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Original Research Article

Prospective Randomised Clinical Trial Examined the Impact of Dexamethasone on the Analgesic Effectiveness of Transverse Abdominis Plane Block during Laparoscopic Gynaecological Operations

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Abstract

Background and Aims: More recent evidence suggests that dexamethasone, when used as an adjuvant to adjacent sedatives in peripheral nerve blocks, may reduce the need for narcotics, making it a more popular choice. However, the precise mechanism(s) through which dexamethasone exerts its effects remains unknown. We compared the deterioration leisure time in patients undergoing laparoscopic gynecological systems under general anesthesia when dexamethasone was managed primarily by means of intravenous (IV) course despite block only, to that of patients who had dexamethasone directed as an adjuvant with adjacent narcotic in Transversus abdominis plane (TAP) block (GA).

Material and Methods: A double-blind, prospective, randomized, parallel treatment experiment is now being carried out. Our most important discovery concerned the period that elapsed before the patient needed rescue analgesia. Four hundred patients were randomly assigned to the perineural (PN) Group or the intravenous (IV) Group using a computer-generated random numbers table and the sealed opaque envelope method. Once the PN group was under general anesthesia, 15 ml of 0.25% levobupivacaine and 4 mg (1 ml) of dexamethasone were injected into the tibial artery and femoral artery (TAP) under ultrasound supervision. Patients in the IV group were given a dexamethasone dose (8 mg) and a TAP block (both sides, 15 ml of 0.25% levobupivacaine).

Results: The PN group waited 6.63 hours before asking for more pain relief, whereas the IV group waited 5.04 hours. Pain ratings were similar across the two groups.

Conclusion: When paired with 0.25 percent levobupivacaine, the analgesic effects of a TAP block were not noticeably different whether dexamethasone was administered intravenously or by TAP block.

Keywords: Dexamethasone, general anesthesia, gynecological laparoscopic procedures, local anesthetics, nerve block, transverse abdominis plane"

Introduction

Even with laparoscopic surgery, there is still a possibility of feeling acute surgical pain, which is especially true on the first day after surgery. Patients still report feeling pain during laparoscopic operations, despite the fact that it has been shown in a

number of studies that the transverse abdominis plane (TAP) block has an impact that reduces the amount of opioids required for pain management. [1] This pain has a multifocal basis, with both parietal and visceral components. There is evidence that adding dexamethasone to local anesthetics (LA) in peripheral nerve blocks lengthens the time that patients feel no pain after the procedure [2-4]. Additionally, some research has suggested that intravenous steroid therapy during surgery decreases the use for opioids [5,6]. This means that it is not known whether the effect of PN-administered dexamethasone is due to its peripheral action or its systemic absorption." We hypothesized that when used as an adjuvant with TAP block, IV dexamethasone would have the same analgesic effect as its PN administration in reducing pain after laparoscopic gynecological procedures. First and foremost, we observed time duration prior to which patients asked for pain medication. Secondarily, outcome measures for the usage of rescue analgesics and the incidence of nausea and vomiting.

Material and Methods

This tertiary care hospital and medical college-based study was performed between July 1, 2021, and June 30, 2022. It was prospective, randomized, parallel treatment, and double-blind. The procedure was performed with the patient's knowledge and consent as well as after gaining clearance from the hospital's ethics committee. Patients in the research were women with infertility who were having laparoscopic gynecological procedures with general anesthesia (GA) and who were classified as either ASA physical status 1 or 2. Patients having a history of severe respiratory or cardiac disease, preexisting neurological impairments, hepatic or renal insufficiency, preexisting diabetes, or patients currently undergoing steroid therapy were excluded from the study.

As outpatient surgeries, laparoscopic gynecological procedures are comprehensive. It is common practice for pre-op clinics to instruct patients to use a visual simple scale (VAS) with 11 points, where 0 indicates no annoyance and 10 indicates the greatest possible suffering, to express how they are feeling throughout the course of a medical treatment. This is done so that medical professionals can more accurately assess the patient's level of discomfort. Last night, not a single patient had a drop of anything (8 h for solids and 2 h for clear fluids). Forty individuals were selected at random and placed in either the Gathering PN or the Gathering IV groups, using a mechanism that generates random numbers on a computer. Fixed, opaque envelopes ensured the secrecy of information regarding bunch tasks. The patient, the anesthesiologist doing the blocks, the intraoperative anesthesiologists, the trained professionals, the chaperons, and the data seeker were all in the dark during the whole operation.

"Patients in the Group PN group were given a transanal ultrasound-guided 0.25% levobupivacaine (Levo Anawin, Neon Labs Limited, India) TAP block following GA acceptance along with 4 mg (1 ml) of PN dexamethasone (extra methyl and phenyl paraben, decoin, Biocare, India) and 2 ml of common saline IV. The TAP block consisted of 8 mg (2 ml) of IV dexamethasone, 15 ml of 0.25% levobupivacaine, and 1 ml of normal saline on each sides, all administered by intravenous infusion."

