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Original Research Article

CLINICAL EVALUATION OF ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK USING BUPIVACAINE VERSUS BUPIVACAINE AND DEXMEDETOMIDINE FOR POST OPERATIVE ANALGESIA IN PATIENTS UNDERGOING ABDOMINAL SURGERIES

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ABSTRACT

Background & Aims- Post-operative pain is the primary adverse outcome that distresses the patient, prolongs the hospital stay and increases the incidence of admission after surgery. This study is to evaluate and compare the duration and quality of analgesia with bupivacaine and bupivacaine with dexmedetomidine after transverse abdominis plane block in abdominal surgeries using pain scores (at rest) and vitals monitoring. Also, here we are comparing the opiod consumption in both the cases along with the post operative sedation scores among the two groups.

Study Design-This study was Clinical Observational hospital based study.

Materials and methods- This prospective observational study, conducted at Gandhi Medical College and associated hospitals, bhopal, After obtaining Institute Ethics Committee approval and written informed consent, 60 participants were included in the study who were undergoing lower abdominal surgeries, 30 participants received bilateral Ultrasound guided Transverse Abdominis Plane block with 20ml of 0.5% bupivacaine + 2ml Normal Saline while remaining 30 participants received Ultrasound guided Transverse Abdominis Plane block with 20ml of 0.5% bupivacaine + 0.5mcg/kg dexmedetomidine dissolved in 2ml Normal Saline at the end of the surgery. The primary outcomes were pain scores at 1, 4, 8, 12, 18, 24 hours postoperatively, time to first rescue analgesia, dose of rescue analgesic use over 24 hours and comparison of sedation scores. The secondary outcome was to know any side effects or complications, if any.

Statistical Analysis- The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software. For statistical significance, p value of less than 0.05 was considered statistically significant.

Results- The key findings of this study were that when dexmedetomidine was added to bupivacaine as an adjunct in TAP block, postoperative analgesia is prolonged and resulted in better pain control than bupivacaine alone. Total analgesic consumption in the Bupivacaine + dexmedetomidinegroup (MEAN- 11.2±9.4mg) was significantly lower than Bupivacaine group alone (MEAN= 19.6±10.2mg). Mean ± SD of time of first rescue analgesia(in hours)

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in bupivacaine + Dexmedetomidine was 8.07 ± 2.61 hours which was significantly higher as compared to bupivacaine (5.63 ± 2.58) hours. (p value=0.0006)

Keywords- Transverse Abdominis Plane (TAP) block, rescue analgesia, dexmedetomidine, post operative analgesia, VAS score, RAMSAY sedation score

1. INTRODUCTION

Post-operative pain is the primary adverse outcome that distresses the patient, prolongs the hospital stay and increases the incidence of admission after surgery. The main objective of treating the post-operative pain is to eradicate or, to minimise the pain and to speed up the healing process without any side effects.

The transverses abdominis plane block (TAP block) is a novel technique for pain relief in abdominal surgeries, which was first described by Kuppuvelumani et al. in 1993 and was first documented by Rafi in 2001 with the help of surface anatomical landmarks in the lumbar triangle of petit. It involves the injection of a local anaesthetic solution into a plane between the internal oblique muscle and transversus abdominis muscle. Thoracolumbar nerves originates from the T6 to L1 spinal roots run into this plane and provides sensory innervation to the anterolateral abdominal wall , hence, the local anaesthetic spread in this plane and block the neural afferents which results in providing analgesia to the anterolateral abdominal wall. Single-shot TAP block is a valuable part of multimodal analgesia as it effectively relieves pain, reduces post-operative use of opioids and other analgesics(NSAIDS). Real-time ultrasonography also helps providers to identify appropriate tissue plane and perform the block with accuracy under direct visualization of all the adjacent structures, position of the needle and spread of local anaesthetic.

There is a scope for elucidating differences between posterior transversus abdominis plane blocks and lateral (i.e., type 1) quadratus lumborum blocks; also, the optimal dose of local anaesthetic , mode of administration, technique used and combination of adjuvants to prolong transversus abdominis plane blocks requires future investigation.

