

Comparative study of continuous wound infiltration of bupivacaine at subcutaneous versus preperitoneal plane for post-caesarean section analgesia

Deepak Kurdukar

Assistant Professor, Department of Anaesthesiology, Vedanta Institute of Medical Sciences, Taluka Dahanu Dist Palghar, INDIA.

Email: kurdya54@gmail.com

Abstract

Background: Continuous wound infusion (CWI) of local anesthetics through a fenestrated catheter placed by the surgeon at the site of the wound incision has been proven to improve pain control and reduce opioid requirement after many types of surgery. However, current literature provides conflicting views regarding the ideal plane for analgesia in post-caesarean cases. In present study we compared continuous wound infiltration of bupivacaine at subcutaneous versus preperitoneal planes for post-caesarean section analgesia. **Material and Methods:** Present study was a prospective, comparative, interventional study, conducted in pregnant women, 20-40 years age, ASA grade I/II, posted for elective Caesarean section by Pfannenstiel incision. 60 Patients were randomly divided into subcutaneous group (group S) or preperitoneal group (group P) by chit method. **Results:** Total 60 patients were randomly divided group S (n=30) or group P (n=30). General characteristics such as age (in years), weight (in kgs), height (in cms), ASA status I/II, indication for LSCS, high risk factors (previous LSCS/ laparotomy, hemoglobin less than 9 gm%), duration of surgery (min) were comparable in both groups. We compared post-operative pain by Visual Analogue Scale (VAS) at post-operative hours (1,2,3,4,5,6,12,24,36,48). We did not find any statistically significant difference between group S and group P, at any post-operative period. No side effect/adverse effects of continuous wound infiltration were noted in present study. **Conclusion:** Good quality analgesia by continuous wound infusion was noted in both (subcutaneous and preperitoneal) groups.

Keywords: continuous wound infiltration, subcutaneous plane, preperitoneal plane, post-caesarean analgesia

Address for Correspondence:

Dr Deepak Kurdukar Current post- Assistant Professor, Department of Anaesthesiology, Vedanta Institute of Medical Sciences, Taluka Dahanu Dist Palghar, INDIA.

Email: kurdya54@gmail.com

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INTRODUCTION

Caesarean section is one of the most frequently performed obstetric surgeries all around world. Pain after caesarean

section is often under-treated due to unfounded fears that analgesic drugs or interventions might induce maternal and neonatal side-effects and because the severity of post-caesarean section pain is often underestimated.¹ Acute postoperative pain following abdominal surgeries results in hemodynamic instability, decreased postoperative pulmonary function, delayed recovery, and discharge from hospital.² Postoperative pain relief results in early mobilization of the patient, better hemodynamic stability, oral intake on the 1st postoperative day, and better satisfaction from patient and family. Continuous wound infusion (CWI) of local anesthetics through a fenestrated catheter placed by the surgeon at the site of the wound incision has been proven to improve pain control and reduce opioid requirement after many types of surgery,

especially cardiac, thoracic, breast, pelvic, and spinal procedures.^{3,4} The placement of the catheter within the wound in relation to the anatomical layers of the abdomen is identified as an important determinant of analgesic efficacy. However, current literature provides conflicting views regarding the ideal plane for analgesia in post-caesarean cases.^{5,6,7} In present study we compared continuous wound infiltration of bupivacaine at subcutaneous versus preperitoneal planes for post-caesarean section analgesia.

MATERIAL AND METHODS

Present study was a prospective, comparative, interventional study, conducted in Department of Anaesthesiology, Vedanta Institute of Medical Sciences, Palghar with help of department of obstetrics and gynaecology. Study duration was of 1 year (from November 2019 to October 2020). Institutional ethics committee approval was taken.

Inclusion criteria

Pregnant women, 20-40 years age, ASA grade I/II, posted for elective Caesarean section by Pfannensteil incision., willing to participate

Exclusion criteria

Intraoperative surgical or anaesthetic complications requiring additional intervention.

Bad obstetric history, medical disorders in present pregnancy such as hypertension, heart disease, renal disease, liver disease, patients with psychiatric diseases.

Evidence of fetal compromise and anomalies, neonates requiring NICU admission, stillbirth.

During surgery additional general anaesthesia required.

