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Original Research Article

Efficacy of Dexmedetomidine and Propofol for Preventing Intraoperative Nausea and Vomiting During Spinal Anaesthesia for Caesarean Section – A Comparative Study

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Abstract:

Background: Spinal anaesthesia has been associated with intraoperative nausea and vomiting (IONV), especially during caesarean section, which is attributed to several mechanisms. Some recent studies showed that a few drugs used in anaesthesia practice like propofol, dexmedetomidine are effective in preventing intraoperative nausea and vomiting.

Aims and Objective: To compare the efficacy of propofol and dexmedetomidine to decrease intraoperative nausea and vomiting during spinal anaesthesia for caesarean section under spinal anaesthesia.

Methodology: An institution based prospective analytical study was conducted. 88 parturients, ASA class II, aged 20-30 years, who were going for spinal anesthesia for caesarean section were divided into two groups, group D (Dexmedetomidine group) and group P (Propofol group). Group D received 1μg/kg intravenous dexmedetomidine diluted to 20 mL with physiological saline, group P received 0.4 mg/kg intravenous propofol diluted to 20 mL with physiological saline, after umbilical cord clamping. Patients' hemodynamics will be was monitored at 3-minute intervals. Incidence of nausea and committing was evaluated according to Bellville scoring system during the intraoperative period.

Results: Incidence of intraoperative nausea and vomiting was higher in Dexmedetomidine group than Propofol group but it was not statisfically significant. Incidence of bradycardia was higher in Dexmedetomidine group ($p < 0.05$) but incidence of hypotension was significantly ($p < 0.05$) higher in Propofol group though neither of these required any drug intervention. Oxygen saturation level, sedation score and respiratory rates were similar between the two groups.

Conclusion: Propofol and dexmedetomidine are equally effective to decrease intraoperative nausea and vomiting during spinal anaesthesia for caesarean section

Keywords: Propofol, Dexmedetomidine, Nausea; Vomiting, Caesarean Section, Anaesthesia, Spinal.

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Introduction

Spinal anaesthesia is widely-accepted as the anaesthetic method of choice for caesarean section owing to its safety and speed. However, there are a few trivial yet disturbing side effects observed with this technique, including intraoperative nausea and vomiting (IONV). IONV during spinal anaesthesia is associated with multiple etiologies, associated with immediate contractions of diaphragm and causes a lot of problems to both patients and surgeons and from anaesthesia point of view, the most dangerous problem is risk of pulmonary aspiration, specially in full stomach patients. To prevent or at least to reduce the morbidities associated with IONV, some drugs are being used conventionally such as antihistamine drugs, droperidol, metoclopramide, ondansetron etc which on other hand, produce undesirable side effects, like extra pyramidal symptoms (dopamine receptor antagonists), excessive sedation and tachycardia (antihistamine drugs),dystonic reactions etc.[1,2,3,4,]. Recent re-

searchers have already focussed on the search for effective and well tolerated antiemetic agents which lack the adverse effects of older agents. Propofol, a diisopropylphenol derivative, used for induction and maintenance of surgeries, is known to exert antiemetic properties even in subhypnotic dose [5,6]. The precise mechanism of propofol's antiemetic properties has not been elucidated, signal mechanism have been proposed including a direct depressant effect on CTZ, the vagal nuclei and other centres implicated in nausea and vomiting. In animal models, propofol has been shown to decrease synaptic nerve transmission in the olfactory cortex and a decrease serotonin levels in the area postrema[7]

Dexmedetomidine is a potent and highly selective α2-adrenoceptor agonist, widely used in different clinical settings like anaesthesiology and intensive care unit (ICU), binds to transmembrane G protein-binding receptor located in the brain and spinal cord. It affects the functions of central nervous system, circulatory system and exhibits sedative, analgesic, sympatholytic properties[8]. Recently, the effect of dexmedetomidine on nausea /vomiting has been the focus of clinical researchers. Recently, many studies have shown that it has antiemetic effect [9,10]. The proper mechanism of antiemetic action is still unclear. Most likely by increasing sympathetic outflow and decreasing parasympathetic outflow from the central nervous system, dexmedetomidine may exert its effect by increasing the gastric emptying and the gastrointestinal motility, which possibly has an important effect in decreasing IONV[11].

