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Analgesic Efficacy of Dexamethasone as an Adjunct to Levobupivacaine for Transverse Abdominal Plane (Tap) Block After Cesarean Section

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Abstract

Background: When performing various nerve block procedures, several adjuvants have been utilized to enhance the effectiveness and lengthen the duration of local anesthetics. The purpose of the current study was to determine how adding dexamethasone to levobupivacaine affected the effectiveness and duration of the transversus abdominis plane (TAP) block.

Material & Methods: A randomized trial was done in 60 patients undergoing gynaecological laparoscopic surgery. All patients were randomized to two groups of 30 each. Group 1 received Levobupivacaine with Normal saline and group 2 received Levobupivacaine with Dexamethasone 8mg.

Result: The maximum numbers of patients were between 20-30 years. Weight and height shows significant differences. Both the two groups experienced a gradual reduction in pain after the TAP block, as evidenced by VAS and the need of analgesics. The requirement for the first rescue analgesia was delayed in group II than group I, which was statistically significant with p–value <0.001.

Conclusion: In women scheduled for elective cesarean section, dexamethasone as an addition to levobupivacaine in the TAP block increases the duration until the first rescue analgesic request and decreases the overall amount of analgesic administered in the postoperative period.

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1. Introduction

One of the biggest concerns of patients undergoing any surgery is postoperative pain. To promote early ambulation, reduce the need for analgesics, shorten hospital stays, and lower postoperative morbidity, it is crucial to alleviate postoperative pain.

Pain following LSCS has somatic components originating from nociceptors within the surgical wound and the visceral component arising from the uterine incision. The mainstay for treating postoperative pain arethe systemic or neuraxial opioids, as they are highly effective against both the components. However they are associated with a number of undesirable side effects such as nausea, vomiting, pruritis, constipation and respiratory depression.

There are many pharmaceutical and nonpharmacological ways to treat postoperative pain, but none have been found to be particularly effective. [1]Currently, abdominal nerve block with parenteal analgesics which is a part of multimodal analgesic technique getting popular for these patients. The elucidation of Transversus Abdominis Plane (TAP) block was first introduced in 2001 by Dr. Rafi in Ireland, using lumbar triangleas an anatomic referencepoint.This block has been widely used for post- operative analgesia following various surgeries such as caesarean section, appendicectomy, repair of hernia, hysterectomy, abdominoplasty and prostectomy[2-4].

According to Sidiqui et al.'s meta-analysis [5], TAP block prolongs analgesia and decreases opioid intake in the postoperative phase without having any negative side effects.

Levobupivacaine is the most often used local anesthetic in regional anesthesia because bupivacaine is more cardio- and neurotoxic. [6] But compared to bupivacaine, its duration of action is shorter. Adjuvants have been utilized to extend the duration of blockage, such as opioids, dexamethasone, magnesium sulphate, ketamine, and dexmedetomidine, but each one caused adverse effects, such as drowsiness, nausea, and vomiting. [7] Dexamethasone has a long and well organized glucocorticoid structure and also have anti-inflammatory properties. When added to local anesthetics as an adjuvant in peripheral block, it increases the duration of action. In numerous localized blocks, dexamethsone has demonstrated its effectiveness in extending the duration of local anesthetics. [8] Dexamethasone was only sometimes used in research as an adjuvant to levobupivacaine in TAP blocks. This study aims to evaluate the effectiveness of dexamethsone when used as an adjuvant to levobupivacaine in a TAP block for the treatment of pain.

2. Methodology

The present Interventional study was carried out in the Department of Anesthesiology, SantoshMedicalCollegeandHospitals,Ghaziabad,UP after getting approval of the Institutional Ethical committee over the period from January 2019 to July 2020. Details of the procedure were explained to all the patients and written informed consent was taken. The study was carried out in 60 ASA grade I women between the age group of 20-40 yrs, scheduled for elective cesarean section, and had BMI less than 30.

Subjects were randomly distributed into two groups by sealed envelope method. Group 1 received Levobupivacaine with Normal saline and group 2 received Levobupivacaine with Dexamethasone 8mg. Patients with a history of drug allergy to local anesthetics, bleeding diathesis, cardiac, pulmonary, hepatic, renal, or neurological disorders, with local infection at the site of infiltration, diabetes mellitus, and other metabolic diseases were excluded from the study.