Contraindication to spinal anaesthesia.

Not willing for participation in study.

A detailed history was obtained and thorough general and systemic examination was performed. Preanesthetic checkup was done one day prior to the surgery. Patients were evaluated for any systemic diseases and laboratory investigations like CBC, urine routine and microscopic examination, KFT, LFT, BSL were performed prior to surgery. Study was explained to the patients along with Visual Analogue Scale (VAS) for pain perception.

RESULTS

Total 60 patients were considered for present study. Patients were randomly divided group S (n=30) or group P (n=30). General characteristics such as age (in years), weight (in kgs), height (in cms), ASA status I/II, indication for LSCS, high risk factors (previous LSCS/ laparotomy, hemoglobin less than 9 gm%), duration of surgery (min) and number of rescue doses of paracetamol infusion were comparable in both groups.

Written informed consent was obtained from all participants. In operation theatre, the standard monitoring was done and baseline parameters were recorded. Spinal anaesthesia was given as per departmental standard operating procedures under proper aseptic condition. Antibiotics, IV fluids and uterotonic agents were provided as per obstetric department protocol.

Patients were randomly divided for continuous wound infusion into subcutaneous group (group S) or preperitoneal group (group P) by chit method.

1. In the subcutaneous group, after peritoneal closure, the rectus muscle and fascia were closed, and a 19G, 700-mm wound infiltration catheter was placed over it along the length of the wound in the subcutaneous plane and skin was closed subsequently.
2. In the preperitoneal group, after peritoneal closure the wound infiltration catheter was placed along the length of the wound so as to lie in the preperitoneal plane. The rectus fascia was then closed over it, followed by the skin.

The catheters were secured at a point 1–2 cm beyond one end of the incision and provided with a separate sterile dressing.

Postoperatively in the recovery room, both groups of subjects received a 10-mL bolus of 0.25% bupivacaine through the catheter. Subsequently, the catheters were connected syringe pumps set to deliver 0.25% bupivacaine at 5 mL/h for the next 48 h. A single dose of IV paracetamol 1 g was given to all patients at the end of the surgery. Patients with significant pain received injection paracetamol 1 g IV as a rescue medication. Patients' data were collected every hour for the first 6 h, then every 6 hourly till 48 h of postoperative period. At the end of 48 h, the catheters were removed under aseptic conditions. Findings were collected in predesigned proforma, entered in Microsoft excel and analyzed with the help of SPSS version 21. The values of the two groups were compared and expressed as mean \pm SD. Statistical analysis was done by using Student's paired t-test for quantitative and Chi-square test for qualitative parameters. The p value of <0.05 was considered as statistically significant.

Table 1: General characteristics

General characteristics	group S {No. of patients (%)/ mean \pm SD}	group P {No. of patients (%)/ mean \pm SD}	p value
Age (in years)	23.8 \pm 2.5	24.2 \pm 2.8	0.62
Weight (in kgs)	65.4 \pm 6.4	64.5 \pm 7.8	0.56
Height (in cms)	151.5 \pm 6.9	152.5 \pm 7.1	0.41
ASA status			0.25
I	9 (30%)	11 (37%)	
II	21 (70%)	19 (63%)	
Indication for LSCS			0.73
Previous caesarean section	13 (43%)	14 (47%)	
Contracted pelvis	11 (37%)	11 (37%)	
Breech presentation	6 (20%)	5 (17%)	
High risk factors			
Previous LSCS/ laparotomy	14 (47%)	14 (47%)	-
Hemoglobin less than 9 gm%	3 (10%)	4 (13%)	0.67
Duration of Surgery (min)	49.60 \pm 21.9	52.40 \pm 20.4	0.52
No. of rescue doses	2.3 \pm 1.9	2.4 \pm 1.7	0.65

We compared post-operative pain by Visual Analogue Scale (VAS) at post-operative hours (1,2,3,4,5,6,12,24,36,48). We did not find any statistically significant difference between group S and group P, at any post-operative period (1,2,3,4,5,6,12,24,36,48). No side effect/adverse effects of continuous wound infiltration were noted in present study.

