



Comparison of the Effects of Intrathecal Morphine Administration and Transversus Abdominis Muscle Block as Post-Caesari Section Analgesics

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Abstract. The problem that is often faced by patients after cesarean section surgery is pain in the operating area, many therapies are used to reduce pain scores in patients. From non-medical mentosa, medical therapy to pain intervention. Two of the methods to reduce postoperative cesarean section pain are intrathecal morphine injections and transversus abdominis muscle blocks (TAP blocks). This study aims to find differences in pain scores after sectio caesaria surgery between patients who received intrathecal morphine and patients who received TAP block. An experimental study used the Post Test Only Control Group Design on Dirgahayu Hospital patients. A total of 108 patients were divided into 3 groups. Group K was not intervened by pain, group B was intervened by TAP block, group M was intervened with intrathecal morphine injection. VAS score was measured at the 4th hour postoperatively. Data were analyzed with the One-Way ANOVA test followed by the Post Hoc Test Bonferroni. Lower pain score was obtained in the group that received pain intervention than the control group with a significant difference ($p < 0.05$). The pain scores of patients who received TAP block were lower than those who received intrathecal morphine with a significant difference ($p < 0.05$). There was a significant difference in pain scores between intrathecal morphine and TAP block. It is hoped that TAP block administration will be used to reduce the pain scale after sectio caesaria surgery. Further research is needed regarding these 2 methods.

Keywords: Analgetic; Cesarean Section; Morphin; Postoperative Pain; TAP Block.

1. INTRODUCTION

Post-cesarean section pain remains a common problem for obstetric patients. Anesthesiologists have many methods for managing pain in post-cesarean section patients. These include intrathecal opioids administered preoperatively and a combination of transversus abdominis muscle blocks postoperatively.

One drug administered intrathecally to manage post-cesarean section pain is morphine. Morphine belongs to the opioid class. Although it has histamine-releasing effects and can trigger nausea and vomiting, it has a relatively long half-life and can synergize with spinal anesthetics, resulting in prolonged analgesia. Intrathecal morphine is administered during spinal anesthesia, mixed with anesthetics, with an analgesic duration of approximately 24-36 hours postoperatively.

Another method for reducing pain in patients after lower abdominal surgery is a transversus abdominis plane block (TAP block). A transversus abdominis muscle block (TAP block) is administered by injecting local anesthetic plus steroids bilaterally near the surgical wound.²

This study aimed to determine whether there is a difference in post-cesarean section outcomes in patients undergoing deep transversus abdominis block and intrathecal morphine, based on the patient's postoperative pain scale. The study was conducted on patients

undergoing cesarean section at Dirgahayu Hospital. It is hoped that this study will provide a basis for further research in determining methods for reducing pain in post-operative patients.

2. METODE

This was an experimental study with a post-test only control group design, with patients at Dirgahayu Hospital as the subjects. The selected patients were female patients undergoing elective cesarean sections. The inclusion criteria were age 25 to 35, term pregnancy, vital signs within normal limits, no complicating conditions that could interfere with anesthesia such as preeclampsia, heart disease, infection, obesity, fetal abnormalities, non-emergency surgery, or other complications, and no complications during or after the operation. A total of 108 patients were divided into three groups of 36 patients each. The Control Group (K) underwent cesarean section with premedication of ondancetron 4 mg intravenously as an antiemetic. Preload was administered with a 500 cc Ringer's lactate infusion. Spinal anesthesia was then administered with 12.5 mg intrathecal bupivacaine. During the operation, tranexamic acid 500 mg intravenously was administered as an antihemorrhage, and methylergometrine, a uterotonic, and oxytocin, was administered slowly intravenously. Postoperatively, patients were given 100 mg of intravenous tramadol and ketoprofen suppositories as preoperative analgesics. In the ward, patients received intravenous ketorolac 30 mg and a tramadol 100 mg drip in 500 cc of lactating fluid at a rate of 20 drops per minute on postoperative days 0 and 1. Pain levels were measured 4 hours after surgery, assuming the effects of spinal anesthesia had worn off and whether the patient required additional analgesia. 1 Pain levels were measured using a Visual Analogue Scale on patients 4 hours postoperatively before receiving additional analgesia.

