

Wound Infiltration for Enhanced Recovery After Cesarean Surgery in Rural Hospital: A Case Series

Roy Sando*, Jimmy Wongkar

Department of Anesthesiology and Intensive Therapy, Santo Damian Hospital, Lewoleba, Indonesia

Corresponding Author

Roy Sando, MD
Department of Anesthesiology and
Intensive Therapy, Santo Damian
Hospital, Lewoleba 86611, Indonesia
roysandoo@gmail.com

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Abstract

Cesarean section is a major surgical procedure frequently associated with significant postoperative pain, which may delay mobilization and prolong hospital stay, particularly in rural hospitals with limited healthcare resources. Wound infiltration with local anesthetic represents a simple and practical analgesic component within the multimodal pain management strategy of the Enhanced Recovery After Cesarean Surgery (ERACS) pathway. This case series describes ten parturients scheduled for elective cesarean section with American Society of Anesthesiologists (ASA) physical status II and body mass index (BMI) < 30 kg/m². All patients received regional anesthesia using subarachnoid block without intrathecal adjuvants. Local wound infiltration was performed before skin closure using 0.2% isobaric bupivacaine with adrenaline (1:200,000) along the incision margins. Postoperative outcomes included pain intensity was assessed by the Visual Analog Scale (VAS) at 2, 4, and 6 hours, as well as postoperative nausea and vomiting, early ambulation, early initiation of breastfeeding and length of hospital stay. Across all cases, low early postoperative pain scores were observed, with VAS score ≤ 2 during the first 4 hours and decreasing to 1 at 6 hours postoperatively. Eight patients achieved early ambulation and successfully initiated breastfeeding within 24 hours. Two patients experienced postoperative nausea and vomiting, which delayed mobilization and prolonged hospital stay beyond 24 hours. No wound complications or signs of local anesthetic systemic toxicity were observed. In this rural hospital setting, wound infiltration with bupivacaine and adrenaline was associated with favorable early postoperative outcomes and appears to be feasible, low-resource adjunct within ERACS protocols to support early recovery after cesarean delivery.

Keywords: Anesthesia, Local; Cesarean Section; Pain, Postoperative; Rural Health Service; Wound Infiltration.

Introduction

Cesarean section is one of the most frequently performed obstetric surgical procedures worldwide, with global rate increasing from approximately 7% in 1990 to 21% in 2021.¹ Women undergoing cesarean delivery frequently experience moderate to severe postoperative pain during the first 48 hours,² which may impede early mobilization, delay mother-infant bonding, and prolong hospital stay. These challenges are particularly pronounced in rural healthcare settings, where limited resources may restrict comprehensive perioperative care and access to advanced analgesic techniques.¹ Postoperative pain management after cesarean section

commonly relies on multimodal analgesia combining non-opioid and opioid medications. However, opioid-based regimens may be insufficient to achieve optimal pain control and are associated with adverse effects such as postoperative nausea and vomiting, delayed recovery, and impaired maternal function.³

Local anesthetic wound infiltration has been reported to reduce postoperative pain intensity and opioid requirements, offering a simple and affordable adjunct to multimodal analgesia, particularly in resource-limited settings.^{2,4}

ERACS is a standardized perioperative care pathway encompassing preoperative, intraoperative, and postoperative elements aimed at optimizing maternal recovery and improving patient-centered outcomes.⁵ Although international guidelines support the use of wound infiltration as part of multimodal analgesia, evidence describing its practical implementation within ERACS frameworks in rural and resource-limited hospitals remains limited. This case series describes early postoperative outcomes associated with wound infiltration using local anesthetic as part of an ERACS-oriented approach in a rural hospital setting.

Case Presentation

This case series includes ten consecutive elective cesarean deliveries that met the inclusion criteria during the observation period at this rural hospital. The ten parturients were women in their early 20s to late 30s, all with a body mass index (BMI) below 30 kg/m² and classified as American Society of Anesthesiologists (ASA) physical status II. Obstetric indication included previous cesarean section (PCS), transverse fetal lie and fetal macrosomia. Preoperative assessment showed stable maternal

conditions without clinically relevant abnormalities.