An independent anaesthesiologist, who was not engaged in the preparation of the study medicines or the postoperative monitoring of the patients prepared the medication. The research medicine was delivered and the patients were monitored after surgery by a second anaesthesiologist, who was blinded to the manufacture of the study drug.

Both groups received anaesthesia using the same standardised balanced anaesthesia approach, which included endotracheal intubation and muscular relaxation. Isoflurane and nitrous oxide in oxygen were used to keep GA at a MAC of 1.1–1.3. Blood pressure measured non-invasively

and heart rate (HR) were both maintained within 20% of their respective baselines. This trendelenburg position, at an angle of 30° to 45°, was used during surgery. Access to carboperitonium was achieved, and IAP was maintained at 10–12 mmHg. Furthermore, 0.1 mg/kg of IV ondansetron and 75 mg of IV diclofenac were given 20 minutes before the end of surgery to help with postoperative nausea and vomiting. Treatment for any lingering neuromuscular blockage was administered post-procedure with intravenous neostigmine (50 micrograms per kilogram) and glycopyrolate (10 micrograms per kilogram). After patients regained consciousness and the ability to breathe on their own, they were extubated.

The Sonosite Turbo ultrasonic scanner and a linear probe (7-12 Hz) were used to perform the TAP block (Washington, USA). This evaluation focused on the point on the midaxillary line where the ultrasonic test's costal edge and iliac peak intersect. For this procedure, a 23G spinal needle was used in an in-plane approach to obstruct the internal oblique and transverse abdominis muscles (Quincke, USA).

Patients were monitored continuously for pulse, arterial pressure, pain on a visual analogue scale (VAS) at rest and during activity, and the severity of nausea, vomiting, and diarrhoea throughout the first two, four, and six hours they spent in the PACU, respectively. Patients who had a visual analog scale (VAS) pain score of 10 or higher during the first six hours after surgery were given 2 mg/kg of IV tramadol. After 6 hours in the PACU, patients were sent home with instructions to take 500 mg of oral paracetamol every 4 hours.

They were contacted by phone 24 hours a day to learn about their pain levels and paracetamol usage. The amount of analgesics used over the course of a 24-hour period and the time taken to administer first aid analgesia were also noted. We kept track of any instances of nausea, vomiting, and procedure-related side effects such LA toxicity, hyperglycemias, and infections.

Statistic evaluation

SPSS was used to undertake the statistical analysis for the study (SPSS Inc., Chicago, IL, version 20.0 for Windows).

A TAP block's analgesic effects may be prolonged by administering dexamethasone, regardless of administration method. To be 90% certain that there is no difference between PN and IV dexamethasone therapy, the treatment parallel design study needs 36 patients and a two-sided 90% confidence interval excluding a mean difference of more than 100 minutes (assuming the SD of 90 min).After accounting for instances that were lost to follow-up, the experiment included a total of 40 patients, dividing them evenly (20 per group).

The Kolmogorov-Smirnov test was used in order to ascertain whether the components were provided uniformly. Means and standard deviations for demographic data (age, body mass index, length of surgery, doses of intraoperative fentanyl and intraoperative propofol, duration of first pain-free salvage period in hours, number of pain-relieving organizations (Paracetamol (PCM) + Tramadol), and PCM use were calculated and analyzed using a two-tailed, independent samples t test at no cost to the researchers (g). Because VAS ratings are not normally distributed, we performed the Mann-Whitney U test to find correlations and displayed the median and range. We compared how often each group was confused using the Chi-square test. The significance threshold for accepting important facts was set at 0.05

Results

A total of 400 enrolled patients who had laparoscopic gynaecological operations under GA. Both groups' intraoperative data and demographic traits were equivalent. As can be observed in Table 1, the two groups of patients needed similar doses of fentanyl. In patients receiving PN, the average time before they needed a rescue analgesic was considerably ($P < 0.05$) shorter than in those

receiving IV. Paracetamol use was lower in the PN group than in the IV group in the first 24 hours following surgery, with the difference being statistically significant at the P 0.05 level [Table 2].

Table 1: Patient demographics and intraoperative data

Variables	PN Group (*n*=200)	IV Group (*n*=200)
Age (Years)	25.34±1.34	23.45±2.34
Weight (Kg)	50.12±2.34	54.34±4.45
ASA status (I/II)	200/0	198/2
Diagnosis infertility (Primary:Secondary)	16:3	11:6
Duration of surgery (min)	71.34±9.34	89.34±23.34
Intraoperative fentanyl (µg)	111±3	121±4
Intraoperative propofol (mg)	89±12	90±5