The Transversus Abdominis Plane Block (TAP Block) group (B) received the same treatment as the Control group, but also received ultrasound-guided blockade of the left and right transversus abdominis muscles using 15 cc of 0.25% bupivacaine plane and 5 mg of dexamethasone on each side. In addition to the treatment given to the control group, the Intrathecal Morphine (M) group also received 2 mg of morphine as an adjuvant to spinal anesthesia, which prolongs the pain-relieving effect and provides postoperative analgesia. Data were processed using SPSS for Windows Release 26.0. The data obtained showed a normal distribution, so they were analyzed using a One-Way ANOVA test to determine differences between the three groups, followed by a Bonferroni post hoc test to determine differences between each group at a significance level of 0.05.

3. RESULT

The study involved 108 patients divided into three groups. The results of the Visual Analogue Score (VAS) measurements of postoperative pain are shown in the following table:

Table 1. Visual Analogue Scale Pasien Post SC.

Kelompok	N	Maksimum	Minimum	Mean	SD
K	36	6	3	4,92	0,906
B	36	4	1	2,14	0,899
M	36	4	2	3,06	0,583

Data analysis revealed a normal distribution. Statistical analysis using one-way ANOVA revealed a significant difference ($p=0.000$) in the Visual Analogue Scale scores of patients between the three experimental groups. Further differences for each experimental group were analyzed using the Bonferroni post hoc test.

Table 2. Uji Bonferroni dan Tamhane Visual Analogue Scale Post Caesarian Section.

Kelompok	Mean Difference	95% Confidence Lower	95% Confidence Upper	P
K B	2,778	2,31	3,24	0,000
K M	1,861	1,40	2,33	0,000
B K	-2,778	-3,24	-2,31	0,000
B M	-0,917	-1,38	-0,45	0,000
M K	-1,861	-2,33	-1,40	0,000
M B	0,917	0,45	1,38	0,000

The visual analogue scale showed a significant difference in group B compared to group K (p value = 0.000). Group M showed the same results when compared to group K (p value = 0.000). A significant difference can be seen between group B and group M where the visual analogue scale in group B was lower than in group M ($p = 0.000$).

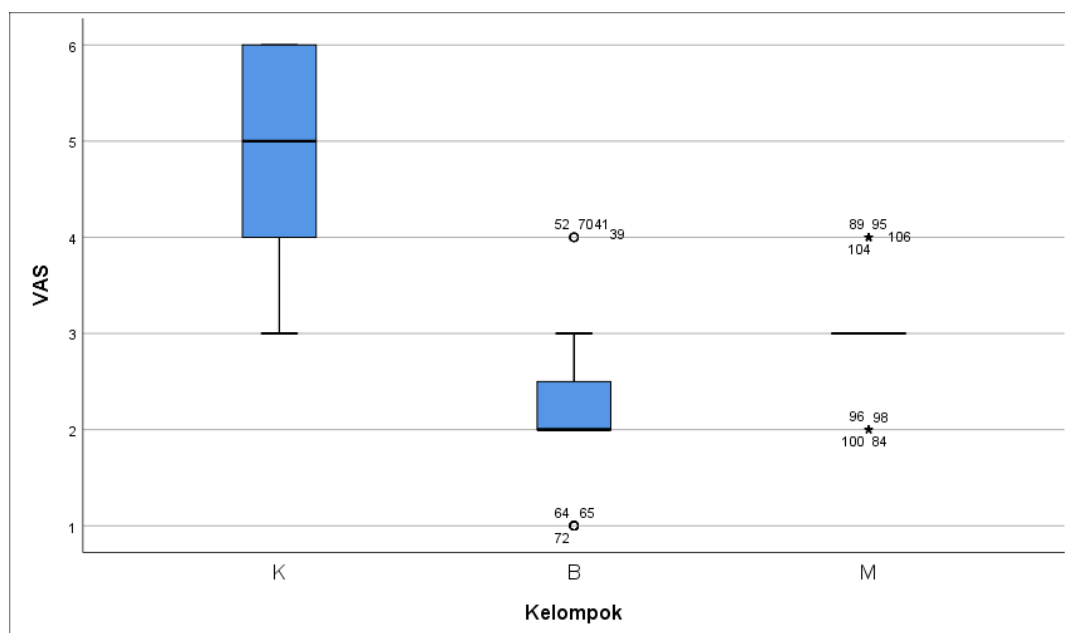


Figure 1. Grafik box plot 3 Group Intervension.

