Factors associated with moderate to severe pain after cesarean delivery under spinal anesthesia

ORIGINAL ARTICLE

REVIEWED BY

Metha Songthamwat, MD., PhD.; Siriluk Norsuwan, MD.; Pacharin Napamadh, MD.; Srisuda Songthamwat, MD.

Udon Thani Hospital, Thailand.

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Correspondence to: Metha Songthamwat; udonhome@yahoo.com

ABSTRACT

OBJECTIVE

To identify factors associated with moderate to severe pain after cesarean delivery under spinal anesthesia.

METHODS

A nested cohort in the randomized controlled trial (RCT) was conducted using the secondary information of term pregnant women undergoing cesarean delivery under spinal anesthesia from a previous RCT. All patients received postoperative intravenous opioids using patient-controlled anesthesia (PCA). The pain scores were assessed at 12, 20 and 24 hours. The time and amount of opioid use by PCA were recorded. The participants who had a pain score $\geq$4, or who needed additional PCA opioid in the first 24 hours were defined as moderate to severe pain.

RESULTS

A total of 100 participants were included in this study. Of these, the intravenous morphine by PCA was used in 8%, 38% and 54% in the first 2, 12 and 24 hours after cesarean delivery, respectively. The mean of intravenous morphine used was 4.4 mg. The mean pain score at 12, 20 and 24 hours were 2.7, 2.5 and 2.3, respectively. Moderate to severe pain occurred in 66 patients and 57 had a pain score $\geq$4 within 24 hours. An associated factor of less pain was the use of an oral analgesic drug (adjusted odds ratio, 0.29; 95% confidence interval, 0.10 to 0.80; $P<0.05$).

CONCLUSION

Nearly two-thirds of patients had moderate to severe pain after cesarean delivery under spinal anesthesia using bupivacaine and intrathecal morphine. The use of oral analgesic drugs was an associated factor with less pain after cesarean delivery.

INTRODUCTION

Cesarean delivery is one of the most common operations in women and accounts for more than 30% of all births.[1] Spinal anesthesia with bupivacaine is the most widely used regional anesthesia for this operation because of its speed of onset and reliability.[1] Postoperative pain is one of the greatest concerns of all mothers.[2] Indeed, evidence suggests that more than half of patients undergoing major surgery report inadequate pain relief.[3] This significantly detracts from the sense of well-being and joy by limiting maternity activities such as baby care and breastfeeding.[4,5] In many centers, opioids are commonly used for pain control after surgery in various forms such as intrathecal, intravenous, intramuscular or patient-controlled anesthesia (PCA). However, the side effects, such as dizziness, nausea, vomiting are commonly found and severe side effect i.e., respiratory depression was also reported.[6] Many non-opioid drugs such as acetaminophen or nonsteroidal anti-inflammatory drug (NSAID) are also commonly used for post-operative pain relief.[7] The use of these analgesics for appropriate pain control after cesarean delivery should depend on the understanding of pain pattern and severity of postoperative pain, however, this understanding is still limited. Therefore, the purpose of this study is to investigate patterns and severity of the pain including factors to be associated with the pain after cesarean delivery.

METHODS

STUDY DESIGN AND OVERSIGHT

This study is a nested cohort study using secondary data from a randomized study that evaluated the effectiveness of oral diclofenac and paracetamol for pain control after cesarean delivery.[8] The study was conducted in a tertiary care regional hospital. The study protocol was approved by the Udonthani Hospital Research Ethics Committee (number 58/2560).

PATIENTS

The patients were pregnant women who underwent a low transverse cesarean section under spinal anesthesia from January through June 2018. They were counseled and invited to participate in this study. The inclusion criteria were singleton term pregnant women who indicated for a low transverse cesarean section. The exclusion criteria were patients who had medical diseases such as hypertension, diabetes, received general anesthesia for this operation or unwilling to participate in this study. Written informed consent was obtained after the explanation of the study methods to the participants.

