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Original Research Article

Post-Operative Pain Management in Caesarean Section: A Study of TAP Block Versus Local Wound Infiltration

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Abstract:

Background and Aim: It is widely reported that pain is a very common issue experienced by individuals after undergoing surgery. Various techniques are used to reduce pain, promoting early mobility and faster recovery. In this study, we aimed to compare the effectiveness of transversus abdominis plane block and local wound infiltration in providing pain relief after caesarean section. The study was conducted in a randomised double-blind manner, with the use of bupivacaine and clonidine.

Material and Methods: A group of one hundred women between the ages of 18 and 35, who are members of the American Society of Anaesthesiologists (ASA) The study included individuals who had undergone a lower segment caesarean section and were classified as having a physical status of I or II. The patients were divided into two groups of 50 each, Group A and Group B, using a computer-generated random list. Group A was administered TAP Block with 40 ml of 0.25% Bupivacaine on both sides, along with 1 µg/kg clonidine in divided doses. In contrast, Group B received 40 ml of 0.25% Bupivacaine and B µg/kg clonidine. The VAS score was evaluated at regular intervals, as is customary in health journalism. The duration of pain relief and the amount of tramadol needed within a 24-hour period were measured and compared.

Results: it was observed that there was a notable decrease in VAS score values between 2-6 hours in group A compared to group B. The statistical significance level was found to be less than or equal to 0.05. No significant difference was observed at 8, 12, and 24 hours. The highest mean VAS score values were observed at 8 hours in both groups. Group L had a score of 5.37±0.68, while group T had a score of 5.45±0.88. Group B had a VAS score of >4, with a mean of 4.71±1.12 at the 4-hour mark. There was no notable distinction between the two groups, indicating that both groups had similar pulse rates. No instances of bradycardia were observed in either group.

Conclusion: The TAP block has proven to be a highly effective method for providing postoperative pain relief to patients who have undergone a caesarean section. In addition to extending the duration before the first rescue analgesic is needed, the TAP block also reduces the overall amount of analgesics required.

Keywords: Caesarean Section, Local Wound Infiltration, Transversus Abdominis Plane Block, Visual Analogue Scale.

Introduction

After a caesarean section, anaesthesiologists face a distinct set of challenges when it comes to patients' post-operative care. These women are determined to stay vigilant, at ease, and agile so they can properly care for their babies. There are various approaches to address moderate to severe postoperative pain that typically lasts for about 48 hours after a caesarean section.1 As part of a multimodal analgesic regimen, opioids are necessary at first to achieve effective pain relief. However, opioids can cause side effects such as nausea, vomiting, itching, drowsiness, and difficulty breathing, which can vary depending on the dosage. Methods that decrease the need for opioids could potentially be helpful for this group. Various techniques have been employed to achieve a pain-free recovery, including local anaesthesia infiltration, epidural analgesia, peripheral nerve block, and intravenous analgesia.[2-5] Postoperative analgesia has been found to provide significant benefits for obstetric patients. There are various approaches to address post-operative pain and enhance the patient's well-being. These include the use of systemic medications like non-steroidal anti-inflammatory drugs, acetaminophen, opioids, ketamine, and gabapentin, as well as employing

local anaesthesia techniques that target peripheral nerves. [6] While single-shot neuraxial analgesic techniques using long-acting opioids or patient-controlled epidural opioid administration can provide effective pain relief, they can also lead to side effects such as nausea, vomiting, and itching, which can decrease patient satisfaction. Regional anaesthesia with local anaesthetics can help reduce or eliminate these side effects. Blocking the neural afferent supply to the abdominal wall, such as through abdominal field blocks, ilioinguinal, and iliohypogastric nerve blocks, has been found to be highly effective in providing pain relief after caesarean section surgery. [7]

