EFFECTS OF OXYTOCIN AND MISOPROSTOL FOR LABOR INDUCTION ON UMBILICAL CORD BLOOD GAS PARAMETERS

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Key words:
Oxytocin, misoprostol, umbilical artery blood gas, labor induction, pH

Resume: To compare the effects of oxytocin and misoprostol used in labor fetal blood gas parameters. This prospective randomized trial involved 60 women who completed 37-42 gestational weeks and who required labor induction prior to normal vaginal birth. Labor was induced in 30 women with an intravenous low dose oxytocin regimen and in 30 with intravaginal misoprosrol (PGE1). Following childbirth, umbilical artery blood gas was analyzed, with pH, pCO2, pO2, HCO3 and base excess (BE) compared in the two groups. Mean age and obstetrical data (gravidity, parity, gestational weeks and birthweight) were similar in the two groups (p>0.05). All infants had 1 and 5 minute APGAR scores ≥7. Umbilical artery blood pH was similar in the oxytocin and misoprostol groups (7,30±0,08 vs. 7.32±0.05, p=0.781), as were the other blood gas parameters (pCO2, pO2, base excess and HCO3; p>0.05 each). Induction of labor with either oxytocin or misoprostol in women with uncomplicated term pregnancies had no adverse effects on umbilical artery blood gas parameters.

Introduction: Induction of labor refers to the process whereby uterine contractions are initiated by mechanical or pharmacological methods before the onset of spontaneous labor[1]. Induction of labor is advised in situations when the pregnancy is dangerous for the mother or fetus; or when induction is beneficial for both. Induction of labor decreases operative labor and minimizes risks to the fetus. Among the factors influencing the method used to induce labor are cervical and membrane status, parity, and patient and provider preferences[4]. The ideal method should be safe, painless, inexpensive, comfortable and effective. The most common pharmacological agents are oxytocin and prostaglandins (PGE1 and PGE2). Oxytocin is a safe and efficient starter of uterine contractions, but its success is associated with the condition of the cervix at the start of the labor. Misoprostol (methyl II, 16-dihydroxy-16-methyl-9-oxoprost-13E-en-oate), a synthetic prostaglandin E1 analogue, is a gastric cytoprotective agent and is used for labour induction, especially in patients with an unripe cervix. Published meta-analyses have stated that women who received misoprostol for labour induction had a higher rate of vaginal delivery within 24 h of induction and a lower Caesarean rate than women in whom labour was induced by other methods. If labor is not induced under acceptable indications and surroundings, the uterus may be overstimulated, causing it to contract too frequently. Too many contractions may lead to changes in fetal heart rate and result in fetal distress[2]. We therefore compared the effects of oxytocin and misoprostol on fetal blood gas parameters.

Materials and method: This prospective case–control study was conducted at the Obstetrics and Gynaecology Department of National maternal and Child Health Center, Mongolia. A total of 60 women were enrolled. The women considered eligible for the study had singleton term (37–42 weeks) pregnancies and had given birth by vaginal route within 24 h after induced labour with misoprostol or oxytocin; none of them had a rhesus negative blood group or any known medical disease or foetal problem such as birth trauma or asphyxia that complicated the pregnancy. Women with Bishop Scores ≤ 5 were given misoprostol and women with scores above this had received oxytocin. All deliveries were electronically monitored. The neonates were not included in the study if there was foetal distress or if there were any side effects related to the drugs. The First group consisted of 30 healthy babies of women who received oxytocin infusion starting from 2 mIU/min, increasing the dose by 2 mIU/min increments every 20 min to a maximum of 30 mIU/min in 0.9% saline. The second group consisted of healthy babies of 30 women who received 25 µg misoprostol every 4 h placed in the posterior fornix of the vagina. Following vaginal birth, the umbilical cord was clamped, and a 2 cc blood sample was drawn from the umbilical artery within 30 seconds. Blood gas samples were analyzed for pH, pCO2, pO2, HCO3 and base excess (BE), while obeying the rules of cold chain.

One and five minute APGAR scores of each newborn were recorded.

This study protocol was approved by the Local Ethics Committee of our Hospital, and all subjects provided informed consent.

Statistical analysis was performed using SPSS software. A one-way ANOVA *F* test was used for the comparison. $P < 0.05$ indicated statistical significance.

Results: The mean age of all women enrolled in this study was 26.5±5.05 the mean gestation age was years, and 39.85±0.68 weeks. The demographic and obstetrical data of the two groups were comparable (p>0.05 each; Table 1). All infants had 1 and 5 minute Apgar scores ≥7. Comparisons of umbilical arterial blood gas pH, pCO2, pO2, HCO3 and BE showed no differences between the oxytocin and misoprostol groups (p>0.05 each; Table 2).