Aims and Objective

The primary goal of this study was to compare the efficacy of propofol and dexmedetomidine to decrease intraoperative nausea and vomiting during caesarean section under spinal anaesthesia. With it, our aim was to notice the effect of these two drugs on hemodynamic parameters on patients in terms of heart rate, oxygen saturation, systolic, diastolic and mean blood pressure during surgery and sedation score and also to monitor the sedation in both groups according to the Ramsay sedation scale .We also noticed whether any rescue antiemetic was needed or not in either population during the study.

Methods

After getting approval from the institute's ethics committee, an observational analytical study with a prospective design was conducted in North Bengal medical college on 88 parturients undergoing elective caesarean section surgery under spinal anaesthesia in the obstetrics and gynaecology operation theatre, aged between 20 years and 30 years and of ASA II category, maintaining both inclusion-exclusion criteria. The duration of this study was over 4 months. Pre- anaesthetic check-up was performed on each patient including history taking, physical examination, neurological assessment, investigations. Written informed consent was taken from all the patients in their own language.

All parturients were maintained on a nil per oral diet for 8 hours prior to anaesthesia and received IV ranitidine (2-4 mg/kg) 90 minutes prior to the surgery as premedication to decrease the risk of acid pneumonitis. No other antiemetics was given as pre medication. In the operating room, intravenous line was secured with 18G cannula and patients were coloaded with ringer's lactate solution at 15ml/kg. Monitors including pulse oximeter, non-invasive arterial blood pressure, and electrocardiograph were connected to the patient and baseline vitals recorded. Then they were allocated randomly with the help of computer generated random number tables into two groups consisting 44 adults in each group.

Under aseptic condition, spinal anaesthesia was given in L3-L4 intervertebral interspace through 25 G Quincke lumbar puncture needle with hyperbaric bupivacaine 0.5% solution.

Group D: group D was received 1μg/kg intravenous dexmedetomidine diluted to 20 mL with physiological saline after umbilical cord clamping

Group P: group P was received 0.4 mg/kg intravenous propofol diluted to 20 mL with physiological saline, after umbilical cord clamping. Haemodynamic parameters were monitored and recorded using a preset proforma at 3 minutes intervals throughout surgery. Hypotension, a decline of more than 20% from baseline pressure or mean arterial pressure <65 mm hg was managed with mephentermine (6 mg iv at incremental doses) or phenylephrine (100 mcg iv at incremental doses).Nausea and vomiting was evaluated using Bellville scoring tools for assessment of nausea and vomiting (0=no symptoms, 1= nausea, 2 =retching, 3= vomiting) [12] Sedation was graded according to the Ramsay sedation scale at 10 min interval until the end of surgery. (1- awake – anxious and agitated or restless or both ; 2- awake,co-operative; 3- response to commands; 4-responsive to mild stimuli; 5- responsive to pain stimuli; 6- asleep, unresponsive) [13] Need for any rescue antiemetics, was also be noted.We decided to use injection metoclopramide 10 mg IV in that case.

Result

There were a total number of 88 patients in this study. Demographic data had shown no significant differences except for gravidity between groups. Mean duration of surgery was 41.18 minutes. Mean age of the study population was 24.58 (SD± 2.410) .The mean weight of study population was 65.16 (SD± 7.597).Mean of all preoperative vitals are shown in table 1. Among 88 study population, ma-

jority (84.1%) did not have any episode of nausea or vomiting.10.2 % had one episode of IONV and rest 5.7% had 2 episode of IONV. Comparison of IONV was slightly more in group D but this was not statistically significant (table 2).Only one patient had crossed Nausea-vomiting Bellville grading score 2.(table 2).For this patient only, we used injection metoclopramide 10 mg iv as rescue antiemetic. Total 12 patient developed bradycardia and among them proportion was higher among D (83.3%) group than P group which was statistically significant ($p < 0.05$)(table 3).

11 patients of P group developed hypotension which was also statistically significant ($p < 0.05$) compared to other group (table 4). However, there was no statistically significant difference in the sedation score at each time point between the two groups (Figure 1).

All patients had an adequate sensory level of spinal block for surgery, i.e. T3- T5 sensory level. Oxygen saturation level and respiratory rates were similar between the two groups. There was no such adverse effects seen by these two drugs during study. No patient could recall what happened during the operation.