The TAP block is performed on both sides, within the ilio-lumbar triangle of Petit. This area is bounded by the iliac crest at the bottom, the latissimus dorsi at the back, and the External Oblique (EO) muscle at the front. [8] The technique known as blunt uses a double-loss of resistance as the needle is carefully advanced through the layers of EO and Internal Oblique (IO) fascia. Progressed through the EO and Internal Oblique (IO) fascia layers. It is important to position the needle accurately between the IO and the Transversus Abdominis (TA) muscles. Local anaesthetics (LA) are carefully and precisely injected into all layers of the surgical incision in LIA, using a 22-gauge, 1.5-inch needle for accurate placement. When administering local anaesthesia, the needle is carefully inserted into the tissue plane, typically around 0.5 to 1 cm. As the needle is slowly withdrawn, the local anaesthetic solution is injected. This technique helps minimise the chances of accidentally injecting into a blood vessel. Two important factors to consider when evaluating the effectiveness of LA wound infiltration are the reduction in opioid usage and the relief of pain scores. [9]

Nevertheless, the primary method for postoperative pain relief remains the use of local anaesthetic WI. This approach entails injecting local anaesthetics into the incision and continues to be favoured by practitioners due to its straightforwardness. In recent times, with the remarkable advancements in ultrasound techniques, numerous clinicians have started utilising TAP block and comparing it with WI to ascertain the superior technique in adults. However, the findings remain inconclusive.

Bupivacaine is a type of local anaesthetic that falls under the amide category and has a long-lasting effect. In TAP block and LIA, Bupivacaine is typically administered at a concentration of 0.25%-0.5%, with a maximum dosage of 175-225 mg. [10] Clonidine is commonly used as an adjuvant to local anaesthesia. Clonidine has shown analgesic properties when given intrathecally or epidurally, which are believed to be due to its α2 agonist properties. There is some uncertainty surrounding the benefits of including clonidine in peripheral nerve blocks alongside local anaesthetics. However, many experts believe that clonidine can enhance the quality and duration of the block. Clonidine is typically administered at a dosage of 1 µg/kg. Administered at a dosage of 3 µg/kg in TAP block and LIA. [11,12] In this study, we aimed to compare the effectiveness of transversus abdominis plane block and local wound infiltration in providing pain relief after caesarean section. The study was conducted in a randomised and double-blind manner, with the use of bupivacaine and clonidine.

Material and Methods

A total of one hundred women between the ages of 18 and 35, who are members of the American Society of Anaesthesiologists (ASA) and have a physical status of I or II, were selected for the study. These women were scheduled for a lower segment caesarean section under spinal anesthesia.

The sample size was calculated based on the expectation of a minimum 35% difference between the two groups. Thus, each group consisted of 50 patients to ensure a 5% alpha error and 80% statistical power. Preoperative assessment was conducted prior to surgery for elective patients and immediately before surgery for emergency caesarean section cases.

Exclusion criteria for the study included patient refusal, documented allergy to the study drugs, patients with ASA III and IV classification, patients with a Body Mass Index (BMI) over 30 kg/sqm, and patients presenting with cord prolapse, hand prolapse, and uterine rupture.

The participants were divided into two groups of 50 each, Group A and Group B, using a computer-generated random list. Group A was administered TAP Block with 40 ml of 0.25% Bupivacaine on both sides, along with 1 µg/kg clonidine in divided doses. In contrast, Group B received 40 ml of 0.25% Bupivacaine and B µg/kg clonidine.

A thorough examination and necessary investigations were conducted before the day of surgery. The pre-anesthetic evaluation included a detailed explanation of the SA, TAP block, LIA technique, post-operative follow up, and VAS score procedure. Prior to the surgery, all patients were instructed to take oral ranitidine 150 mg as a premedication. Patients were instructed to refrain from eating or drinking for a minimum of 8 hours.

During the procedure, an 18 G IV cannula was carefully placed and patients received a preloaded infusion of lactated Ringer's solution at a rate of 15 ml per kilogramme. The basal vitals, including heart rate, blood pressure, and saturation, were measured using Electrocardiography, Noninvasive blood pressure, and pulse oximeter.

Both groups underwent spinal anesthesia. The patient's vital signs, including heart rate, blood pressure, and saturation, were continuously monitored during the surgery. Any complications such as low blood pressure and slow heart rate were promptly addressed using appropriate medications. Two techniques were used for post-operative pain relief. Group A was administered a TAP block at the conclusion of the procedure using the nerve stimulator technique. A combination of Inj. Bupivacaine 0.25% 20ml and inj. Clonidine 1µg/kg was administered on both sides. Group B was administered local infiltration anaesthesia, which involved the injection of medication at various layers of the abdomen. The injection contains Bupivacaine 0.25% and Clonidine 1µg/kg, which is divided into three parts totalling 40 ml. The solution was injected in the paracolic gutter on each side, into the rectus by the operating surgeon, and subcutaneously after the wound closure. Patients were transferred to the Post Anaesthesia Care Unit for further care and treatment.

