

Phenylephrine to obtund Oxytocin-induced Hemodynamic Changes during caesarean section

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ABSTRACT

Aim: To compare mean hemodynamic changes in patients receiving phenylephrine as co-administration with oxytocin in elective caesarian section.

Study Design: Randomized controlled trial.

Setting: Department of anesthesia, Nishtar hospital Multan.

Duration of Study: Dec-2017 to May-2018.

Methods: A total number of 70 patients who underwent elective cesarean section (CS) under spinal anesthesia were included in this study. Group I: was allotted to patients in whom phenylephrine was administered just prior to the administration of oxytocin and Group II: was allocated to the patients in whom a 3 ml injection of normal saline was given prior to oxytocin administration. Mean hemodynamic changes were measured in terms of changes in systolic blood pressure (SBP) and heart rate in every patient before administration of oxytocin and after 3 minutes. Mean changes in SBP and Heart rate was measured. Data analysis was carried out using SPSS v 20.0. Independent sample t-test was used to compare mean change in systolic blood pressure and heart rate between the groups.

Results: Mean age of patients included in this study was 28.10±4.85 years. There were 4(5.7%) females who were having eclampsia during pregnancy and 5(7.14%) females were having gestational diabetes mellitus. Mean change in SBP was more in placebo group -8.13±18.02 versus -0.43±8.35 mmHg in phenylephrine group (p-value 0.04). Mean change in heart rate was 5.8±13.81 beat/min as compared to -14.06±11.39 beats/min in phenylephrine group (p-value <0.001).

Conclusion: Phenylephrine significantly obtund oxytocin-induced changes in systolic blood pressure and heart rate (in terms of tachycardia) during caesarean section.

Keywords: Cesarean section, oxytocin, phenylephrine, systolic blood pressure, heart rate.

INTRODUCTION

Obstetric hemorrhage is one of the major peripartum complications and its incidence is increasing day by day^{1,2}. Oxytocin has been recommended as a first line treatment for the management of postpartum hemorrhage (PPH) to initiate and maintain adequate uterine contractility to minimize the blood loss. Several dose regimens of oxytocin have been attested with some desirable (uterotonic) and undesirable (cardiovascular) effects³. Larger doses of oxytocin can result in several adverse effects e.g., hypotension, chest pain, flushing, headache, vomiting, pulmonary edema, and even cardiovascular collapse in hemodynamically unstable patients^{4,5,6}.

Recent guidelines have recommended an initial oxytocin dose of 3 units to promote uterine contractions and for prophylaxis of PPH during elective caesarean section (CS)⁷. It would be of clinical value to know whether an alpha agonist is effective in reducing oxytocin induced hypotension. This may have implications for the reduction of hypotension and maternal symptoms during administration of oxytocin infusions for prophylaxis of PPH, or as therapy during active bleeding⁸.

Dyer et al. concluded that co-administration of phenylephrine during oxytocin administration obtunded hemodynamic response to oxytocin and phenylephrine helps to maintain normal cardiac output after oxytocin administration⁸. But in a recent study by Rumboll and colleagues, phenylephrine did not obtund the hemodynamic effects of oxytocin. In their study, the mean change in systolic blood pressure (SBP) was 16.9±2 mmHg in phenylephrine group and 19.0±1.9 mmHg in placebo group and mean changes in heart rate were 13.5±2.3% in phenylephrine group versus 14.0±1.5% in saline group⁹. But this difference in SBP and heart rate were not statistically significant⁹. So this study was proposed to determine whether prior administration of intravenous phenylephrine obtunds hypotension and tachycardia caused by a slow bolus of oxytocin 3U. Because phenylephrine is routinely used in our setup as an adjunct to oxytocin administration to obtund oxytocin induced hypotension and tachycardia in elective caesarian section and existing knowledge has mixed results regarding the role of phenylephrine in reducing hemodynamic instability after oxytocin administration. The reasons for these differences may be due to genetic variations in different populations so the adequacy of phenylephrine in reducing the adverse cardiovascular effects of oxytocin is need to be re-established in our population.

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METHODS

This (randomized clinical trial) was conducted in Nishtar Hospital Multan. Seventy (70) female pregnant patients planned for elective C-section were included in this study. The study duration was Dec-2017 to May-2018. These patients were divided into placebo group and study group using draw randomization. In study group patients, phenylephrine was administered just prior to the administration of oxytocin. While in placebo group 3 ml injection of normal saline was given prior to oxytocin administration.

Anesthesia for the caesarian section and oxytocin dosage regimen were given according to the standard protocols. Mean hemodynamic changes were measured in terms of changes in systolic blood pressure (SBP) and heart rate in every patient. We measured baseline SBP and heart rate before administration of phenylephrine and normal saline injection. Then 50 µg bolus of phenylephrine was given to all patients in group I before administration of oxytocin injection. Immediately after administration of phenylephrine or normal saline 3 U of oxytocin diluted in 5 ml of saline was given to all patients in group I and II respectively. No vasopressor was given for 3 minutes after oxytocin administration. Systolic blood pressure and heart rate after 3 minutes of administration of oxytocin was noted

in all patients and mean changes in SBP and heart rate was noted.

