CLINICAL ARTICLE

Effect of intramuscular administration of dexamethasone on the duration of labor

Maryam Kashanian⁎, Farideh Dadkhah, Fattaneh Mokhtari

Department of Obstetrics and Gynecology, Iran University of Medical Sciences, Tehran, Iran

Received 24 February 2008; received in revised form 1 April 2008; accepted 3 April 2008

Abstract

Objective: To evaluate the effect of dexamethasone administration on labor duration. Method: In this controlled trial 122 nulliparous women with a full-term pregnancy and a Bishop score of 7 or greater were randomly assigned to receive a single 8-mg dose of dexamethasone or placebo 6 hours before initiation of labor induction. Results: The interval between initiation of labor induction and beginning of the active phase of labor was shorter in the dexamethasone than in the control group (3.09±1.5 hours vs. 4.21±1.8 hours; \( P = 0.001 \)). The duration of the second stage of labor was also shorter in the dexamethasone group (22.23±16.09 minutes vs. 29.01±15.32 minutes; \( P = 0.014 \)). Conclusion: The administration of dexamethasone was found to shorten labor duration.

© 2008 International Federation of Gynecology and Obstetrics. Published by Elsevier Ireland Ltd. All rights reserved.

KEYWORDS
Corticosteroids; Dexamethasone; Duration of labor; Induction of labor

1. Introduction

Although administrating corticosteroids is a suggested method to shorten labor duration, the role of these agents in the process of labor is not well understood [1–5]. Several animal studies have shown the importance of corticosteroid secretion by the fetal adrenal glands on the beginning of labor [1–6], and infusing gluocorticoids in the lamb fetus was also shown to induce preterm labor [6]. These findings have led to the hypothesis that corticosteroids also had an effect on the labor of women [1,2].

Different studies have shown the paracrine and autocrine effects of corticosteroids on the human uterus, and receptors for these agents have been detected on the human amniotic membrane [1,7,8]. Kalantaridou et al. [9] have suggested that the corticotrophin-releasing hormone (CRH), which has been identified in various organ systems, including the female reproductive system, is the principal regulator of the hypothalamic–pituitary–adrenal axis. Circulating placental CRH is responsible for the physiologic hypercortisolism of the latter half of pregnancy and plays a role in the onset of labor. O’Sullivan et al. [10] reported that a prolonged gestation is more likely to occur when the fetus has congenital adrenal hyperplasia caused by 21-hydroxylase deficiency, which may be due to an impaired cortisol production.

All of these studies show the probable effects of corticosteroids on the labor process. Corticosteroids have
been administered intravenously, intramuscularly, and by extra-amniotic infusion in various clinical trials [11–14]. The purpose of the present study was to evaluate the effect of a single intramuscular administration of dexamethasone on the duration of labor, and its possible adverse effects.

2. Materials and methods

A double-blind, randomized, controlled trial was performed between March 2006 and May 2007 at Akbarabadi Teaching Hospital, Tehran, Iran, with women who had been admitted to the labor ward for labor induction. The indications included postterm pregnancy, prolonged latent phase of labor, abnormal results to fetal assessment tests, and reduced fetal movements.

The inclusion criteria were nulliparity; favorable cervix with a Bishop score of 7 or greater; pregnancy duration of at least 37 weeks according to a reliable date for the last menstrual period and a first-trimester ultrasound evaluation; normal maternal weight with body mass index (calculated as weight in kilograms divided by height in meters squared) between 19.8 and 26.0; singleton fetus; and cephalic presentation.

The exclusion criteria were any maternal systemic disorders, including diabetes mellitus and pre-eclampsia; the intake of any drugs besides iron or other ordinary nutritional supplements; body mass index not between 19.8 and 26.0; noncephalic presentation; active uterine contractions (2 or 3 regular and forceful contractions per 10-minute intervals); probable macrosomia (suggestion by ultrasound or estimation of fetal weight by 2 experts); premature rupture of membranes; intrauterine growth restriction; fetal distress; significant vaginal bleeding; placenta previa; probable placental abruption (symptoms and signs suggestive of placental abruption); unfavorable pelvis (the diagonal conjugate diameter, ischial spines, pelvic sidewalls, and sacrum were evaluated for adequacy by 2 experts); overdistension of the uterus (clinical presumption and confirmation of polyhydramnios by ultrasound); and any uterine anomaly or history of surgical intervention in the uterus, including cesarean delivery.

With 122 participants, this double-blind study had 90% statistical power, with $\alpha=0.05$ and $1-\beta=0.085$. The participants were randomly assigned to the dexamethasone sodium phosphate ($n=61$) or the control group ($n=61$). No cervical ripening agents were used before labor initiation in either group.

Dexamethasone reaches its maximum effect between 2 and 3 hours following the injection [15]. In the dexamethasone group 8 mg (2 mL) of the product (Daru Paksh, Tehran, Iran) was administered intramuscularly 6 hours before initiation of labor induction; and labor induction was performed by standard protocol, i.e., started with 2.5 mIU/min of oxytocin, with the dose increased by 2.5 mIU/min every 20 minutes. In the control group 2 mL of distilled water was administered intramuscularly 6 hours before initiation of labor induction, and the oxytocin administration was conducted as in the study group. The first vaginal examination and determination of the Bishop score were performed by the investigator and the injection of dexamethasone or distilled water was performed by her coworker; thus, neither the participants nor the investigator knew the nature of the injection. All participants were monitored by the investigator, and mothers and newborns were observed for 10 days when chorioamnionitis and neonatal sepsis were suspected.

