ORIGINAL ARTICLE

The Comparison of Efficacy between Intrathecal Morphine Combined with Either Intravenous Selective COX-II Inhibitor or Acetaminophen and Intrathecal Morphine Alone for Analgesia after Cesarean Section: A Double-Blinded Randomized Controlled Trial

Dissakul Prasitruangsuk, MD[1], Oraluxna Rodanant, MD[1], Natchaya Puchiwattanapong, MD[1], Somrat Charuluxananan, MD[1]

[1] Department of Anesthesiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

Background: Spinal anesthesia is a popular anesthetic of choice for cesarean section but inadequate analgesia may result in delayed ambulation and healing after surgery. Multimodal analgesia is currently applied to decrease the adverse effect of each medication, enhance analgesic efficacy and promote Enhanced Recovery After Surgery (ERAS). Non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen are recommended for enhanced recovery after cesarean section (ERAC).

Objective: To compare the analgesic efficacy of a combination of acetaminophen or selective COX-II inhibitors with intrathecal morphine and intrathecal morphine alone after cesarean section.

Materials and Methods: Eighty-eight parturients undergoing cesarean section were divided into three groups. Acetaminophen group: intrathecal morphine 0.1 mg and intravenous acetaminophen 1 gram every 6 hours. Parecoxib group: intrathecal morphine 0.1 mg and intravenous parecoxib every 12 hours. Control group: intrathecal morphine 0.2 mg only. The primary outcome was total morphine consumption in the first 24 hours postoperatively. The secondary outcomes were pain intensity, vomiting episodes, and time to first dose of opioid.

Results: The parecoxib group showed total morphine reduction in the first 24 hours of 10.655 mg (95% CI –15.04 to –6.27, p<0.001) compared with the control group. The pain intensity at rest and movement decreased in the parecoxib group compared to the control group at 4, 8, and 12 hours postoperatively (at rest: p=0.020, 0.001, and 0.002, at movement: p=0.002, 0.002, and 0.002). The acetaminophen group showed reduction of the pain intensity at 4 hours postoperative compared with the control group (p=0.011). Vomiting episodes and total ondansetron consumption were lower in the parecoxib group and the acetaminophen group. The parecoxib group also showed prolonged time to first dose of opioid usage.

Conclusion: Parecoxib decreased total opioid consumption, decreased postoperative vomiting episodes and increased time for first dose opioid requirement. Acetaminophen also reduced the pain intensity and vomiting at 4 hours postoperative. The alternative and multimodal concepts in intraoperative and postoperative pain medications are the easiest ERAC components to improve outcome for the anesthesiologist.

Keywords: Acetaminophen; Cesarean section; COX-II inhibitor; Intrathecal morphine

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Cesarean section accounts for 32% of modes of delivery due to decreased morbidity and mortality in complicated pregnancy[1]. Spinal or epidural anesthesia are popular anesthetic choices for elective cesarean section. The authors used spinal anesthesia as common practice for cesarean section, with 11 mg of 0.5% hyperbaric bupivacaine and 0.1 to 0.2 mg of intrathecal morphine. The severe postpartum pain is reported by 10.9% of the patients with cesarean section, increasing in intensity by 32.5% over normal delivery[2]. Inadequate analgesia may result in delayed ambulation and healing after surgery, and may progress to chronic pain. Intravenous opioids for postoperative pain control are associated with many side effects, such as pruritus, respiratory depression, nausea and vomiting[1,3].

Multimodal analgesia, using two or more

Correspondence to:

Rodanant O.

Department of Anesthesiology, Faculty of Medicine, Chulalongkorn University, 1873 Rama IV Road, Pathumwan, Bangkok 10330, Thailand.

Phone: +66-2-2564000 ext. 60904-60906

Email: drtuen@yahoo.com

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analgesics with different mechanisms, is currently applied to decrease the adverse effects of each medication, enhance analgesic efficacy, and promote Enhanced Recovery After Surgery (ERAS)[1,4-7]. Implementing enhanced recovery after cesarean section (ERAC) protocol will likely be the most important change to improve maternal outcomes, quality care, and minimize opioid requirement. The intraoperative anesthetic and postoperative pain managements are the easiest ERAC components to change for the anesthesiologist[8]. Many methods were also employed for cesarean sections, such as quadratus lumborum block, transversus abdominis plane block, and other nonopioid analgesics.

