

# Local Infiltration and Intraperitoneal Instillation of Ropivacaine versus Local Ropivacaine Infiltration alone for Post-Operative Pain Control in Elective Cesarean Section

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## Abstract

**Introduction:** The post-operative period is as important as the pre-operative and intraoperative period for an anesthesiologist. The aim should be to get pain free and comfortable patients after every surgery whether it is done in regional or general anesthesia. Spinal anesthesia is used routinely for cesarean sections, but its effect lasts for few hours only, so to make patients pain free, different multimodal analgesia techniques with minimal side effects have been tried for post-parturient as they may also have a negative impact on the health of a newborn infant. As already studied, inj. ropivacaine is comparatively safer option than inj. bupivacaine. For post-operative analgesia in patients underwent cesarean surgery, we tested local infiltration of injected ropivacaine alone against both intraperitoneal instillation and local infiltration.

**Aims and Objectives:** Inj. ropivacaine 0.2% intraperitoneal instillation and local infiltration for the management of post-operative pain after elective cesarean section under spinal anesthesia were evaluated against inj. ropivacaine 0.2% inj. local infiltration alone in the present study.

**Materials and Methods:** An American Society of Anesthesiologists Grades I and II pregnant woman undergoing spinal anesthesia for an elective cesarean section was separated into two groups randomly (R1 and R2 group, each have 30 patients). A 20 mL injection of 0.2% ropivacaine was administered to Group R1 patients before the skin closure at an incision site and patients in Group R2 administered with intraperitoneal instillation of inj. ropivacaine 0.2% in 5 mL Inj. before peritoneum closure and local infiltration of 15 mL inj. ropivacaine at the site of incision, before skin closure. During the post-operative period, visual analog scale (VAS) was used to measure pain intensity, and the analgesia duration was evaluated by timing the beginning of the sensory block to the time at which additional analgesia was requested. Patients' hemodynamic and side effects data were also collected.

**Results:** Group R2 had a considerably extended analgesia duration than Group R1 ( $P < 0.05$ ).  $147.17 \pm 4.67$  and  $170.33 \pm 3.69$  min were the mean ( $\pm$ SD) analgesia duration in R1 and R2 groups, respectively. At the time of the initial analgesic request, the following mean ( $\pm$ SD) VAS values were observed: Group R1 –  $36.7 \pm 5.14$  and Group R2 –  $32.6 \pm 6.52$ .

**Conclusion:** Combining inj. ropivacaine 0.2% local infiltration with intraperitoneal instillation improves post-operative analgesia in cesarean section than using inj. ropivacaine 0.2% local infiltration alone under spinal anesthesia.

**Key words:** Cesarean section, Intraperitoneal instillation, Local infiltration, Ropivacaine, Spinal anesthesia

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## INTRODUCTION

Nowadays, the use of a cesarean section for delivery has become very frequent.<sup>[1]</sup> About 15–20% of all deliveries are done with cesarean section over the world whereas the numbers (40%) are more in developing countries.<sup>[2]</sup> We can use multiple anesthesia techniques for cesarean sections such

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as spinal, epidural, spinoepidural, or general anesthesia. Like any surgery, cesarean section is also associated with intense pain postoperatively that can be treated with opioids or nonsteroidal anti-inflammatory drugs, or combination. We cannot use IV opioids in parturients as they need to nurture their newborn baby and are associated with side effects such as urinary retention, respiratory depression, vomiting, pruritus, as well as nausea.<sup>[1,3]</sup> The pain after surgery makes the post-anesthesia period more uncomfortable and it interferes with emotional bonding to develop with the newborn and to start breastfeeding, also increases hospital stay and cost of the stay.<sup>[3,4]</sup>

Opioids are necessary for the treatment of severe pain and epidural analgesia needs close supervision, but non-opioid systemic analgesics are ineffective in reducing pain.<sup>[1,5]</sup> Ropivacaine, a long-acting local anesthetic, is a pure left isomer with lower toxicity potential on the central nervous system and cardiovascular system than bupivacaine. Ropivacaine lowers opioid intake by blocking painful impulses from the injury site through reversible hyperpolarization of peripheral nerve fibers.<sup>[6]</sup>

## MATERIALS AND METHODS

Informed approval and consent from the Institutional Ethics Committee were required for this prospective randomized clinical study on 60 pregnant women with American Society of Anesthesiologist Grades I and II undertaking elective cesarean sections, scheduled under spinal anesthesia which were involved and operated by the same surgical team. All patients were blinded about group allocated, exclusion criteria for the study were known sensitivity background to local anesthetics of amide-type, patient's refusal, skin site infection, patients on opioids, valvular heart disorders, elevated intracranial tension, endocrinal diseases, renal diseases, metabolic disorders, coagulation disorders, hepatic disorders, as well as cesarean section under epidural/general anesthesia. The envelope method was used to randomly divide the patients into two groups.

