IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 23, Issue 5 Ser. 5 (May. 2024), PP 15-20
www.iosrjournals.org

Comparison of Effectiveness of adjuvant fentanyl and dexamethasone in Subcostal Transversus Abdominis Plane Block for Laparoscopic Cholecystectomy

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ABSTRACT
***Background:** Dexamethasone and fentanyl both are effective adjuvant in TAP block for postoperative analgesia in abdominal surgeries. Laparoscopic cholecystectomy surgery is common and is associated with postoperative pain. Effective post-operative analgesia after laparoscopic cholecystectomy surgery is important because patient suffer from distress, respiratory complications, delirium, myocardial ischemia, prolonged hospital stay, and chance of chronic pain.*
***Objectives:** To Evaluate the postoperative analgesic effectiveness of dexamethasone or fentanyl as an adjuvant to bupivacaine in USG-guided Subcostal TAP block for patients in laparoscopic cholecystectomy surgeries.*
***Method:** This study was a prospective, randomized trial was carried out in Bangladesh medical college Hospital. Study population was from both sexes undergoing laparoscopic cholecystectomy surgery. All 60 enrolled patient was selected by computer generated random allocation. Total 60 patients, ASA physical status I, II undergoing laparoscopic cholecystectomy and asked to remain fasting 6 h before surgery. The selected patients were randomly divided into 2 Groups (30 patients each) depending upon the study drug administered. Standard monitoring was included electrocardiogram, pulse Oximetry, and noninvasive blood pressure. Statistical analysis was done by using chi square test, unpaired 't' test, window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-24).*
***Results:** Present study demonstrates that statistically significant difference was noted in the time to first analgesia and also in the pain scores at 8 hours and 12 hours. First dose of rescue analgesia was given after 670.00 ± 6.06 minutes when fentanyl was added as an adjuvant to bupivacaine for TAP block, whereas the first dose of rescue analgesia had to be given at 533.33 ± 54.97 minutes when dexamethasone was used as an adjuvant. Total opioid requirement during the first 48 hours was 55.667 ± 20.67 mg of tramadol, when fentanyl was used as an adjuvant, whereas 79.667 ± 22.81 mg of tramadol had to be used when dexamethasone was used as an adjuvant. Statistically significant difference was noted in the heart rate and BP at 4 hours, but no interventions were needed for that.*
***Conclusion:** Fentanyl produces a longer duration of postoperative analgesia with no deleterious effects on haemodynamic status compared to dexamethasone, when added to bupivacaine for Subcostal TAP block in Laparoscopic Cholecystectomy surgeries.*
***Keywords:** Fentanyl, Dexamethasone, TAP, Bupivacaine.*

I. INTRODUCTION

Laparoscopic cholecystectomy (LC) is a minimally invasive method that causes minor postoperative discomfort in the parietal, visceral, incisional, and referred areas. [1] Patient-controlled intravenous analgesia is frequently used with multimodal methods, epidural analgesia, and intraperitoneal injection of local anesthetics (LA) in these patients. As part of this strategy, transversus abdominal plane (TAP) block is a well-known technique for postoperative analgesia during laparoscopic abdominal surgery. [2,3] TAP block is safe; it has fewer adverse effects, such as postoperative nausea and vomiting (PONV), and lessens or eliminates the need

for painkillers. [4] Furthermore, a number of medical professionals are actively working to increase the accuracy of LA absorption via ultrasonography. Thus, this novel method has proven that laparotomy and laparoscopic surgeries are effective analgesics. [5]

Transversus abdominis plane (TAP) block has been offered as a postoperative pain management technique to lower the number of opioids used, as well as their associated side effects and patient management expenses. According to reports, TAP block is a better method for lessening pain after abdominal surgery.[6] Although opioids are extensively utilized, their usage is constrained by their potential negative effects and potential to impede postoperative recovery. It has been demonstrated that transversus abdominis plane (TAP) block is a practical and secure substitute method for delivering analgesia after abdominal procedures. In order to anesthetize the median and lower abdominal wall, TAP block was designed to block the anterior branches of the spinal nerves from T7 to L1, which are located in the neurofascial plane between the internal oblique and transversus abdominis muscles. [7] Open gastrointestinal surgery, gynecological surgery, and some urological operations are recognized indications for a TAP block. Additionally, reports of the safety of this block in patients with coagulant deficiencies or anticoagulants have been made. [8] Numerous related studies have shown the best abdominal area to analgesia and the effectiveness of using ultrasound-guided ways to provide analgesia during surgery. Regrettably, the duration of effective abdominal wall analgesia resulting from a single injection TAP block is limited to 8 hours. [9] To extend the analgesic duration of TAP block, a variety of adjuvants were added to local anesthetics; however, it is still unknown which adjuvants to use and at what dosage. [10]