2. MATERIAL AND METHODS

After approval by Institutional Ethical Committee and written informed consent 60 patients of ASA grade I, II posted for lower abdominal surgeries with age ranging from 16-50 years were selected.

All the patients were educated preoperatively about the use of VAS score on a 10 point scale with 0 being no pain and 10 being the worst possible pain. Patients were asked to be nil per orally for 6 hours prior to surgery. After shifting the patient to operation theatre, an intravenous access was established and monitoring was instituted with electrocardiogram (ECG), oxygen saturation (SpO2), non-invasive blood pressure (NIBP) –systolic, diastolic and mean arterial blood pressure. Baseline vital parameters were recorded. IV Midazolam 0.03 mg/kg was administered 15 min before induction of general anaesthesia. Patients were pre oxygenated with 100% oxygen for 3 minutes and General Anaesthesia was induced using i.v. propofol 2mg/kg given over 30-60 seconds. After the induction, i/v Succinylcholine 2mg/kg was used for facilitation of intubation. Patient was ventilated via bag and mask for 1 minute and endotracheal intubatiob done with appropriate size of endotracheal tube, and IPPV started.

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Baseline parameters were noted as 0 hour, which was the time post surgery and just before the administration of TAP block. Patient's in Group 1 received Ultrasound guided Transverse Abdominis Plane block with 20ml of 0.5% bupivacaine + 2ml Normal Saline. Block was performed with patient in supine position, parts was cleaned and draped. Under all aseptic precautions, ultrasound guided TAP block was performed with portable ultrasound machine using linear high frequency probe (5-13Hz). Sterile ultrasound jelly was applied on probe and covered with sterile surgical gloves. Transducer was placed between anterior superior iliac spine and lower sub-costal margin behind the mid-axillary line. The probe was kept transverse to the abdomen, the plane between the internal oblique and transversus abdominis muscle identified behind the mid axillary line. 23G Quincke spinal needle was introduced by inplane technique, needle was kept perpendicular to the ultrasound beam and 20ml of 0.5% bupivacaine + 2ml normal saline was injected between the internal oblique and transversus abdominis muscle. Drug placement was 63 confirmed by direct visualisation of separation of the fascial plane on ultrasonogram.
Similarly, in group 2 patients, ultrasound guided transverse abdominis plane block was performed using 20ml of 0.5% bupivacaine + 0.5mcg/kg dexmedetomidine dissolved in 2ml Normal Saline.

Primary objectives were:

- To evaluate and compare the duration and quality of analgesia with bupivacaine and bupivacaine with dexmedetomidine after transverse abdominis plane block in abdominal surgeries using pain scores (at rest) and vitals monitoring.
- To study and compare the opiod consumption in both the cases.
- To compare the post operative sedation scores among the two groups.

Secondary objectives were-

- To study occurrence of side effects and complications if any.

Statistical Analysis:

The presentation of the Categorical variables was done in the form of number and percentage (%). On the other hand, the quantitative data were presented as the means ± SD. The following statistical tests were applied for the results:
1. The comparison of the variables which were quantitative in nature was analysed using Independent t test.
2. The comparison of the variables which were qualitative in nature was analysed using Chi-Square test. If any cell had an expected value of less than 5 then Fisher's exact test was used.

The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 25.0.
For statistical significance, p value of less than 0.05 was considered statistically significant.