Non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen are recommended for enhanced recovery after cesarean section (moderate evidence level, strong recommendation grade)[6]. Acetaminophen has good efficacy for pain control, relatively low adverse event, and is safe to use in parturient and breastfeeding women[9]. NSAIDs are also safe for pregnant women and are not associate with bleeding tendency. Selective COX-II inhibitors have lower postoperative bleeding compared with conventional NSAIDs[9] and single dose of selective COX-II inhibitors (parecoxib) does not cause adverse effects in breastfed infants[10]. The relative infant dose of parecoxib after a single dose of maternal parecoxib is very low (<1%) and neonatal behavioral scores are within normal range[10]. Few studies mentioned COX-II inhibitors for postoperative pain control in cesarean section[11,12,15], thus, the efficacy of COX-II inhibitors in cesarean section cannot be concluded.

The objective of the present study was to compare the analgesic efficacy of combinations of acetaminophen or selective COX-II inhibitors with intrathecal morphine and intrathecal morphine alone. Combining these nonopioid analgesic medications may enhance analgesic efficacy, decrease opioid consumption and its adverse events, and may enhance recovery after surgery.

Materials and Methods

The present study was a randomized, double blinded clinical trial of acetaminophen combined with intrathecal morphine or selective COX-II inhibitors combined with intrathecal morphine, compared with intrathecal morphine alone for post-cesarean section pain control. The protocol was approved by the Institutional Review Board (IRB No. 478/63), Faculty of Medicine, Chulalongkorn University. The patients' informed consents were obtained after detailed explanation. Data were collected between October 2020 and October 2021 at King Chulalongkorn Memorial Hospital.

Eighty-eight parturient enrolled in the present study were between 18 and 40 years of age, the American Society of Anesthesiologists (ASA) physical status II, BMI between 18 and 40 kg/m². The exclusion criteria were following: refused to participate, uncooperative patients, patients with allergy or contraindication to medication in the present study, cardiovascular instability, local infection at back, neurological disease, chronic opioid usage and neuropathic pain.

The parturient were allocated into 3 groups with a block of six randomization.

1. Acetaminophen group: intrathecal morphine 0.1 mg and postoperative pain control with acetaminophen.
2. Parecoxib group: intrathecal morphine 0.1 mg and postoperative pain control with parecoxib.
3. Control group: intrathecal morphine 0.2 mg only.

Every participant received esomeprazole 20 mg orally in the evening before surgery and in the morning of surgery. Prior to the surgery, nurse anesthetist who was not on the research team opened the allocation concealment and prepared the study medications for the patient. Intrathecal medication was prepared in sterile manner in an identical-looking syringe and identical volume (0.2 mL). Intravenous medication was prepared in identical plastic bag. The anesthesiologist and outcome assessors were blinded to group allocation.

In the operating room, under a supervision of one senior anesthesiologists, the spinal anesthesia was performed by anesthesia resident using the Quincke needle 27G, 0.5% hyperbaric bupivacaine 11 mg was used in every group. The patients in acetaminophen group and parecoxib group received 0.1 mg of intrathecal morphine. And 0.2 mg of intrathecal morphine was given to the patients in control group.

The participants were given postoperative pain control as the following.

1. Acetaminophen group: Participants received intravenous acetaminophen 1,000 mg at the postanesthetic care unit, followed by intravenous acetaminophen 1,000 mg at 6, 12, 18, and 24 hours postoperatively.
2. Parecoxib group: Participants received intravenous parecoxib 40 mg in normal saline solution 100 mL at the postanesthetic care unit, followed by intravenous parecoxib 40 mg in normal

saline solution 100 mL at 12 and 24 hours and 100 mL of normal saline solution at 6 and 18 hours postoperatively.

3. Control group: Participants receive 100 mL of normal saline solution as a placebo at the postanesthetic care unit, followed by 100 mL of normal saline solution at 6, 12, 18, and 24 hours postoperatively.

In the postanesthetic care unit, pain intensity was assessed by using visual analog scale (VAS) when patient arrived (0 hour postoperatively) by nurse anesthetist who did not prepare the study medication. If participants had moderate to severe pain (VAS score ≥4) or requested further analgesics, intravenous morphine 1 mg would be given every 10 minutes until pain was controlled. The maximum dose of morphine is 4 mg. If participants had nausea or vomiting, 4 mg of ondansetron was given.

