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Efficacy of Betamethasone on the Fetal Motion and Biophysical Profile and Amniotic Fluid Index in Preterm Fetuses

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Abstract: The term of preterm birth is used to define the premature neonates considering pregnancy age. In less than 34 week pregnancies, corticosteroids are prescribed to promote embryos' lung maturity. The presents study aimed at evaluating effects of betamethasone injection on feeling embryo motion by mother and index and biophysical profile in preterm pregnancies. In a descriptive-analytical study, 40 pregnant women with the pregnancy age of 30-34 weeks were evaluated. Embryo motion and index and biophysical profile of the amniotic fluid were checked before prescription of double dosage of muscular betamethasone (12 mg) at a 24 h time interval. The injection was repeated for 24 and 48 h after the first injection. The resulted outcomes were compared with those results related to before betamethasone injection. In this study, there was statistically meaningful relationship between embryo motions before injection of betamethasone and 12 h after its injection ($p = 0.03$). Also, there was a significant relationship between embryo motions 24 and 48 h after injection of betamethasone ($p = 0.001$). In other words, the embryo motions decreased 12 h after injection of betamethasone. They were improved 48 h after betamethasone injection. But, index and biophysical profile results of amniotic fluid were left unchanged. Application of betamethasone leads to evident but transient decrease in embryo motions. Although motion element of index and biophysical profile of amniotic fluid which is one of the tests used in evaluating the embryo health is fixed and normal, it can be concluded that injection of betamethasone may not affect embryo health.

Key words: Preterm labor, betamethasone, embryo motion, biophysical profile

INTRODUCTION

The term of preterm birth is used to describe the premature neonates considering pregnancy age. Preterm birth is defined as birth taking place before completing of 37 weeks of pregnancy (Autret-Leca *et al*., 2009; Golfurushan *et al*., 2011; Haas *et al*., 2012; Milan *et al*., 2011). In this condition, 85% of neonate mortality results from prematurity. Some before 37 weeks of pregnancy increase in comparison with term birth neonates. It is associated with mortality increase of these neonates (Goldust *et al*., 2011; Khandelwal *et al*., 2012; Newnham and Jobe, 2009; Sadeghpour *et al*., 2011). Some medicines and interventions including hydration, mitigating beta-adrenergic receptors agonists, magnesium sulphate, prostaglandin controller and blockers calcium have been used to control preterm labor (Caldas *et al*., 2012; Goldust *et al*., 2012; Sadighi *et al*., 2011). Corticosteroids are prescribed to promote embryo lungs mature in less than 34 week pregnancies (Bensley *et al*., 2012; Goldust *et al*., 2013a; Vafaee *et al*., 2012). Betamethasone is a glucocorticoid used to induce pulmonary maturation in preterm babies and reduce the incidence of respiratory distress (Hjalmarson and Sandberg, 2011). The mechanism for this action is still unclear. Additionally, betamethasone increases the size of the air sacs in the lungs (alveoli) and improves oxygen exchange (Anonymous, 2010). Despite the positive effects of this drug, there are several side effects with its use (Goldust *et al*., 2013b, c; Jarreau *et al*., 2010) When preterm is created with a long distance from term, complications and mother and neonatal mortality rate increase significantly. Therefore, intensive medical care's are of high importance in women with preterm labor (Goldust *et al*., 2013d; Mohebbipour *et al*., 2012; Schwab *et al*., 2012). Biophysical profile is a non-invasive method to study embryo health before birth. In this method, possibility of asphyxia and risk of embryo

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mortality are evaluated (Bontis *et al*., 2011). The results may lead to some interventions for immediate terminating of preterm pregnancy considering increase of preterm labor rate within the recent decades, the complications created in neonates associated with more labor load on society, family and health system, importance of effects of prescription of betamethasone to evaluate embryo lung in preterm neonates, referring of some references to effects of corticosteroid on tests used to evaluated embryo health considering effects of corticosteroid therapy on decreasing index and biophysical profile score of amniotic fluid in preterm embryo (Crowther *et al*., 2011; Goldust and Rezaee, 2013; Lotti *et al*., 2013). Therefore, it was decided to study effects of betamethasone on tests used to evaluated embryo health (index and biophysical profile of amniotic fluid and embryo motions).

