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Original Research Article

To Compare the Effect of Dexamethasone and Dexmedetomidine Given as Adjuvant with Ropivacaine in Transverse Abdominis Plane Block in Total Abdominal Hysterectomy

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Abstract

Background: Several adjuvants have been used to improve the efficacy of the transversus abdominis plane (TAP) block because it has been used as an effective component of multimodal analgesic treatment for major abdominal surgeries. Dexmedetomidine and dexamethasone are two important additive when given as premixed with ropivacaine in transverse abdominis plane block, in terms of analgesic drug requirement and duration of post-operative analgesia in total abdominal hysterectomy patients.

Aims and Objectives: To compare the analgesic effect of 0.2% ropivacaine as an adjuvant with dexamethasone 4mg and dexmedetomidine 10 mcg in transverse abdominis plane block for post-operative analgesia in total abdominal hysterectomy.

Materials and Methods: This study was conducted on 120 adult patients randomly allocated into two groups of 60 patients each. In Group A, the patient received 20 ml of 0.2% of ropivacaine with dexamethasone 4mg on either side, while in Group B, the patient received 20 ml of 0.2% of ropivacaine with dexmedetomidine10mcg on either side. Statistical analysis was done using appropriate parametric /non-parametric tests and chi-square tests.

Results: The duration of post-operative analgesia was significantly longer in Group B than in Group A (174.30 ± 24.24 minutes and 273.57 ± 13.25 minutes, respectively) ($p<0.05$). The total mean dose of post-operative analgesia was lower in Group A (1.3± 0.5) than in Group B (2.3 ± 0.5). Numerical rating scale was lower in Group A at 2, 4, 8, 12 and 24 hours compared to Group B ($p<0.05$).

Conclusion: Using dexamethasone as an adjuvant to ropivacaine improves the efficacy of TAP block in terms of duration and requirement of analgesia than dexmedetomidine with a significant reduction of post-operative analgesic requirement without any adverse effects.

Keywords: Dexamethasone, Dexmedetomidine, Ropivacaine, Post-Operative Analgesia, Transverse Abdominis Plane Block, Abdominal Hysterectomy.

Introduction

Women undergo hysterectomy surgery frequently. Because of the extensive incision and soft tissue undermining involved in this operation, moderate to severe post-operative pain may occur. [1] Although various Non-steroidal anti-inflammatory drugs (NSAIDs) or opioids were traditionally used for post-operative analgesia, their usage is limited to a short time and has common adverse effects. [2] Recently, nerve blocks have been advocated to provide good analgesia and alleviate the above difficulties.

Transversus abdominis plane (TAP) block, a regional analgesic method for post-operative analgesia, is highly beneficial in major abdominal surgeries. [3] Adjuvants are utilized in several regional block procedures to improve the quality and duration of local anesthesia. [4] Ropivacaine is the most commonly used local anesthetic for peripheral nerve blocks. It often provides adequate post-operative analgesia for 4-10 hours, such different additives like morphine, tramadol, dexamethasone, dexmedetomidine, and clonidine have been used to increase the efficacy of peripheral nerve blocks. [5]

Dexamethasone could be used as an additive in regional nerve blocks due to its anti-inflammatory and antagonistic nociceptors C fibers effects. Its role as an additive to local anesthetics has been demonstrated in various peripheral nerve blocks; however, it's still lacking in TAP block for lower abdominal surgery under general anesthesia. [5]

Dexmedetomidine, an alpha-2 adrenergic receptor agonist, is a valuable adjuvant due to its sedative, analgesic, and hemodynamic stabilizing properties and prolonged post-operative analgesia with minimal side effects. It has a relatively high ratio of alpha-2 / alpha-1 activity and lacks respiratory depression making it a safe adjuvant. [6] Hence, this study was designed to compare dexamethasone and dexmedetomidine given as an adjuvant with ropivacaine in transverse abdominis plane block in total abdominal hysterectomy.

