ISSN 2515-8260 Volume 09, Issue 02, 2022

Analytical observational assessment of the intra-operative anaesthesia management and postoperative pain scores after caesarean section

[1]Dr. Diwakaran R, [2]Dr. Prem Kumar Saminathan

[1]MD, Fellowship in Anesthesia, NUH Singapore, Associate Professor, Department of Anesthesia, Madha Medical College Kovur, Chennai, Tamil Nadu, India
[2]MBBS, Junior Resident, Department of Anesthesia, Madha Medical College Kovur, Chennai, Tamil Nadu, India

Corresponding Author:
Dr. Diwakaran R

Abstract

Aim: Evaluate The Intraoperative Anaesthesia Management and Postoperative Pain Scores after Caesarean Section.
Methods: This analytical observational study conducted in the Department of Anaesthesiology, Madha Medical College Kovur Chennai, India during Feb 2021 to Feb 2022. All patients either receiving GA or spinal anaesthesia for CS receive IV tramadol infusion for post-operative pain control, which is started either at the request for first analgesia in the PACU or at 60 min, whichever comes first. Patients are assessed for pain using numerical rating scale (NRS) immediately in the PACU and at regular intervals. Any patient having NRS >4 is given rescue analgesia.
Results: Percentage of patients having NRS >4 and who required rescue analgesia on immediate assessment (time zero) was 15 (15%). After that, 13 patients (13%) at 30 min, 10 (10%) patients at 45 min and 5 (5%) patients at 60 min had NRS of >4 and required first rescue analgesia. There was no statistically significant difference among patients in PACU having NRS >4 from those having NRS <4 in terms of the type of incision, ASA grading and duration of surgery. Patients receiving RA had a statistically significant (P-value < 0.01) low percentage of patients with NRS >4 and need for first rescue analgesia at time zero and at 30 min when compared to the percentage of patients operated under GA. The difference became insignificant after 30 min. Overall, 18% of patients received some sort of co-analgesia, mainly in the form of IV paracetamol 15% and only two patients received TAP block.
Conclusion: The pain management in the PACU was adequate as all patients were given rescue analgesia if they had NRS of >4 and no patient was shifted from PACU with NRS of >4.

Keywords: Pain management, anaesthesia, caesarean section

Introduction

Recent studies have shown that the way healthcare workers (HCWs) communicate with patients can suggest perceptual experiences that can increase anxiety and pain [1, 2]. In the first randomized study investigating the effects of communication before a potentially painful

procedure, participants were more likely to vocalize pain during i.v. cannula insertion where a negative suggestion was given [3]. Similarly, in a well-designed, double-blind, randomized controlled trial of 140 women receiving spinal anaesthesia for Caesarean section or epidural analgesia for labour, those participants who were warned of a 'big bee sting' before local anaesthetic infiltration had higher pain scores than those informed that the anaesthetist was 'numbing the area' [2]. The word 'nocebo' has been coined to de- scribe non-pharmacological adverse effects of an intervention similar, but opposite, to the 'placebo' effect [4-6].

Advances in brain imaging have led to further understanding of the neurobiology of this phenomenon where the anterior cingulate cortex, which links the limbic system with the sensory cortex, appears to be modulated when a negative suggestion is given [7, 8]. It appears that a sensation can be associated and perceived as suffering, or not, dependent on the words used.

The International Association for the Study of Pain (IASP) defines pain as, 'an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage' [9]. According to this definition, the word 'pain' may function as a negative suggestion or nocebo communication which elicits a subconscious change in a patient's mood, perception, or behaviour [10]. Therefore, the assessment of postoperative pain using negatively valenced, [1] nocebo [2] communications might be expected to adversely affect patient perceptions of their postoperative experience.

Postoperative pain management is said to require accurate and reliable methods of assessment performed on a regular and ongoing basis [11]. Although multiple outcome measures are required to adequately capture the complexity of the pain experience, in clinical practice, the assessment of pain typically uses simple scales such as the visual analogue scale (VAS) score or verbal numerical rating score (VNRS) [12, 13]. In the postoperative setting, the functional capacity of the patient may also be assessed using the VAS for pain at rest (static) and movement (dynamic) [14]. The VNRS and VAS are widely used and have been found to correlate well with each other in a number of studies [11].