3. RESULTS

The study was conducted in Department of Anaesthesiology, Gandhi Medical College and associated Hospital, Bhopal. 60 patients of age group between 16- 50 years of either sex of ASA grade - I and ASA grade – II who undergone abdominal surgeries were included in the

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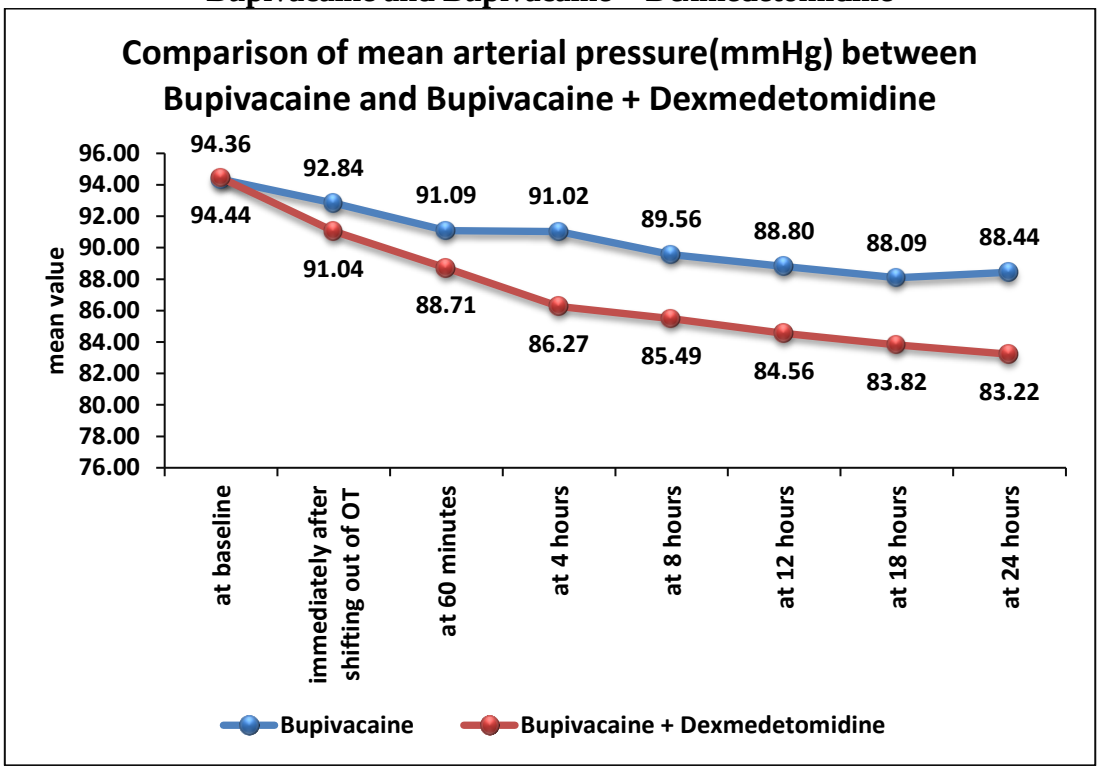
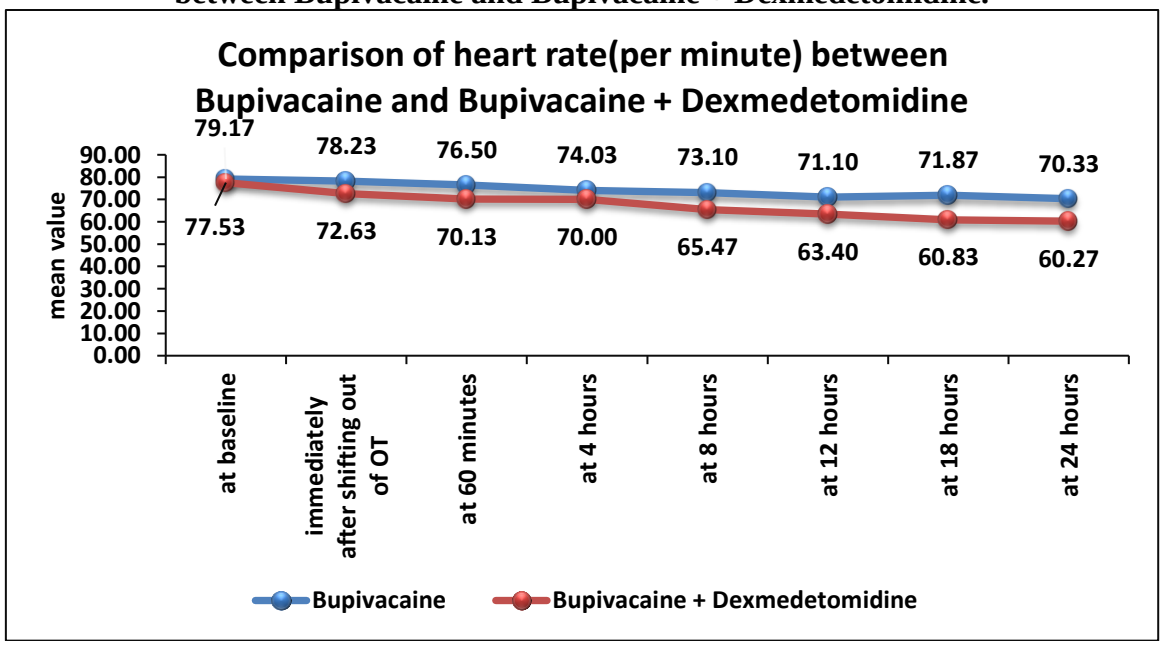
study. Patients were divided into two groups:-Bupivacaine(n=30) and Bupivacaine + Dexmedetomidine(n=30) and results are as follows.