Table 1: Descriptive Statistics of Patient Demographics and Preoperative Vital Signs

Variables	N	Mean	Standard deviation
Age	88	24.6	2.41
Body weight (kg)	88	65.2	7.59
Preoperative spo2	88	99.7	0.45
Preoperative heart rate	88	87.9	8.09
Preoperative respiratory rate	88	21.2	2.2
Preoperative SBP (mm hg)	88	124	7.52
Preoperative DBP (mm hg)	88	79.6	5.65
Preoperative MBP (mm hg)	88	94.3	5.56

Table 2: Distribution of Nausea/Vomiting Grading by Drug Group

Drug groups	Episode of nausea/vomiting				Total	P-Value
	0	1	2			
D	36 (81.8%)	6 (13.6%)	2 (4.5%)		44 (100%)	0.534
P	38 (86.4%)	3 (6.8%)	3 (6.8%)		44 (100%)	
Total	74 (84.1%)	9(10.2%)	5 (5.7%)		88	
	Grading of nausea/vomiting					
	0	1	2	3		
D	36 (81.8%)	5 (11.4%)	2 (4.5%)	1 (2.3%)	44 (100.0%)	0.74
P	38 (86.4%)	3 (6.8%)	3 (6.8%)	0 (0.0%)	44 (100.0%)	
Total	74 (84.1%)	8 (9.1%)	5 (5.7%)	1 (1.1%)	88 (100.0%)	

Table 3: Distribution of Preoperative Heart Rate by Drug Group

Drug groups	Heart rate		Total	P value
	Bradycardia n (%)	Normal n (%)		
D	10 (83.3%)	34 (44.7%)	44	0.013
P	2(16.7%)	42(55.3%)	44	
Total	12 (100%)	76 (100%)	88	

Table 4: Distribution of Mean Blood Pressure Status by Drug Group

Drug Group	Hypotension n (%)	Normal MBP n (%)	Total (n)	P-value
D	4 (26.7%)	40 (54.8%)	44	0.043
P	11 (73.3%)	33 (45.2%)	44	
Total	15 (100%)	73 (100%)	88	

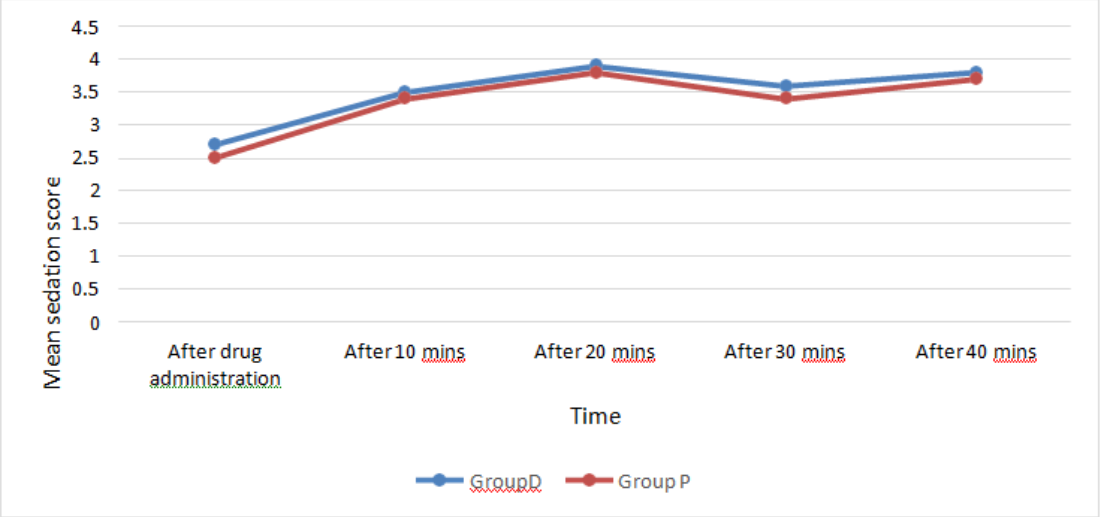

Figure 1: Line diagram showing mean sedation score for both the drugs with respect to time

Statistical analysis plan: Collected data was checked for consistency and completeness and entered in Microsoft Excel data sheet. Data was organized and presented using the principles of descriptive statistics with help of tables and charts. Appropriate test was applied for categorical variables. P value less than 0.05 was considered as statistically significant. Analysis of the data was done by IBM SPSS version 20

Discussion

IONV (Intraoperative nausea and vomiting) occurs more frequently in parturients than non- pregnant women who undergo abdominal surgeries under regional anesthesia. Physiological changes of pregnancy are considered as an important factor for IONV during caesarean section like high level of progesterone and its subsequent smooth muscle relaxation, increased gastrin secretion, decreased gastrointestinal motility, and lowered esophageal sphincter. One of the important factors that may influence the incidence or severity of IONV with spinal anaesthesia is sympathectomy-related hypotension.