Fentanyl is the most often utilized short-acting opioid when used intrathecally with local anesthetics. It enhances the state of intraoperative and postoperative analgesia and works in concert with local anesthetics. [11] According to reports, postoperative analgesia can last for up to 180–240 minutes when fentanyl at a dose of 10–25 micrograms is administered intrathecal.5. However, there are a few negative effects that intrathecal opioids may cause, including respiratory depression, itching, nausea, vomiting, and urine retention. [12]

A novel selective α2-agonist called dexmedetomidine (Dex) is being marketed as a sedative, sympatholytic, and analgesic adjuvant for local anesthetics. [13] Dex is roughly eight times more selective than clonidine when it comes to α2-adrenergic receptors (α2-AR), which are linked to sedative and analgesic effects in the spinal and supraspinal regions as well as an antinociceptive effect on visceral and somatic pain. More importantly, this medication's safety during cesarean birth was proved by the fact that it does not cross the placenta appreciably (0.77 maternal/fetal index). [14] Numerous investigations have suggested that administering Dex intrathecally can extend analgesia and lessen the adverse effects of administering opioids. [15]

II. METHODOLOGY:

This prospective randomized observational comparative study was carried out in the department of Anesthesiology, Bangladesh Medical College Hospital (BMCH), Dhaka. During September 2021 to February 2022. Total 60 patients both sexes undergoing laparoscopic cholecystectomy. After taking consent and matching eligibility criteria, data were collected from patients on variables of interest using the predesigned structured questionnaire by interview, observation. Statistical analyses of the results were be obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-24).

III. RESULTS:

Table 1 Distribution of the study patients according to age and sex (n=60)

	Comparison of drug		
Age distribution	**Group A n(%)**	**Group B n(%)**	p value
20-29	6(20.0)	8(26.67)	0.912^{ns}
30-39	12(40.0)	11(36.67)	0.302^{ns}
40-49	7(23.33)	6(20.0)	0.410^{ns}
50-59	5(16.67)	5(16.67)	0.073^{ns}
Total	30(100.0)	30(100.0)	
Sex Distribution			
Male	18(60.0)	20(66.7)	0.173^{ns}
Female	12(40.0)	10(33.3)	0.853^{ns}

The majority of the patients were in the age range of 30-39 years in old both Group. No statistical difference between mean ages of the groups. (p>0.05). Males were predominant in both groups but no statistically significant difference between sex of the groups. [Table 1]

Table 2 Distribution of the study patients according to weight and height (n=60)

	Comparison of drug		
Weight (Kilogram)	**Group A n(%)**	**Group B n(%)**	p value
40-49	2(6.6)	2(6.6)	0.352^{ns}
50-59	7(23.3)	8(26.7)	0.963^{ns}
60-69	7(23.3)	6(20.0)	0.246^{ns}
70-79	7(23.3)	4(13.3)	0.073^{ns}
80-89	6(20.0)	4(13.3)	0.610^{ns}
90-99	1(3.3)	6(20.0)	0.521^{ns}
Height (Meter)			
1.40-1.49	2(6.7)	4(13.3)	0.342^{ns}
1.50-1.59	4(13.3)	10(33.3)	0.463^{ns}
1.60-1.69	9(30.0)	2(6.7)	0.846^{ns}
1.70-1.79	5(16.7)	5(16.7)	0.833^{ns}
1.80-1.89	8(26.7)	11(36.7)	0.389^{ns}
Total	30(100.0)	30(100.0)	

The majority in Group A is between 50-59, 60-69 & 70-79 and majority in Group B is between 50-59 kg, but no statistically significant was found when correlated. (p>0.05). The majority higher height in Group A is between 1.60-1.69 and majority higher weight in Group B is between 1.80-1.89 meter, but no statistically significance was found when correlated. (p>0.05). [Table 2]

Table 3 Distribution of the study patients according to ASA class (n=60)