Material and methods

This cross-sectional study conducted in the Department of Anaesthesiology, Madha Medical College Kovur Chennai, India during Feb 2021 to Feb 2022, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

In this institution, RA in the form of spinal anaesthesia is the technique of choice for majority (80%) of CS. Hyperbaric bupivacaine 9-12 mg is used in combination with fentanyl in the dose of 0.15-0.25 mg for induction of spinal anaesthesia. Patients receiving RA get short-acting intrathecal fentanyl with local anaesthetic. When GA is used as a technique of anaesthesia for CS, IV opioids are used for intraoperative analgesia. However, the type of IV opioids used is either at the discretion of primary anaesthesiologists or on the availability of opioids. Intraoperative use of co-analgesia in the form of IV paracetamol, diclofenac suppository or transverses abdominus plane (TAP) block are also used for both spinal anaesthesia and GA at the discretion of primary anaesthesiologists. All patients either receiving GA or spinal anaesthesia for CS receive IV tramadol infusion for post-operative pain control, which is started either at the request for first analgesia in the PACU or at 60 min, whichever comes first. Patients are assessed for pain using numerical rating scale (NRS)

ISSN 2515-8260 Volume 09, Issue 02, 2022

immediately in the PACU and at regular intervals. Any patient having NRS >4 is given rescue analgesia. The opioid used in the PACU is IV tramadol, both for post-operative infusion and for rescue analgesia. The institution policy for patients having a working labour epidural in place and coming for emergency CS is to initially give a bolus of 10 ml of 2% xylocaine followed by titrated doses of 0.5% bupivacaine (maximum 10 ml) till a block of thoracic level between T5 and T6 is achieved as assessed by loss of temperature sensation. These patients in the PACU and in the ward for the next 12 h are given as an infusion of local anaesthetic and fentanyl (bupivacaine 0.1% with fentanyl 50 μg of local anaesthetic solution). For rescue analgesia, these patients are given boluses of local anaesthetic from the epidural catheter.

We excluded patients who did not consent to be a part of the study, who were suffering from chronic pain or mental illness, had history of substance abuse, language barrier, operated for morbidly adherent placenta, unable to communicate with the nursing staff or operated for CS under already placed labour epidural (as their pain management regime was different from patients receiving GA or spinal for CS). Data were collected by a designated research assistant or nurses from acute pain management services, who were trained by the primary investigator to fill the data collection sheet, from the anaesthesia record form, nursing notes, post-operative notes and observation of nursing and anaesthesia pain assessment and management in the PACU. A predesigned data collection sheet was used to collect the data, which included patients' demographics, American Society of Anaesthesiologist (ASA) classification, type of incision (vertical midline or pfannenstiel), surgical time, type of anaesthesia, type of intraoperative opioid and co-analgesia used in the OR. The PACU parameters for data collection included NRS at time zero, then at 30, 45 and 60 min and time to first rescue analgesia and time taken to reach the score of <4 after rescue analgesia and occurrence of any side effects. All patients were followed throughout their stay in the PACU.

Patients were informed regarding the assessment of pain score using NRS from 0 to 10, where 0 is no pain and 10 is the worst possible pain. In addition, mild pain was taken as NRS of 0–3, moderate as NRS from 4 to 6 and severe as NRS from 7 to 10. Side effects assessed were sedation, nausea, vomiting, pruritus, respiratory depression and low oxygen saturation of <94%. Following score were used for assessment of side effects:

Sedation (0 = no sedation, 1 = drowsy, easily roused, 2 = somnolent, difficult to rouse)
Nausea + vomiting (0 = none, 1 = mild, 2 = severe) Pruritus (0 = none, 1 = yes)

Statistical analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 21.0. For quantitative variables (age, weight, height and pain scores), means and standard deviations will be computed and analysed by independent sample t-test and Mann–Whitney U-test. Frequency and percentages were computed for qualitative data and analysed by Chi-square and Fisher's exact test. A p-value of ≤ 0.05 was treated as significant.

Results

100 patients were enrolled in the study and assessed in the PACU. The demographic characteristics including the ASA status, mode of admission, type of anaesthesia, type of incision (vertical midline or pfannenstiel) and surgical time are shown in Table 1. The first assessment in the PACU was done immediately (time = 0 min) and was repeated at 30, 45 and 60 min [Table 2]. None of the patients stayed beyond 120 min in the PACU. Percentage of patients having NRS >4 and who required rescue analgesia on immediate assessment (time zero) was 15 (15%). After that, 13 patients (13%) at 30 min, 10 (10%) patients at 45 min and 5 (5%) patients at 60 min had NRS of >4 and required first rescue analgesia. There was no

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statistically significant difference among patients in PACU having NRS >4 from those having NRS <4 in terms of the type of incision, ASA grading and duration of surgery.

According to the institution, PACU protocol of any patient having NRS >4 received rescue analgesia. The results of this study revealed that all patients having NRS >4 received rescue analgesia (I/V tramadol bolus 1 mg/kg) which took 3-15 min for NRS to become <4 [Table 2]. Infusion of I/V tramadol was started following the first rescue analgesia and if the patient did not require any rescue analgesia it was started at 60 min. None of the patients at any time in PACU were reported to have sedation score of >2, respiratory rate of <10 or drop in saturation to < 94%. There were 3 patients (3%) who had nausea and vomiting score of 1 and 1 patients (1%) who complained of pruritus. All patients were treated according to the PACU protocol and did not require further intervention.