Data analysis was carried out using SPSS v20.0. Mean and standard deviations were calculated for quantitative variables like age, baseline systolic blood pressure and baseline heart rate. Independent sample t-test was used to compare mean change in systolic blood pressure and heart rate between the group placebo and study group. P-value <0.05 was taken as significant difference.

RESULTS

Mean age of patients included in this study was 28.10±4.85 years. There were 4 (5.7%) females who were having eclampsia, while 5(7.14%) females were having gestational diabetes mellitus. Mean systolic blood pressure of study patients was 122.23±13.98 mmHg in study group versus 121.53±15.22 in placebo group. Mean baseline heart rate of study patients was 101.10±13.71 beats/min in study group and 96.80±15.53 in placebo group. Mean change in SBP was more in placebo group -8.13±18.02 versus -0.43±8.35 mmHg in phenylephrine group (p-value 0.04). however, mean change in heart rate was 5.8±13.81 beat/min as compared to -14.06±11.39 beats/min in phenylephrine group (p-value <0.0001) [Table 1].

Table 1: Data of Study Variables.

	Study Group	Placebo Group	p-value
Baseline SBP	122.93±12.72	121.53±15.33	0.70
SBP after 3 minutes	120.03±15.95	112.70±15.08	0.005
Mean Change in SBP	-0.43±8.35	-8.13±18.02	0.04
Baseline HR	101.10±13.71	96.80±15.53	0.10
HR after 3 minutes	88.43±14.60	102.60±15.26	0.001
Mean change in HR	-14.06±11.29	5.80±13.81	<0.001

DISCUSSION

There is a huge risk of intrapartum hemorrhage in pregnant patients planned for CD because of atony of uterine. Oxytocin is used in CD to treat uterine atony and its prophylactic administration can reduce the incidence hemorrhage by 40%.¹⁰Oxytocin administration is associated with hypotension and tachycardia, it can also cause vomiting, nausea, headache and arrhythmias.¹¹ Deterrence of these events is clinically very important.

In present study we found that phenylephrine administration significantly obtund oxytocin related hypotension and tachycardia in CS patients. In present study, reduction in SBP was more in placebo group -8.13±18.02 versus -0.43±8.35 mmHg in phenylephrine group. While we observed increase in HR in placebo group and a significant reduction in HR was observed in phenylephrine group.

Hasan et al. also found significant frequency of hypotension in 46.5% patients who did not received phenylephrine and in only 20% patients who received phenylephrine 100 µg bolus and in 0% patients who received 200 µg bolus of phenylephrine.¹² However, Rumball et al. did not found any significant effect of phenylephrine to obtund the significant decrease in systolic blood pressure and increase in heart rate after oxytocin

administration.⁹ In present study, we gave 50 µg bolus of phenylephrine.

Recommendations have been made that the oxytocin dose for routine prophylaxis of uterine atony and PPH at CS should be reduced.¹³ This has been supported by numerous studies. Sartain et al. showed fewer HR and BP changes after a bolus of 2 U rather than 5 U, suggesting a dose-dependent response.¹⁴A latest randomized trial confirmed that three U oxytocin administered over 15s, repeated two times if necessary in response to inadequate uterine contraction, become associated with a decrease total oxytocin dose compared with continuous infusion of oxytocin at some point of optional CS¹³.

However, obstetricians worldwide still often request oxytocin 10 U. In pregnant females with severe cardiac disorder, the recommendation is that very low dose of oxytocin 0.05–0.5 U should be used. In a single such case series, patients with cardiac conditions who had been given titrated doses of oxytocin (powerful in preventing the hemodynamic consequences of oxytocin) had good enough uterine contraction. Slow administration as opposed to a speedy bolus, is also powerful at minimizing cardiovascular effects. Thomas et al. Confirmed that after a dose of five U is given as a slow infusion, HR and BP changes were confined to within 10% of baseline values¹⁵.

Phenylephrine is a strong direct-acting alpha-1 adrenergic receptor agonist, which causes vasoconstriction

and reflex bradycardia. Its movements on the human move, and more specifically on maternal hemodynamics, have been reviewed clearly.¹⁶ Phenylephrine is a fast onset and short-appearing agent, and has emerge as the drug of preference for reversing SA-caused hypotension, which is due to arterial vasodilatation resulting in a reduction in SVR¹⁷.

It would therefore seem applicable to administer phenylephrine to counter the reduction in SVR and tachycardia caused by oxytocin. The hemodynamic effects of oxytocin were obtunded significantly in our study patients.

CONCLUSION

Phenylephrine significantly obtund oxytocin-induced changes in systolic blood pressure and heart rate (in terms of tachycardia) during caesarean section.

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