Materials and Methods

A cross-sectional analytical study was performed at Sri Aurobindo Medical College & Post

Graduate Institute, Indore (MP) on 120 patients for one month. Patients of age Group 35-60 years, ASA I and II grade patients, and patient posted for total abdominal hysterectomy were included in the study. However, patients with ASA III and IV who did not consent were allergic to the study drug, coagulopathy, and infection at the block site were excluded.

Patients were divided by the alternate method into two groups: Group A patients received blockage with 0.2% ropivacaine with dexamethasone 4mg as an adjuvant, and Group B patients received blockage with 0.2% ropivacaine with dexmedetomidine 10mcg as an adjuvant. The assessment was performed with a numerical rating scale of 0 hours, 2 hours, 4 hours, 6 hours, 12 hours, and 24 hours. Along with this, the time of first rescue analgesia was noted.

Pre-anesthetic evaluation: A thorough pre-anesthetic evaluation, including the airway assessment, was performed. After shifting patients to the operation theatre, monitors were attached, and baseline parameters viz heart rate, systolic and diastolic blood pressure, mean arterial pressure, spo2, and ECG tracings were recorded.

Post-operative procedure:

The surgery was performed, and at the end of the surgery, Petit's triangle was identified on both sides above the iliac crest between the fibers of the external oblique and latissimus dorsi muscles. Under all aseptic precautions, the block was given

through Petit's triangle with a 20 G epidural needle attached to a 20 ml syringe containing the drug as per the Group allocation. The needle was introduced perpendicular to the skin and advanced until two "POPS" or "give way" were felt. Then the drug was deposited in the fascial plane after aspiration, and aspiration was checked every 5 ml to rule out the intravascular injection. The patient was observed for 15 minutes and then shifted to the post-anesthesia care unit.

Group A: Patient received 20 ml of 0.2% of ropivacaine with dexamethasone 4mg on either side.

Group B: Patient received 20 ml of 0.2% of ropivacaine with dexmedetomidine 10mcg on either side.

Post-operative observations: The presence and severity of pain, nausea, vomiting and other side effects were assessed for all patients in both Groups. These assessments were performed for 30 mins at 2, 4, 6, 12, and 24 hours postoperatively in the ward. All patients were asked to give scores for their pain and the degree of nausea at each time. Pain severity was measured using a numerical rating scale (0=no pain) to 10 (worst pain).

Rescue analgesia was given on a numerical rating scale ≥ 4. The time of first onset & the time of the first request for analgesia requirements during the first 24 hours were noted. Any signs of adverse effects of the technique like local site infection, hematoma formation, local anesthetic toxicity due to intravascular injection of anesthetic (like dizziness, tinnitus, perioral numbness and tingling, lethargy, seizures, signs of cardiac toxicity like atrioventricular conduction block, arrhythmias, myocardial depression, and cardiac arrest) were noted.

Statistical analysis plan

Data were categorized first using the frequency distribution table. Quantitative data were expressed as mean+/-SD. After defining the normality of the data, the quantitative variables were analyzed using appropriate parametric /non-parametric tests. The association of categorical variables was analyzed using the chi-square test. P value < 0.05 was considered statistically.

Results

Demographic characteristics like age, weight, sex, ASA I/II status, body mass index (BMI), and duration of surgery were comparable among both Groups. The duration of post-operative analgesia was significantly prolonged in Group A compared to Group B, with a mean duration of 273.57 ± 13.25 minutes and 174.30 ± 24.24 minutes, respectively (Table 1).