Table 2: Comparison of Visual Analogue Scale (VAS) for pain

Post-operative duration (hours)	group S (mean \pm SD)	group P (mean \pm SD)	p value
1	2.9 \pm 2.7	2.6 \pm 2.4	0.08
2	2.7 \pm 2.1	2.5 \pm 2.0	0.32
3	2.5 \pm 1.9	2.4 \pm 1.6	0.57
4	2.4 \pm 1.8	2.3 \pm 1.7	0.65
5	2.2 \pm 2.0	2.1 \pm 1.8	0.06
6	2.2 \pm 1.9	2.3 \pm 1.7	0.34
12	2.6 \pm 1.9	2.4 \pm 1.8	0.07
24	2.5 \pm 1.6	2.3 \pm 1.5	0.06
36	2.3 \pm 1.4	2.2 \pm 1.3	0.53
48	2.2 \pm 1.4	2.1 \pm 1.3	0.34

DISCUSSION

Modern anesthesia has advanced, at which all patients can be guaranteed a pain-free intraoperative period. Unfortunately, we often fall short when it comes to providing post-operative pain relief. Infusion with local anesthetics not only provides adequate pain control but also reduces the inflammatory responses and catecholamines level secondary to surgery, which also has an added benefit of enhancing wound healing by increasing wound perfusion and oxygenation. Optimal postoperative analgesia in caesarean delivery patients helps in early mobilization, initiate breast feeding and reduce complications such as deep venous thrombosis and delayed discharge. Kainu *et al.*⁹ found no advantage of continuous infusion of LAs in the subfascial plane, whereas according to O'Neil *et al.*¹⁰ it achieves better analgesia with lesser side effects than epidural morphine. In a meta-analysis by Gupta A *et al.*,¹¹ they concluded that only a subgroup of gynaecologic and obstetric surgeries

showed a significant reduction in VAS scores along with a modest reduction in morphine consumption when wound catheters were used primarily as a postoperative analgesic modality. Also, they found that subfascial or preperitoneal placement of catheters resulted in better analgesia; however, the surgical population attributed to this finding is heterogeneous, comprising different forms of surgeries and sites, hence calling for better designed studies. In a similar study by Thomas D *et al.*,¹² cumulative 48-h morphine consumption showed no statistical significance ($P = 0.058$) between the preperitoneal group (15.96 ± 7.69 mg) and subcutaneous group (21.26 ± 11.03 mg). Postoperative cumulative morphine consumption and pain scores are comparable when bupivacaine is infused continuously through wound infiltration catheter either in the preperitoneal or subcutaneous layer following Caesarean delivery. Similar findings were noted in present study. Fredman B *et al.*,¹³ investigated efficacy of post-operative wound infusion with Bupivacaine for pain

control after cesarean section delivery, they noted that it was safe and simple technique that provides effective analgesia and reduces Morphine requirements after cesarean section. It is postulated that the subfascial placement of the catheter is more efficacious as it may block the visceral nociceptive input¹⁴ but in present study and other studies¹² also, no such finding was noted. A meta-analysis confirmed that both single shot local anaesthetic wound infiltration and continuous wound infusion reduce postoperative opioid consumption and mildly improve pain scores. Pain scores were similar whether the catheter was placed preperitoneal or subcutaneously.¹⁵ Rackelboom T *et al.*,¹⁶ conducted a randomised controlled trial for continuous wound infusion effectiveness for postoperative analgesia after cesarean delivery. They compared analgesic efficacy of subcutaneous versus preperitoneal infiltration of mixture of local anaesthetics and NSAIDs and found that the 48-h cumulative morphine use was 57% less in the preperitoneal group when compared with subcutaneous group.¹⁶ The factors that may affect analgesia provided by continuous wound infiltration include location of injection, landmark vs USG, and LA administered (including drug, total dose, concentration, and volume). Certainly, in some particular settings, such as pediatric surgery or cesarean section, continuous wound infusion has widely demonstrated its advantages both with respect to neuraxial analgesia than other techniques, guaranteeing excellent outcomes in terms of postoperative pain control, opioid demand, ease of execution, side effects.¹⁷ Further studies on postoperative analgesia with long acting local anesthetics by wound infiltration technique are required.