PROCEDURES

All participants underwent a low transverse cesarean section under spinal anesthesia which was performed by an anesthesiologist in the operating room using 0.5% bupivacaine plus 0.1 to 0.2 mg of morphine. All patients received standard care for a low transverse cesarean section in the operating room, recovery room and were transferred to the postpartum ward after 2 hours post-operation. After the operation, all participants received intravenous morphine by patient-controlled anesthesia (IV–PCA) for pain control. The setting of intravenous morphine by IV–PCA protocol was 1 mg/ml by IV–PCA only mode without loading, the delayed time for each morphine dose was 5 minutes and the maximum

Table 1. Characteristics of the participants

Characteristic	Total (N=100)
Median age (IQR)–yr	29 (24–33)
20–34	83
≥35	17
Median body mass index (IQR)–kg/m^2	29.6 (4.8)
Median gestational age (IQR)–wk	38 (38–39)
37–41	98
≥42	2
Primipara	23
Median operation time (IQR)–minutes	45 (37.0–56.5)
<60	78
≥60	22
Tubal resection	57
Adhesion	15
Previous surgery	51
Indication	
Previous cesarean section	47
Cephalopelvic disproportion	53
Fetal distress	10
Type of incision	
Pfannenstiel	24
Low midline	76
Median blood loss (IQR)–ml	300 (200–300)
≥500	91
>500	9
Oral analgesic used	50

IQR=interquartile range

Table 2. Associated factors for moderate to severe pain after cesarean delivery

Factor	Moderate to severe pain (N=66)	Mild Pain (N=34)	Odds ratio (95% CI)	Adjusted odds ratio (95% CI)	P Value
Advanced maternal age ≥35 yr–no. (%)	12 (18.2)	5 (14.7)	1.29 (0.41–4.02)	1.17 (0.31–4.40)	0.82
Maternal body mass Index–kg/m^2	30.0±4.99	28.8±4.32	1.05 (0.97–1.15)	1.08 (0.98–1.19)	0.14
Primipara–no. (%)	16 (24.2)	7 (20.6)	0.94 (0.51–1.72)	0.67 (0.17–2.66)	0.57
Operation time ≥60 minutes	18 (27.3)	4 (11.8)	2.81 (0.87–9.11)	3.22 (0.89–11.7)	0.08
Tubal resection–no. (%)	37 (56.1)	20 (58.8)	0.89 (0.39–2.07)	1.16 (0.34–3.99)	0.38
Adhesion–no. (%)	12 (18.2)	3 (8.8)	2.30 (0.60–8.77)	3.12 (0.51–19.0)	0.22
Previous surgery–no. (%)	35 (53.0)	16 (47.1)	1.27 (0.55–2.91)	2.81 (0.47–17.0)	0.26
Indication–no. (%)					
Previous cesarean section	30 (45.5)	17 (50.0)			
Cephalopelvic disproportion	30 (45.5)	13 (38.2)	0.85 (0.21–3.44)	1.44 (0.12–17.4)	0.78
Fetal distress	6 (9.1)	4 (11.8)	1.31 (0.54–3.16)	2.37 (0.33–17.0)	0.39
Type of incision–no. (%)					
Pfannenstiel	14 (21.2)	10 (29.4)			
Low midline	52 (78.8)	24 (70.6)	1.54 (0.60–3.98)	1.67 (0.53–5.22)	0.38
Blood loss ≥500 ml	7 (10.6)	2 (5.88)	1.90 (0.37–9.68)	1.41 (0.10–11.2)	0.75
Oral analgesic used	28 (42.4)	22 (64.7)	0.40 (0.17–0.95)	0.29 (0.10–0.80)	0.02

CI=confidence interval

* Plus–minus values are means ±SD.

morphine dose was 30 mg in 4 hours. The pain scores were recorded using a numerical rating scale by trained ward nurses at 12, 20 and 24 hours post–operation. The numerical pain rating scale composed of 11 scores (0 to 10). The 0 score was no pain, 1 to 3 was mild pain, 4 to 6 was moderate pain, 7 to 10 was severe pain.[9] The possible associated factors of pain, such as age, duration of operation, previous surgery, were recorded. The participants who had a pain score of more than or equal to 4 or needed additional opioids by IV–PCA at 12, 20 or 24 hours were defined as a moderate to severe pain group. The participants who had a pain score within 24 hours post–operation of less than 4 and had no need for additional IV–PCA opioids were defined as a mild pain group.

STATISTICAL ANALYSIS

The baseline characteristics of both groups were presented as number and percentage for

categorical data and mean with standard deviation or median with interquartile range for the continuous data. The normality test was done by skewness and kurtosis test for normality. Both groups were compared for possible associated factors for moderate to severe pain using an unpaired t-test for continuous variables, Pearson's Chi-square and Fisher exact tests for categorical variables. The crude and adjusted odds ratio with a 95% confidence interval (CI) was calculated by bivariate and binary logistic regression analyses for the magnitude of the effect. Statistical analysis was performed using Stata version 13. $P<0.05$ was considered statistically significant. The sample size calculation using the formula for estimating the prevalence of moderate to severe post-operative pain[10]. The estimated proportion is 0.5 with an acceptable error of 0.1, an alpha error of 0.05 and the power is 80%. The number of participants by calculation was 97 participants and the total sample size was 100.

