Research Article

Effect of Supplemental Maternal Oxygenation on Placental Blood pH in LSCS under Spinal Anesthesia

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ABSTRACT

The use of supplemental oxygen in uncomplicated cesarean deliveries under spinal anesthesia has been thoroughly investigated during recent decades. The aim of this study was to determine whether administering supplemental oxygen via a face mask to the mother is really beneficial or not. Healthy parturients at term undergoing elective cesarean section under spinal anesthesia were randomly allocated into two groups: Group A (n=15), who were allowed to breathe room air and Group O (n=15), who were supplemented with oxygen at the rate of 6liters/min via a face mask. Maternal oxygen saturation was measured continuously by using pulse oximeter. Maternal heart rate and mean arterial pressure were also recorded. Umbilical cord blood samples were collected and sent for arterial blood gas analysis (ABGA) following delivery of the infant. We found out that there was significant fall in pH of the umbilical cord blood in the Group receiving supplemental oxygen. Thus, we conclude that it is unnecessary to routinely supplement oxygen in all healthy parturients undergoing cesarean section under spinal anesthesia.

KEY WORDS: oxygenation, pH, spinal anesthesia

INTRODUCTION:

The use of supplemental oxygen for parturients undergoing cesarean section under spinal anesthesia has been routine practice for more than 30 years.[1] Central neuraxial block may impair functions of respiratory muscles; normally T_4-T_5 blockade is given for lower segment section.[2] Many of us administer oxygen to mother thinking it will help the neonate by increasing oxygen delivery to fetus.[3-6] During recent years, it has been observed that the supplementation of oxygen to the mother does not improve fetal oxygenation.[7-8] Recent studies have shown poorer outcome with hyperoxia. It was noted few years ago that administration of 60% oxygen during spinal anesthesia increases free radicals.[9] Reactive oxygen species are formed in the presence of hyperoxia under pHysiological conditions and are generated after hypoxia, ischemia, and reperfusion.[10] They play a key role in mediating tissue injury. Thus, giving oxygen to the mother may benefit the fetus by increasing oxygenation, but also be harmful by accelerating lipid peroxidation. Thus supplementing oxygen to mother may not benefit but may lead to change in acid –base status. We designed the proposed study to observe the effect of maternal oxygenation on neonates.

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MATERIALS AND METHODS:

The study protocol was approved by Institutional ethical committee no DMIMS(DU)/IEC /2014-15/1033. The study design was prospective randomized comparative study. The study included 80 parturients, full term pregnancy posted for elective caesarean section under spinal anesthesia. The patients who had respiratory insufficiency due higher blockade above T_4 or hypotension were excluded from the study. Only the patients who were stable after induction were included in our study. We had selected 30 patients, they were divided in two groups each comprising of 15 patients. Group A (n=15), who breathed room air (not supplemented with oxygen) and group O (n=15), who were supplemented with oxygen at the rate of 6litres/min through mask after induction. The vitals- Heart rate (HR), Mean arterial

pressure (MAP), Arterial saturation (Spo_2) were recorded just after the delivery of baby. After the delivery of the baby and clamping of the umbilical cord, immediately a blood sample was withdrawn from umbilical vein in a heparinized syringe and sent for arterial blood gas analysis (ABG). The collected ABG reports were analyzed with respect to PH and compared statistically. Multiple comparison test-'t test' was used to compare the data statistically.

OBSERVATION:

We observed that in Group A, the mean pH was 7.3413±0.0403 and in group O, the mean pH was 7.2793±0.0369, p value less than 0.0001, statistically significant.

We also observed that there was no significant change in PaO_2 and $PaCO_2$ in both the groups. In group A, mean PaO_2 was 18.54±6.32 and in group O, it was 19.65±5.99. The mean $PaCO_2$ in group A was 52.80±6.32 and in group O it was 49.52±5.76.

We observed that in both the groups there was no difference statistically for heart rate and mean arterial pressure. The average maternal heart rate was 76.67±10.87 in group A, while it was 75.87±9.36 in group O, p value 0.8305 not significant. The mean arterial pressure (MAP) was 75.33±7.17 in Group A, while in Group O, it was 73.04±6.90, p value 0.3714, not significant. The observed SpO2 in group A was 96±1.07%, while in group O it was 99±0.76, p less than 0.0001, highly significant.

RESULTS

A total of 80 parturients were enrolled in the study. Fifty participants were excluded from the study because they had prolonged labor pain, fetal distress and required emergency cesarean section. The mothers' age, body mass index, baseline hematocrit, and indications for cesarean section for the two groups were similar. The surgical details, including uterine incision to delivery interval, duration of surgery, and estimated blood loss were also similar between the groups. In addition, the amount of preload fluid, total intra-operative fluid administration, and vasopressor consumption were not significantly different.