Patients who underwent the mentioned techniques were monitored for 24 hours, with pain levels evaluated using the VAS score at various time intervals. Scoring was done by marking a 10-cm line to indicate the level of pain, ranging from "no pain" to "worst pain." According to research, a pain level of 2.0 to 3.0 cm on a 10-cm VAS is considered to be the patient-acceptable symptom state. Patients experiencing breakthrough pain with a VAS score greater than 4 were administered tramadol, and the administration time of the drug was recorded. The duration of analgesia was determined by measuring the time from the placement of the block to the administration of the first dose of tramadol. The total consumption of tramadol within the first 24 hours was carefully observed and documented. After the operation, patients' vital signs such as heart rate, blood pressure, and oxygen saturation were monitored at regular intervals of 0, 2, 4, 6, 8, 12, and 24 hours. Any abnormality in their haemodynamics was promptly addressed and treated. Recorded were the adverse effects associated with the procedure or drugs. The sample size was determined based on a previous study conducted by Das N et al. According to a source cited in the text, [9]

Statistical Analysis: The data was compiled and entered into a spreadsheet program (Microsoft Excel 2019) and then exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were reported using measures such as means and standard deviations or median and interquartile range, depending on their distribution. The presentation of qualitative variables was in the form of counts and percentages. Confidence level and level of significance were set at 95% and 5% respectively for all tests.

Results

All 100 patients who participated in the study successfully completed it. The two groups had similar ages and weights, as shown in Table 1. The age distribution in group B was as follows: 16% of the participants were under 20 years old, 54% were between 21 and 25 years old, and 30% were 26 years old or older. The age distribution in group A was as follows: 14% were under 20 years old, 52% were between 21 and 25 years old, and 34% were 26 years old or older. The two groups had similar age and weight, but the differences were not statistically significant (P value > 0.05). This suggests that the observed differences in other variables are unlikely to have occurred by chance [Table 1].

The post-operative analgesia was assessed by analysing the VAS score at various intervals over a 24-hour period, as shown in Table 2. Group A showed significantly lower VAS score values between 2-6 hours compared to group B. The statistical significance level was found to be less than or equal to 0.05. No significant difference was observed at 8, 12, and 24 hours. The highest mean VAS score values were observed at 8 hours in both groups. In group L, the score was 5.37±0.68, while in group T, it was 5.45±0.88. Group B had a VAS score of >4, with a mean of 4.71±1.12 at the 4-hour mark.

In comparison to Group B, Group A exhibited a statistically significant longer duration of rescue analgesia ($p \leq 0.05$). The total amount of tramadol needed in a 24-hour period was observed in both groups. The mean total dose of tramadol (mg) required in Group B was higher compared to Group A and showed statistical significance ($p \leq 0.05$).

The pulse rate after surgery was monitored for a full day. The average pulse rate was consistently above 75 throughout the study. There was no notable distinction observed between the two groups, indicating that both groups had similar pulse rates. No instances of bradycardia were observed in either group.

Table 1: Frequencies of age group and weight among the two groups

Age group (Years)	Group A (%) N=50	Group B (%) N=50	Total (%)	P value
<20	7 (14)	8 (16)	15 (15)	0.09
21-25	26 (52)	27 (54)	53 (53)	
>26	17 (34)	15 (30)	32 (32)	
Weight	62.24±6.32	63.10±6.25		0.22

Table 2: Comparison of Group A and Group B with postoperative mean VAS scores at different time points

Treatment Times	Group A (%) N=50	Group B (%) N=50	P value
0 hrs	1.05±0.25	1.23±0.41	0.22
2 hrs	2.08±1.21	1.48±0.50	0.003*
4 hrs	2.38±1.26	4.71±1.12	0.001*
6 hrs	3.80±1.48	5.03±0.90	0.002*
8 hrs	5.45±0.88	5.37±0.68	0.54
12 hrs	5.39±0.12	5.10±0.32	0.36
24 hrs	5.05±0.54	4.68±0.72	0.22