RESULTS

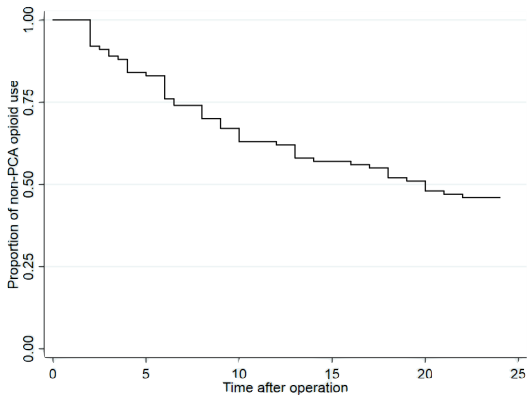
A total of 100 participants were included in this study. The participants' characteristics are shown in Table 1. All participants received low transverse cesarean delivery under spinal anesthesia using 0.5% bupivacaine plus 0.1-0.2 mg of morphine. Fifty participants received diclofenac 50 mg plus paracetamol 500 mg single dose at 12 hours post-operation. All participants were followed until 24 hours post–operation and were included in the analysis. Of these, the addition of morphine by IV–PCA was used in the first 2 hours in 8 participants, within the first 12 hours in 38 participants. After 24 hours post-operation, 54% of them used additional opioids by IV–PCA (Figure 1).

The mean of additional morphine used was 4.4 mg. The mean pain score at 12 hours post-operation was 2.7. At 12 hours post-operation, 12 participants had no pain. Sixty five participants had mild pain, 20 participants had moderate pain and three participants had severe pain (Figure 2A). The mean pain score at 20 hours post-operation was 2.5. At 20 hours post-operation, 14 participants had no pain, 63 participants had mild pain, 22 participants had moderate pain and one had severe pain. (Figure 2B) The mean pain score at 24 hours post-operation was 2.3. At 24 hours post-operation, 19 participants had no pain, 64 participants had mild pain,17 participants had moderate pain and no participant had severe pain. (Figure 2C)

There were 66 participants in moderate to severe pain group. The possible associated factors including; advanced maternal age, maternal body mass index, parity, operative time, tubal resection, adhesion, previous surgery, indication for cesarean delivery, type of incision, amount of blood loss and oral analgesic drug used were compared between moderate to severe pain and mild pain group. An oral analgesic drug used had an adjusted Odd ratio of 0.29 (95% confidence interval 0.10 to 0.80) with a statistically significant difference. No statistically significant difference was demonstrated in other factors between both groups (Table 2).

DISCUSSION

From this study, although intrathecal morphine was used in post–cesarean delivery, about two-thirds of the patients reported moderate to severe pain or



Median=20 hours after operation

Figure 1. Proportion of non-PCA opioid user presented as Kaplan-Meier graph

needed additional morphine. The pain was not related to types of incision, tubal resection and operative time. Additional oral analgesic drugs, however, were associated with reduced postoperative pain significantly.

The mean pain score in this study was similar to that of Nilyam et al. study which reported pain scores 2.9 at both 12 hours and 24 hours after cesarean delivery using both general and spinal anesthesia with intrathecal morphine[11] and Howel et al. study[12] using general anesthesia with postoperative IV–PCA opioids, but more than that of Girgin et al. study which reported pain score at 24 hours 0.1 using spinal anesthesia with intrathecal morphine with postoperative IV–PCA.[13]

Our center is the same as many hospitals, the availability of IV–PCA is limited due to the lack of equipment. Most postoperative pain has been managed by intravenous or intramuscular opioids or NSAIDS when patients request. The limitation of ward staff and the patient's knowledge can cause ineffective pain control which made suffering to the patients.[14] Woldehaimenot et al. reported that only

