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ORIGINAL RESEARCH

Study of Post-Operative Analgesic Effect Using Plain Ropivacaine & Ropivacaine Combined with Epinephrine as Intraperitoneal Instillation & Incisional Infiltration in Caesarean Section Patients

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ABSTRACT

Background: Caesarean section commonly induces moderate to severe pain lasting 48 hours after surgery. Prompt and adequate post-operative pain relief is an important component of caesarean delivery that can make the period immediately after the operation less uncomfortable as well as mother can initiate early breastfeeding that helps to contract the uterus and accelerates the process of uterine involution in the postpartum period. Various clinical studies have shown that ropivacaine is equal to bupivacaine in local anesthetic potency and is less toxic than bupivacaine in regard to the production of mild central nervous system and cardiovascular toxicity. Methodology- The study was carried out a tertiary care center on patients fulfilling the inclusion and exclusion criteria. Patients were randomly allocated in two groups i.e, Group A & Group B consisting of 50 patients in each. Spinal anaesthesia was performed at L3-L4 with 8–10 mg of a hyperbaric bupivacaine 5 mg/mL solution. Intraperitoneal instillation and incisional infiltration with 30 mL of 0.25% ropivacaine was performed in Group A. Intraperitoneal instillation and incisional infiltration with 30 mL of 0.25% ropivacaine plus epinephrine (5mics) (1:2,00,000) was given in Group B. The haemodynamic monitoring was done at every 15 mins in first hour of skin closure, in the recovery room, then at 2 hours, 4 hours, 6 hours, 8 hours, 12 hours and 24 hours after closure of the skin measuring heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and SPO2. Results- In both the groups, study drugs prolonged the duration of analgesia for similar duration in post-operative period. Hence, there is no difference between duration of analgesia provided by the study drugs post-operatively in both the groups and is statistically non-significant since p>0.05. Conclusion- 0.25% plain ropivacaine 30 ml and 0.25% Plain ropivacaine 30 ml plus epinephrine (1:2,00,000). Both given as intraperitoneal instillation and incisional infiltration, provide adequate post-operative analgesia for similar duration of hours.

Keywords: Analgesic, ropivacaine, epinephrine, caesarean, intraperitoneal

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INTRODUCTION

Caesarean section is widely performed obstetric procedure, and different rates for this procedure are quoted all over the world. Caesarean section commonly induces moderate to severe pain lasting 48 hours after surgery. [1] Adequate postoperative pain relief is an important component of caesarean delivery that can make the period immediately after the operation less uncomfortable as well as mother can initiate early breastfeeding that helps to contract the uterus and accelerates the process of uterine involution in the postpartum period. Local anaesthetics cause reversible blockade of impulse propagation along the nerve fibres by inhibiting the influx of sodium ions through the cell membrane of the fibres. Several studies have reported on use of pre-emptive local anaesthetics (local anaesthetic given during the operation to prevent or reduce pain afterwards) to relieve postoperative pain, with results ranging from being beneficial [2, 3] to conferring no benefit.[4,5] The local anesthetic may be administered before or after the incision as abdominal nerve block or pre- or post-incisional abdominal wound infiltration. [6] Ropivacaine is FDA approved, amide type, long acting local anaesthetic that is structurally related to Bupivacaine. Ropivacaine is exclusively the S (-) enantiomer. Epinephrine is added to local anaesthetics with the objective to reduce the maximum plasma concentration.[7,8] causing local vasoconstriction at the site of injection [9] thereby slowing absorption. Epinephrine is rated as a pregnancy. category C drug by the FDA, but in small amounts appears safe for use with local infiltrative anaesthesia in pregnant women. The rationale for this route of administration is that the peritoneum is exposed to block of visceral nociceptive conduction, thereby providing an additional mechanism of analgesia.

In present study, we thus aimed to evaluate the post-operative pain relief by plain ropivacaine and ropivacaine plus epinephrine as intraperitoneal instillation & incisional infiltration prior to the closure of peritoneum at the end of caesarean-section.

MATERIALS & METHODS

The present cross sectional analytical study was undertaken at tertiary care centre after obtaining local ethical committee approval. The sample size taken for the study was 100 patients, divided into two groups i.e. Group A & Group B. Patients having age between 19 years to 35 years, ASA physical status II, elective caesarean section, previous caesarean section were included in the study. Whereas, patients with ASA physical status III and IV, hypersensitive to amide-type local anaesthetics, contraindicated for spinal anaesthesia, and those who needed emergency Caesarean- section were excluded from the study. Valid written informed consent was taken from the patients participating in the study.