Group R1 ( $n = 30$ ) – 20 mL of local infiltration inj. ropivacaine 0.2% at site of incision.

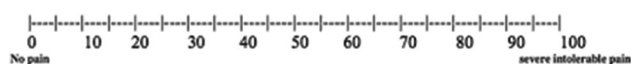
Group R2 ( $n = 30$ ) – 15 mL inj. ropivacaine 0.2% is injected locally at the incision site, and 5 mL inj. ropivacaine 0.2% is injected intraperitoneally. As a preoperative preparation, an intradermal sensitivity test for ropivacaine was performed on all patients. Inj. glycopyrrolate 0.2 mg I.M was administered 30 min before induction of anesthesia, inj. ranitidine 50 mg and inj. metoclopramide 10 mg to all patients. Preloading with ringer lactate in a dose of 10 ml/kg BW with 18G cannula was done before induction

of anesthesia. On the surgery day, the patient was brought into the OT, and the multipara monitor consisted of heart rate (HR), non-invasive blood pressure (BP), SpO<sub>2</sub> (pulse oximeter), as well as electrocardiography was attached. In the left lateral decubitus site, a Quincke spinal needle of 25-gauge was used to execute a midline subarachnoid block at L3/4 or L2/3 intervertebral space, as well as all aseptic precautions were followed. After the free flow of cerebrospinal fluid, inj. bupivacaine 0.5% 2 ml was injected intrathecally. After that, the patients were put in a supine posture and prepared for the procedure. After completion of surgery, 20 ml of 0.2% inj. ropivacaine hydrochloride was infiltrated in group R1 subcutaneously while in Group R2, intraperitoneal instillation, as well as local infiltration both, was done. A 26-gauge needle was used to measure the degree of sensory block and the results were reported as a lack of feeling to a pinprick. The Bromage scale was used to record motor blocks. The aim was to study the efficacy of ropivacaine when used in combination in relieving pain compared to ropivacaine used locally alone. "Visual analog scale" [VAS] evaluates the degree of pain which was already explained to all patients beforehand. The highest point on the scale, 100, indicates very severe pain, whereas the lowest point, 0, denotes no pain at all.

### Rating of VAS Score

1. 0: No pain
2. 1–25: Mild pain
3. 26–50: Moderate pain
4. 51–75: Severe pain
5. 76–100: Very severe pain.

### Visual Analogue Scale (VAS)



### Criteria of Bromage Score Grade

1. Grade 0 – Feet and legs can move
2. Grade 1 – Knees just flexed, feet free to move
3. Grade 2 – Knees are unable to bend and feet are just slightly able to move
4. Grade 3 – Feet and legs are unable to move.

Before spinal anesthesia, baseline measurements were taken. HR, systolic and diastolic BP (DBP), electrocardiogram, SpO<sub>2</sub>, as well as respiratory rate were monitored perioperatively. After intrathecal injection, data were collected at 0, 5, 10, 20, 30, 45, and 60 min and then every hour for the next 8 h. During the intraoperative and post-operative periods, patients were constantly monitored for problems such as vomiting, nausea, respiratory depression, hypotension, dyspnea, shivering, chest pain, bradycardia, dysrhythmia, and any other symptoms within the first 24 h

after surgery. No cases of any complications were recorded in this study.

The observations were analyzed to statistical analysis with Student's "t-test," and for qualitative parameters, "Chi-square test" has been employed. Statistical analysis was performed on the data collected from all three study groups and represented in tabular form using Statistical Package for the Social Sciences version 17 statistical software. For intergroup comparison,  $P > 0.05$  and  $P < 0.05$  were deemed as insignificant and significant, respectively. In this case, the level of significance was fixed at  $P < 0.01$ .

## RESULTS

Table 1 represents parturient in both the groups is similar in the context of weight, mean age, sex, height, duration of anesthesia, as well as surgery type.

Pre-operative and intraoperative HR, systolic BP, DBP, mean BP, and SpO<sub>2</sub> were comparable in both groups.

At the time of the initial request for analgesic, the following mean ( $\pm$ SD) VAS values were observed: Group R1 – 36.7  $\pm$  5.14 and Group R2 – 32.6  $\pm$  6.52 [Table 2].

## DISCUSSION

Cesarean section is associated with moderate pain after the wearing-off effect of spinal anesthesia. The multimodal approach is quite convincing to reduce post-operative pain in the parturient. More recently, anesthesiologists are focusing on preemptive analgesia which means that analgesics are sufficiently given before patient experiences pain so that pain intensity can be reduced postoperatively and the requirement of painkillers also can be minimized. Wound infiltration with long-acting or intermediate-acting

local anesthetics is simple as well as safest technique, used by anesthesiologists all over the world.