	Comparison of drug			
ASA Class	**Group A n(%)**	**Group B n(%)**	**Total**	**p value**
Class I	18(60%)	16(53.33%)	34	0.205 ^{ns}
Class II	14(46.67%)	12(40%)	26	0.635 ^{ns}
Total	30(100%)	30(100%)	60	

The majority ASA in Group A and B is Class I, but no statistically significance was found when correlated. (p>0.05)

Table 4 Distribution of the study patients with mean duration of operation and arterial pressure and heart rate after anaesthesia (n=60)

	Comparison of drug			
	Group A n=30 Mean±SD	**Group B n=30 Mean±SD**	**Total**	**p value**
Duration in Minute (Surgery)	32.16±7.38	33.33±5.683	60	0.398^{ns}
Arterial pressure				
Mean Arterial Blood Pressure at 4th hour after anaesthesia	66.96±13.39	61.73±2.88	60	0.039^{s}
Mean Arterial Blood Pressure at 8th hour after anaesthesia	63.70±2.74	62.63±1.15	60	0.803^{ns}
Mean Arterial Blood Pressure at 12th hour after anaesthesia	66.73±2.34	67.36±2.44	60	0.210^{ns}
Mean Arterial Blood Pressure at 24th hour after anaesthesia	74.43±3.11	72.76±3.71	60	0.508^{ns}
Mean Arterial Blood Pressure at 36th hour after anaesthesia	65.70±2.74	65.63±1.15	60	0.623^{ns}
Mean Arterial Blood Pressure at 48th hour after anaesthesia	66.83±5.83	65.26±5.73	60	0.891^{ns}
Heart rate after anaesthesia				
Heart Rate intraoperative at 4th hour after anaesthesia	80.56±8.18	70.96±11.59	60	0.035^{s}

Heart Rate intraoperative at 8th hour after anaesthesia	75.46±11.35	72.50±9.02	60	0.239^{ns}
Heart Rate intraoperative at 12th hour after anaesthesia	77.36±12.41	72.50±9.02	60	0.177^{ns}
Heart Rate intraoperative at 24th hour after anaesthesia	68.83±5.07	66.36±2.0	60	0.086^{ns}
Heart Rate intraoperative at 36th hour after anaesthesia	67.10±4.42	67.46±3.80	60	0.832^{ns}
Heart Rate intraoperative at 48th hour after anaesthesia	68.53±5.56	68.46±3.80	60	0.490^{ns}

Mean duration of operation was little higher in Group B, but no statistically significance was found when compared. (p>0.05). After anaesthesia incidence of increased MAP (Mean ± SD) was seen more in Group A in comparison to Group B at 4th hour and that was statistically significant but from 8th hour up to 48th hour rest were not statistically significant. After anaesthesia incidence of increased Heart Rate (Mean ± SD) was seen more in Group A in comparison to Group B at 4th hour and that was statistically significant but from 8th hour upto 48th hour rest were not statistically significant. [Table 4]

Table 5 Distribution of the study patients with Visual Analogue Scale (VAS) after anaesthesia (n=60)

	Comparison of drug			
Visual Analogue Scale (VAS)	**Group A n=30 Mean±SD**	**Group B n=30 Mean±SD**	**Total**	**p value**
VAS at 4th hour after anaesthesia	1.63±0.629	1.50±0.498		0.466^{ns}
VAS at 8th hour after anaesthesia	3.42±0.626	2.86±1.27		0.043^{s}
VAS at 12th hour after anaesthesia	3.65±0.776	2.49±0.765		0.036^{s}
VAS at 24th hour after anaesthesia	3.25±0.507	3.31±0.490		0.231^{ns}
VAS at 36th hour after anaesthesia	2.52±0.509	2.60±0.498		0.425^{ns}
VAS at 48th hour after anaesthesia	2.93±0.626	2.40±0.466		0.323^{ns}

After anaesthesia VAS (Mean ± SD) was seen greater in Group A in comparison to Group B at 8th & 12th hour and that was statistically significant but 4th hour & 24th to 48th hour rest were not statistically significant. [Table 5]

IV. DISCUSSION

This prospective, randomized, double-blinded study was conducted in Department of Anaesthesiology & ICU, Bangladesh Medical College & Hospital, Dhaka from September 2021 to February 2022. Total of 60 patients fulfilling inclusion/exclusion criteria were studied to compare dexamethasone and fentanyl as an adjuvant to bupivacaine in tap block for postoperative analgesia, in patients undergoing laparoscopic cholecystectomy surgery.