Spinal anaesthesia was performed at L3-L4 with 8–10 mg of a hyperbaric bupivacaine 5 mg/mL solution. Adequate action was noted by pin prick sensation. A urinary catheter was inserted systematically before the Caesarean section and was left in place for 24 hours. All Caesarean sections was performed using a Pfannenstiel incision. Intraperitoneal instillation and incisional infiltration with 30 mL of 0.25% ropivacaine was performed in Group A. In Group B: intraperitoneal instillation and incisional infiltration with 30 mL of 0.25% ropivacaine plus epinephrine (5mics) (1:2,00,000) was given. Patients were prepared and draped. The Pfannenstiel incision was done. A routine lower segment caesarean section was performed, baby delivered, oxytocin 5 units given and the placenta delivered by cord traction. The uterus was closed by a single layer of inverted figure of 8 vicryl suture or continuous suture. Haemostasis was secured with further single sutures. Uterovesical visceral peritoneum on the anterior uterine wall was left unsutured.10 ml of prepared solution, was drawn into a 20ml syringe attached to a 23-gauge needle and needle-sprayed (instilled) on the unsutured peritoneal edges. The receded parietal peritoneal edges were sought for and pulled into view with several artery clamps. This was to allow visualization that enhanced direct instillation of

the prepared solution into the parietal peritoneum. The parietal peritoneum was also left unsutured. The rectus muscles were approximated with 2 interrupted vicryl 1 (polyglycolic) sutures. The rectus aponeurosis edges were instilled with another 10 ml of the prepared solution and the edges sutured with vicryl 1cutting needle. Remaining 10 ml was infiltrated subcutaneously along the superior and inferior skin wound edges and the skin approximated with subcutaneous absorbable vicryl 2. 0 sutures.

The **haemodynamic monitoring** was done at every 15 mins in first hour of skin closure, in the recovery room, then at 2 hours, 4 hours, 6 hours, 8 hours, 12 hours and 24 hours after closure of the skin measuring heart rate (HR), systolic blood pressure (SBP), Diastolic blood pressure (DBP), mean arterial pressure (MAP) and SPO2. Duration of analgesia by the study drug was checked and assessed. Pain assessment was done at every 15 minutes in 1st hr of skin closure, in the recovery room, then at 2 hours, 4 hours, 6 hours ,8 hours, 12 hours and 24 hours after closure of the skin. Time for rescue analgesia was recorded. Intraoperative and postoperative side effects were recorded.

RESULTS

Table 1: Heart rate among study population

Heart rate	**Group A**		**Group B**		**P-value**
	Mean	**SD**	**Mean**	**SD**	
Before infiltration	96	5.71	94	7.84	**0.14**
After 15 min	88	12.24	87	12.16	**0.68**
After 30 min	80	2.79	79	2.25	**0.06**
After 45 min	78	1.14	77	7.20	**0.33**
After 1 hour	76	1.93	76	1.93	**1**
After 2 hours	75	4.02	74	1.21	**0.09**
After 4 hours	74	7.38	75	7.5	**0.5**
After 6 hours	80	4.84	79	1.52	**0.1**
After 8 hours	84	7.05	82	4.27	**0.08**
After 12 hours	86	8.58	84	5.11	**0.15**
After 24 hours	88	8.81	86	6.52	0.2

Table 2: Systolic BP among study population

Systolic BP	**Group A**		**Group B**		**P- value**
	Mean	**SD**	**Mean**	**SD**	
Before infiltration	122	8.39	120	2.96	**0.11**
After 15 min	121	7.3	120	5.29	**0.43**
After 30 min	118	2.45	117	6.46	**0.30**
After 45 min	113	4.81	115	6.83	**0.09**
After 1 hour	112	8.47	112	5.46	**0.99**
After 2 hours	110	7.47	110	1.93	**0.99**
After 4 hours	115	11.59	117	6.89	**0.29**
After 6 hours	120	5.84	122	5.84	**0.09**
After 8 hours	124	1.76	124	1.76	**1**
After 12 hours	123	6.53	124	1.76	**0.29**
After 24 hours	120	5.95	122	7.11	**0.13**