A thorough pre anaesthetic check-up was done for all the patients. Detailed history of present illness, any relevant past history of disease was recorded. Clinical examination of respiratory system, cardiovascular system and central nervous system with vertebral spine was done. The patients were explained in detail about the procedure of Transverse Abdominis plane block. All their queries and doubts were answered to get their confidence and support.

VAS will be explained to all the patients and information will be given regarding the pain scoring system, which is ranged from 0 to 10, for the determination of pain severity.

All the patients will fast 8 hrs prior to surgery and will receive premedication with Tab Ranitidine 150mg HS. All patients will be having an

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intravenous line with 18-G cannula before arriving in the operating room. Anaestheticmachine, breathing circuits and monitors will be properly checked beforehand. Full range of drug and equipment including appropriate size laryngoscope blade, endotracheal tubes and airways will be kept in hand. After the patient will be draped, spinal anaesthesia will be administered using 0.5% heavy Bupivacaine intrathecally to patients using 26-G Quincke tip spinal needle. After the effect of anaesthesia, the patient will be turned 30 degree to the Semi-Fowler position on the left side and to a 25 degree upright position from the waist. 4-6 litres/minute of oxygen will be given to all patients until the end of the operation. Sensory and motor levels will be checked every two minutes, and the surgery will begin once a sufficient spinal block level (T7) will be reached. After the surgery, the TAP block needle entry site will be identified by landmark technique- "Triangle of Petit" which lies above the pelvic rim in the mid-axillary line. The site for introduction is lies slightly above the iliac crest and mildly posterior to the mid axillary line within Petit Triangle. 23G blunt tip needle were used and should be introduce perpendicular to skin. A "pop" sound is felt when the needle traverse through the plane of the External oblique muscle. A second "pop" sound heard when the needle further introduced into the plane just above the transverse abdominis muscle.After negative aspiration, 15ml of 0.25% Levobupivacaine plus 1ml of 0.9% Normal saline on each side for Group I and 15ml of 0.25% Levobupivacaine plus 1ml (4mg) Dexamethasone on each side for Group II were administered between the two muscles.

Pain severity was measured using a visual analog scale (VAS), A 10 cm unmarked line in which 0 cm-no pain and 10 cm-worst pain imaginable. The time at which patient asks for analgesia (rescue analgesia) will also be noted. The duration of analgesia and adverse events, if any, will also be noted.

All the data were analyzed using SPSS version 22.0 software. The appropriate statistical methods was used to make cross tabulation frequencies, ratio, histogram, scatter plots and also was used in different parametric and non- parametric measurements such as Pearson correlation test, independent- measures test, ANOVA tests and the Spearman correlation test.

3. Result:

In this study 60 women aged between 20 to 40 years fulfilling the inclusion criteria were included. They were randomly divided into two groups of 30 each. The maximum numbers of patients were between 20-30 years. No significant differences were found among the two groups with respect to mean age, BMI, onset of sensory block and MPG grade. Whereas weight and height showed significant differences i.e.; p value <0.05. (As shown in Table I).

As shown in table 2, we observed that both the two groups experienced a gradual reduction in pain after the TAP block, as evidenced by VAS and the need of analgesics. This difference was reported from 0 hour to 48 hours post operatively. At 0 post operative hour the mean VAS score for abdominal pain of group I and group II was 1.03 ± 0.18 and 1.0 ± 0.0 with P value of 0.31 respectively. VAS score was lower in Group II, where we added dexamethasone with 0.25% levobupivacaine, which was statistically not significant (P>0.05). At the 2nd post operative hour the mean VAS score for abdominal pain of group I and group II was 2.33 ± 0.66 and 2.10 ± 0.30 with a P value of 0.09 respectively. VAS score was lower in group II than group I, which was statistically not significant (P >0.05). At 4th post operative hour the mean VAS score 5.20 ± 1.73 and 3.23 ± 0.86 with P value of <0.001. VAS score was lower in group II than group I which was statistically significant (P <0.05). At 6th post operative hour the mean VAS score for group I and group II was 6.50 ± 1.20 and 3.57 ± 0.63 with P value of <0.001. VAS score was lower in group II than group I which was statistically significant (P <0.05). Similarly at 8th, 10th, 12, and 24th hour the mean VAS score was significantly low in group II. So from 4th post operative hour till 24th hour group II showed significantly lower VAS score. From 36th to 48th post operative hours was statistically not significant (p value >0.05).