We observed that when oxygen was administered to parturients, there was significant fall in umbilical vein PH which reflects the acid base status of the baby. The mean pH in group A was 7.3413±0.0403, while in group O it was 7.2793±0.0369 as shown in Table 1. In group A mean PaO_2 was 18.54±6.32 and in group O, it was 19.65±5.99. The mean $PaCO_2$ in group A was 52.80±6.32 and in group O, it was 49.52±5.76. There was no significant change in PaO_2 and $PaCO_2$ in both the groups (Table 1).

The mean heart rate in group A was 76.67±10.87 while it was 75.87±9.36 in group O as shown in Table 2. The mean arterial pressure (MAP) was 75.33±7.17 in Group A while in Group O it was 73.04±6.90 as shown in Table 2. The arterial saturation (Spo2) in group A was 96±1.07 % while in group O it was 99±0.76 as shown in Table 2. The pH of both the groups is graphically compared as shown in Graph 1.

DISCUSSION:

Oxygenation during surgical procedure is mandatory now a days but it has it's own side effects.

In 2009, M.Van de Velde says based on current knowledge, to continue supplementing oxygen to mother is not necessary and there is no better outcome for fetus.[11] In 2013,Chatmongkolchart et al studied supplementation of oxygen in caesarean section under regional anesthesia and concluded that it is neither beneficial nor harmful to neonates.[12] In 2014, Arunotai Siriusssawakul and colleagues studied the effect of supplementary oxygen say oxygen supplementation helps when there is desaturation but shall be kept optional.[13]

In our study we observed that supplementing oxygen has no benefits rather it leads to decrease in pH in neonates in patients who were supplemented with oxygen as compared to who were not administered oxygen. Unless the parturients are desaturated, no need to supplement with oxygen routinely.

Table 1:Comparison of arterial blood gas analysis(ABGA) parameters in both the groups.

Parameter	Group A	Group B	*p-value*
pH	7.3413±0.0403	7.2793±0.0369	<0.0001; S
PaO_2	18.54±6.32	19.65±5.99	0.6244; NS
$PaCO_2$	52.80±6.32	49.52±5.76	0.1486; NS

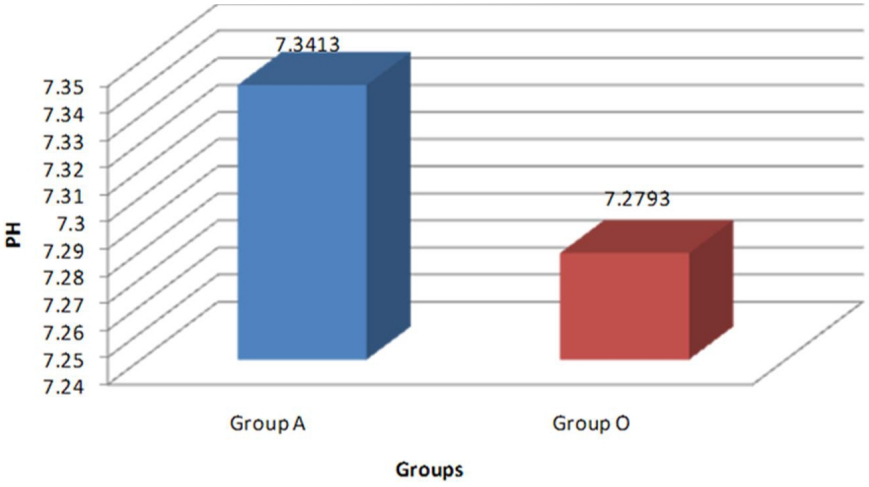
S- Significant; NS- Not significant

Table 2: Comparison of hemodynamic parameters in both the groups.

Parameter	Group A	Group O	*p-value*
Heart rate (mins)	76.67±10.87	75.87±9.36	=0.8305; NS
Mean arterial pressure (mm of Hg)	75.33±7.17	73.04±6.90	= 0.3804; NS
Arterial saturation (Spo_2 %)	96±1.07	99±0.76	<0.0001; S

S- Significant; NS- Not significant

Graph 1: Comparison of pH in both the groups.



CONCLUSION:

It is concluded that routine supplementation of oxygen to healthy parturients undergoing lower segment cesarean section under spinal anesthesia is not necessary as it does not improve fetal oxygenation rather it may be harmful to the baby as it leads to acidosis and may cause formation of free radicals, which are harmful.

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