Propofol infusion at subhypnotic doses as an antiemetic has been broadly investigated [14,15]. Rasooli et al have shown subhypnotic doses of midazolam or propofol are effective in the prevention of nausea and vomiting during and after caesarean section with spinal anesthesia and does not significantly influence hemodynamic of the patients [16]. Gurbet et al [17] found that the intraoperative infusion of dexmedetomidine significantly reduced the PONV in patients undergoing total abdominal hysterectomy. In a study Geng et al [18] showed that for adult patients undergoing gynaecological laparoscopic surgery, supplemental use of dexmedetomidine during general anaesthesia reduced the incidence of early postoperative nausea but not vomiting within the 24 h after surgery. Here, in this study, we found that Propofol and Dexmedetomidine are both effective in preventing IONV in cesarean section under spinal anaesthesia. Patients receiving Dexmedetomidine had slightly higher incidence of IONV than those who received Propofol but that was not statistically significant. Majority of the patients in our study did not developed any symptom of nausea.

Dexmedetomidine is a potent and highly selective α2-adrenoceptor agonist. Alpha-2–mediated vasoconstriction may result in transient tachycardia and elevated blood pressure. However, once the baroreceptor is upregulated and the vagal tone is activated, dexmedetomidine may induce hypotension with sympatholytic effects as a result of the reduced release of norepinephrine. In pregnant women, baseline heart rate, stroke volume, and cardiac output are already increased to meet the metabolic demand of the fetus; impairing the compensation of cardiovascular effects may affect parturient's baseline cardiovascular function and cause organ damage [19].

In a study of 2020, Bailong Hu et al showed that intravenous dexmedetomidine (1 μg/kg) and midazolam (0.02 mg/kg) were equally effective in preventing PONV introduced by hemabate and dexmedetomidine is superior to midazolam in patient satisfaction[20]. Here, in our study, we focussed on intraoperative period and here the proportion of IONV was not statistically significant in between propofol and dexmedetomidine group for caesarean section under spinal anaesthesia and sedation score was similar in two drugs. In another study of 2022 by Hyoseok Kang et al, it was seen that dexmedetomidine and midazolam showed similar hemodynamic effects and patient satisfaction in parturients under spinal anaesthesia. [21]. Here, we found that proportion of bradycardia was more in patients who received Dexmedetomidine but hypotension was more in Propofol group but either of

these required no intervention. They became normal with time within intraoperative period. Though we found higher incidence of bradycardia in Dexmedetomidine group and hypotension in propofol group, neither of these was too much deviated from normal lower limit and required any active drug intervention.

These issues resolved spontaneously within the intraoperative period. So, most probably these were due to effect of spinal anaesthesia due to various causes discussed earlier and not due to these two drug interventions. This is the first of its kind study according to our literature review comparing these two drugs. As there is paucity of research regarding direct comparison of these two drugs, dexmedetomidine and propofol for prevention of IONV during cesarean section under spinal anaesthesia the ideal dose and mode of administration still not clear. So, more extensive research in multiple centres might reveal newer findings regarding these two drugs.

Conclusion

In conclusion**,** IV dexmedetomidine (1 microgram/kg) and propofol (0.4mg/kg) diluted to 20 mL with physiological saline after umbilical cord clamping are equally effective in preventing intraoperative nausea and vomiting during spinal anaesthesia for caesarean section.

Abbreviation

- IONV – intraoperative nausea and vomiting
- PONV – post operative nausea and vomiting
- ASA – American society of anaesthesiologists
- HR – heart rate
- SBP – systolic blood pressure
- DBP – diastolic blood pressure
- MBP – mean blood pressure
- RR – respiratory rate
- SpO2 – peripheral oxygen saturation