Ropivacaine 0.2% intraperitoneal instillation as well as local infiltration, as opposed to 0.2% ropivacaine local infiltration alone, extends the analgesia duration as well as gives satisfactory analgesia (reduced VAS rating). When performing surgical operations, local infiltration around the incision site and even deeper in the surgical cavity may limit the formation as well as spread of injury-induced release. The effect of certain local anesthetics may be attributable in part to their ability to suppress nociception transduction as well as sensitization phases. By suppressing certain inflammation stages (such as neutrophil priming) and block several of the neuronal routes activated due to inflammation (such as some G protein-coupled receptors and protein kinase C), local anesthetics can impede inflammatory and local sensitizing responses on the affected area.<sup>[7,8]</sup>

Nguyen *et al.*<sup>[11]</sup> also identified that ropivacaine infusion after cesarean surgery considerably extended the duration it took to achieve rescue analgesia in comparison to the control group. Ropivacaine is a local anesthetic of long-acting amide type with chemical properties comparable to that of bupivacaine but it is less toxic than it.<sup>[9]</sup>

Intraperitoneal inj. of ropivacaine before and after laparoscopy considerably reduced post-operative pain in comparison to a placebo, according to a study by Labaille *et al.*<sup>[10]</sup> Table 3 demonstrates that 147.17  $\pm$  4.67 and 170.33  $\pm$  3.69 min were the mean ( $\pm$ SD) analgesia duration in R1 and R2 groups, respectively. The analgesia duration in R2 group was considerably longer as compared to R1 group based on comparison and statistical analysis ( $P < 0.0001$ ).

Gautam *et al.*<sup>[11]</sup> found that intraperitoneal instillation of inj. ropivacaine 0.2% intraperitoneal infiltration as well as local infiltration provided greater post-operative analgesia after cesarean section than only inj. ropivacaine 0.2% local infiltration under spinal anesthesia. Yong *et al.*<sup>[12]</sup> conducted a meta-analysis and systematic review comparing intraperitoneal ropivacaine instillation versus no instillation to alleviate the pain during laparoscopic cholecystectomy and discovered that pain at 4–8 h and 9–24 h was considerably lowered with intraperitoneal ropivacaine instillation.

In another study, Kaushal-Deep *et al.*<sup>[13]</sup> compared the effectiveness of 0.2% ropivacaine injected intra-incisional and intraperitoneally in patients receiving an uncomplicated laparoscopic cholecystectomy and found that this was a cost-effective method for discharging an estimated nine out of 10 patients on the same day.

Other investigations have represented comparable outcomes.<sup>[14-16]</sup> At the time of the initial request of analgesic,

**Table 1: Demographic variables of two groups**

Demographic data	Group R1	Group R2	P-value
Age (years)	26.5 $\pm$ 5.871	25.1 $\pm$ 4.4	0.300
Weight (kg)	58.2 $\pm$ 5.1	57.3 $\pm$ 5.57	0.516
Sex (female)	100%	100%	–
Height (cm)	150.73 $\pm$ 3.16	150.97 $\pm$ 2.73	0.745

**Table 2: Mean ( $\pm$ SD) time for first rescue analgesia in two groups**

Variable	Group R1 (n=30)	Group R2 (n=30)	P-value
	Mean $\pm$ SD	Mean $\pm$ SD	
Time for first rescue analgesia (min)	147.17 $\pm$ 4.67	170.33 $\pm$ 3.69	<0.0001

**Table 3: Comparison of Mean±SD VAS scores in two groups**

Variable	Group R1 (n=30)	Group R2 (n=30)	P-value
	Mean±SD	Mean±SD	
VAS score	36.7±5.14	32.6±6.52	0.009

VAS: Visual analog scale

the following mean (±SD) VAS values were observed: Group R1 – 36.7 ± 5.14 and Group R2 – 32.6 ± 6.52 (P = 0.009). Ropivacaine infiltration following hemorrhoids surgery decreased VAS ratings considerably and reduced total morphine use, as shown by Vinson-Bonnet *et al.*<sup>[17]</sup> Callesen *et al.*<sup>[18]</sup> demonstrated that ropivacaine by combining field block and intraperitoneal instillation to alleviate pain following laparoscopic sterilization results in a considerably lower cumulative pain rating when contrasted with the placebo group during coughing as well as movement. The greatest disparity in pain levels was noticed 1 h after the procedure, however, there was no difference between groups after 4 h. Several additional researches have found comparable results.<sup>[19-22]</sup>

## CONCLUSION

Ropivacaine 0.2% intraperitoneal instillation as well as local infiltration were shown to provide greater post-operative analgesia after cesarean section in comparison to ropivacaine 0.2% local infiltration alone while the patient was under spinal anesthesia, as per the outcomes of the clinical tests. Intraperitoneal instillation of 0.2% ropivacaine local inj. also increased the analgesia duration as well as gave better analgesia (reduced VAS value) than 0.2% local infiltration of ropivacaine alone.

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