GRAPH-1: Comparison of trend of mean arterial pressure(mmHg) between Bupivacaine and Bupivacaine + Dexmedetomidine



GRAPH-2 : Comparison of trend of heart rate(per minute) at different time intervals between Bupivacaine and Bupivacaine + Dexmedetomidine.



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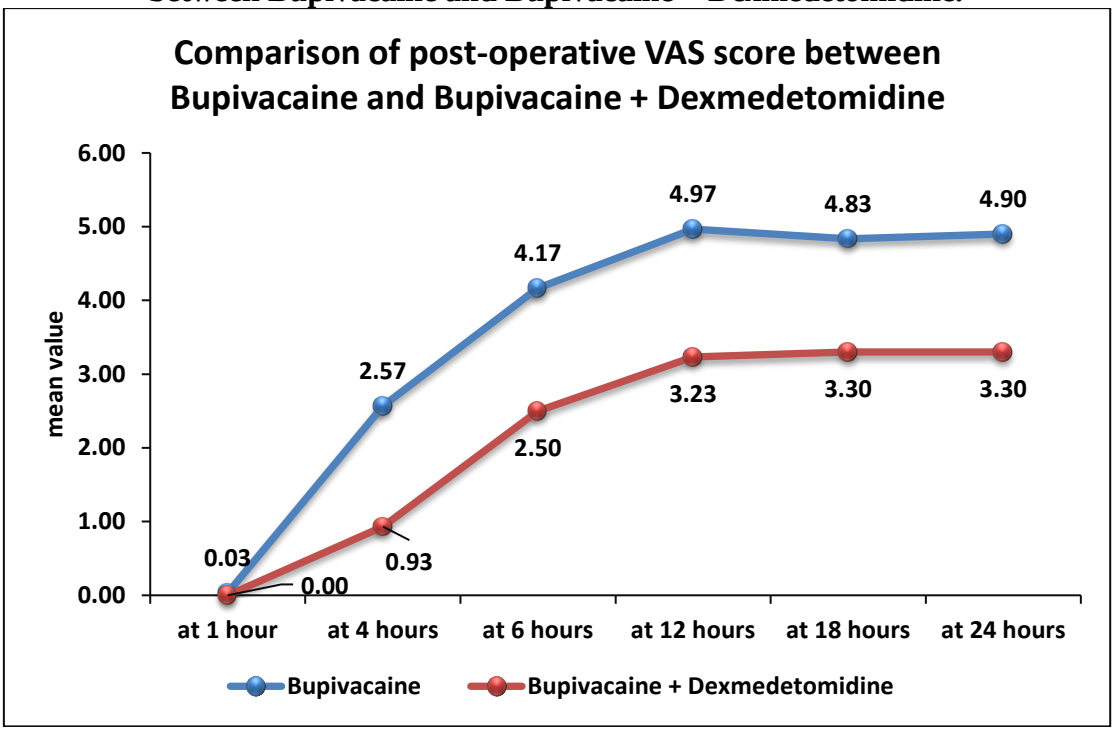
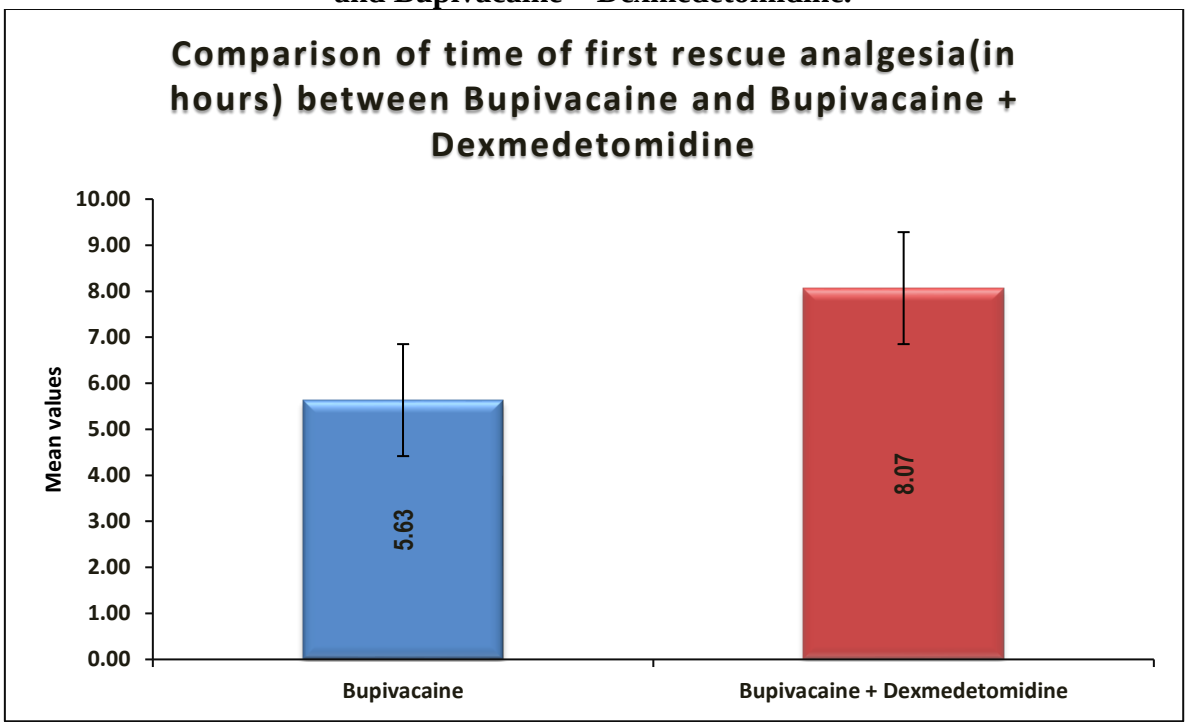
GRAPH-3: Comparison of trend of post-operative VAS score at different time intervals between Bupivacaine and Bupivacaine + Dexmedetomidine.



GRAPH 4- Comparison of time of first rescue analgesia(in hours) between Bupivacaine and Bupivacaine + Dexmedetomidine.



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GRAPH 5- Comparison of trend of post-operative Ramsay sedation score at different time intervals between Bupivacaine and Bupivacaine + Dexmedetomidine.

