The effects of intramuscular dexamethasone on cervical ripening and induction of labor

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Abstract

Introduction: One of the problems in midwifery is induction of cases in which it is necessary to terminate pregnancy. Thus the methods of cervical ripening and labor induction have always been sought. The aim of this study was to determine the effect of intramuscular dexamethasone on cervical ripening and induction of labor.

Materials and Methods: This study was a single-blind, randomized clinical trial on 100 eligible nulliparous women in their 42 to 40 weeks of gestation in 2009 who were admitted to Amir Hospital in Ahvaz. For the experiment group 8 mg dexamethasone was administered 12 h before induction. The controls were given 2 cc of normal saline at the same intervals. Data were analyzed using Chi-square and t-tests and a p value less than 0.05 was considered significant.

Results: There was no significant difference between the two groups in terms of age, demographic characteristics, initial Bishop score, first and fifth minute Apgar score, and meconium difference. The mean time interval between the induction and the onset of active phase in the experiment group was $3.1 \pm 0.68$ hours and in the control group it was $4.2 \pm 1.3$ hours. There was a significant difference between the groups ($P=0.001$).

Conclusion: Intramuscular dexamethasone improved Bishop score, through reducing the time duration from the induction to the onset of labor phase.

Keywords: Induced Labor, Cervical Ripening, Dexamethasone

Introduction

The onset of spontaneous labor pains is a physiological sign of termination of pregnancy. However, in many pregnant women, due to medical and obstetric complications, cervical ripening and induction of labor are required prior to the onset of labor pains. This procedure has many benefits for both mother and fetus (1-2). Induction consists of stimulation of
uterine contractions using various artificial methods, prior to the onset of spontaneous labor, with or without rupture of membranes, which leads to progressive cervical dilation and fetal delivery. Induction of labor is the most common obstetrics technique and the fastest growing medical method in the United States of America (3). Labor induction can be performed through medical and non-medical methods. The conventional method for induction is using oxytocin, which may involve postpartum atony and water intoxication (4). Risks associated with prostaglandins include overstimulation of uterus and maternal complications such as nausea, vomiting, diarrhea, and fever. Prostaglandin products should only be administered in the labor room or its vicinity, where uterine activity and fetal heart rate can be monitored (5). Additionally, induction failure can have physical and psychological complications for the mother (6). Another medication that may help cervical ripening and delivery process is use of glycolcorticosteroids. Although their role in onset of labor is unknown, finding glycolcorticosteroids receptors on fetal membranes at onset of delivery strengthens this role (7). The present study aims to examine the effect of intramuscular injection of dexamethasone on cervical ripening and labor induction.

Materials and Methods
Study was conducted as a single-blind random clinical trial at Amiralmoemenin Hospital in Ahwaz between March and November 2009. Study population comprised primiparous pregnant women in their 40-42 weeks (based on LMP, confirmed by first-trimester ultrasound) referred for termination of pregnancy. Study inclusion criteria were Bishop score ≤4, singleton fetus, cephalic presentation, absence of abnormalities diagnosed by second-trimester ultrasound, normal amniotic fluid, and late gestation natural fetal movement. Study exclusion criteria were known uterine malfunction, macrosomia, placenta previa or placenta abruptio risk, history of surgery on uterus, uterine contractions, and fetal distress. Next, NST and biophysical profile of qualified subjects were performed to assess fetal health and diagnose oligohydramnios. Then, subjects with normal fetal health test results entered the study after providing written consent. Data collection tools included interview form, observation and vaginal examination registration form. After data collection, which included mother’s personal details, her accurate history, necessary physical examinations, and record of vital signs, vaginal examination to determine Bishop score (assessment of dilation and shortening of uterine neck, fetal head position in the pelvis, and condition of the cervix) and status of membrane rupture were performed. Results, date and time of participation in the study were recorded in the interview, observation, and examination form. A total of 100 women qualified for entry in study, and were randomly assigned to case and control groups (based on even or odd examination form number). Case group members received 8 mg (equivalent to 2 ml) intramuscular injections of dexamethasone in the latent phase, and control group members received 2 ml injections of normal saline in the latent phase. Participants were trained to avoid sexual intercourse, use of laxative, use of herbal or chemical medications, or use of traditional methods to induce delivery during this period, and to notify the researcher in if they observed the following: regular painful abdominal contractions, reduced fetal movement, watering, bleeding or bloody discharge, so that arrangements are made for hospitalization. During hospitalization, vaginal examination was performed. Also, amniotomy was performed at 3-cm dilatation for all study subjects. Twelve hours after injection, classical induction using oxytocin at the rate of 2.5 m
unit/min was performed, and increased at the same rate every 15 minutes, so that patients could enter active phase. If they failed to enter active phase (3 regular contractions in 10 minutes, with dilatation of 3-4 cm) 6 hours after induction, oxytocin was discontinued, and they were considered non-responsive. During the active phase, uterine contractions were assessed and recorded in terms of severity, frequency, and duration. Fetal heart rate was controlled every 15 minutes, and according to patient’s condition, colposcopy (vaginal examination) was performed to assess labor progress. Other normal care for parturient was also performed. Then time of injection, Bishop score on admission, injection interval to onset of active phase and its duration, time of entry into the second and the third stages of labor and duration of each stage, and placenta l expulsion were recorded. During the second and the third stages of labor, intravenous oxytocin infusion was routinely used for mothers.