Table 2: Postoperative analgesic consumption

Rescue analgesic requirement	PN Group (*n*=200)	IV Group (*n*=200)	*P*
Time to first rescue analgesia (h)	6.34±2.12	4.89±2.11	0.005
Total number of times analgesic administered (PCM + Tramadol)	1.63±0.49	1.94±0.24	0.03
Total number of times (PCM) administered	1.23±0.23	1.34±0.23	0.02
Number of patients requiring tramadol	0/200	3/197	0.01
PCM consumption (g)	0.675±0.23	0.876±0.23	0.02

Except for the 12-hour time period (P 0.05), when the PN Gathering had a lower mean VAS score than the IV Gathering, there was no statistically significant difference between the two groups' resting VAS scores. At no point did the VAS scores significantly vary between the two groups, with the exception of 4 and 12 h (P 0.05), when the mean VAS score of the PN Gathering was lower than that of the IV Gathering. Rest and hack had a median VAS score of 3 in the first 24 hours following surgery. There were no cases of nausea or vomiting among the patients in either group.

Discussion

Based on the findings of several studies, it seems that a single bolus infusion of LA in a TAP block may provide pain relief for around 3-4 hours regardless of the LA utilized [7-9]. Dexamethasone, whether given intravenously (IV) or peripherally (PN), has been shown by our data to provide longer-lasting pain relief than in the aforementioned clinical studies. Ultrasound-guided transabdominal procedural (TAP) block for postoperative pain management in gynecologic laparoscopic surgery: a randomized controlled trial by Kawahara *et al*. With a considerable drop in tramadol use between 0 and 6 hours postoperatively, TAP block seems to be particularly effective for managing pain in the immediate postoperative period [10]. Our research showed that the PN Group waited substantially longer (6.632 1.5 h) before requesting a rescue analgesic than the IV Group (5.041 1.7 h), and the PN Group also required fewer rescue analgesics overall. The average value on the visual analog scale (VAS) for pain felt during hacking and rest in the first 24 hours following surgery was 3. Low VAS ratings indicate to have clinical value in a group of childcare patients who are home-prepared in less than six hours, although the mean difference to initially save pain alleviating and paracetamol use may not be clinically large.

When used with LA for pain management, dexamethasone is often used as an adjuvant since it extends the duration of pain relief. Meta-analysis of randomized controlled trials showed that the duration of fringe nerve (brachial plexus) blocks might be increased when dexamethasone was administered in conjunction with an adjacent opioid. [11] It was discovered by Parrington *et al*. that increasing the pain-free duration with dexamethasone from 30 ml of 1.5% mepivacaine in a supraclavicular brachial plexus block increased it by 104 minutes (1.6 hours). [3] Cummings *et al*. found that the addition of dexamethasone (8 mg) to ropivacaine (30 ml, 0.5%) and bupivacaine (30 ml, 0.5%) for use in interscalene blocks significantly increased the duration of pain relief by 1.9 and 1.5 times, respectively. Akkaya *et al*. [12] focused on the effects of TAP block the board with LA alone vs the addition of dexamethasone (16 mg) to levo-bupivacaine (30 ml, 0.25%) for patients undergoing lower region cesarean delivery. Dexamethasone patients waited 13 hours longer for the first additional dose of analgesia, and they used significantly less tramadol overall and in terms of pain ratings than levobupivacaine patients (6). We found that the analgesic effect lasted much longer in the PN group versus the control group in this experiment [13]. Perhaps the difference is because we introduced GA after the TAP block, unlike Akkaya *et al*. Dexamethasone was administered at a higher dosage and a larger volume of LA was utilized in the trial by Akkaya *et al*. (30 ml vs. 60 ml) (8 mg vs. 16 mg). To our knowledge, this is the first research to compare the results of TAP block with those of alternative routes of dexamethasone delivery. In our trial, dexamethasone's use did not significantly lengthen the time that patients had pain relief, but it did enhance the quality of pain relief as judged by a visual analog scale (VAS) after the first 24 hours.

Adding intravenous (IV) dexamethasone to a multimodal regimen at a dose between 0.1 and 0.21 mg/kg is known to reduce the need for narcotic pain relievers [5,14-16]. In our study, we utilized a dexamethasone dosage that was similar to the average (8 mg). Interscalene, supraclavicular, and ankle blocks with long-acting LA administered by a single injection may provide results comparable to those achieved using PN dexamethasone in terms of analgesia duration and pain reduction when paired with IV dexamethasone [17-19].

Exactly how dexamethasone affects LA remains a mystery. Though some research has shown that glucocorticoids have an immediate effect on nerve conduction, others have shown that dexamethasone increases PN vasoconstriction, which slows LA absorption.

Our study included a dose of dexamethasone (8 mg) administered after GA induction by any means. There were zero cases of diarrhea or vomiting in either group. This might be due to fewer people using opiates or to dexamethasone's well-known antiemetic effects. [20,21]

Conclusion

Patients having laparoscopic gynecological procedures benefit from enhanced analgesia when dexamethasone is given intravenously (IV) or by intramuscular injection (PN) in addition to a bilateral TAP block with levobupivacaine.

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