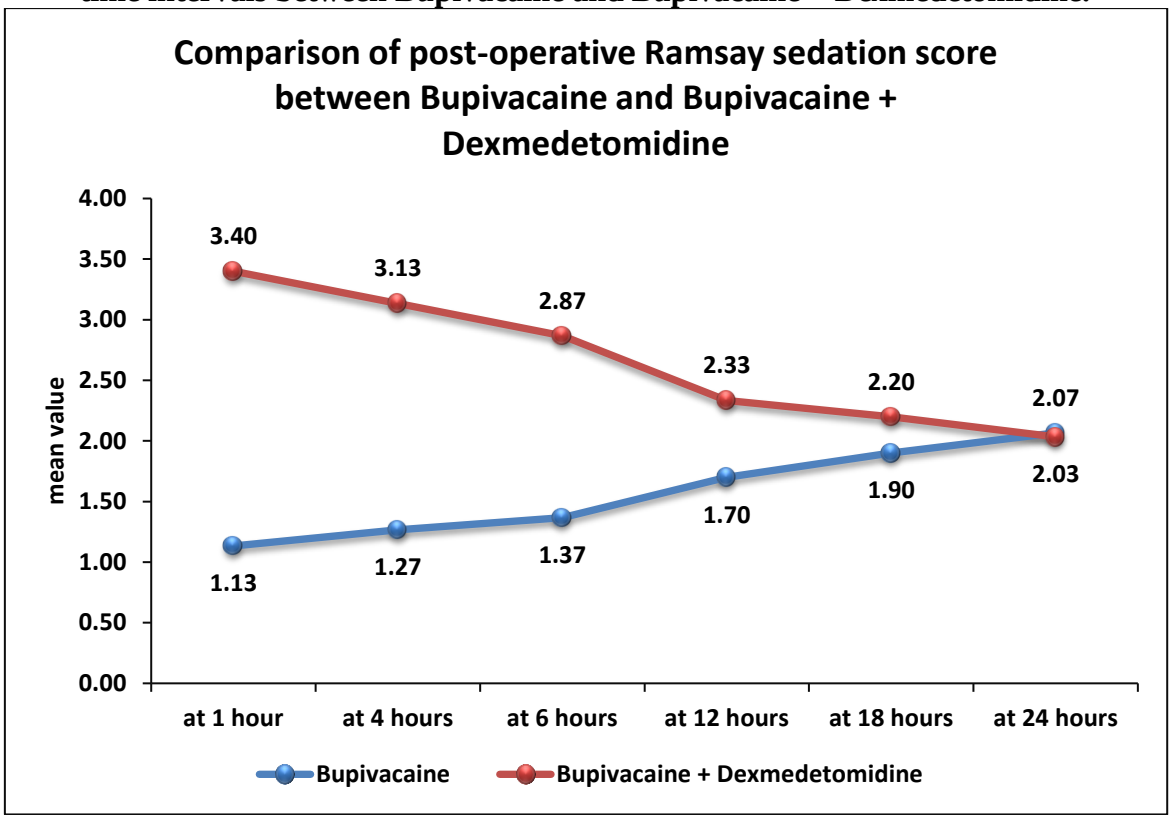

TABLE 1-Comparison of total number of analgesics between Bupivacaine and Bupivacaine + Dexmedetomidine.

Total number of analgesics	Bupivacaine(n=30)	Bupivacaine + Dexmedetomidine(n= 30)	Total	P value
0	4 (13.33%)	9 (30%)	13 (21.67%)	0.003*
1	6 (20%)	15 (50%)	21 (35%)	
2	17 (56.67%)	5 (16.67%)	22 (36.67%)	
3	3 (10%)	1 (3.33%)	4 (6.67%)	
Mean ± SD	1.63 ± 0.85	0.93 ± 0.78	1.28 ± 0.88	0.002‡
Median(25th-75th percentile)	2(1-2)	1(0-1)	1(1-2)	
Range	0-3	0-3	0-3	

‡ **Independent t test,** * **Fisher's exact test**

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TABLE 2- Comparison of total dose of morphine (mg) between Bupivacaine and Bupivacaine + Dexmedetomidine.