MATERIALS AND METHODS

In this descriptive-analytical study, forty 18-35 years old women hospitalized with preterm pregnancy of 30-34 weeks as well as need to corticosteroid injection were evaluated for two years (Mar. 2010 to Mar. 2012) in Tabriz, Alzahra hospital. Written consent was obtained from all the patients. This study was approved by ethic committee of Tabriz University of medical sciences. The inclusion criteria included preterm labor without receiving sulphate, placenta previa, preterm associated with vaginal hemorrhage, history of preterm labor, uterus abnormalities and interest in attending the study. The exclusion criteria were preterm labor receiving tocolytic medicines, suffering from uterus infection, receiving benzodiazepines and narcotic analgesic, growth inter-uterus disorder with distorted color Doppler, embryo heart arrhythmia, congenital anomalies of embryo, history of receiving steroid and heart diseases of embryo. The subjects were tested before injection, 24 and 48 h after injection considering index and biophysical profile. The results of before betamethasone injection (12 mg IM at a 24 h time interval and two times per day) were compared with those outcomes obtained after injection of betamethasone. Feeling of embryo motion by the mother was evaluated and compared before injection of betamethasone and 12, 24 and 48 h after its prescription. This study evaluated parameters such as chronological age of the patients, pregnancy age, gravidity, parity, history of diseases including eclampsia, pregnancy diabetes, hypertension, reasons of patients' referring to the center such as delivery pain, history of preterm labor, vaginal hemorrhage, uterus disorders, number of embryo motions, index of amniotic fluid, total score of Biophysical Profile (BPP) and Non-stress Test (NST) result.

Statistical analysis: The obtained data were analyzed using descriptive statistical methods (Mean±Standard deviation, frequency and percentage) and quantitative variables were compared using mean difference test for dependent groups. Also, Chi square test and Mc Nemmar test was applied to compare qualitative variables. To statistically analyze the data, SPSS.15 software was used. In this study, $p = 0.05$ was regarded as significant.

RESULTS

Mean age of the understudy subjects was 29.12±5.27 years and the youngest and oldest patients were 18 and 35 years old, respectively. Mean pregnancy age of the understudy subjects was 31.55±1.23 weeks such that the minimum and maximum pregnancy age was respectively 30 and 34 weeks. In this study, there were two cases of abortion history with three abortions in one case and 4 abortions in another subject. The understudy subjects gave birth to 15 alive neonates with one alive birth in 11 cases (73%) and three alive births in two cases (13%). Additionally, two neonates (13.3%) died after birth. Out of 15 subjects, 4 (26.7%) and 11 (73.3%) cases suffered from parity 2 and 1, respectively. Considering 40 subjects, gravid 3, 2 and 1 was observed in 3 (7.5%), 11 (27.5%) and 26 (65%) cases, respectively. Out of 40 patients, 2 cases (5%) suffered from pregnancy diabetes and one case (2.5%) experienced hypertension during pregnancy. Also, out of 40 cases, 25 patients (62.5%) suffered from premature delivery pain, 15 subjects (37.5%) experienced no premature delivery pain, vaginal hemorrhage was seen in 13 cases (32.5%) and 27 patients (67.5%) did not experienced vaginal hemorrhage. None of the 40 understudy patients experienced history of preterm birth. In this study, 12 patients (30%) were cared without any especial action, 28 cases (70%) was treated using serum therapy. Before prescription of betamethasone, appropriate and inappropriate embryo motions were identified in 34 (85%) and 6 (15%) cases, respectively. Number of embryo motions was appropriate in 26 cases (65%) 12 h after prescription of betamethasone. It was inappropriate in 14 cases (35%). Number of embryo motions was appropriate in 27 cases (67.5%) and inappropriate in 13 cases (32.5%) after 24 h of betamethasone prescription. Additionally, number of embryo motions was appropriate in 38 cases (95%) after 48 hours of betamethasone prescription. It was inappropriate in 2 cases (5%). There was a statistically meaningful relationship between feeling of embryo motion before prescription of betamethasone and 12 h after its prescription ($p = 0.03$). But, there was not any statistically meaningful relationship between feeling of embryo motio

Table 1: Comparison of biophysical profile before and 24 and 48 h after injection of betamethasone

Before treatment profile	24 h after treatment	48 h after treatment		
		10	8	Total
8	8	2 (40.0)	1 (20)	3
	10	2 (40.0)	0	2
10	8	2 (5.7)	1 (2.9)	2
10		32 (91.4)	0	33