All patients had intravenous morphine in patient-controlled analgesia (PCA) fashion at the ward for 24 hours. The setting was PCA dose of 1 mg, no basal infusion, lock out interval of 10 minutes and a 4-hour limit of 10 mg. And additional pain control postoperatively was given, as mentioned. If participants had nausea or vomiting, 4 mg of ondansetron prn every 6 hours was given.

In the first 24 hours postoperatively, total morphine consumption, a VAS 0 to 10 for pain intensity at 0, 4, 8, 12, 18, and 24 hours, and the rate of vomiting episodes were collected by nurse anesthetist when patients were at postanesthetic care unit and collected by ward nurse when patients were at ward. Total morphine consumption was the primary outcome while pain intensity, vomiting episodes, and time of first dose of opioid were secondary outcomes.

Sample size calculation

Because no previous data was available, the authors conducted a preliminary study collecting total opioid consumption from patients undergoing elective cesarean section under spinal anesthesia using 0.5% hyperbaric bupivacaine of 11 mg and intrathecal morphine of 0.2 mg with a sample size of 20. Following this regimen, total morphine consumption in the first 24 hours was 25 mg with a standard deviation of 16. Using the formula for superiority trial, total morphine reduction of more than 50% would be statistically significant, with alpha=0.05 and beta=0.1, the sample size would be 28 per group. Dropout rate of 10% was added, thus, the total sample size of the present study was 90.

Statistical analysis

Pain intensity data were presented as mean ± standard deviation (SD), and analyzed by repeated measures analysis of variance (ANOVA) and pairwise comparison. For nominal or ordinal data, it was presented as percentage and analyzed by using the chi-square test. Quantitative data were presented as mean±SD and analyzed by ANOVA. The time to the first dose of morphine administration would be analyzed by log rank test and demonstrated in Kaplan-Meier curve. A p-value less than 0.05 was considered statistically significant.

Results

All 88 parturient completed the study as shown in the CONSORT flow diagram (Figure 1). All groups had comparable demographic data including age, height, weight, ASA classification, comorbidity, type of incision, anesthetic level, duration of surgery, and dose of vasopressor used. There were no significant differences between the three groups (Table 1). Neither serious surgical complications such as postpartum hemorrhage nor abnormal uterine bleeding was report in the present study.

Primary outcome

Total morphine consumption in first 24 hours was significantly lower in the parecoxib group than in the acetaminophen group and in the control group, with a mean (±SD) of 2.38±2.53, 8.83±9.19, and 13.03±10.97 mg, respectively ($p<0.001$) (Table 2). The mean difference in total morphine consumption in the first 24 hours between the parecoxib group and the acetaminophen group was –6.454 mg (95% CI –10.80 to –2.11, p=0.004) (Table 3). And the mean difference of total morphine consumption in first 24 hours between the parecoxib group and the control group was –10.655 mg (95% CI –15.04 to –6.27, $p<0.001$) (Table 3). Other comparisons did not show statistical significance.

Secondary outcome

Pain intensity at rest evaluated by the VAS was lower in the parecoxib group compared to the control group at 4, 8, and 12 hours, postoperatively, with a mean difference of –0.966 (95% CI –1.77 to –0.16, p=0.020), –1.586 (95% CI –2.48 to –0.69, p=0.001), and –1.379 (95% CI –2.24 to –0.52, p=0.002), respectively. Comparing the acetaminophen group with the control group, the acetaminophen group also showed lower pain intensity at rest at 4 hours postoperative, with a mean difference of –1.053

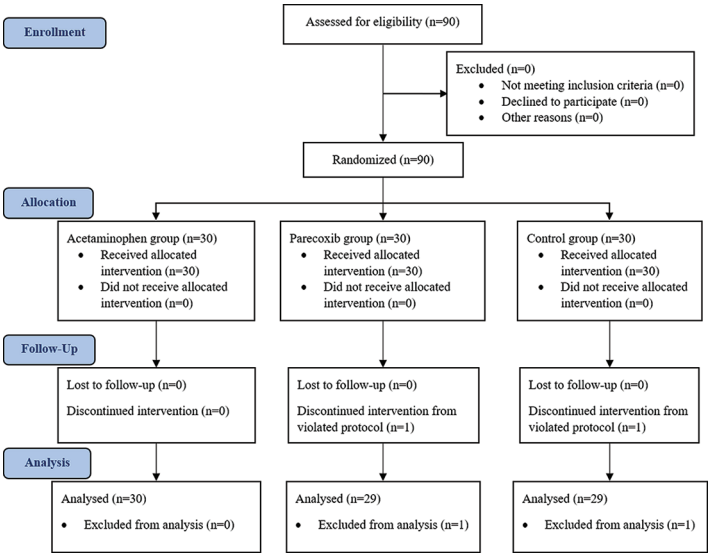

Figure 1. CONSORT flow diagram.