Data were analyzed with SPSS-15 software using Chi-square and t-test, and confidence interval was taken 95%, at significance level P<0.05.

Finally, the two groups were compared in terms of Bishop scores before and 12 hours after injection, interval from injection to onset of active phase, duration of induction, duration of active phase, Apgar score and neonatal weight, neonatal gender, cesarean section, fetal meconium discharge, and the required items.

### Results

According to the results obtained, the two groups were not significantly different before the study in terms of maternal age and BMI is the first trimester of pregnancy, number of miscarriages, mean gestational age, and mean cervical Bishop score (P>0.05) (table 1).

### Table 1: Patients’ details according to age, gestational age, number of abortions, BMI, first minute Apgar score, neonatal weight and initial Bishop Score

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dexamethasone</th>
<th>Normal saline</th>
<th>P (value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean maternal age (years)</td>
<td>23.5±3.836</td>
<td>22.8±3.89</td>
<td>0.8</td>
</tr>
<tr>
<td>Mean gestational age (weeks)</td>
<td>40.4±0.46</td>
<td>40.4±0.38</td>
<td>0.2</td>
</tr>
<tr>
<td>Number of abortions (persons)</td>
<td>6</td>
<td>4</td>
<td>0.15</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>24±1.02</td>
<td>25±0.85</td>
<td>0.27</td>
</tr>
<tr>
<td>First minute Apgar</td>
<td>8.88±0.34</td>
<td>8.13±0.38</td>
<td>0.24</td>
</tr>
<tr>
<td>Infants’ weight (grams)</td>
<td>3416±277.25</td>
<td>3340±324.45</td>
<td>0.88</td>
</tr>
<tr>
<td>Mean initial Bishop Score</td>
<td>2.33±0.82</td>
<td>2.45±0.77</td>
<td>0.64</td>
</tr>
</tbody>
</table>

Mean Bishop score 12 hours after injection was 7.23±1.32 in the case group, and 2.98±0.89 in the control group, and the difference between the two groups was statistically significant (P<0.0001) (table 2). Mean Bishop Score in the case group prior to intramuscular injection of dexamethasone was 2.33±0.82 and after injection, it increased to 7.23±1.23; and t-test revealed a significant difference between the two occasions (P<0.0001). Mean Bishop score in the control group was 2.45±0.77 before injection of normal saline, and 2.98±0.89 after injection, and paired t-test showed a significant difference between the two occasions (P=0.01).

Natural delivery was performed in 88.4% of the case group members, and in 67.4% of the control group members, and the
difference between the two groups was significant (P=0.018).
There were insignificant differences between the two group’s infants in terms of the first and the fifth minute Apgar score, gender, and also meconium discharge (P>0.05). Meconium frequency in amniotic fluid was 11.6% in the case group and 15.4% in the control, but the difference was insignificant (P>0.05).
The following subjects were excluded in the case group: two for uterine overstimulation, and 7 due to absence, and in the control group: one due to umbilical cord prolapse and cesarean section, and 6 due to delivery in other centers.