4. DISCUSSION

Post-caesarean section pain should be monitored in the ward after vital signs. This is related to the speed of patient mobility and recovery after surgery. However, administering a wide variety of pain medications, in addition to carrying a high risk of side effects, also increases the workload of healthcare workers due to increased attention and monitoring of medication administration in patients with high pain scores. Methods that significantly relieve pain and are expected to reduce the workload of healthcare workers include intrathecal morphine administration and transversus abdominis plane muscle blocks (TAP blocks).

Morphine is an opioid administered for acute and chronic pain conditions. Morphine is commonly used as adjuvant of spinal anesthesia. The advantage of intrathecal (IT) morphine over intravenous (IV), oral (PO), or transdermal (TD) opiates is due to its delivery into the subarachnoid space with direct access to opiate receptors and ion channels. Changing the route of morphine administration from systemic to intrathecal requires close attention to dosing as the potency of the morphine is dramatically enhanced by intrathecal delivery. Intrathecal morphine is more likely to benefit patients with nociceptive or neuropathic pain that is well localized and responsive to systemic opioids. This pain may or may not be cancer-related. One benefit of intrathecal delivery is since it bypasses first-pass metabolism and the blood-brain barrier by working directly at the dorsal horn of the spinal cord, morphine can achieve an analgesic effect at a lower dose and with potentially less systemic side effects than with large dose oral opioids. Intrathecal morphine is less likely to benefit patients with pain that is refractory to systemic opioids. Additionally, intrathecal opiates should be avoided or minimized in patients with pulmonary disease, obstructive sleep apnea, or substance abuse. Intrathecal administration of morphine through implantable pumps should be avoided in patients with cancer-related pain with a life expectancy of fewer than three months, as it takes time to titrate the optimal dosing regimen. Opioids work in three distinct areas of the central nervous system (CNS): the periaqueductal-periventricular gray matter, the ventromedial medulla, and the spinal cord. Morphine interacts predominantly with the mu-receptor. The mu-binding sites of opioids are present in the brain, with high densities of sites found in the posterior amygdala, hypothalamus, thalamus, caudate nucleus, putamen, and some cortical areas. They are also on the terminal axons of primary afferents within the substantia gelatinosa of the spinal cord. The onset of action: 5 to 10 minutes. Duration of action: Clinical duration of action can be as long as 20 hours given the biphasic pattern.

The use of intrathecal morphine is very common in caesarian section patients. Generally, the dose used is 100 mcg as a single dose added to local anesthetic in spinal anesthesia. Doses

higher than this have resulted in higher incidence of side effects with minimal benefit in terms of quality of analgesia. Some centers utilize this drug to decrease dose of local anesthetic and improved quality of block.

This study found that morphine pain scores were lower than those of controls, with significant test results ($p=0.000$). Nermin Girgin's research proved that intrathecal morphine combined with bupivacain has no difference effect than IV morphine PCA for post caesarian section pain. Min Gi Ban's study has rescued was a significant decrease in VAS score and total fentanyl administration in group intrathecal morphine and combination intrathecal morphine and bupivacain group. Izumi Sato discovered intrathecal morphine for post caesarean section analgesia decreased incidence of delayed ambulation after surgery.⁷ A meta-analysis study shows that high dose (0,1-0,25mg) of intrathecal morphine prolong analgesia after caesarian delivery compared with low doses (0,05-0,1 mg). However high dose intrathecal morphine can result in side effects such as nausea, vomiting, pruritus, sedation, and respiratory depression.

The transverse abdominis plane (TAP) block is a peripheral nerve block designed to anesthetize the nerves supplying the anterior abdominal wall (T6 to L1). It was first described in 2001. Local anesthetic is then injected between the internal oblique and transverse abdominis muscles just deep the fascial plane between (the plane through which the sensory nerves pass. In a recent meta-analysis, the TAP block was shown to reduce the need for postoperative opioid use, increase the time to first request for further analgesia, and provide more effective pain relief, while decreasing opioid related side effects such as sedation and postoperative nausea and vomiting. Studies included a combination of both general abdominal and gynecologic procedures. The introduction of ultrasound has allowed providers to identify the appropriate tissue plane and perform this block with greater accuracy under direct visualization.