Table 1. Demographic characteristics, operative data, and anesthetic-related data of three study groups

	Acetaminophen group (n=30)	Parecoxib group (n=29)	Control group (n=29)	p-value
Age (year); mean±SD	33.9±4.5	34.0±4.2	33.4±4.9	0.874
Height (cm); mean±SD	160.6±5.1	159.8±7.5	160.4±5.2	0.859
Weight (kg); mean±SD	70.0±11.0	75.6±12.2	71.1±9.9	0.130
Comorbidity; n (%)				N/A
None	23 (76.7)	23 (79.3)	17 (58.6)	
Antiphospholipid syndrome	1 (3.3)	0 (0.0)	0 (0.0)	
Asthma	0 (0.0)	1 (3.4)	0 (0.0)	
Thalassemia	0 (0.0)	0 (0.0)	1 (3.4)	
GDM A1	2 (6.7)	0 (0.0)	2 (6.9)	
GDM A2	3 (9.9)	0 (0.0)	4 (13.8)	
Gestational hypertension	0 (0.0)	1 (3.4)	0 (0.0)	
Preeclampsia without severe feature	0 (0.0)	2 (6.8)	0 (0.0)	
HIV infection	0 (0.0)	0 (0.0)	1 (3.4)	
Hyperthyroidism	0 (0.0)	1 (3.4)	0 (0.0)	
Obesity	0 (0.0)	0 (0.0)	1 (3.4)	
SLE	0 (0.0)	0 (0.0)	1 (3.4)	
Twin pregnancy	1 (3.3)	1 (3.4)	2 (6.9)	
Type of incision; n (%)				0.319
Pfannenstiel	26 (86.7)	26 (89.7)	22 (75.9)	
Low midline	4 (13.3)	3 (10.3)	7 (24.1)	
Anesthetic level; n (%)				0.426
T2	0 (0.0)	1 (3.4)	0 (0.0)	
T3	1 (3.3)	1 (3.4)	1 (3.4)	
T4	28 (93.3)	22 (75.9)	26 (89.7)	
T6	1 (3.3)	5 (17.2)	2 (6.9)	
Duration of surgery (minutes); mean±SD	50.7±14.8	54.7±20.6	49.3±12.6	0.429

GDM=gestational diabetes mellitus; SLE=systemic lupus erythematosus; N/A=not applicable

Qualitative values are total number and percentage, analyzed by chi-square test. Quantitative values are mean ± standard deviation (SD), analyzed by ANOVA.

Table 2. Total morphine consumption and rate of vomiting episodes

	Acetaminophen group (n=30)	Parecoxib group (n=29)	Control group (n=29)	p-value
Total morphine consumption in first 24 hours (mg); mean±SD [range]	8.8±9.2 [5.4 to 12.3]	2.4±2.5 [1.4 to 3.3]	13.0±11.0 [8.9 to 17.2]	<0.001*
Vomiting episodes; n (%)				0.026*
0	30 (100)	28 (96.6)	22 (75.9)	
1	0 (0.0)	1 (3.4)	1 (3.4)	
2	0 (0.0)	0 (0.0)	5 (17.2)	
3	0 (0.0)	0 (0.0)	1 (3.4)	
Total ondansetron use; n (%)				0.010*
0 mg	30 (100)	28 (96.6)	22 (75.9)	
4 mg	0 (0.0)	1 (3.4)	2 (6.9)	
8 mg	0 (0.0)	0 (0.0)	5 (17.2)	

Qualitative values are total number and percentage, analyzed by chi-square test. Quantitative values are mean ± standard deviation (SD), analyzed by ANOVA.