Table 1: Demographic data and duration of surgery

Parameters	Group A (n=60)	Group B (n=60)	P-value
Age (years)	43.70±3.05	44.30±4.68	0.462
Weight (kg)	71.37± 2.54	70.30±3.52	0.562
BMI (kg/m^2)	25.59±1.40	25.77±1.75	0.772
ASA I/ii[a]	14/16	13/17	0.562
Duration of surgery (min)	80.00±9.65	76.83±12.83	0.001
Mean duration of postoperative analgesia (min)	273.57±13.25	174.30±24.24	<0.001

Data are expressed as Mean±SD

In Group A, only one rescue analgesic dose was demanded by 70% of patients, and two analgesic doses were required by 30% of patients over 24 hours; in Group B, three rescue analgesic doses were given to 33.3% of patients, and two analgesic doses were given to 66.7% of patients. Moreover, the number of mean rescue analgesic doses was significantly lower in Group A (1.3 ± 0.5)

as compared to Group B (2.3 ± 0.5) postoperatively (Figure 1).

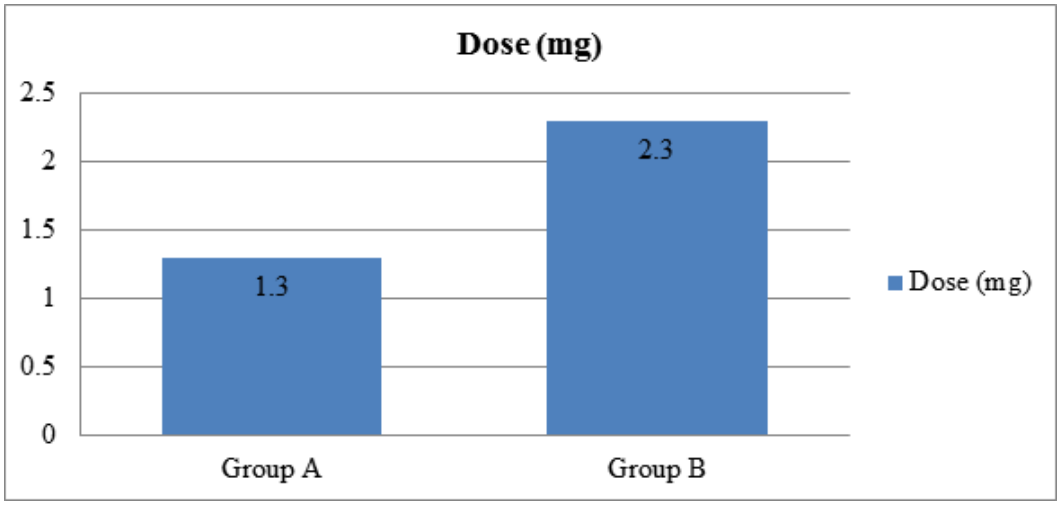

Figure 1: Total dose of post-operative analgesia in 24 hours

NRS scores were >4 in both the Groups except at 2 hours and 4 and 8 hours in Group A (Table. 2). As compared to Group A, NRS was significantly higher in Group B till 24 hours postoperatively (p-value <0.05). A better satisfaction score was noted in Group A patients compared to Group B but with a statistically insignificant difference. No significant side effects were reported in any Group.

Table 2: Numerical rating scale (NRS)

Time (hours)	Group A (n=60)	Group B (n=60)	P-value
2	0.12 ± 0.32	3.40 ± 0.57	< 0.05
4	0.63 ± 0.57	4.82 ± 1.02	< 0.05
8	2.32 ± 0.47	4.99 ± 0.72	< 0.05
12	4.44 ± 0.50	5.75 ± 0.95	< 0.05
24	5.39 ± 0.49	6.46 ± 0.85	< 0.05

Data are expressed as Mean±SD.

Discussion

Using USG for TAP block [7] has improved the block's success rate and safety profile. TAP blocks have been identified as a valuable component of multimodal analgesia for many abdominal surgical operations. [9-13] Many investigations have confirmed corticosteroids' adjuvant function in central neuraxial and peripheral blocks. Dexamethasone has been shown in various studies to be an effective adjuvant to local anesthetics for brachial plexus block. [8,14,15] Another adjuvant to ropivacaine is dexmedetomidine, which has delayed the onset of pain and rescue analgesia post-surgery. [16] In light of this, we conducted a study to compare the effect of dexamethasone and dexmedetomidine given as adjuvant with ropivacaine in transverse abdominis plane block in total abdominal hysterectomy.

