



A COMPARATIVE STUDY BETWEEN INJECTION BUPIVACAINE WITH INJECTION DEXMEDETOMIDINE VERSUS INJECTION BUPIVACAINE ALONE IN TRANSVERSUS ABDOMINIS PLANE BLOCK AND RECTUS SHEATH BLOCK FOR POST-OPERATIVE ANALGESIA IN PATIENTS UNDERGOING LAPAROSCOPIC SURGERY"

Anaesthesiology

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ABSTRACT

Background And Aims- TAP block and RS block is beneficial for pain management after conducting abdominal surgery. The aim of the study is comparing the effects of bupivacaine with dexmedetomidine versus bupivacaine alone in TAP block and RS block for post-operative analgesia in patients undergoing laparoscopic surgery. **Material And Methods -** This Prospective, Randomized, comparative study included a total of 60 patients. 60 Patients were divided into two groups. Patients were allocated in Bupivacaine alone group (B), and Bupivacaine with dexmedetomidine group(D). TAP was identified by linear probe, 22 gauge needle with syringe filled with study solution(0.25% Bupivacaine plane 20 ml for group B and 0.25% Bupivacaine with dexmedetomidine 1 mcg/kg for group D) injected in plane bilaterally. Rectus sheath block with 10 ml of study solution. **Result -** The comparison of mean NRS between the two groups at different time intervals were assessed. In Group B, NRS score exceeded 4 between the 5th and 6th hour, and again exceeded >4 between 8th to 10th hours while in the Bupivacaine with Dexmedetomidine group, NAS score exceeded 4 between the 8th and 12th hour in the postoperative period. **Conclusion -**USG guided TAP and RS block is an effective method of postoperative pain relief in laparoscopic surgeries. Both drugs significantly reduce postoperative pain but bupivacaine with dexmedetomidine has more prolonged pain relief as compared to bupivacaine alone.

KEYWORDS

Bupivacaine, Dexmedetomidine, TAP block, RS block, Laparoscopic surgery, Ultrasound-Guided

INTRODUCTION -

The key characteristic of laparoscopic surgery is the use of carbon dioxide to create pneumoperitoneum, which activates the sympathetic system, resulting in various physiological changes such as increase in heart rate, arterial pressure, and systemic and pulmonary vascular resistance.[1] This can become a risk factor for adverse cardiological effects in patients with pre-existing essential hypertension, ischemic heart disease, increased intracranial or increased intraocular pressure[2][3]. Last but not least, CO₂-induced pneumoperitoneum is associated with post-operative pain[4]. TAP blocks have been used extensively as it is technically unchallenging. This technique involves the injection of local anesthetic between the internal oblique and transversus abdominis muscles. The goal is to target the spinal nerves originating from the T6 to L1 segments of the spinal cord, thereby interrupting the sensory nerve supply to the anterolateral abdominal wall, which includes the abdominal skin, muscles, and parietal peritoneum. [5]. Rectus sheath blocks have been used extensively which is a fascial plane block involving deposition of local anaesthetic between the rectus muscle and its posterior sheath. This block's the terminal branches of lower thoracic spinal nerves (T7 to T12)[6][7]. In recent years, transversus abdominis plane block and rectus sheath block have been used for pain management during abdominal surgery under general anesthesia such as cholecystectomy, colectomy, cesarean section, hysterectomy, prostatectomy and hernia repair[8][9].

Primary Objective -: To assess the total duration of post-operative analgesia by NRS scale at regular intervals.

Secondary Objective:

- 1- Time of first rescue analgesia drug required after surgery.
- 2- Total amount of rescue analgesia drugs required after surgery in the first 24 hours.
- 3- Hemodynamic changes.
- 4- Any adverse events during and after surgery.

Methodology -

Type Of Study - Prospective interventional study.

Study Design - Randomized competitive double blinded study

After institutional ethical committee approval, the patients with ASA grade I and ASA grade II, as per the inclusion criteria were given explanation regarding the procedure in their vernacular language.

The minimum required sample size for the study was calculated using

Raosoftware. 60 Patients of ASA grade I&II and ages between 18 to 65 years were divided into two groups. Patients were Randomized according to the calendar method. In a sequential manner i.e. on even dates, patients were allocated in Bupivacaine alone group (B), and on odd dates patients were allocated on bupivacaine with dexmedetomidine group (D).