First rescue analgesia (hrs) observedbetweengroupIandIIwas 5.80 ± 1.56and11.73 ± 1.84withaPvalueof<0.001respectively.Therequirement forthefirst rescue analgesia was delayed in group II than group I, which was statistically significant(pvalue<0.05).

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4. Discussion

For peripheral nerve block, a large numberof animal studies have demonstrated the analgesic efficacy of corticosteroids, as an adjuvant with local anesthesia.It has proved from various studies that when dexamethasone used as an adjuvant with bupivacaine microsphere prolongs the duration of blockade of intercostal nerve blocks in sheep model. Castillo and his colleagues did studies on rat models to show addition of dexamethasone microsphere to bupivacaine prolongs the sciatic nerve blockade. The anti-inflammatory effects of steroids enhances the duration of the blocks. However, it must be noted that a microsphere technology is incorporated for continuous and prolonged release of the drug than the aqueous solution used for their studies.Neural safety of corticosteroids for nerve blocks were observed from several animal studies. Dexamethasone provided a faster onset of action and longer duration of analgesia without any adverse effects. Parrington and colleaguesduring supraclavicular brachial plexus blockadeused 30 mL mepivacaine 1.5% to which 8 mg of dexamethasone was added. The dexamethasone group having a comparable longer duration of analgesia: 332 (225 448 min) vs. 228 (207 263 min) min when compared with the control group. And also conclude that no significant differences in the time of onset of sensory and motor blockade with both groups.

In our study patients belonging to ASA grade I and age group 20 to 40 years were included. Also patients with the age below 20 and age above 40 were excluded from the study. The Mean age in group I was 26.03 in group II it was 26.17 ± 3.60 which was not significant. Also in group I the mean weight in kg was 68.07 ± 4.62 and in group II was71.10 ± 3.22 with a P value of <0.01 showed statistical significance, ie: P< 0.05. The mean height in cms in group I is 163.73 ± 4.23 and in group II is 165.97 ± 2.06 with a P value of 0.01 which is statistically significant.

The intensity of pain is demonstrated by distribution of VAS score. It was noticed that the intensity of pain increases for the first few postoperative hours, and reduces by 24 hours. But pain is a very subjective experience and not same for all the person. It is how much the person is expressing and exist whenever the person appeals. So thorough and proper observation of pain is quite difficult. As VAS scores were estimated by patients the accurate measurement was limited and objective estimation of pain could be deleterious. VAS scores were assessed individually and noted. It was observed in our study that the mean sensory block in group I was 39.53±4.09 and in group II it was 39.87±3.60. Hence there were no statistical significant changes (P >0.05) between group I & II in the onset of sensory block. The average VAS score at different interval in both groups from 4 hours to 24 hours was statistically significant. The difference in the VAS scores among the groups was more evident, particularly during 2nd to 8th postoperative period. VAS score at different interval in both groups from 4 hours to 24 hours was statistically significant and from 36 to 48 hours was statistically not significant.

VAS score is the most common clinically used method to evaluate pain severity and relief. Eventhough clinical non significant, significant statistical differences are caused by the Numeric differences of the VAS. Kelly et al. [9] reported that the minimum clinically significant difference (MCSD) in VAS score was 0.9 (95%CI, 0.6 to 1.3). Parameters like gender, age, and cause of pain does not cause variations in the MCSD in VAS. Our results in VAS score are basically in line with the above range. Therefore it can be concluded that dexamethasone combined with TAP block is considered to be clinically significant.