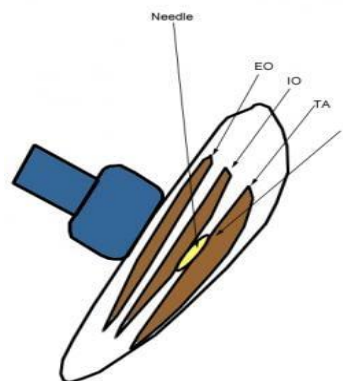


Figure 2. Illustration depicting the placement of the ultrasound probe along the abdominal wall, and the ideal placement of local anesthetic.

The TAP block is a simple procedure that can be used as an adjunct for postoperative pain control in abdominal, gynecologic, or urologic surgery involving the T6 to L1 distribution. Surgical procedures investigated by randomized clinical trials include large bowel resection, caesarean delivery, abdominal hysterectomy, open appendectomy, and laparoscopic cholecystectomy.

Penelitian ini menunjukkan skor nyeri yang rendah pada kelompok blok otot trasnversus abdominis dibanding kelompok kontrol secara signifikan. Dan juga didapatkan skor nyeri yang lebih rendah pada kelompok blok transversus abdominis dibanding kelompok morfin secara signifikan. The effect of transversus abdominis plane (TAP) block on postoperative pain remains uncertain. This meta-analysis aimed to assess the analgesic efficacy of TAP block in patients undergoing colorectal surgery. Based on 7 clinical trials, we found that TAP block was an effective approach for reduced postoperative acute pain and morphine consumption. Maybe there will be research to assess the analgesic efficacy of transversus abdominis plane (TAP) block in patients post caesarian section.

Eko Nofiyanto's study has discovered TAP Block with ropivacaine 0,25% provided safe and effective analgesia in sectio caesarea for pregnant patients with severe comorbid cardiac mitral stenosis. TAP Block preventing cardiac complications, reducing opioid use, accelerating mobilization time, and has the same hospitalization duration with normal patients. Poupak Rahimzadeh used 20 cc ropivacaine 0,25% for TAP block significantly decreased pain score at rest especially in 8 until 12 hours. There was no statistically significant difference between control group and TAP block group in terms of consumption of analgesics. The postoperative TAP block could offer better postoperative analgesia than preepmtive TAP block.

In the other rescearch retrospective study in single center reviewed 718 patients underwent elective abdominal surgery with TAP block and non-TAP block discovered TAP block did not reduced use of intravenous analgesics, antiemetic drugs and pain scores when used as a supplementary approach for the treatment of acute postoperative pain in the PACU in the present study. Cohort retrospective study of all adult patient which received TAP block that underwent colorectal procedures discovered no significant differences were observed in post operative pain scores (either first 4 hours or for entire duration of hospital stay) or opioid consumption between the pre-induction and the post induction groups. A significant difference was found between intrathecal morphine and transversus abdominis muscle block (TAP block) in reducing post-caesarean section pain scores. Lower pain scores were found with TAP block compared with intrathecal morphine. Further research is needed on the efficacy of intrathecal morphine and transversus abdominis block in various patient conditions.