The preparation of the study drugs and its administration was done by different anaesthesiologists for both the groups who were blinded to the study drugs.

Induction was started with drugs such as midazolam 0.05 mg/kg, fentanyl 2-5 mcg/kg, propofol 2 mg/kg, vecuronium 0.1 mg/kg. Airway was secured with the appropriate size of I-gel. Anesthesia was maintained with Oxygen 50% and air, intermittent bolus of muscle relaxant as per the requirement and isoflurane with keeping MAC between 0.5 - 0.7%. Injection Paracetamol 1 gram was given.

TAP and RS block was given after induction of the patient. Linear high frequency ultrasound probe was placed over the mid axillary line between the costal margin and iliac crest. Once a TAP was identified between the internal oblique and transversus abdominis, a 22 gauge needle with syringe filled with a study solution drug was inserted in-plane under the vision of the probe. The needle was inserted till it reached between internal oblique and transverse abdominis muscle and then 20 ml drug was delivered. In the rectus sheath block a linear probe with high frequency was placed lateral to the lateral border of the rectus abdominis muscle in a transverse plane and a 22 gauge needle was introduced in plane to ultrasound probe just below the costal margin at an angle of 45 degree to skin. The needle was further advanced until it was positioned deep to the potential space between the deepest (posterior) border of the rectus abdominis muscle but superficial to the posterior aspect of the rectus sheath and 5 ml of study solutions were installed. Procedure was done bilaterally, both for TAP block and RS block. The assessment included observation of baseline vitals - HR, BP, RR, and SpO₂ at regular intervals started after block until study stopped. After the patient was fully awake, pain was assessed using the NRS scale at regular intervals by another team member of Anaesthesiology. Hemodynamic vitals were assessed after induction at 2, 5, 10, 15, 30 minutes, 1, 3, 6, 9, 15, 18, 21, and 24 hours. NRS scales were assessed at 0min, 30min, 1hr, 2hr, 4hr, 6hr, 8hr, 12hr, 24hr. 0th hour was considered as the time when the patient reached the recovery room. First line rescue analgesia was given in the form of inj Paracetamol 1 gm IV at NRS >4. Second rescue analgesia was given in

the form of injection Tramadol 50 mg intravenous.

Inclusion Criteria -

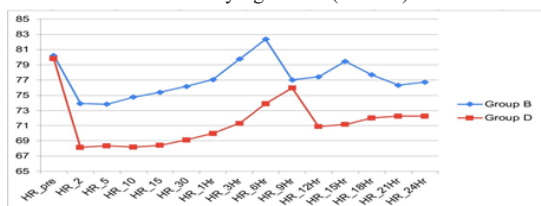
- 1- All laparoscopic surgery < 180 minutes.
- 2- ASA grade 1 and 2.
- 3- Age 18 years to 65 years

Exclusion Criteria -

1. Patients who do not give consent for study.
2. Pregnant women.
3. History of allergy to LA and dexmedetomidine.
4. Coagulation disorder
5. Locally block site infection.

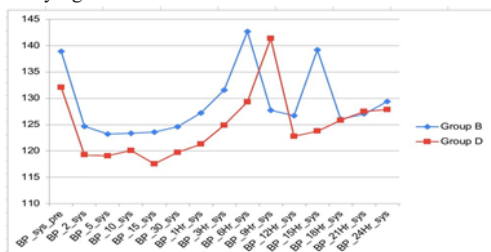
RESULT-

The two groups were comparable in terms of demographics, and ASA status distribution was not found to be significant ($P>0.05$) between the two groups. Sex distribution of two groups was comparable and the difference was not statistically significant ($P>0.05$).



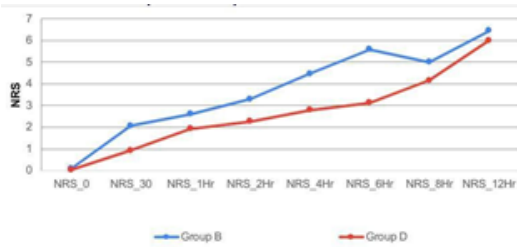
Graph 1:- Comparison of heart rate between bupivacaine and bupivacaine with dexmedetomidine

The average baseline heart rate was 80.2 b/m for Group B and 79.8 b/m for Group D. There was no significant difference between the two groups. After the surgery was complete, the heart rate increased in the group B after 6 hours and again at 15 hours. However, in group D, the heart rate was increased only after 8 hours. The difference between the two groups with respect to the increase in heart rate was found to be statistically significant.