Comparison between technique of anaesthesia and time for the need of first rescue analgesia is shown in Table 3. Patients receiving RA had a statistically significant (p-value < 0.01) low percentage of patients with NRS >4 and need for first rescue analgesia at time zero and at 30 min when compared to the percentage of patients operated under GA [Table 3]. The difference became insignificant after 30 min.

Table 1: Patients' demographic, ASA status, mode of admission and type of anaesthesia

Demographic	Frequency	%
Age Mean (SD)	28.33 (5.75)	
Weight (kg) Mean (SD)	72.69 (13.03)	
Height (cm) Mean (SD)	158.56 (5.59)	
ASA status		
I	14	14
II	78	78
III	8	8
Mode of admission		
Emergency	30	30
Elective	70	70
Type of anaesthesia		
General	20	20
Regional	80	80
Type of incision		
Pfannenstiel	90	90
Vertical midline	10	10
Duration of surgery		
≤90 min	97	97
>90 min	3	3

Table 2: Assessment of pain with NRS at different time intervals in the PACU, use of rescue analgesia, time taken for the pain score to reach >4 and number of patients having complications

	Immediate	30 min	45 min	60 min
Number of patients	100	97	90	85
Severity of pain				
No pain (NRS=0)				
Number of patients	76	65	55	50
% of patients	76	67.01	61.11	58.83
Mild pain (NRS=0-3)				
Number of patients	15	30	33	33
% of patients	15	30.93	36.67	38.82
Mean NRS (SD)	2.23 (0.83)	2.15 (0.68)	2.02 (0.67)	2.01 (0.65)

Moderate pain (NRS=4-6) Number of patients	7	1	1	1
% of patients	7	1.03	1.11	1.17
Mean NRS (SD)	4.77 (0.83)	4.78 (0.73)	4.58 (0.24)	5.25 (0.95)
Severe pain (NRS=7-10) Number of patients	2	1	1	1
% of patients	2	1.03	1.11	1.17
Mean NRS (SD)	7.5 (0.79)	7.57 (0.39)	8.1(1.0)	7.40 (0.60)
Moderate to severe pain				
Number of patients	9	2	2	2
% of patients	9	2.06	2.22	2.35
Mean NRS (SD)	5.26 (1.3)	6.45 (1.43)	5.48 (1.46)	5.41 (1.31)
Min-Max NRS	4-10	4-9	4-10	4-9
Number of patients with pain score >4 receiving rescue analgesia	15	13	10	5
Time (min) after rescue analgesia for pain to reached <4 (Min-Max)	5-11	3-16	4-16	3-16
Complications	1	3	3	1

NRS=Numeric rating scale, SD=Standard deviation, Min=Minutes, Min=Minimum, Max=Maximum.

Table 3: Comparison between technique of anaesthesia and time for the need of first rescue analgesia is

Time to first rescue analgesia	N (NRS>4)	Technique of anaesthesia		p-value
		GA (n=20)	RA (N=80)	
0 min	15	10(50%)	5 (6.25%)	<0.01
30 min	13	8 (16%)	5 (6.25%)	<0.01
45 min	10	4 (8%)	6(7.5%)	0.06
60 min	5	1 (2%)	4 (5%)	0.85

Discussion

This study provides information about the effect of intraoperative factors on PACU pain scores as patients were shifted from OR to PACU. The results of this study showed that patients having moderate to severe pain after CS in PACU on immediate assessment was 8.4%. A study from Nigeria has reported a much higher percentage of their patients experiencing some degree of pain in the immediate post-operative period with 79.6% reporting severe pain following CS [5]. Another study by al-Hassan *et al*. revealed a 69% of patients having moderate or severe (VAS ≥4) on immediate recovery from anaesthesia in the PACU but having a significantly less pain on discharge from PACU [16]. The results from our study and other quoted in the literature [15, 16] contrasts with the Audit Commission's (UK) recommendation of <5% of patients should experience severe post-operative pain [17] and also with the proposed standard of target for best practice recommending 100% patients to have a pain score of <4 on first awakening and within 30 min of first awakening in the PACU [18]. Immediate pain in the recovery can be due to intraoperative factors leading to inadequate pain control when patients are first assessed in the PACU and subsequent pain scores on overall pain management in the PACU. However, researchers examining pain management have focused on specific stages of patient care [19], which often did not include intraoperative factors which may have an association on pain scores in PACU after abdominal surgery like CS. Factors such as technique of anaesthesia, type of opioids used in the OR, use of co-analgesia in the OR, type of incision, surgical time duration, ASA grading and overall pain assessment and use of rescue analgesia in the PACU may explain the gap between the standards set by Joint Commission Accreditation of Healthcare Organization of uniformly low pain score and those reported in the literature.