Table 1. Baseline characteristics

Characteristics	Oxytocine (n=30)	Misoprostol (n=30	Significance
Age* (years)	27.5±5.8 (18-38)	25.5±4.3 (19-40)	0.577
Gravidity	2.0(2) (1-8)	1.0(1) (1-5)	0.035
Parity	1.0 (0-3)	0(1) (0.2)	0.196
Gestational age* (weeks)	39.7±1.3(37-41.8)	40.0±0.7 (38.1-41.6)	0.470
Birthweight* (g)	3319.58±49.44	3152.45±55.2	0.383

There is no significant difference between demographic data (Table 1).

Table 2. Demographic, blood gas characteristics in the oxytocin and misoprostol groups

Characteristics	Oxytocine (n=30)	Misoprostol (n=30	Significance
pH*	7,30±0,08 (7.09-7.41)	7.32±0.05 (7.10-7.22)	0.781
pCO_2(mmHg)*	43.15±8.66 (19.9-61.2)	44.16±7.73 (21-58.9)	0.580
pO_2 (mmHg)*	18.64±8.31 (4.8-38.2)	18.60±7.38 (7.7-39.1)	0.981
BE (mmol/l)*	-3.73±2.49 (-12-0)	-3.2±2.89 (-12-2)	0.480
HCO_3(mmol/l)*	21.70±1.21 (17.8-23.6)	21.76±1.58 (18.2-24.4)	0.619

*Mean ± SD (min-max)

Also there was no significant difference between oxytocin and dinoprostone groups in pH, pCO2, pO2, HCO3 and BE values in umblical artery blood gas analyzes (P> 0.05). Three of the neonates in the oxytocin group and 2 of the neonates in the dinoprostone group were admitted to the neonatal intensive care unit and no significant difference was found between the groups (Table 2). All newborns admitted to intensive care unit were discharged together with their mothers in good health.

Discussion: The initiation of labor has become a routine procedure in gynecology and obstetrics clinics. We compared the effects of two different methods of labor induction on fetal blood gas parameters. To exclude the effects of fetal distress, we excluded women with chronic maternal disease, complications of pregnancy or fetal distress, and included only uncomplicated pregnancies ending with vaginal birth. Evaluations included Apgar scores and umbilical artery blood gas parameters of the newborn to determine whether acidemia had occurred. Fetal acidemia has been defined as pH ≤7.20 and pathological fetal acidemia as pH ≤7.0. Risks of fetal morbidity and mortality were found to be increased at umbilical artery pH ≤7.0, whereas no morbidity was observed in term babies with umbilical artery pH >7.0[9]. Uterine perfusion decreases during contractions, and increased uterine activity has negative effects on uteroplacental and fetoplacental circulation[11]. Intravenous oxcytocin was shown to result in hyperstimulation in 8.3-11.1% of women and fetal distress in 15.9-18%, suggesting that oxytocin application during labor may trigger fetal oxidative stress[5, 12]. However, oxytocin did not have any negative effects on pH and did not increase perinatal risk[11, 13]. When we investigated the effects of oxytocin-induced labor on fetal acid-base status, we observed an acid-base balance in the umbilical cord, a finding supported by intrapartum cardiotocographic findings and Apgar scores. Thus, the use of oxytocin to assist labor does not have negative effects on the fetus[11, 13]. Intracervical or intravaginal application of misoprotone (PGE1) is also frequently used to induce labor[5, 6, 10]. Long term treatment with low-dose controlled misoprostol was well tolerated by both the mother and the fetus (14), with uterine hyperstimulation rates of 7.4-7.8% and fetal distress rates of 10.9-26% [5, 12]. In comparison, we observed lower uterine hyperstimulation (2.6%) and fetal distress

(7.7%) rates in our misoprostol group, whereas the fetal distress rate in our oxytocin group was 9.3%. Arterial and venous umbilical cord gas parameters have been found to be unaffected by oxytocin augmentation or induction[11, 13]. Moreover Apgar scores, which indicate the well being of newborn infants, were shown to be statistically similar in women induced with misoprostole and oxytocin[5, 12]. We found that all Apgar scores were ≥7, all umbilical artery pHs were above 7.30, and none of the newborns experienced fetal acidosis. Umbilical artery blood gas parameters did not differ significantly in our oxytocin and misoprostol groups, indicating that their safety and effectiveness were similar for labor induction.

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