* p<0.05 is considered statistically significant

Table 3. Comparison between groups for total morphine consumption in first 24 hours

Group	Mean difference (mg)	95% confidence interval	p-value
Acetaminophen vs. Parecoxib	6.454	2.11 to 10.80	0.004*
Acetaminophen vs. Control	–4.201	–8.55 to 0.15	0.058
Parecoxib vs. Control	–10.655	–15.04 to –6.27	<0.001*

* p<0.05 is considered statistically significant

(95% CI –1.85 to –0.25, p=0.011). And between the parecoxib group and the acetaminophen group, parecoxib showed superior pain reduction, with a mean difference of –1.246 (95% CI –2.14 to –0.36, p=0.007) at 8 hours and –1.052 (95% CI –1.91 to –0.20, p=0.016) at 16 hours postoperatively. Overall pain intensity within 24 hours between groups indicated no statistical significance except0 between the parecoxib group and the control group with a mean difference of 1.000 (95% CI 0.17 to 1.83, p=0.019) (Table 4, Figure 2).

For pain at movement, there was preferable pain control of the parecoxib group than in the control group at 4, 8, and 12 hours postoperatively, with a mean difference of –1.690 (95% CI –2.71 to –0.65, p=0.002), –1.793 (95% CI –2.91 to –0.68, p=0.002) and –1.448 (95% CI –2.36 to –0.54, p=0.002), respectively. Pain intensity at movement in the acetaminophen group was also lower than the control group at 4 hours postoperatively, with a mean difference of –1.690 (95% CI –2.714 to –0.645. p=0.002). Comparing with the acetaminophen group, the parecoxib group showed better pain control at 8, 12, and 18 hours postoperatively with the mean difference of –1.507 (95% CI –2.61 to –0.40, p=0.008), –0.980 (95% CI –1.89 to –0.08, p=0.034) and –1.213 (95% CI –2.03 to –0.40, p=0.004), respectively. Nevertheless, overall pain intensity during movement was lower in the acetaminophen group compared with the parecoxib group, with a mean difference of –1.102 (95% CI –2.12 to –0.09, p=0.034) (Table 5, Figure 3).

Vomiting incidence and total dose of ondansetron in the first 24 hours were lower in the acetaminophen group and the parecoxib group than the control group (Table 2).

Time to the first dose morphine administration in the parecoxib group was the longest with a mean of 850.034±105.627 minutes compared to the acetaminophen group and control group, with a mean of 303.133±57.957 and 244.172±44.711, respectively. A ratio of patients who did not receive morphine postoperatively at the period of time in each group (the survival rate from morphine administration) were also highest in the parecoxib group (34.5%), paralleled with the acetaminophen group (6.7%) and the control group (3.4%) (Figure 4).

Discussion

ERAC provides an evidenced-based system to improve maternal outcomes, functional recovery, maternal-infant bonding, and patient experience. Intraoperative and postoperative pain management is one of the components in ERAC protocol and

Table 4. Pairwise comparison of pain intensity at rest between 3 groups

Postoperative time		Mean difference (mg)	95% confidence interval	p-value
4 hours	Acetaminophen vs. Parecoxib	–0.087	–0.89 to 0.71	0.829
	Acetaminophen vs. Control	–1.053	–1.85 to –0.25	0.011*
	Parecoxib vs. Control	–0.966	–1.77 to –0.16	0.020*
8 hours	Acetaminophen vs. Parecoxib	1.246	0.36 to 2.14	0.007*
	Acetaminophen vs. Control	–0.340	–1.23 to 0.55	0.449
	Parecoxib vs. Control	–1.586	–2.48 to –0.69	0.001*
12 hours	Acetaminophen vs. Parecoxib	1.052	0.199 to 1.905	0.016*
	Acetaminophen vs. Control	–0.328	–1.18 to 0.53	0.447
	Parecoxib vs. Control	–1.379	–2.24 to –0.52	0.002*
18 hours	Acetaminophen vs. Parecoxib	0.81	0.06 to 1.56	0.034*
	Acetaminophen vs. Control	0.534	–0.21 to 1.28	0.158
	Parecoxib vs. Control	–0.276	–1.03 to 0.48	0.468
24 hours	Acetaminophen vs. Parecoxib	0.367	–0.39 to 1.12	0.338
	Acetaminophen vs. Control	0.022	–0.74 to 0.78	0.022
	Parecoxib vs. Control	–0.345	–1.11 to 0.42	0.371
Overall	Acetaminophen vs. Parecoxib	–0.721	–1.55 to 0.11	0.086
	Acetaminophen vs. Control	0.279	–0.55 to 1.11	0.503
	Parecoxib vs. Control	1.000	0.17 to 1.83	0.019