In this study observed that the mean age was not statistically significant (p>0.05) between two groups. Similar observation was found Ahmed A. R. et al. they showed the mean age was not statistically significant (p>0.05) between three groups. [16] Wael Abd Elmoneim Mohamed Abdelwahab et al. they showed the mean age was not statistically significant (p>0.05) between two groups. [17] In this study observed that was not statistically significant (p>0.05) between two groups. Ahmed A. R. et al. they showed between three groups were not statistically significant (p>0.05). [16] Wael Abd Elmoneim Mohamed Abdelwahab et al. they showed two groups were not statistically significant (p>0.05). [17]

In this study observed that the mean weight not statistically significant (p>0.05) between two groups. Wael Abd Elmoneim Mohamed Abdelwahab et al. they showed the mean weight was not statistically significant (p>0.05) between two groups. [17] In this study observed that the mean height was not statistically significant (p>0.05) between two groups.

In this study observed that ASA class between two groups were not statistically significant (p>0.05). Ahmed A. R. et al. they showed ASA Class was not statistically significant (p>0.05) between three groups. [16]

In this study observed that the mean duration of operation was not statistically significant (p>0.05) between two groups. Ahmed A. R. et al. they showed the mean duration of operation for B group was not statistically significant (p>0.05) between three groups. [16] Wael Abd Elmoneim Mohamed Abdelwahab et al. they showed the mean duration of operation was not statistically significant (p>0.05) between two groups. [17]

In this study mean arterial blood pressure after anaesthesia was statistically significant (0.039) between these two groups. MAP at 8th hour was not statistically significant (0.803) between these two groups. MAP at 12th hour was not statistically significant (0.210) between these two groups. MAP at 24th hour was not statistically significant (0.508) between these two groups. MAP at 36th hour was not statistically significant (0.623) between these two groups. MAP at 48th hour was not statistically significant (0.891) between these two groups.

In this study heart rate post anaesthesia were recorded and found that heart rate at 4th hour was statistically significant (0.005) between these two groups. Heart rate at 8th hour was not statistically significant (0.239) between these two groups. Heart rate at 12th hour was not statistically significant (0.177) between these two groups. Heart rate at 24th hour was not statistically significant (0.086) between these two groups. Heart rate at 36th hour was not statistically significant (0.832) between these two groups. Heart rate at 48th hour was not statistically significant (0.490) between these two groups.

In this study VAS after anaesthesia were recorded and found that VAS at 4th hour was not statistically significant (0.466) between these two groups. VAS at 8th hour was statistically significant (0.043) between these two groups. VAS at 12th hour was statistically significant (0.036) between these two groups. VAS at 24th hour was not statistically significant (0.231) between these two groups. VAS at 36th hour was not statistically significant (0.425) between these two groups. VAS at 48th hour was not statistically significant (0.323) between these two groups.

In this study observed that the time of first analgesic requirement was statistically significant (0.002) between two groups. Group A needed analgesia early as compared to Group B that means Group B has longer duration of analgesic overweight as compared to Group A. Ahmed A. R. et al. they showed the mean duration of operation was statistically significant (p=0.008) between three groups. [16] Wael Abd Elmoneim Mohamed Abdelwahab et al. they showed the mean duration of operation was statistically significant (p=0.00) between two groups. [17]

In this study observed that the total analgesic requirement was statistically significant (0.003) between two groups. Ahmed A. R. et al. they showed the total analgesic requirement for B group was statistically significant (p=0.047) between three groups. [16]

Limitations of the study

The present study was conducted in a very short period due to time constraints and funding limitations. The small sample size was also a limitation of the present study.

V. CONCLUSION

Fentanyl produces a longer duration of postoperative analgesia with no deleterious effects on haemodynamic status compared to dexamethasone, when added to bupivacaine for Subcostal TAP block in Laparoscopic Cholecystectomy surgeries.

VI. RECOMMENDATION

This study can serve as a pilot to much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

ACKNOWLEDGEMENTS

The wide range of disciplines involved in comparison of effectiveness of adjuvant fentanyl and dexamethasone in subcostal transversus abdominis plane block for laparoscopic cholecystectomy research means that editors need much assistance from referees in the evaluation of papers submitted for publication. I would also like to be grateful to my colleagues and family who supported me and offered deep insight into the study.

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