Our study found that the duration of analgesia was increased with dexamethasone as an adjuvant to ropivacaine for TAP block (80.00 ± 9.65), compared to dexmedetomidine 76.83 ± 12.83). This resulted in a better quality of analgesia in patients undergoing total abdominal hysterectomy.

These findings of our study have been supported with Deshpande JP *et al. [17]* studied the analgesic efficacy of dexamethasone (4 mg) added to

ropivacaine in transversus abdominis plane block for transabdominal hysterectomy under subarachnoid block. Here, adding dexamethasone to ropivacaine in the TAP block prolonged the post-operative analgesia and reduced post-operative analgesic requirement following abdominal hysterectomy under spinal anesthesia. Our results are also in concordance with the study of Gnanasekar et al., [18] where they evaluated the effect of 8 mg of dexamethasone with 0.25% ropivacaine in TAP block in 70 patients undergoing abdominal hysterectomies under general anesthesia. Duration of analgesia was prolonged in dexamethasone (525.8 ± 81.30 minutes) compared to that of (243 ± 97.36 minutes) in the control Group.

Our study also found that the number of mean rescue analgesic doses was significantly lower in Group A (1.3 ± 0.5) compared to Group B (2.3 ± 0.5) postoperatively. Also, NRS scores were found to be lower in Group A as compared to Group B. These findings of our study have been supported by Gnanasekar et al., [18] where they evaluated the effect of 8 mg of dexamethasone with 0.25% ropivacaine in TAP block in 70 patients undergoing abdominal hysterectomies under general anesthesia where the mean pain scores were significantly lesser in dexamethasone Group.

In contrast to this, a study conducted by Rai P *et al. [*19] studied the effect of the addition of dexmedetomidine (0.5mcg/ kg) to ropivacaine (0.25% 20ml) in transversus abdominis plane block on post-operative pain in lower segment cesarean section under spinal anesthesia. The initial analgesic dose took longer in the Dexmetomidine Group. The VAS score was lower in all post-operative patients in the Dexmedetomidine Group for the first 6 hours.

Due to the use of TAP block in our study, none of the patients from either Group experienced any block-related adverse effects such as injury to adjacent viscera, hematoma, or local anesthetic toxicity as supported by previous study. [20,21]

Conclusion

Adding dexamethasone to bupivacaine in TAP block prolongs the duration of post-operative analgesia and reduces the analgesic requirements compared to adding dexmedetomidine following open abdominal hysterectomy under spinal anesthesia resulting in better patient satisfaction and recovery without any major side effects.

References

1. David LB. Spinal, epidural, and caudal anesthesia. In: Miller RD, editor. Miller's Anaesthesia. 7th ed. Philadelphia: Churchill Livingstone; 2010; 2:1611–38.
2. Kehlet H, Rung GW, Callesen T. Post-operative opioid analgesia: time for a reconsideration?. J Clin Anesth 1996; 8(6):441-445.
3. Rozen WM, Tran TM, Ashton MW, Barrington MJ, Ivanusic JJ, Taylor GI. Refining the course of the thoracolumbar nerves: a new understanding of the innervation of the anterior abdominal wall. Clinical Anatomy: The Official Journal of the American Association of Clinical Anatomists and the British Association of Clinical Anatomists. 2008 May; 21 (4):325-33.
4. Mcdonnell JG, O'Donnell BD, Farrell T, Gough N, Tuite D, Power C, Laffey JG. Transversus abdominis plane block: a cadaveric and radiological evaluation. Regional anesthesia and pain medicine. 2007 Sep 1;32(5):399-404.
5. Gupta KK, Garg H, Singh G, Singh A. Effect of Adding Dexamethasone to Ropivacaine in Transversus Abdominis Plane Block for Lower Abdominal Surgeries: A Prospective Randomized Trial. Journal of Research and Innovation in Anesthesia. 2022; 10(5):10049-2012