Table 2: Patients’ details in terms of duration of induction, and delivery process

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dexamethasone</th>
<th>Normal saline</th>
<th>P (value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Bishop score after injection</td>
<td>7.2±1.32</td>
<td>2.98±0.89</td>
<td>0.0001</td>
</tr>
<tr>
<td>Mean interval between induction and active phase (hours)</td>
<td>3.1±0.68</td>
<td>4.2±1.3</td>
<td>0.001</td>
</tr>
<tr>
<td>Mean interval between induction and delivery (hours)</td>
<td>5.3±0.99</td>
<td>7.2±1.5</td>
<td>0.003</td>
</tr>
<tr>
<td>Mean duration of induction (hours)</td>
<td>3.25±0.76</td>
<td>5.94±2.41</td>
<td>0.0001</td>
</tr>
<tr>
<td>Mean duration of active phase (hours)</td>
<td>3.56±1.5</td>
<td>3.18±0.47</td>
<td>0.56</td>
</tr>
<tr>
<td>Mean duration of second stage of delivery (min)</td>
<td>33.1±0.02</td>
<td>37.7±13.9</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Discussion**

In this study, it was found that mean interval between induction of labor and onset of active phase, and also duration of induction in the case group receiving dexamethasone were significantly shorter than in control group. In a study by Kashanian et al., study population consisted of women in 41 weeks gestational age and Bishop scores greater than or equal to 7, and intramuscular injection of dexamethasone was used, more women in dexamethasone group entered active phase than women in the control group. Also, interval between induction and onset of active phase in the case group was shorter than that in control group (3.9±1.5 against 4.21±1.8, P=0.001) (8).

In another study conducted by Ziaeet al., aiming to determine the effect of intramuscular injection of dexamethasone on induction of labor, women in 41 weeks gestational age and Bishop scores greater than or equal to 7 received intramuscular injections of 10 mg dexamethasone in two doses with 12 hours interval, and the next day, induction was carried out using oxytocin. These patients were compared with patients in similar conditions, but receiving oxytocin. In this study, more of the patients from dexamethasone group entered active phase than patients in control group, and interval between induction and onset of active phase was shorter in this group than in control group (9).

In another study conducted by Barakai et al. (1997) with the aim to investigate the effect of extra-amniotic normal saline with dexamethasone for induction of labor, interval between induction and onset of active labor in dexamethasone group was shorter than that in the group that received extra-amniotic normal saline only. Also, 90.25% of dexamethasone group entered active phase, and 88.37% of control group, but the difference was insignificant. Mean
onset of oxytocin to delivery was 7.25±2.86 hours in the case group, and 9.76±3.91 hours in the control group, with a significant difference between the two groups (P=0.002). Results of this study showed that injection of extra-amniotic normal saline was a suitable and inexpensive method for cervical ripening and response to induction, and addition of dexamethasone could help shorten delivery process (10).

Many studies conducted on animals (mostly sheep) have also obtained similar results (11). However, some of the more extensive review studies have produced contradictory results in this area. For example: Cavanegh et al. in a review study on the effect of corticosteroids in cervical ripening and induction of labor concluded that, efficacy of corticosteroids in induction of labor was still unknown and required further studies. In 2006, they extended their studies, but arrived at the same conclusion (12-13).

Still, studies have shown that toward termination of pregnancy, prostaglandins derived from amnion and chorion are metabolized and can easily affect adjacent deciduas and myometrium through increased cortisol. In other words, they can cause passage from zero uterine phase to phases 1 and 2 of labor (14). With respect to potential role of placental Corticotropin-Releasing Hormone during pregnancy, studies have shown that this hormone can trigger onset of active contractions (15). Moreover, studies have been conducted on premature labor and maternal stress (16). Also, studies have shown that in embryos with congenital adrenal hyperplasia, where cortisol level is reduced, more cases of post-term deliveries are observed. Results of some studies are indicative of increased cervical glucocorticoid receptors prior to onset of labor, which are in line with confirming impact of dexamethasone on process of delivery (17).

**Conclusion**

Given studies already conducted and the present study, it appears that administration of dexamethasone with positive effect on cervical ripening, through improved Bishop score reduces time between induction and delivery, and also accelerates labor; perhaps it could be used to help the process of delivery.

**Acknowledgements**

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**Conflict of interest**

Authors had no conflict of interests in this study.

**References:**