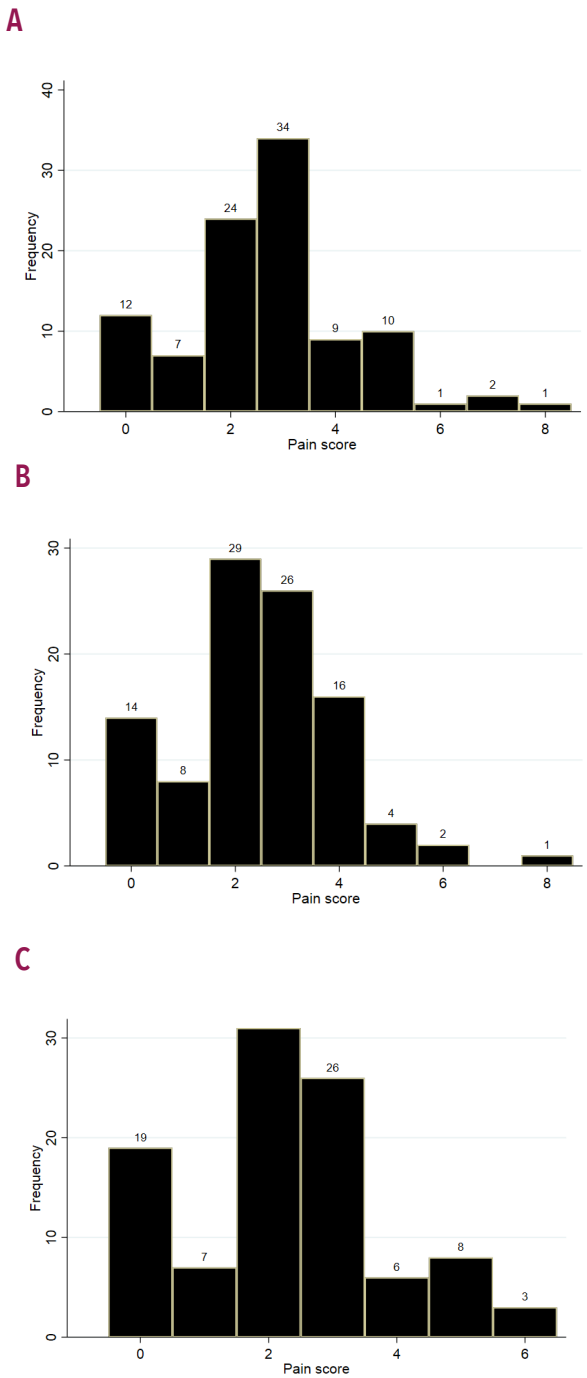


Figure 2. Pain score after operation
Panel A, at 12 hours; Panel B, at 20 hours; Panel C, at 24 hours

a few postoperative patients (2.5%) received pain medication within 15 minutes after complaining of pain and a large number of patients never asked for pain medication during hospitalization.[14] Surgeon and ward staff should be concerned about this fact and postoperative pain management should be based on this limitation.

The clinical implications of this study are first, although intrathecal morphine has been reported for postoperative pain relief at about 16.3 to 17.5 hours,[13] 8.0% of patients needed additional analgesia within 2 hours post-operation, one-fourth of patients within 6 hours and half of the patients within 20 hours. Oral analgesic drugs have been proven for their effectiveness for reducing pain in this study. The starting time however in this study was at 12 hours post-operation which was too late. Therefore, additional analgesic drugs such as paracetamol and NSAIDS especially by the oral route should be offered to patients within 2 hours post-operation. The intravenous or intramuscular analgesic drugs such as NSAIDS or morphine should be added in cases of moderate to severe pain when the oral form of the analgesic drug is insufficient for pain control. This multimodality treatment has been recommended.[1] However, pain control should be managed individually. This is dependent on the level of pain and the patient's satisfaction because nearly half of all patients do not need additional analgesia.

The limitation of this study is the secondary data analysis of a randomized controlled trial, so the pain scores were measured only at 12, 20 and 24 hours post–operation. The pain scores were affected by the intervention (paracetamol plus diclofenac). The post-operative pain in this study was based on pain control by intrathecal morphine with post-operative IV–PCA which is different from general anesthesia or post-operative intravenous or intramuscular opioids. Further research about the result of multimodality pain control with different conditions, such as lack of IV–PCA should be conducted.

In summary, nearly two-thirds of the patients had moderate to severe pain after cesarean delivery under spinal anesthesia using 0.5% bupivacaine with 0.1 to 0.2 mg intrathecal morphine. Pain can happen as early as within two hours after the operation. The use of oral analgesic drugs was associated with pain reduction after cesarean delivery.

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