*** Indicate statistically significance at p≤0.05**

Discussion

Ensuring effective pain control after surgery is crucial for the overall well-being of the patient. Poor pain management can lead to higher rates of illness and death. [1,2] When it comes to postoperative caesarean section, it's important to carefully plan the postoperative analgesic regimen, taking into account both the mother's needs and the well-being of the breastfeed-dependent newborn. These complications can arise from respiratory, dietary intake, and ambulation impairment. [13] It is important to note that when breastfeeding, patients should avoid opioids as they can be secreted in breast milk. With these considerations in mind, we decided to investigate the effectiveness of the TAP block and LIA in providing pain relief after a caesarean section, using 0.25% ropivacaine. Performing a TAP block during an LSCS under SA can be a great opportunity. Administering injections during the postoperative period helps prevent delays in the operating room and ensures that the newborn is delivered and kept safe. At the conclusion of the surgery, we administered a TAP block. The haemodynamic parameters were recorded during the surgery and for the following 24 hours. The study recorded the postoperative VAS score, duration of analgesia, time of first rescue analgesia administered, total dose of rescue analgesic needed, and any observed side effects.

In our study, it was observed that Group A had notably lower pain scores compared to Group B within the initial 6 hours. The VAS scores were similar in both groups during the first 24 hours. The TAP block works by blocking the anterior primary rami of the T7-T12 spinal nerves. These nerves pass between the internal oblique and transversus abdominis muscles, perforate the rectus abdominis, and ultimately innervate the anterior abdomen through the anterior cutaneous branches. [14] A study conducted by Charles F Bellows and David H Berger discovered that the use of 0.25% Bupivacaine with epinephrine for local site infiltration during laparoscopic ventral hernia repair was more effective compared to the control group. [15] However, during the second hour, the VAS score was recorded at a relatively low 3.1±0.9. Only the peripheral nerves at the site of incised tissue planes are blocked in LIA. Our research yielded results that align with a study conducted by Das N et al. [16]. In their study, they found that the VAS scores were significantly lower in the TAP block group and the time to rescue analgesia was longer compared to the LIA group. In a prospective study, Atim et al [17] examined the impact of TAP block with bupivacaine and infiltration of the skin and subcutaneous tissue on patients undergoing hysterectomy, which aligns with our own research. It was discovered that the group receiving TAP block experienced lower pain scores at 6 hours and 24 hours. This indicates that TAP block may be a more effective method for managing postoperative pain compared to infiltration at the surgical site. Patients who were given clonidine alongside bupivacaine for TAP block experienced a longer duration before needing additional pain relief compared to patients who received the same drug in LIA. When intravenous clonidine is used in peripheral block, the sedation it causes is actually less compared to other uses. A review conducted by McCartney et al. examined 27 studies and found that only 5 of them showed sedation when clonidine was used as an additive. [18] Tramadol was chosen for rescue analgesia due to numerous studies confirming its effectiveness. Single-dose intramuscular tramadol, ranging from 50-100 mg, has been shown to provide postoperative analgesia that is comparable to morphine, pentazocine, and ketorolac. [19] When the drug is absorbed into the muscle, it can be quickly absorbed due to the high number of blood capillaries present. The TAP block is highly effective as it involves the precise administration of local anaesthetics into the specific area between the transversus abdominis and IO muscles. This region is where the thoracolumbar nerves, which originate from the T6 to L1 spinal roots, play a crucial role in regulating the sensation of the entire anterolateral abdominal wall. [20] Postoperative nausea and vomiting (PONV) is a common issue that many patients experience after surgery. It can be quite bothersome and uncomfortable. In 2015, Guo Q et al. conducted a meta-analysis consisting of 9 Randomised Controlled Trials, which yielded similar results. [21] In their study, morphine was utilised as a rescue analgesic. The TAP block

resulted in a notable decrease in overall morphine consumption by 3.85 mg over a 24-hour period, in comparison to wound infiltration. It was determined that the TAP block offers better pain relief when compared to wound infiltration in a multimodal analgesic regimen.

Conclusion

Based on the evidence, the TAP block has proven to be a highly effective method for providing postoperative pain relief to patients who have undergone a caesarean section. In addition to extending the time before the first rescue analgesic is needed, the TAP block also reduces the overall amount of analgesics required.

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