Table 3: Diastolic BP among study population

Diastolic BP	Group A		Group B		P-value
	Mean	SD	Mean	SD	
Before infiltration	82	4.83	84	7.19	**0.1**
After 15 min	80	5.79	82	4.83	**0.06**
After 30 min	78	5.86	78	5.86	**1**
After 45 min	76	3.2	76	3.20	**1**
After 1 hour	74	3.02	74	3.02	**1**
After 2 hours	71	6.51	72	4.16	**0.36**
After 4 hours	72	2.35	72	2.35	**1**
After 6 hours	78	5.86	80	5.79	**0.08**
After 8 hours	80	5.79	82	4.83	**0.06**
After 12 hours	82	8.2	84	3.49	**0.11**
After 24 hours	82	4.83	84	8.07	**0.13**

Table 4: MAP among study population

MAP	Group A		Group B		P -value
	Mean	SD	Mean	SD	
Before infiltration	95.33	4.5	96	4.87	**0.47**
After 15 min	93.66	5.2	94.66	3.72	**0.27**
After 30 min	91.33	4.1	91	4.32	**0.69**
After 45 min	88.33	2.57	89	3.34	**0.26**
After 1 hour	86.66	3.57	86.66	2.91	**0.99**
After 2 hours	84	4.39	84.66	2.84	**0.37**
After 4 hours	86.33	4.39	87	2.13	**0.33**
After 6 hours	92	4.49	94	4.75	**0.03***
After 8 hours	94.66	3.88	96	3.52	**0.07**
After 12 hours	95.66	5.67	97.33	2.5	**0.06**
After 24 hours	94.66	3.76	96.66	6.18	**0.06**

*shows statistical significance

Table 5: VAS among study population

VAS	Group A		Group B		P value
	Mean	SD	Mean	SD	
Before infiltration	1	1.03	2	0.8	**<0.0001***
After 15 min	1	0.92	1	0.69	**1**
After 30 min	1	0.94	1	0.88	**1**
After 45 min	0	0	0	0	**0**
After 1 hour	0	0	0	0	**0**
After 2 hours	1	0.94	1	0.92	**1**
After 4 hours	2	0.78	2	0.78	**1**
After 6 hours	4	0.67	4	0.75	**1**
After 8 hours	5	1.14	5	1.56	**1**
After 12 hours	5	1.79	5	2.04	**0.99**
After 24 hours	5	1.73	5	2.13	**0.99**

*shows statistical significance

Table 6: Duration of analgesia among study population

Duration of analgesia	Group A		Group B		P-value
	Mean	SD	Mean	SD	
Time in hours	4.82	1.59	4.74	1.7	**0.8**

Table 7: SPO2 among study population

SPO2	Group A		Group B		P- value
	Mean	SD	Mean	SD	
Before infiltration	99	1.65	98	2.49	**0.01***
After 15 min	99	1.51	99	1.61	**1**
After 30 min	100	0	99	1.61	**0.0002***
After 45 min	100	0	100	0	**0**
After 1 hour	100	0	100	0	**0**
After 2 hours	100	0	100	0	**0**
After 4 hours	99	1.51	99	1.61	**1**
After 6 hours	99	1.51	99	1.61	**1**
After 8 hours	98	2.49	98	2.49	**1**
After 12 hours	99	1.51	99	1.61	**1**
After 24 hours	98	2.49	99	1.61	**1**

*shows statistical significance

DISCUSSION

HEART RATE

In table 1. HR before infiltration and instillation of study drug in group A is 96±5.71 and in group B is 94±7.84 HR after infiltration and instillation of the study drug in GROUP A and GROUP B at 15 mines, 30mins, 45 mines, 1 hr., 2 hours., 4 hours, 6 hours, 8 hours, 12hours and 24 hours were comparable in both groups, P VALUE> 0.05, hence statistically not significant between both groups. HR at 2 hours and 4 hours are 75±7.38, 74±7.38 in group A and in group B to be 74±1.21 and 75±7.5 respectively, were significantly lower in both the groups than the other noted time interval showing minimal pain and hence maximum effect of the study drugs at that time duration. Study conducted by Hongyu Zhou et al [10] showed the HR at every postoperative time point were not significantly different between groups.

SYSTOLIC BLOOD PRESSURE

In table 2, SBP before infiltration and instillation of study drug in group A is 122±8.39 and in group B is 120±2.96. SBP after infiltration and instillation of the study drug in GROUP A and GROUP B at 15 mins, 30mins, 45 mins, 1 hr, 2 hours, 4 hours, 6hours, 8 hours, 12 hours and 24 hours were comparable in both groups, P VALUE> 0.05, hence statistically not significant between both the groups. Study conducted by Hongyu Zhou et al [10] showed the BP at every postoperative time point were not significantly different between groups.

