79</td>
<td>6.55 ± 2.50</td>
</tr>
<tr>
<td>Difference</td>
<td>–1.75</td>
<td>1.10</td>
</tr>
<tr>
<td>% change</td>
<td>–23.81 ↑↑</td>
<td>14.38 ↓↓</td>
</tr>
<tr>
<td>t-value</td>
<td>–10.925</td>
<td>2.191</td>
</tr>
<tr>
<td>p-value</td>
<td>0.001 **</td>
<td>0.041 *</td>
</tr>
</tbody>
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Data are expressed as mean ± SD.
* : p<0.05: Significant.
** : p<0.01: Highly Significant.

Table 3: Mean values of VAS in the two Groups (A & B).

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<tr>
<td>Difference</td>
<td>–0.987</td>
<td>3.437</td>
</tr>
<tr>
<td>p-value</td>
<td>0.330 (NS)</td>
<td>0.001 **</td>
</tr>
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Data are expressed as mean ± SD.
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p<0.01: Highly Significant.
pain can be divided into mind-body interventions, alternative systems of medical practice, manual healing, and physical methods [8].

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Degree of pain was evaluated by Visual Analogue Scale for both Groups (A & B) before and after delivery.

The results of this study found that there was statistically significant decrease in pain in Group (B) which treated by Lidocaine and Dexamethasone Iontophoresis and on the other hand there is significantly increasing in pain in Group (A).

In recent years, phonophoresis and Iontophoresis have begun to receive attention from many physical therapists concerned with orthopedic and sports injuries [12,13].

In this study the solution was used is Lidocaine hydrochloride which is supported by [14]. Who mentioned that studies have also reported that transdermal delivery of Lidocaine has a possibility to be used for local anesthesia and pain management of the skin. Therefore, there is a need to enhance the transdermal delivery of Lidocaine to achieve rapid onset of action; this can be achieved using physical enhancement techniques such as Iontophoresis.

The effect of dexamethasone are agreed with [15] who found that the efficacy profile of Lidocaine as a local anesthetic is characterized by a rapid onset of action and intermediate duration of efficacy. Therefore, Lidocaine is suitable for infiltration, block and surface anesthesia. Longer-acting substances such as bupivacaine are sometimes given preference for subdural and epidural anesthesia; Lidocaine, on the other hand, has the advantage of a rapid onset of action. Epinephrine (aka adrenaline) vasoconstricts arteries reducing bleeding and also delays the reabsorption of Lidocaine, almost doubling the duration of anaesthesia. For surface anesthesia several formulations are available that can be used e.g. for endoscopies, before intubations etc. Buffering the PH of Lidocaine makes local freezing less painful.

References
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المتخصص العربى

أجريت هذه الدراسة لمعرفة فعالية مادة الليدوكين والديكساميثازون المنحلين بواسطة جهاز اللدودات الكهربائية في تخفيف آلام الولادة الطبيعية. شارك في هذه الدراسة أربعون سيدة حامل. تم اختيارهن عشوائياً من مستشفى باب الشعراء الجامعي بالقامرة. جامعة الأزهر، تراوحت أعمارهن بين 20 و 40 عاماً. كل السيدات الحوامل ورغم ولادة طبيعية. كل السيدات الحوامل كن حوامل لأول مرة ومتعددات الولادة. تم تقسيمهن إلى مجموعتين متساويتين في العدد: المجموعة (أ) (مجموعة حاكمة): تتكون من 20 سيدة وسوف تناول بعض مسكن بينما المجموعة (ب) (مجموعة الدواء): تتكون من 20 سيدة تم إدخال مادة الليدوكين والديكساميثازون إلينها في بداية كلا من المرحلة الأولى والثانية من الولادة بواسطة جهاز اللدودات الكهربائية. تم تقسيم درجة الألم بواسطة مقايضة جدول التعبيرات الوجهية للمجموعتين (أب) قبل وبعد الولادة. أوضحت نتائج هذه الدراسة أن هناك انخفاضاً نو دالة إحساسية عالية في درجة الألم في المجموعة (ب) التي تم علاجها بواسطة إدخال الليدوكين والديكساميثازون بواسطة اللدودات الكهربائية بينما كان هناك زيادة ذات دالة إحساسية عالية في درجة الألم في المجموعة (أ). (1)

وهكذا يمكن أن نستخلص إن إدخال الليدوكين والديكساميثازون بواسطة اللدودات الكهربائية فعال في علاج الألم وهذا يؤكدنا بطريقة علاج بسيطة وواقعة وغير مكلفة ونهاجة.