* $p<0.05$ is considered statistically significant

Table 5. Pairwise comparison of pain intensity at movement between 3 groups

Postoperative time		Mean difference (mg)	95% confidence interval	p-value
4 hours	Acetaminophen vs. Parecoxib	0.010	–1.02 to 1.05	0.984
	Acetaminophen vs. Control	–1.679	–2.71 to –0.65	0.002*
	Parecoxib vs. Control	–1.690	–2.73 to –0.65	0.002*
8 hours	Acetaminophen vs. Parecoxib	1.507	0.40 to 2.61	0.008*
	Acetaminophen vs. Control	–0.286	–1.39 to 0.82	0.608
	Parecoxib vs. Control	–1.793	–2.91 to –0.68	0.002*
12 hours	Acetaminophen vs. Parecoxib	0.980	0.08 to 1.86	0.034*
	Acetaminophen vs. Control	–0.468	–1.37 to 0.44	0.307
	Parecoxib vs. Control	–1.448	–2.36 to –0.54	0.002*
18 hours	Acetaminophen vs. Parecoxib	1.213	0.40 to 2.03	0.004*
	Acetaminophen vs. Control	0.355	–0.46 to 1.17	0.387
	Parecoxib vs. Control	–0.034	–0.85 to 0.78	0.933
24 hours	Acetaminophen vs. Parecoxib	0.390	–0.42 to 1.20	0.343
	Acetaminophen vs. Control	0.355	–0.46 to 1.17	0.387
	Parecoxib vs. Control	–0.034	–0.85 to 0.78	0.933
Overall	Acetaminophen vs. Parecoxib	–1.102	–2.12 to –0.09	0.034*
	Acetaminophen vs. Control	–0.275	–1.29 to 0.74	0.593
	Parecoxib vs. Control	0.828	–0.20 to 1.85	0.112

* $p<0.05$ is considered statistically significant

is the easiest way to implement in the practice of anesthesiologists. The goal of experiencing less postsurgical pain is not only reduces an individual's suffering but also improves functional recovery with faster return to the activities of daily living, including maternal-infant bonding, returning home, and higher satisfaction. Postoperative pain after cesarean section has been treated by multiple analgesic techniques and multimodal analgesia is recommended. Important considerations in this patient's group include small amounts of pain medications transfer via breast feeding, less side effects such as nausea or vomiting

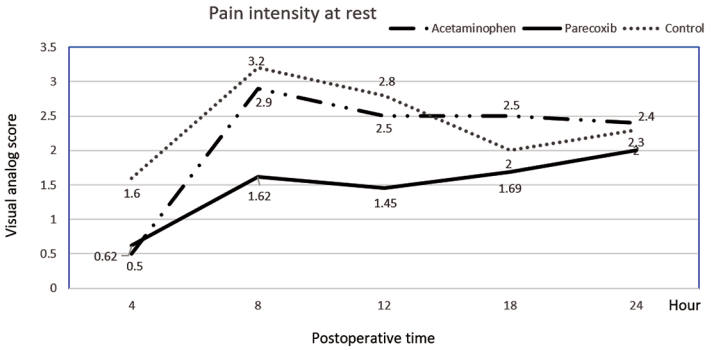

Figure 2. Pain intensity at rest in visual analog scale (p=0.004).

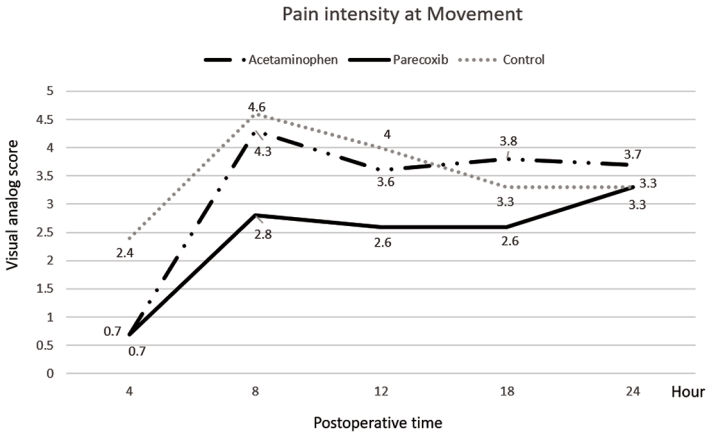

Figure 3. Pain intensity at movement in visual analog scale (p=0.002).