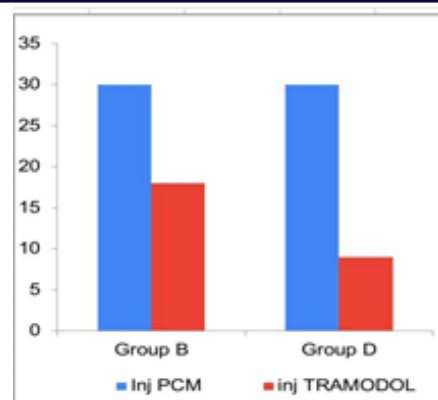
Graph 2: Comparison Of Systolic Blood Pressure Between Group Bupivacaine And Dexmedetomidine

According to the data, the baseline mean SBP was 138.9mmHg in group B, which was comparable to 132.1 in group D, and the difference was not statistically significant. After induction, SBP was recorded at regular intervals. The results showed that SBP was significantly lower in group (D) than in group (B). However, after 8 hours, SBP increased in group D, but it was still lower than in the bupivacaine alone group.



Graph 3: Comparison of nrs scale between group bupivacaine and dexmedetomidine.

The above graph shows a significant difference in NRS score between two groups during the postoperative period. NRS scores were recorded at 0 minutes, 30 minutes, 1, 2, 4, 6, 8, 12, and 24 hours. In group B, NRS score exceeded 4 between the 5th and 6th hour, and again exceeded >4 between 8th to 10th hours while in group D, NRS score exceeded 4 between the 8th and 12th hour in the postoperative period.



Graph 4: Comparison of rescue analgesia between group bupivacaine and bupivacaine with dexmedetomidine in 24 hour.

Based on the graph provided, it can be observed that in group B, the frequency of Paracetamol was 30 (50%), while Tramadol was 18 (66.7%). On the other hand, in group D, the frequency of Paracetamol was 30 (50%) and Tramadol was 9 (33.0%). Our study shows that the opioid consumption was less in group D compared to group B.

DISCUSSION-

This study involved a total of 60 patients, with 30 patients in each group. The difference in mean age (46.20 ± 11.26 and 49.83 ± 10.69), mean weight (66.13 ± 6.76 and 64.60 ± 6.92), and ASA status distribution (20:10 and 17:13) was not found to be significant between the two groups. It was observed that Bupivacaine with dexmedetomidine had prolonged pain relief till 8 to 10 hours postoperatively and Bupivacaine alone group had pain relief till 4 to 5 hours postoperatively. In first 9 hours the mean NRS score of bupivacaine with dexmedetomidine group was more 0.03 ± 0.2 to 6.0 ± 0.9 compared to bupivacaine alone 0.1 ± 0.4 to 4.47 ± 1.3 showed that bupivacaine with dexmedetomidine has more prolonged analgesic effect than bupivacaine alone because dexmedetomidine has analgesic property. Postoperatively opioid (Tramadol) consumption was less in group D, (33.0%) compared to group B (66.7%). Dexmedetomidine, a highly selective α_2 agonist, has been studied for its efficacy and safety in extending the duration of TAP block when used as an adjuvant in various surgical procedures[10]. Numerous studies have shown that incorporating dexmedetomidine into local anesthetics (LAs) for central neuraxial blocks and peripheral nerve blocks is both safe and effective. This combination enhances the effects of the local anesthetics, reduces the need for additional analgesics, and improves postoperative recovery[11][12]. Therefore, based on the results of this study, the recommended dose of dexmedetomidine for combining with bupivacaine in the TAP block is $1 \mu\text{g/kg}$ [13]. Similar study conducted by Soma Ganesh Raja Neethirajan et al[14] involved the use of 0.125% bupivacaine alone and inj bupivacaine (0.125%) with dexmedetomidine 1 mcg/kg in TAP block only. They found that postoperative pain relief was more effective in the dexmedetomidine group (7.33 h) than the bupivacaine group (4.8h). The present study used a higher concentration of bupivacaine (0.5%) than the previous study, which used a lower concentration. Therefore, the lack of efficacy in these studies can be attributed to the lower concentration of drugs. Our study's good results may be related to the use of a higher concentration of bupivacaine, indicating the importance of adequate concentration along with the volume and total dose of the local anesthetic agent. In addition to the TAP block, our study also used the Rectus sheath block, which increased the duration of postoperative pain relief. Wafaa T Salem et al [15] using bupivacaine 0.25% and dexmedetomidine 2mcg/kg. In their study, the time of first request of rescue analgesia was longer in the dexmedetomidine group. In our study, we used dexmedetomidine in a lower dose (1mcg /kg), and the results were similar to the aforementioned study.