- a. Nermin Girgin's research proved that intrathecal morphine combined with bupivacain has no difference effect than IV morphine PCA for post caesarian section pain. (Girgin Nermin, Gulbert Alp, Turker Gurkan, et al. Intrathecal Morphine in Anesthesia for Caesarian Delivery: Dose Response Relationship for Combinations of Low Dose Intrathecal Morphine and Spinal Bupivacaine. *Journal of Clinical Anesthesia* 2008 May:180-5)
- b. Aparna Sinha's study demonstrated that TAP block is a feasible option for pain relief following repair abdominal wall hernias. It produced markedly improved pain scores and promoted early ambulatory leading to greater patient satisfaction and earlier discharge. (Sinha Aparna, Jayaraman Lakshmi, Punhani Dinesh, et al. Transversus Abdominis Plane Block for Pain Relief in Patients Undergoing in Endoscopic Repair of Abdominal Wall Hernia: A Comparative, Randomised Double Blind Prospective Study. *J Minim Access Surg* 2018 Jul-Sep;14(3):197-201.)
- c. Morphine is an opioid administered for acute and chronic pain conditions. The advantage of intrathecal (IT) morphine over intravenous (IV), oral (PO), or transdermal (TD) opiates is due to its delivery into the subarachnoid space with direct access to opiate receptors and ion channels. Changing the route of morphine administration from systemic to intrathecal requires close attention to dosing as the potency of the morphine is dramatically enhanced by intrathecal delivery. Intrathecal morphine is more likely to benefit patients with nociceptive or neuropathic pain that is well localized and responsive to systemic opioids. This pain may or may not be cancer-related. One benefit of intrathecal delivery is since it bypasses first-pass metabolism and the blood-brain barrier by working directly at the dorsal horn of the spinal cord, morphine can achieve an analgesic effect at a lower dose and with potentially less systemic side effects than with large dose oral opioids. Intrathecal morphine is less likely to benefit patients with pain that is refractory to systemic opioids. Additionally, intrathecal opiates should be avoided or minimized in patients with pulmonary disease, obstructive sleep apnea, or substance abuse. Intrathecal administration of morphine through implantable pumps should be avoided in patients with cancer-related pain with a life expectancy of fewer than three months, as it takes time to titrate the optimal dosing regimen. Opioids work in three distinct areas of the central nervous system (CNS): the periaqueductal-periventricular gray matter, the ventromedial medulla, and the spinal cord. Morphine interacts predominantly with the mu-receptor. The mu-binding sites of opioids are present in the brain, with high densities of sites found in the posterior amygdala, hypothalamus, thalamus, caudate nucleus, putamen, and some cortical areas. They are also on the terminal axons of primary afferents within the substantia gelatinosa of the spinal

cord. The onset of action: 5 to 10 minutes. Duration of action: Clinical duration of action can be as long as 20 hours given the biphasic pattern. (Cummings Adrienne, Orgill D Britlyn, Fitzgerald Brian M. Intrathecal Morphine. PubMed 2022 May 1 [cited 2022 June 13] :1-7).

- d. The transverse abdominis plane (TAP) block is a peripheral nerve block designed to anesthetize the nerves supplying the anterior abdominal wall (T6 to L1). It was first described in 2001. Local anesthetic is then injected between the internal oblique and transverse abdominis muscles just deep the fascial plane between (the plane through which the sensory nerves pass. In a recent meta-analysis, the TAP block was shown to reduce the need for postoperative opioid use, increase the time to first request for further analgesia, and provide more effective pain relief, while decreasing opioid related side effects such as sedation and postoperative nausea and vomiting. Studies included a combination of both general abdominal and gynecologic procedures. The introduction of ultrasound has allowed providers to identify the appropriate tissue plane and perform this block with greater accuracy under direct visualization.

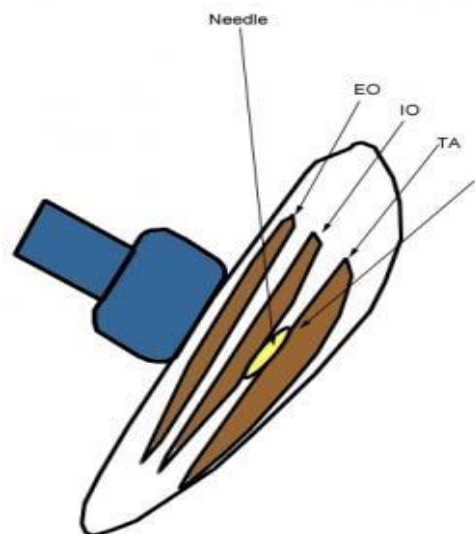


Figure 3. Illustration depicting the placement of the ultrasound probe along the abdominal wall, and the ideal placement of local anesthetic.