ISSN 2515-8260 Volume 09, Issue 02, 2022

Previous literature has shown an association with type of surgical incision and severity of pain [20], however, this study did not observe any statistically significant difference in the severity of pain as assessed by NRS scoring in terms of the type of incision. The probable reason could be unequal numbers in two groups as pfannenstiel incision was the commonly used incision (91%) versus midline vertical incision (9%) in this study.

Considering technique of anaesthesia, a statistically significant difference ($P < 0.01$) in the number of patients having NRS >4 at time zero and at 30 min receiving RA and GA for CS was observed. The percentage of patients receiving RA, having NRS >4 was significantly low compared to patients operated under GA in the initial 30 min in PACU. Our findings are consistent with previous studies that have shown lower pain scores for patients receiving RA [21]. However, difference between percentage of patients having moderate to severe pain after 45 min became statistically insignificant between GA and RA. The most probable reason could be the short duration of intrathecal fentanyl used in all cases done under RA. A study by Naghibi *et al*. revealed lower pain scores in the first 6 h post-operatively for patients operated under RA, but after that there were no significant differences between RA and GA regarding post-operative pain scores [22]. Another study by Tyritziz *et al*. has found the lasting effect of analgesic effect of RA for up to 2 h [23]. The difference in the lasting effect of RA can be due to the use of long-acting intrathecal opioid-like morphine, which was used in the study by Naghibi *et al*. and not by the Tyritziz *et al* [22, 23]. Addition of intrathecal fentanyl to local anaesthetic to potentiate the effect of subarachnoid block is a widely used practice [24, 25]. However, the analgesic effect of intrathecal fentanyl lasts for about 30 min with an elimination half-life of 1.5–6 h [26]. The same effect is observed in this study where the analgesic effect seemed to decline, as difference between frequency of patients with NRS >4 between GA and RA became insignificant at 45 min. In a randomized trial comparing intrathecal morphine with intrathecal fentanyl and a combination of intrathecal morphine and fentanyl, the quality of post-operative analgesia with fentanyl, when used alone, was found to be inferior to that with morphine. The investigators concluded that the combination of opioids offered no advantage over morphine alone in management of post-caesarean pain [27]. Similarly, Dahl *et al*. found a clinically relevant reduction in severity of post-operative pain and analgesic consumption with the use of intrathecal morphine when compared to other intrathecal opioids in patients undergoing caesarean section with spinal anaesthesia [28]. McMorrow *et al*. found that the pain scores and analgesia requirements after CS were lowest in those receiving spinal morphine [29]. One survey from United States indicated that majority (77%) of respondents used intrathecal morphine [30]. However, availability of preservative-free intrathecal morphine is a major issue in developing country like the one in which this study was conducted.

In this study, intraoperative co-analgesia was used in only 18% patients. The most common intraoperative co-analgesia used was IV paracetamol. A study done by Ozmete *et al*. on the efficacy of pre-operative paracetamol in patients undergoing CS under RA found that additional analgesic requirements were significantly lower in patients receiving IV paracetamol 15 min before induction of anaesthesia compared to the control group in the first post-operative hour [31]. The results of our study showed that majority of the patients receiving IV paracetamol had received GA (80%). These patients despite being given IV paracetamol had higher pain scores compared to patients receiving RA.

TAP block was used in only two patients who received RA. These two patients had NRS <4 beyond 60 min in PACU. One systemic review published on the use of TAP block in CS patients showed significantly improved post-operative analgesia in women undergoing CS who did not receive intrathecal morphine but showed no improvement in those who did receive intrathecal morphine [32]. The use of TAP block is therefore a valuable option for developing countries where availability of intrathecal morphine is an issue.

Pain management does not only vary between hospitals but also between wards within the

ISSN 2515-8260 Volume 09, Issue 02, 2022

same hospitals [33]. PACU is a very critical area where pain needs to be assessed and managed properly. Number of studies report not only pain intensity but also pain relief in terms of "escape criteria," which is the need and delivery of rescue analgesia. The results of this study revealed that all patients having NRS of >4 received rescue analgesia which took 3-15 minutes for NRS to become <4.

One of the limitation of our study is that there is wide difference in the number of patients operated under GA (20%) compared to RA (80%) making the comparison less valid. However, this was an observational study done over a time period, where the number of patients operated under different techniques cannot be controlled.

Conclusion

The pain management in the PACU was adequate as all patients were given rescue analgesia if they had NRS of >4 and no patient was shifted from PACU with NRS of >4.

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