Moiniche et al [10] performed a meta-analysis, where the effectiveness of intraperitoneal local anaesthetic administration for postoperative pain relief after laparoscopic surgery was investigated. Very accurate results regarding the effectiveness of intraperitoneal local anaesthetic administration after LC for postoperative analgesia could not be obtained by them and it was difficult to explain the reason for the different results. In the present study, post-operative VAS scores both at rest and during movement were significantly lower in TAP block group. It was observed in our study that the time taken for first analgesia and total dose of analgesia were significantly increased in group A. Post operative analgesia was requested in a later time gap by the patients who received dexamethasone with TAP than the patients who did not receive dexamethasone. Thus showing that more doses of post operative analgesics were needed in patients

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who did not receive dexamethasone than those who received dexamethasone with TAP.

Time to first rescue analgesia (hrs) between group I was5.80 ± 1.56 and group II was 11.73±1.84 was statistically significant (p value <0.05). So, the results agree with Zhang et al. [11] who performed nine randomized controlled trials (RCTs) on 575 adult patients undergoing abdominal surgery to compare dexamethasone added to local anaesthetics in ultrasound-guided TAP block with the control group who received TAP block alone for postoperative analgesia.Dexamethasone added to local anestheticssignificantly decreased VAS score at 4h, 6h and 12h after surgery (P < 0.00001). Peterson et al [12] reviewed 7 studies which employed TAP block as part of multimodal analgesic component for managing post-operative pain after infraumbilical surgeries. It was found that patients who were given TAP block had reduced need for morphine consumption. Also, the VAS scores were lower in 4 studies. There was a small reduction in post-op sedation, nausea and vomiting.

Also, the results of our study agreed with those reached by Ammar and Mahmoud who concluded that the addition of dexamethasone to bupivacaine during TAP block provided lower postoperative VAS for pain score at 2h (P = 0.01), 4h(P = 0.01) and 12h(P = 0.02). Furthermore, TFA was significantly longer in the dexamethasone group (P = 0.002), with lesser morphine requirements 48h postoperatively(P = 0.003) [13,14]

5. Conclusion:

Post operative pain and analgesic requirement were found to be less by the addition ofdexamethasone to levobupivacainein TAP block. This is in comparison to theisobaricbupivacaineTAPblockaloneinfemalesundergoingCesareansection.Thusaddingdexamethasone to levobupivacaine in TAP block increases the efficacy of anesthesia andhelpstoreducetheuseofopiodsinpostoperativepainmanagement.

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Table 1: Distribution of the patients in both groups according to their clinico-demographic characteristics

Parameters	Group I (n=30)	Group II (n=30)	p-value
Age in years	26.03 ± 4.25	26.17 ± 3.60	0.89
Weight in kgs	68.07 ± 4.62	71.10 ± 3.22	<0.01
Height in cm	163.73 ± 4.23	165.97 ± 2.06	0.01
BMI (kg/m2)	25.42 ± 1.89	25.83 ± 1.43	0.34
Onset of sensory block (minutes)	39.53 ± 4.09	39.87 ± 3.60	0.76
MPG Grade I [n (%)]	29 (96.7)	96.7	0.19
MPG Grade II [n (%)]	1 (3.3)	3.3	

Table 2: VAS score at different interval in both groups

VAS score	Group I (n=30)	Group II (n=30)	P value
	Mean ± SD	Mean ± SD	
At 0 hrs	1.03 ± 0.18	1.0 ± 0.0	0.31
At 2 hrs	2.33 ± 0.66	2.10 ± 0.30	0.09
At 4 hrs	5.20 ± 1.73	3.23 ± 0.86	<0.001
At 6 hrs	6.50 ± 1.20	3.57 ± 0.63	<0.001
At 8 hrs	6.87 ± 0.68	4.57 ± 1.04	<0.001
At 10 hrs	6.67 ± 0.48	5.77 ± 1.55	0.01
At 12 hrs	6.83 ± 0.53	6.33 ± 0.96	0.02
At 24 hrs	5.27 ± 0.78	5.63 ± 0.93	<0.01
At 36 hrs	3.57 ± 0.73	3.63 ± 0.89	0.95
At 48 hrs	1.57 ± 0.50	1.57 ± 0.50	1.0

Table 3: Time to first rescue analgesia (hrs) between both groups

	Group I (n=30)	Group II (n=30)	P value
	Mean ± SD	Mean ± SD	
Time to first rescue analgesia (hrs)	5.80 ± 1.56	11.73 ± 1.84	<0.001