References

1. Caesarean section under spinal Fujji Y, Tanaka H, Kobayashi N. Prevention of nausea and vomiting after middle ear surgery: Granisetron versus ramosetron. Laryngoscope 1999; 109.
2. Mishriky BM, Habib AS. Metoclopramide for nausea and vomit-ing prophylaxis during and after Caesarean delivery: a system-atic review and meta-analysis. Br J Anaesth. 2012; 108(3): 374–83.
3. Goodman and Gilman, The pharmacological basis of Therapeutics; 1343.
4. Santos A, Datta S. Prophylactic use of droperidol for control of nausea and vomiting during spinal anesthesia for cesarean sec-tion. Anesth Analg. 1984;63(1):85–7.
5. Tarhan Ö, Canbay Ö, Çelebi N, Uzun S, Sahin A, Cos¸kun F et al. Subhypnotic doses of midazolam prevent nausea and vomiting during spinal anaesthesia for caesarean section. Minerva Anesthesiol 2007; 73: 629-34.
6. Strunin L, Rowbotham D, Miles A, eds. The effective management of postoperative nausea and vomiting.London: Aesculapius Medical Press, 1999: 1–42.
7. Peck TE, Williams M, Hill SA. Pharmacology for anaesthesia and intensive care. 2nd ed. European journal of Anaesthesiology 2005; 22: 733–4.
8. Afonso J, Reis F. Dexmedetomidine: current role in anesthesia and intensive care. Rev Bras Anestesiol 2012; 62:118–33.
9. Khasawinah TA, Ramirez A, Berkenbosch JW, et al. Preliminary experience with dexmedetomidine in the treatment of cyclic vomiting syndrome. Am J Ther. 2003;10(4):303–307. doi: 10.1097/00045391-200307000-00012.
10. Zaben KRA, Mohsen WA, Basha AS, Al-Zaben KR, Al-Mustafa MM, Alghanem SM. A balanced anesthesia with dexmedetomidine decreases postoperative nausea and vomiting after laparoscopic surgery. Saudi Med J. 2009;30(12):1537–1541.
11. Massad IM, Mohsen WA, Basha AS, Al-Zaben KR, Al-Mustafa MM, Alghanem SM. A balanced anesthesia with dexmedetomidine decreases postoperative nausea and vomiting after laparoscopic surgery. Saudi Med J. 2009 Dec 1;30(12):1537-41.
12. Bellville JW, Bross ID, Howland WS. A method for the clinical evaluation of antiemetic agents. Anesthesiology 1959; 20:753e60.
13. Dawson R, von Fintel N, Nairn S. Sedation assessment using the Ramsay scale. Emergency Nurse. 2010 Jun 9;18(3).
14. Seyedhejazi M, Eydi M, Ghojazadeh M, Nejati A, Ghabili K, Golzari SE, et al. Propofol for laryngeal mask airway insertion in children: Effect of two different doses. Saudi J Anaesth. 2013;7(3):266–9.
15. Rodola F. Midazolam as an anti-emetic. Eur Rev Med Pharmacol Sci. 2006;10(3):121–6.
16. Rasooli S, Moslemi F, Khaki A. Effect of sub hypnotic doses of propofol and midazolam for nausea and vomiting during spinal anesthesia for cesarean section. Anesthesiology and pain medicine. 2014 Oct;4(4).
17. Gurbet A, Basagan-Mogol E, Turker G, Ugun F, Kaya FN, Ozcan B. Intraoperative infusion of dexmedetomidine reduces perioperative analgesic requirements. Can J Anaesth 2006; 53: 646-652.
18. Geng ZY, Liu YF, Wang SS, Wang DX. Intraoperative dexmedetomidine reduces early postoperative nausea but not vomiting in adult patients after gynaecological laparoscopic surgery: a randomised controlled trial. European Journal of Anaesthesiology. EJA. 2016 Oct

1;33(10):761-6.
19. Kinsella SM, Carvalho B, Dyer RA, Fernando R, McDonnell N, Mercier FJ, et al. Consensus Statement Collaborators. International consensus statement on the management of hypotension with vasopressors during cesarean section under spinal anaesthesia. Anaesthesia 2018; 73: 71-92.
20. Hu B, Zhou H, Zou X, Shi J, Li X, Tan L. A comparison of dexmedetomidine and midazolam for the prevention of postoperative nausea and vomiting caused by hemabate in cesarean delivery: a randomized controlled trial. Drug design, development and therapy. 2020 May 28:2127-33.
21. Kang H, Lim T, jeong Lee H, Kim TW, Kim W, Chang HW. Comparison of the effect of dexmedetomidine and midazolam under spinal anesthesia for cesarean delivery: a randomized controlled trial, single center study in South Korea. Anesthesia and Pain Medicine. 2023 Apr 4;18(2):159.