All patients received subarachnoid block without intrathecal adjuvants. Following fetal delivery and before skin closure, local wound infiltration was performed as part of multimodal analgesia. The anesthetic solution was prepared by diluting adrenaline in normal saline and combining it with isobaric bupivacaine to obtain 20 mL 0.2% bupivacaine with adrenaline (1:200,000). The infiltration was administered in a standardized manner along the subfascial and subcutaneous layers on both margins of the Pfannenstiel incision. Postoperative analgesia consisted of scheduled paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs), with opioids reserved for rescue therapy.

Pain intensities were assessed using the Visual Analog Scale (VAS) at 2, 4, and 6 hours postoperatively. Additional observed outcomes included postoperative nausea and vomiting (PONV), early ambulation, early initiation of breastfeeding (EIBF), and length of hospital stay. Individual patient characteristics and postoperative outcomes are summarized in Table 1.

Across all ten cases, low early pain scores were observed, with VAS values ≤ 2 during the first four postoperative hours and decreasing to 1 by six hours postoperatively. None of the patients required opioid rescue within the first six postoperative hours. Eight patients achieved progressive early ambulation and initiated breastfeeding within 24 hours. Two patients experienced PONV, which was associated with delayed mobilization and prolonged hospital stay beyond 24 hours.

Table 1. Clinical characteristics and postoperative outcomes of parturients of undergoing wound infiltration analgesia.

Case	Age	Parity	BMI (kg/m ²)	ASA	Indication / History	VAS		Ambulation		Hospital Stay >24h
						2h/4h/ 6h	PONV	Level 2h /4h /6h	EIBF	
1	Mid 30s	G2P1	28	II	PCS	1/1/0	Yes	2→2→3	No	Yes
2	Late 20s	G2P1	23	II	PCS	2/1/0	No	3→4→4	Yes	No
3	Early 20s	G1P0	24	II	Transverse lie	1/0/0	No	3→4→4	Yes	No
4	Mid 30s	G3P2	28	II	PCS	1/1/0	No	3→4→4	Yes	No
5	Early 20s	G1P0	27	II	Transverse lie	1/1/0	Yes	2→2→3	No	Yes
6	Late 30s	G2P1	23	II	PCS	1/0/0	No	3→4→4	Yes	No
7	Early 20s	G1P0	25	II	Macrosomia	1/1/0	No	3→4→4	Yes	No
8	Mid 30s	G3P2	29	II	Transverse lie	2/1/0	No	3→4→4	Yes	No
9	Late 20s	G1P0	25	II	Macrosomia	1/1/0	No	3→4→4	Yes	No
10	Mid 20s	G2P1	28	II	PCS	1/1/0	No	3→4→4	Yes	No

*Age presented in de-identified categories (early/mid/late)

**Ambulation level: Level 1 = sitting upright, Level 2 = sitting at bed edge, Level 3 = standing next to bed, Level 4 = walking ambulation.

Abbreviations: VAS = Visual Analog Scale; PONV= postoperative nausea and vomiting;

EIBF = early initiation of breastfeeding; PCS = previous cesarean section.

No wound complications, surgical site infections, or clinical signs of local anesthetic systemic toxicity were observed.

Discussion

Postoperative pain control is a central component of the ERACS pathway, particularly in resource-limited rural hospitals where access to advanced regional analgesic techniques may be restricted. Simple and feasible analgesic strategies are therefore essential to support early postoperative recovery. In this descriptive case series, patients had comparable preoperative characteristics, which reduced variability in analgesic response and

allowed a clearer description of early postoperative outcomes associated with wound infiltration as part of multimodal analgesia.^{6,7}

Local wound infiltration using bupivacaine combined with adrenaline was applied as an intraoperative ERACS-aligned analgesic strategy. Low early postoperative pain scores were observed during the first six postoperative hours, findings that are consistent with previous studies demonstrating reduced postoperative pain following wound infiltration in cesarean delivery.^{2,4}