The TAP block is a simple procedure that can be used as an adjunct for postoperative pain control in abdominal, gynecologic, or urologic surgery involving the T6 to L1 distribution. Surgical procedures investigated by randomized clinical trials include large bowel resection, [caesarean delivery](#), abdominal hysterectomy, open appendectomy, and laparoscopic cholecystectomy. However, the TAP block has also found clinical utility in procedures such as abdominal and inguinal hernia repair, [radical](#)

[prostatectomy](#), [nephrectomy](#), and many different laparoscopic procedures in general. Bilateral TAP blocks can be used for midline incisions. This technique is also useful for procedures in which epidural analgesia is contraindicated (ie, anticoagulated patients). In addition, if prolonged analgesia is desired, a continuous TAP block technique with placement of a catheter has been described. Very few contraindications exist to performing a TAP block. Absolute contraindications include infection at the site of injection, patient refusal or inability to cooperate, and allergy to local anesthetics. (Wiisanen Michael T, Raghavendra Meda. Transversus Abdominis Block. PubMed 2018 May 31 [cited 2022 June 13]: 1-5).

- e. To assess the analgesic efficacy of transversus abdominis plane (TAP) block in patients post caesarian section. The effect of transversus abdominis plane (TAP) block on postoperative pain remains uncertain. This meta-analysis aimed to assess the analgesic efficacy of TAP block in patients undergoing colorectal surgery. Based on 7 clinical trials, we found that TAP block was an effective approach for reduced postoperative acute pain and morphine consumption. (Liu Lin, Xie Yan-Hu, Zhang Wei, et al. Effect of Transversus Abdominis Plane Block on Postoperative Pain after Colorectal Surgery: A Meta-Analysis of Randomized Controlled Trials. *Med Princ Pract* 2018; 27:158-165).
- f. Eko Nofiyanto's study has discovered TAP Block with ropivacaine 0,25% provided safe and effective analgesia in sectio caesarea for pregnant patients with severe comorbid cardiac mitral stenosis. TAP Block preventing cardiac complications, reducing opioid use, accelerating mobilization time, and has the same hospitalization duration with normal patients. (Eko Nofiyanto, Ristiawan Muji Laksono, Isngadi. Transversus Abdominis Plane Block as Postoperative Analgesic for Caesarian Section Patients with Severe Mitral Stenosis. *Journal of Anaesthesia and Pain* 2020;1(2):38-43.)
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- h. Cohort retrospective study of all adult patient which received TAP block that underwent colorectal procedures discovered no significant differences were observed in post operative

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- l. A meta-analysis study shows that high dose (0,1-0,25mg) of intrathecal morphine prolong analgesia after caesarian delivery compared with low doses (0,05-0,1 mg). However high dose intrathecal morphine can result in side effects such as nausea, vomiting, pruritus, sedation, and respiratory depression. (Sultan Pervez, Halpern StephenH, Pushpanathan Ellile, et al. The Effect of Intrathecal Morphine Dose on Outcomes after Elective Caesarian Delivery: A Meta-Analysis. *International Anesthesia Research Society* 2016;123(1):154-64).
- m. The use of intrathecal morphine is very common in caesarian section patients. Generally the dose used is 100 mcg as a single dose added to local anesthetic in spinal anesthesia. Doses higher than this have resulted in higher incidence of side effects with minimal benefit in terms of quality of analgesia. Some centers utilize this drug to decrease dose of local anesthetic and improved quality of block. (Cosgrave David, Shanahan Enda, Conlon

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5. CONSLUSSION

Based on the research results and data analysis comparing intrathecal morphine and transversus abdominis plane (TAB) block as post-cesarean section (CS) analgesics, it can be concluded that both methods are effective in providing post-cesarean section pain control. However, intrathecal morphine tends to produce significantly lower pain scores (VAS/NRS) during rest and mobilization within the first 24 hours. In terms of duration of action, intrathecal morphine has a longer analgesic effect compared to the TAB block, as morphine acts directly on opioid receptors in the dorsal horn of the spinal cord, while the TAB block only provides somatic blockade in the abdominal wall without affecting the visceral (uterine) component of pain.

Regarding side effects, the TAB block demonstrates a better safety profile, with fewer systemic side effects, whereas patients receiving intrathecal morphine show a higher prevalence of pruritus, nausea, and vomiting (postoperative nausea and vomiting). Additionally, the need for additional analgesics (rescue analgesia) tends to be lower in the intrathecal morphine group due to its more comprehensive pain blockade, covering both somatic and visceral pain. Therefore, intrathecal morphine remains the gold standard for high-quality post-CS analgesia, while the TAB block serves as an excellent alternative for patients with contraindications to intrathecal opioids or those who are more susceptible to side effects such as nausea, vomiting, and pruritus.

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