CONCLUSION

Good quality analgesia by continuous wound infusion was noted in both (subcutaneous and preperitoneal) groups. Appropriate use of wound infiltration technique results in enhancement of postoperative analgesia and excellent to good quality of analgesia with minimal side effect profile.

REFERENCES

1. PROSPECT. Recommendations for postoperative analgesia after caesarean section 2014. www.postoppain.org
2. Wu CL, Fleisher LA. Outcomes research in regional anesthesia and analgesia. *Anesth Analg* 2000;91:1232-42.
3. Bianconi M, Ferraro L, Ricci R, Zanolli G, Antonelli T, Giulia B, Guberti A, Massari L. The pharmacokinetics and efficacy of ropivacaine continuous wound instillation after spinal fusion surgery. *Anesth Analg* 2004;98:166-72
4. Forastiere E, Sofra M, Giannarelli D, Fabrizi L, Simone G. Effectiveness of continuous wound infusion of 0.5%

- ropivacaine by On-Q pain relief system for postoperative pain management after open nephrectomy. *Br J Anaesth* 2008;101:841-7
5. O'Neill P, Duarte F, Ribeiro I, Centeno MJ, Moreira J. Ropivacaine continuous wound infusion versus epidural morphine for postoperative analgesia after cesarean delivery: A randomized controlled trial. *Anesth Analg* 2012;114:179-85.
6. de Almeida MC, de Figueiredo Locks G, Brunharo GM, Kauling AL. Postoperative analgesia: Comparing continuous epidural catheter infusion of local anesthetic and opioid and continuous wound catheter infusion of local anesthetic. *Braz J Anesthesiol* 2011;61:293-303.
7. Beaussier M, El'Ayoubi H, Schiffer E, Rollin M, Parc Y, Mazoit J-X, *et al.* Continuous preperitoneal infusion of ropivacaine provides effective analgesia and accelerates recovery after colorectal surgery: A randomized, double-blind, placebo-controlled study. *J Am Soc Anesthesiol* 2007;107:461-8.
8. Aziz L. Postoperative pain management. *Pulse* 2011;5:30-4.
9. Kainu JP, Sarvela J, Halonen P, Puro H, Toivonen HJ, Halmesmaki E, *et al.* Continuous wound infusion with ropivacaine fails to provide adequate analgesia after caesarean section. *Int J Obstet Anesth* 2012;21:199-24.
10. O'Neil P, Duarte F, Ribeiro I, Centeno MJ, Moreira J. Ropivacaine continuous wound infusion versus epidural morphine for postoperative analgesia after caesarean delivery: A randomized controlled trial. *Anesth Analg* 2012;114:179-85.
11. Gupta A, Favaio S, Perniola A, Magnuson A, Berggren L. A meta-analysis of the efficacy of wound catheters for post-operative pain management. *Acta Anaesthesiol Scand* 2011;55:785-96.
12. Thomas D, Panneerselvam S, Kundra P, Rudingwa P, Sivakumar RK, Dorairajan G. Continuous wound infiltration of bupivacaine at two different anatomical planes for caesarean analgesia – a randomized clinical trial. *Indian Journal of Anaesthesia* 2019; 63: 437-43.
13. Lavand'homme P. Improving postoperative pain management: Continuous wound infusion and postoperative pain. *Eur J Pain Suppl* 2011;52:357-63.
14. Adesope O, Ituk U, Habib AS. Local anaesthetic wound infiltration for postcaesarean section analgesia. *European Journal of Anaesthesiology* 2016; 33: 731-42.
15. Rackelboom T, Le Strat S, Silvera S, Schmitz T, Bassot A, Goffinet F, *et al.* Improving continuous wound infusion effectiveness for postoperative analgesia after cesarean delivery: A randomized controlled trial. *Obstet Gynecol* 2010;116:893-900.
16. Fredman B, Zohar E, Tarabykin A, *et al.* Bupivacaine wound instillation via an electronic patient-controlled analgesia device and a double catheter system does not decrease postoperative pain or opioid requirements after major abdominal surgery. *Anesth Analg* 2001; 92:189-9.
17. Paladini G, Di Carlo S, Musella G, *et al.* Continuous Wound Infiltration of Local Anesthetics in Postoperative Pain Management: Safety, Efficacy and Current Perspectives, *J Pain Res.* 2020;13:285-294.

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