Figure 1. Wound Infiltration with Local Anesthetic

The dosing regimen used in this series was selected with particular attention to safety considerations. A total dose of 40 mg bupivacaine (0.2%, 20 mL) combined with adrenaline (1:200,000) was administered following fetal delivery and prior to skin closure. For adult parturients with an estimated body weight range of approximately 50-80 kg, this corresponds to a dose of approximately 0.5-0.8 mg/kg, which remains well below the commonly accepted maximum recommended dose of bupivacaine with adrenaline (3 mg/kg). This conservative dosing strategy was intentionally chosen to maintain a wide safety margin, which is especially relevant in rural healthcare settings with limited monitoring resources.³

Although the concentration of bupivacaine used in this series (0.2%) was slightly lower than that commonly described in ERACS guidance (0.25%),⁶ favorable early pain scores were still observed. This may be related to the timing of administration immediately after fetal delivery and before skin closure, allowing the local anesthetic to act during peak nociceptive activation. The combined subfascial and subcutaneous infiltration technique likely facilitated adequate distribution of the anesthetic

across somatic pain pathways. The addition of adrenaline further enhanced the local anesthetic effect by reducing systemic absorption through vasoconstriction.³ Pain assessment was intentionally focused on the early postoperative period, which corresponds to the expected analgesic window of wound infiltration and the critical recovery phase emphasized in ERACS pathways.

From a physiological perspective, wound infiltration with local anesthetics primarily attenuates somatic incisional pain by blocking voltage-gated sodium channels in peripheral nerve endings. Surgical tissue injury induces the release of inflammatory mediators such as prostaglandins and bradykinin, which increase nociceptor sensitivity at the incision site. By interrupting nociceptive signal transmission during the early phases of pain processing, wound infiltration contributes to reduced pain perception during the immediate postoperative period.^{3,7}

Pharmacologically, while the duration of analgesia provided by wound infiltration is generally shorter than that achieved with interfascial plane blocks such as the transversus abdominis plane (TAP) block, wound infiltration remains a simple and cost-effective option.² In resource-limited rural facilities where ultrasound-guided regional techniques may not be available, this approach represents a pragmatic component of multimodal analgesia.^{2,4}

Previous studies demonstrate reduced opioid requirements following wound infiltration,⁴ and ERACS postoperative guidelines emphasize opioid minimization as an important strategy to reduce PONV.⁸ In this series, two patients experienced PONV, which was likely influenced by

multifactorial contributors such as spinal anesthesia-related hypotension and individual susceptibility rather than inadequate analgesia.³ These events were associated with delayed ambulation and prolonged hospitalization. In contrast, adequate early somatic analgesia supported early ambulation and early initiation of breastfeeding in most patients, in line with ERACS principles aimed at optimizing maternal recovery.⁸

In this descriptive case series, wound infiltration using bupivacaine combined with adrenaline was feasible and associated with low early postoperative pain scores after cesarean delivery in a rural hospital setting, supporting early ambulation and early initiation of breastfeeding as part of an ERACS-oriented multimodal approach. However, these findings are limited by the small sample size, absence of a control group, and the short observation period restricted to the first six postoperative hours, as well as the single-center design, which may limit generalizability to other patient populations and healthcare settings.

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Declaration of Patient Consent

The authors confirm that all necessary patient consent forms have been obtained. In these forms, the patient(s) provided informed consent for the publication of their images and relevant clinical information in the journal. The patients have been informed that while their names and initials will not be published and reasonable efforts will be made to protect their identity, complete anonymity cannot be guaranteed.

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Conflict of Interest

The author(s) report no conflict of interest.

Data Availability Statement

De-identified patient data from this case report/series will be made available upon reasonable request to the corresponding author following publication, subject to institutional data-sharing policies and ethics approval.

Author's Contributions

Conceptualization: RS, JW. Data curation: R.S.

Investigation: RS. Writing – original draft: RS. Writing – review & editing: JW. Supervision: JW. All authors have read and approved the final version of the manuscript.

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