The interval between initiation of induction and beginning of the active phase of labor (a cervical dilatation of 3–4 cm plus 3 forceful contractions over a 10-minute span), the duration of the active phase of labor, and the second and third stages of labor were compared between the 2 groups. The institutional review board and the institutional ethics committee approved the study and all participants gave written informed consent.

Statistical analysis was performed using SPSS version 15 (SPSS, Chicago, Illinois, USA). The $\chi^2$ test was used to compare categorical variables, where appropriate, and the unpaired $t$ test was used to compare continuous variables with a normal distribution. $P<0.05$ in 2-tailed analysis was considered statistically significant.

3. Results

There were no statistically significant differences between the 2 groups regarding maternal age, primary Bishop score, pregnancy duration, and neonatal weight (Table 1). The interval between the initiation of labor induction and the beginning of the active phase of labor was 3.09±1.5 hours (95% confidence interval [CI], 2.70–3.47 hours) in the dexamethasone group and 4.21±1.8 hours (95% CI, 3.72–4.69 hours), and the difference was significant ($P<0.001$). None of the participants entered the active phase of labor before the initiation of the oxytocin infusion.

There was no significant difference between the 2 groups in the duration of the active phase of labor, but the second stage of labor was shorter in the dexamethasone group (22.23 min [95% CI, 18.1–26.39] vs. 29.01±15.32 min [95% CI, 25.09–39.24]; $P=0.01$).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dexamethasone group ($n=61$)</th>
<th>Control group ($n=61$)</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time from induction to the active phase, h</td>
<td>3.09±1.5</td>
<td>4.21±1.8</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Duration of the active phase, h</td>
<td>2.46±1.38</td>
<td>3.87±5.73</td>
<td>NS</td>
</tr>
<tr>
<td>Duration of the second stage, min</td>
<td>22.23±16.09</td>
<td>29.01±15.32</td>
<td>$P=0.01$</td>
</tr>
<tr>
<td>Duration of the third stage, min</td>
<td>6.47±7.33</td>
<td>5.59±1.88</td>
<td>NS</td>
</tr>
<tr>
<td>Apgar score at 1 min</td>
<td>8.79±0.63</td>
<td>8.61±0.73</td>
<td>NS</td>
</tr>
<tr>
<td>Apgar score at 5 min</td>
<td>9.86±0.53</td>
<td>9.67±0.62</td>
<td>NS</td>
</tr>
</tbody>
</table>

Values are given as mean±SD unless otherwise indicated.
There were no significant differences in duration of the third stage of labor or in Apgar scores at 1 and 5 minutes. There was no correlation between neonatal weight and time from induction initiation to beginning of the active phase of labor (Table 2).

No cases of chorioamnionitis or neonatal sepsis were diagnosed in either group.

The mean cervical dilatation was 2.72±0.48 cm at the time of the dexamethasone injection and 2.82±0.44 cm at the time of the initiation of induction, and the difference was not significant.

The mean cervical effacement was 41.31%±8.65% at the time of the dexamethasone injection and 51.8%±8.46% at the time of induction initiation, and the difference was highly significant (P<0.001).

The station of the fetal presenting part in the birth canal was not significantly different before the dexamethasone injection and at the time induction was started.

The number of cesarean deliveries in the 2 groups was not significantly different (10 in the dexamethasone group and 14 in the control group).

4. Discussion

The present study showed that a dexamethasone injection decreased the interval between initiation of labor induction and beginning of the active phase of labor, and that it also decreased the duration of the second stage of labor. Many studies performed on animals, especially sheep [1,2, 6], have suggested that corticosteroids shortened the duration of labor.

Our findings are in agreement with those of Ziaei et al. [12], who reported that intramuscular injections of dexamethasone before labor induction reduced the time between the induction and the active phase of labor. The number of patients was less in their study, however (32 in their study group and 33 in their control group), and the dosage and frequency of injections were different. The participants in their study group received 10 mg of dexamethasone intramuscularly in 2 doses 12 hours apart, and the intravenous infusion of oxytocin was administered the following day. The participants in the control group received oxytocin 24 hours after enroiling.

Barkai et al. [11] found that inducing labor by means of an extra-amniotic infusion of corticosteroids through an intracervical Foley balloon catheter reduced the time between induction of labor and delivery. Moreover, Kashanian et al. [16] reported on the extra-amniotic infusion of a saline solution mixed with dexamethasone through a Foley catheter whose balloon was filled with 15 mL of water, and concluded that the procedure could shorten the duration of labor without significant maternal or fetal risk. In contrast, Kavanagh et al. [1,2] concluded that the effect of corticosteroids on labor induction is uncertain, although they reviewed just 1 small study on this topic.

It has been shown that glucocorticoids induce the synthesis of surfactant protein A in human fetal membranes, and suggested that surfactant protein induced prostaglandin E2 synthesis in chorionic trophoblasts—thus playing a role in the initiation of parturition [17]. Glucocorticoids are normally circulating stress hormones; however, in the initiation of labor, a stressful situation, their expression is regulated by placentaly derived corticotrophin-releasing hormone (CRH) [18, 19]. Other studies have suggested a role for this hormone on the initiation of active contractions of uterus [9, 20], and also a role for maternal stress hormones [21,22]. O’Sullivan [10] concluded that fetuses with congenital adrenal hyperplasia due to 21-hydroxylase deficiency were more likely to have a prolonged gestation, and that this may be due to impaired cortisol production. Other studies have shown an increased amount of glucocorticoid receptors on the cervix before the initiation of labor, which may explain the improvement in cervical effacement after the intramuscular injection of dexamethasone in the present study [23–25].

In conclusion, an intramuscular injection of dexamethasone was found to shorten the duration of labor by decreasing the interval between the induction and the beginning of the active phase, with no observed maternal or neonatal complications.

References