6. Grewal A. Dexmedetomidine: new avenues. Journal of anaesthesiology, clinical pharmacology. 2011 Jul;27 (3): 297.
7. Hebbard P, Fujiwara Y, Shibata Y, et al. Ultrasound-guided transversus abdominis plane (TAP) block. Anaesth Intensive Care. 2007;35(4):616–617.
8. Cummings KC, Napierkowski DE, Parra-Sanchez I, et al. effect of dexamethasone on the duration of interscalene nerve blocks with ropivacaine or bupivacaine. Br J Anaesth 2011;107(3):446–453.
9. Shin HJ, Kim ST, Yim KH, et al. Preemptive analgesic efficacy of ultrasound-guided transverses abdominis plane block in patients undergoing gynecologic surgery via a transverse lower abdominal skin incision. Korean J Anesthesiol 2011; 61(5):413–418.
10. Mcdonnell JG, Curley G, Carney J, et al. The analgesic efficacy of transversus abdominis plane block after cesarean delivery: a randomized controlled trial. Anesth Analg. 2008; 10 6(1):186–191.
11. O'Donnell BD, McDonnell JG, McShane AJ. The transversus abdominis plane (TAP) block in open retropubic prostatectomy. Reg Anesth Pain Med. 2006;31(1):91.
12. Niraj G, Searle A, Mathews M, et al. Analgesic efficacy of ultrasound-guided transversus abdominis plane block in patients undergoing open appendicectomy. Br J Anaesth. 2009; 103(4):601–605.
13. Mukhtar K, Singh S. Transversus abdominis plane block for laparoscopic surgery. Br J Anaesth. 2009; 102 (1): 143–144.
14. Movafegh A, Razazian M, Hajimaoha madi F, et al. dexamethasone added to lidocaine prolongs axillary brachial plexus blockade. Anesth Analg. 2006; 102(1):263–263.
15. Shrestha BR, Maharjan SK, Tabedar S. Supraclavicular brachial plexus block with and without dexamethasone—a comparative study. Kathmandu Univ Med J 2003;1(3):158–160.
16. Bansal P and Sood D. Effect of dexmedetomidine as an adjuvant to ropivacaine in ultrasound-guided transversus abdominis plane block for post-operative pain relief in cesarean section. J Obstet Anaesth Crit Care. 2018; 8:79-82
17. Deshpande JP, Ghodki PS, Sardesai SP. The analgesic efficacy of dexamethasone added to ropivacaine in transversus abdominis plane block for transabdominal hysterectomy under subarachnoid block. Anesth Essays Res. 2017; 11:499-502
18. Gnanasekar N, Kumar GD, Kurhekar P, et al. Comparative evaluation of ropivacaine and ropivacaine with dexamethasone in transverse abdominis plane block for lower abdominal surgeries: a prospective, randomized, double-blinded study. Anesth Essays Re.s 2018;12(4):937–942.
19. Rai, Prashant K, Devendra Singh Negi, and Chand Bagwan. Effect of Addition of Dexmedetomidine to Ropivacaine In Transversusabdominis Plane Block on Post-Operative Pain In Lower Segment Caesarean Section: A Randomized Controlled Trial. 2016.
20. Huynh TM, Marret E, Bonnet F. Combination of dexamethasone and local anaesthetic solution in peripheral nerve blocks: a meta-analysis of randomised controlled trials. Eur J Anaesthesiol. 2015;32(11):751–758.
21. M.O. O., T.P. O., & I.A. S.O. Malacological Survey of Intermediate Hosts of Public Health Importance in Akure South and Owo Local Government Areas of Ondo State, Nigeria. Journal of Medical Research and Health Sciences. 2023; 6(2): 2414–2423.