Total dose of morphine (mg)	Bupivacaine(n=30)	Bupivacaine + Dexmedetomidine(n=30)	Total	P value
0	4 (13.33%)	9 (30%)	13 (21.67%)	0.003*
12	6 (20%)	15 (50%)	21 (35%)	
24	17 (56.67%)	5 (16.67%)	22 (36.67%)	
36	3 (10%)	1 (3.33%)	4 (6.67%)	
Total	30 (100%)	30 (100%)	60 (100%)	

* **Fisher's exact test**

TABLE 3- Comparison of side effects and complications between Bupivacaine and Bupivacaine + Dexmedetomidine.

Side effects and complications	Bupivacaine(n=30)	Bupivacaine + Dexmedetomidine(n=30)	Total	P value
Nausea	1 (3.33%)	0 (0%)	1 (1.67%)	1*
Vomiting	0 (0%)	0 (0%)	0 (0%)	NA
Bradycardia	0 (0%)	1 (3.33%)	1 (1.67%)	1*

* **Fisher's exact test**

4. DISCUSSION

This study was conducted to evaluate the efficacy of Dexmedetomidine in prolonging the duration of Transversus Abdominis Plane block when it is used as an adjuvant with bupivacaine in lower abdominal surgeries done under general anaesthesia. In this study, we found that USG-guided TAP block with dexmedetomidine as an adjuvant with bupivacaine has better post-operative pain relief, reduced rescue analgesic consumption and longer duration of pain relief when compared with bupivacaine alone.

It was observed that the decrease in hemodynamic data was long-lasting, and there might be its role in blocking response to stress following the relief of postoperative pain because of dexmedetomidine. Patients did not require any treatment with vasoactive drugs. This is consistent with a similar study done by Aksu et al.

Only one patient in bupivacaine + dexmedetomidine group had bradycardia, treated with i.v. atropine to optimize HR.

Dexmedetomidine resulted in significantly lesser pain scores at 2, 4, 8, 12, 18 and 24 h after surgery. It is noted that the mean number of analgesics is also statistically significant between the two groups(p=0.002). Also the number of patients who did not need the rescue analgesia were more in dexmedetomidine group (30%) than in the bupivacaine alone group (13.3%). Almarakbi et al. observed that the addition of dexmedetomidine to bupivacaine in TAP block provides better local anaesthesia and better pain control postoperatively with no major side effects in open abdominal hysterectomy.

Total analgesic consumption in the Bupivacaine + dexmedetomidinegroup (MEAN-11.2±9.4mg) was significantly lower than Bupivacaine group alone (MEAN= 19.6±10.2mg). Mean ± SD of time of first rescue analgesia(in hours) in bupivacaine + Dexmedetomidine

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was 8.07 ± 2.61 which was significantly higher as compared to bupivacaine (5.63 ± 2.58).(p value=0.0006)
We also observed that there was a statistical significance with sedation scores, which was higher in dexmedetomidine group till the 12-hour postoperative period than in the other group, but they remained comparable at 18 and 24 h. Agarwal et al. in their study reported no adverse effect except bradycardia in one patient who received TAP block using bupivacaine+dexmedetomidine although they were adequately sedated.

One patient had nausea in bupivacaine group treated with i.v. metoclopramide 10mg.
Almarakbi et al found that in a sample of 50 patients first degree nausea was observed in 3 patients from the group in which dexmedetomidine was added to bupivacaine in TAP block, and 11 patients from the group given bupivacaine alone, and there was no statistically significant difference in terms of nausea-vomiting and antiemetic treatment.

5. CONCLUSION

This study elucidated that TAP block performed by USG-guidance using dexmedetomidine as an adjuvant with 0.5% bupivacaine could account for better analgesia postoperatively than 0.5% bupivacaine alone. It also prolongs the duration of analgesia and reduces the postoperative opioid requirements.However, there is a need for further randomised controlled trials on different population groups undergoing lower abdominal surgeries to enhance the available quality of evidence. Also evaluating the efficacy of TAP block in terms of the approach used is also needed. Continuous TAP block analgesia using a catheter is a new technique for providing analgesia for a longer duration of time further reducing the opioid use and the side effects associated with it.

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Conflicts of interest: There are no conflicts of interest.

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