DIASTOLIC BLOOD PRESSURE

In table 3, DBP before infiltration and instillation of study drug in group A is 82±4.83 and in group B is 84±7.19 DBP after infiltration and instillation of the study drug in GROUP A and GROUP B at 15 mins, 30mins, 45 mins, 1 hr, 2 hours, 4 hours, 6hours, 8 hours, 12hours and 24 hours were comparable in both groups, P-VALUE> 0.05, hence statistically not significant between both groups. Study conducted by Hongyu Zhou et al [10] showed the BP at every postoperative time point were not significantly different between groups.

MEAN ARTERIAL PRESSURE

In table 4, MAP before infiltration and instillation of study drug in group A is 95.33±4.5and in group B is 96± 4.87. MAP after infiltration and instillation of the study drug in GROUP A and GROUP B at 15 mins, 30mins, 45 mins, 1 hr, 2 hours, 4 hours, 8 hours, 12 hours and 24 hours were comparable in both groups, P VALUE> 0.05, hence statistically not significant between both groups. P- value at 6 hours between both the groups is 0.03 showing significant results. Study conducted by Hongyu Zhou et al[10] showed the MAP at every postoperative time point were not significantly different between groups.

VAS SCORE

In table 5, VAS score before infiltration and instillation of study drug in group A is 1.00±1.03 and in group B is 2±0.80, p value<0.0001 showing significant results between two groups. VAS score after infiltration and instillation of the study drug in GROUP A and GROUP B at 15 mins, 30mins, 45 mins, 1 hr, 2 hours, 4 hours, 6 hours, 8 hours, 12hours and 24 hours were comparable in both groups, P VALUE> 0.05, hence statistically not significant between both groups. VAS SCORE in both the groups at 6 hours in group A to be 4.0± 0.67 and in group B to be 4.075± 1.0 showing need for recue analgesia at 6thhour onwards since VAS>4. Rescue analgesia in both the groups is given by iv paracetamol at VAS>4 paracetamol 1 g IV was administered when the patients complained of pain with VAS>4 and then repeated every 6 hours over 24 hours. Study conducted by Hongyu Zhou et al 10 showed that VAS SCORE between two groups were comparable and the time to first rescue analgesic requirement was prolonged in study group where ropivacaine infiltration was done. Study by N.K. Nguyen et al 11 showed that the pain score was reduced after the surgery from 1 to a maximum of 4 hours.

DURATION OF ANALGESIA

In table 6, Duration of analgesia in group A is 4.82± 1.59 hours and group B is 4.74± 1.7 hours which is comparable between both the groups and statistically not significant with p value> 0.05.A study conducted by Cederhol m I et al[12] showed that ropivacaine diminishes and does not accentuate the vasoconstrictive effect of adrenaline and addition of adrenaline does not prolong analgesia provided by plain ropivacaine. Study by Gupta et al [13] Large volume ropivacaine at relative lower concentration injected into cholecystectomy wounds decreased wound pain and prolonged the time of the first request for postoperative analgesia.

SP02

In TABLE 7, SP02 before infiltration and instillation of study drug in group A is 99±1.65 and group B Is 98±2.49, p value=0.01, showing significant results. SPO2 after infiltration and instillation of the study drug in GROUP A and GROUP B at 15 mins, 45 mins, 1 hr, 2 hours, 4 hours, 6 hours, 8 hours 12hours and 24 hours were comparable in both groups, P VALUE> 0.05. Hence, statistically not significant between both groups. At 30 mins, p value=0.0002, though showing significant results, but not affecting patients health status. Our study suggests that instillation and infiltration of the study drug does not cause any respiratory depression decreasing oxygen saturation and that this technique is beneficial to the patients not affecting ventilation and saturation of the patients than the other techniques used for analgesia. In the study by Writer et al. in 1985, respiratory depression was observed in 7% of patients[14] who received 5 mg of morphine by the epidural route, which imposes prolonged monitoring of ventilation up to 24 hours after the injection. Even spinal opioid causes risk of delayed respiratory depression because of cephalic spread as well as other secondary effects such as nausea, vomiting, and pruritis. [15] The risk of complications

such as respiratory depression, urinary retention, pruritus, nausea, and vomiting can cause discomfort to the patient.

CONCLUSION

From our study we conclude that, use of plain ropivacaine with or without adrenaline as intraperitoneal instillation and incisional infiltration provides effective prolonged post-operative analgesia, time for rescue analgesia is prolonged in both the groups. It reduces VAS score significantly in early postoperative period. Provides haemodynamic stability. No major systemic side effects and addition of epinephrine doesn't increase the duration of analgesia and provides no additional benefit.

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