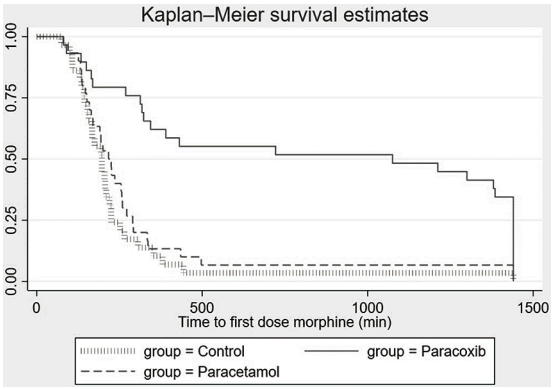

Figure 4. Kaplan-Meier survival analysis demonstrated a ratio of patients who did not receive morphine postoperatively at the period of time in each group (survival rate from morphine administration in each group), p<0.001.

and facilitating postoperative mobility of the mother to take care of the newly born.

For the present trial, the authors hypothesized that the addition of a selective COX-II inhibitor or acetaminophen to intrathecal morphine in elective cesarean section would reduce total opioid consumption, and may produce superior pain control over the traditional method. This hypothesis was well met with the parecoxib group, which showed total morphine reduction in the first 24 hours 10.655 mg (95% CI –15.04 to –6.27, p<0.001) compared with the control group. Not only did using parecoxib as a part of pain treatment decreased morphine consumption, but it also decreased pain intensity at some points in time (4, 8, and 12 hours postoperative at rest and movement), decreased the incidence of vomiting, decreased total ondansetron consumption, prolonged the time to the first dose of opioid and increased the time to first dose for opioid usage.

Even though acetaminophen did not appear to decrease opioid consumption in the present study, it showed superior analgesic activity compared with the control group at 4 hours postoperatively, both at rest and at movement. The incidence of vomiting and total ondansetron consumption were also lower than the control group, along with longer time to first dose opioid requirement.

Previous studies by Paech et al.[11] and Altenau et al.[12] showed decreased total opioid consumption in patients who received parecoxib, celecoxib, or acetaminophen for post-cesarean pain control, but did not decrease pain intensity. Bernstein et al.[13] and Wilson et al.[14] demonstrated no difference in total opioid consumption or pain intensity in patients receiving acetaminophen in postoperative period. Inthigood et al.[15] studied the effect of parecoxib on post cesarean pain control, and results showed no difference in opioid consumption but demonstrated effectiveness in reducing pain scores and increasing patient satisfaction. Neither systematic review nor meta-analysis have been discussed in this point.

The current study's limitations included 1) data collection on other adverse events of opioid (e.g., respiratory depression, sedation, pruritus), 2) information about ambulation, that may be affected by altered opioid usage, and 3) patient's satisfaction score which may produce a more valuable outcome for the present study. Future research may be needed to provide these considerations.

The strengths of the present study include the use of a randomized controlled trial design, multiple types of analgesics (multimodal analgesia concept), multiple distinct comparisons, strict protocolized interventions, easily accessible medication even in rural areas, and being cheap and simple to apply in daily practice. Opioid sparing analgesia is also an important part of the ERAC program.

Conclusion

Parecoxib as a part of postoperative pain control for elective cesarean section under spinal anesthesia showed decreased total opioid consumption, superior pain control, decreased vomiting episodes and increased time to first dose of opioid usage. Acetaminophen also showed decreased pain intensity at some points in time. Combined of these knowledge, the present study protocol was easily applied for routine practice, followed the ERAC program, and did not display a demonstrable adverse outcome. Multimodal concept in perioperative period is preferable and should be recommended for ERAC.

What is already known on this topic?

Previous studies mentioned the application of COX-II inhibitors or acetaminophen in the multimodal analgesia concept for parturient undergoing cesarean section but there was no definite conclusion on the efficacy.

What this study adds?

Parecoxib as a part of postoperative pain control for elective cesarean section under spinal anesthesia decreased total opioid consumption, had superior pain control, decreased adverse events of opioid, and increased survival from opioid usage. Acetaminophen also showed decreased pain intensity at some points in time.

Trial registration

The present study was registered at the Thai Clinical Trials Registry, TCTR20210813001.

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Conflicts of interest

The authors declare no conflict of interest.

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