Values in brackets are percentage

before prescription of betamethasone and 12 and 24 h after its prescription (p = 0.9). There was a statistically significant relationship between feeling of embryo motion before prescription of betamethasone and 24 and 48 h after its prescription (p = 0.001). Generally, results of statistical tests demonstrate that frequency distribution between embryo motion status before injection of betamethasone and 12 h after its injection was statistically meaningful (p = 0.03). Considering p = 0.11, it can be stated that test results before and 24 h after injection of betamethasone was not meaningful. Test results before and 48 h after injection of betamethasone was not meaningful since p = 0.21. Biophysical profile before prescription of betamethasone was 10 and 8 in 35 (87.5%) and 5(12.5%) cases, respectively. After 24 h of betamethasone prescription, it was 10 and 8 in 35 (87.5%) and 5(12.5%) cases, respectively. Biophysical profile relationship after 48 h of betamethasone prescription was 10 and 8 in 3 (95%) and 2 (5%) cases. There was not any statistically meaningful relationship between biophysical profile before and 24 h after prescription of betamethasone (p = 1). Additionally, there was not any statistically meaningful relationship between biophysical profile 24 and 48 h after prescription of betamethasone (p = 0.37) (Table 1).

DISCUSSION

Effects of betamethasone injection on embryo motions, index and biophysical profile of amniotic fluid in preterm 30-34 weeks pregnancies were evaluated in this study. In this study, number of embryo motions was appropriate in 85% of cases before injection of betamethasone. It was appropriate in 65% of subjects after 12 h of betamethasone injection. Considering p = 0.03, there was a meaningful relationship between feeling of embryo motions before and 12 h after injection of betamethasone. There was a meaningful relationship between feeling of embryo motions 24 h after injection of betamethasone in comparison with 48 h after betamethasone injection (p = 0.01). It refers to the fact that feeling of embryo motion improves after 48 h of betamethasone injection (Haas *et al*., 2011). But, this study does not demonstrate any relationship between index and biophysical profile of amniotic fluid before and after prescription of betamethasone. Previous studies have pointed out that biophysical profile, feeling of embryo motion by the mother, embryo's heart rate, motion and breathing decrease after injection of corticosteroid but index of amniotic fluid may be normal or decreased. (Schaffer *et al*., 2010). Bastek *et al*. (2010) demonstrated that injection of betamethasone in pregnant women led to transient decrease of embryo's motions, heart rate and breathing during first 48 h. Then, they were returned to their normal condition within 4-6 days. Also, they demonstrated that injection of corticosteroid did not affect variability of the embryo's heart pulse. It significantly decreased base heart rate of the embryo. In their study on pregnant women (29-34 weeks) using Doppler after corticosteroid therapy, Hashima *et al*. (2010) indicated to no changes in umbilical arterial circulation but MCA circulation was decreased within 72 h. In the study, conducted by Subtil *et al*. (2003), it was made clear that embryo heart rate was decreased within first 32 h after injection of corticosteroid. FHR variability was increased within the first 8 h and then, it was decreased to 8 h. Body motions of the embryo were left unchanged (Subtil *et al*., 2003). Muddler *et al*., conducted a study in this regard and demonstrated that heart rate, body motions and breathing of the embryo were decreased within the first 48 h after injection of corticosteroid. Contrary to the previous studies, FHR variability was also decreased during the mentioned interval (Mulder *et al*., 2004). In their study, Koenen *et al*. (2002) demonstrated that embryo heart rate, in contrary to the previous researches, did not change but decrease of breathing and body motions of the embryo were observed (Koenen *et al*., 2002). Peltoniemi *et al*. (2009) conducted a study in this regard and suggested that breathing and body motions of embryo as well as FHR variability were decreased during the first 72 h. But, heart rate was left unchanged (Peltoniemi *et al*., 2009). In this study, only embryo motions were decreased within the first 12 h and index and biophysical profile were not changed. According to the results obtained from this study, although there was statistically meaningful relationship between embryo motions before and 12 h after injection as well as the meaningful relationship observed between embryo motions after 24 and 48 h of injection of betamethasone, decrease of embryo motions after 12 h of betamethasone injection as well as improvement of embryo motions 48 h after its injection and considering normalness of motion element of biophysical profile, it can be stated that injection of Corticosteroid does not negatively affect embryo health.

CONCLUSION

This study demonstrated that embryo motions were evident but transient after injection of Corticosteroid. But, index of amniotic fluid and biophysical profile did not change as a result of injection of Corticosteroid.

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