CONCLUSION-

Our study has shown that there is an overall reduction of pain following a TAP+RS block during the first 24 hours. The study also suggests that the administration of bupivacaine with dexmedetomidine provides longer postoperative pain relief than using bupivacaine alone. Along with the total volume and dose administered, the concentration of the instilled drug is equally important.

Tables-

TABLE 3:- COMPARISON OF HEART RATE BETWEEN BUPIVACAINE AND BUPIVACAINE WITH DEXMEDETOMIDINE

HR	GROUP B		GROUP D		P value	
	Mean	SD	Mean	SD	Within time interval	Between groups
Pre OP	80.2	9.7	79.8	10.1	<0.001	< 0.001
2 min	76.9	8.8	68.1	6.4		
5 min	73.8	8.9	68.3	6.1		
10 min	74.8	8.5	68.2	6.3		
15 min	75.4	8.2	68.4	6.4		
30 min	76.2	8.2	69.1	6.0		
1 hr	77.1	7.6	70.0	6.5		
3 hr	79.8	7.5	71.3	6.0		
6 hr	82.4	8.5	73.9	6.8		
9 hr	77.0	6.3	76.0	6.5		
12 hr	77.4	6.5	70.9	4.6		
15 hr	79.5	6.7	71.2	3.9		
18 hr	76.3	7.4	72.3	4.0		
21 hr	76.7	6.9	72.3	4.4		
24 hr	76.0	8.3	75.3	8.3		

TABLE 4:- COMPARISON OF SYSTOLIC BLOOD PRESSURE BETWEEN GROUP BUPIVACAINE AND DEXMEDETOMIDINE IN 24 HOUR.

SBP	GROUP B		GROUP D		P VALUE	
	MEAN	SD	MEAN	SD	WITH IN TIME INTERVAL	BETWEEN GROUP
PRE OP	138.9	16.4	132.1	20.1	<0.001	0.017
2 min	124.7	15.0	119.3	14.2		
5 min	123.2	13.2	119.1	12.4		
10 min	123.4	10.0	120.1	9.6		
15 min	123.6	10.1	117.6	8.4		
30 min	124.6	8.6	119.7	7.3		
1 hr	127.2	8.4	121.3	7.7		
3 hr	131.6	8.5	124.9	6.6		
6 hr	142.7	25.8	129.3	7.2		
9 hr	127.7	6.3	141.3	6.0		
12 hr	126.7	7.9	122.8	7.0		
15 hr	139.2	12.6	123.8	8.1		
18 hr	126.0	8.8	125.9	8.4		
21 hr	127.0	7.9	127.5	6.0		
24 hr	129.4	7.4	127.9	6.4		

Two way RMANOVA					p-values	
	Group B		Group D		Within time interval	Between groups
	Mean	SD	Mean	SD		
NRS_0	0.10	0.4	0.03	0.2	<0.001	<0.001
NRS_30	2.07	0.5	0.93	0.9		
NRS_1hr	2.60	0.6	1.93	0.5		
NRS_2hr	3.30	0.7	2.27	0.4		
NRS_4hr	4.47	1.3	2.80	0.5		
NRS_6hr	5.59	1.2	3.13	0.3		
NRS_8hr	5.00	1.5	4.17	1.1		
NRS_12hr	6.45	0.5	6.00	0.9		

Two way RMANOVA					p-values	
	PCM only		With TRAMCOOL		Within time interval	Between groups
	Mean	SD	Mean	SD		
NRS_0	0.09	0.38	0.04	0.19	<0.001	<0.001
NRS_30	1.24	0.97	1.81	0.74		
NRS_1hr	2.09	0.63	2.48	0.64		
NRS_2hr	2.55	0.75	3.07	0.78		
NRS_4hr	3.21	0.82	4.15	1.51		
NRS_6hr	4.19	1.55	4.52	1.45		
NRS_8hr	3.57	0.51	5.19	1.33		
NRS_12hr	5.67	0.66	6.60	0.68		

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