

Effect of Dexmedetomidine as an Adjuvant to Lignocaine and Bupivacaine Used in Transversus Abdominis Plane (TAP) Block for Postoperative Pain Relief

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Abstract: Our aimed to evaluate the effect of dexmedetomidine as an adjuvant to lignocaine and bupivacaine used in transversus abdominis plane (TAP) block for postoperative pain relief. Randomized study of 50 patients scheduled for abdominal hysterectomy was divided into two equal groups in a randomized double-blinded in this study. Group A (Control) patients (n = 25) received TAP block with 10 ml of 0.25% bupivacaine, with 10 ml of 2% lignocaine bilaterally while Group B (Dexmedetomidine) patient (n = 25) received 0.5 mcg/kg (2 ml) of dexmedetomidine, with 10 ml of 2% lignocaine and 10 ml of 0.25% bupivacaine bilaterally. Time for first analgesic administration and side-effects were recorded. There is a statistically significant difference in the time for first analgesic and pain score for 24 hours between the two groups (p value < 0.05). The time for the first demand of rescue analgesia was earlier in group A, 246.60 ± 28.22 min as compared to group B, i.e. 613.90 ± 67.72 min. (p value < 0.05). The average VAS score for the 24 hours was lower in group A 4.98 ± 0.77 than in group B, i.e. 5.18 ± 1.02. (p < 0.05). The addition of dexmedetomidine to local anesthetic agent in TAP block helps achieve better analgesia and decreases the total dose of analgesics required post-operatively without any major side-effects.

Keywords: Dexmedetomidine, lignocaine, bupivacaine, transversus abdominis plane block.

INTRODUCTION

Transversus Abdominis Plane block is a regional anaesthetic procedure that blocks neural afferents of anterolateral abdominal wall McDonnell *et al.*[1] were the first to depict this block.

Hebbard *et al.*[2] described an ultrasound guided approach to the TAP block. 03 approaches for the TAP block described are the subcostal, mid-axillary & lumbar triangle of Petit. The oblique subcostal approach was associated with a larger area of spread (T7-L1) whereas it was only T10-L1 with the other two approaches[3]. Unfortunately, the block duration is limited to the effect of administered local anaesthetic. Dexmedetomidine is a selective alpha 2 adrenergic agonist with analgesic and sedative properties[4]. Its use with bupivacaine either epidurally or intrathecally is associated with prolongation of local anaesthetic effect[5-9].

Laparoscopic surgeries are mainly day care surgeries. Good analgesia is an important requirement in day care surgeries. A major component of pain experienced by patient after abdominal surgeries originates from the abdominal wall incision. Oblique subcostal TAP block with its wider spread provides good post-operative analgesia. There is limited data on the efficacy of dexmedetomidine as adjuvant in TAP

block. In this study we aim to study the efficacy of dexmedetomidine as adjuvant to bupivacaine in TAP block in patients undergoing total abdominal Hysterectomy Local Anaesthetics.

MATERIALS AND METHODS

This study was conducted in Index Medical College Hospital & R.C., Indore after obtaining ethical committee approval from our institute. The duration of study was 06 months. Patient who fulfilled the inclusion and exclusion criteria undergoing lower abdominal surgeries were enrolled in our study, after written informed consent was obtained from each patient after explaining the purpose and details of study.

- This Study, randomized, double blind controlled clinical study in patients undergoing lower abdominal surgery.
- Sample Size : 50 Patients
- Group A (Control)- TAP block with 10 ml of 0.25% bupivacaine, with 10 ml of 2% lignocaine bilaterally 25 Patients

- Group B (Dexmedetomidine)- Bupivacaine (0.25%) + Dexmedetomidine 0.5 mcg/kg (2 ml) of dexmedetomidine, with 10 ml of 2% lignocaine and 10 ml of 0.25% bupivacaine bilaterally 25 Patients

Exclusion Criteria

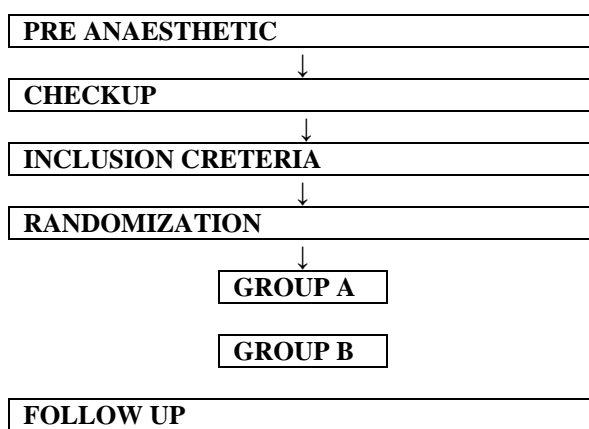
- Age < 18 year
- BMI > 30
- ASA Class III & IV (Severe PIH, Stenotic Valvular Heart disease)
- Emergency Surgery
- History of allergy to local anaesthetics
- Patients with a history of diabetes mellitus
- Patients undergoing a vertical midline skin incision
- Psychiatric patients

- Pre-operative opioids & NSAIDS
- Bleeding diathesis
- Skin infection at puncture site

Parameters Monitored

- Duration of analgesia
- Onset of pain by Visual analog scale (VAS)
- Average VAS score for the 24 hours was lower in group A 4.98 ± 0.77 than in group B, i.e. 5.18 ± 1.02 . ($p < 0.05$)
- Ramsay sedation scale
- Post-operative Pulse rate, Blood pressure, Respiratory rate, SpO₂

FLOW DIAGRAM



The transversus abdominis plane block technique used was Midaxillary Line. All sterile aseptic precautions were adapted and draped with sterile linen before performing the procedure. The investigator was scrubbed and the ultrasound probe was covered with a sterile plastic cover and placed in the midaxillary line just superior to the iliac crest. After identifying the

abdominal layers, the transverses abdominal plane was reached by using 23 gauge spinal needles.

A bolus dose of 20 ml of Drug solution was administered bilaterally for Group A and 20 ml of Drug solution was administered bilaterally for Group B. Patients vital parameters like Pulse rate, Respiratory rate, Saturation, Blood pressure were recorded.

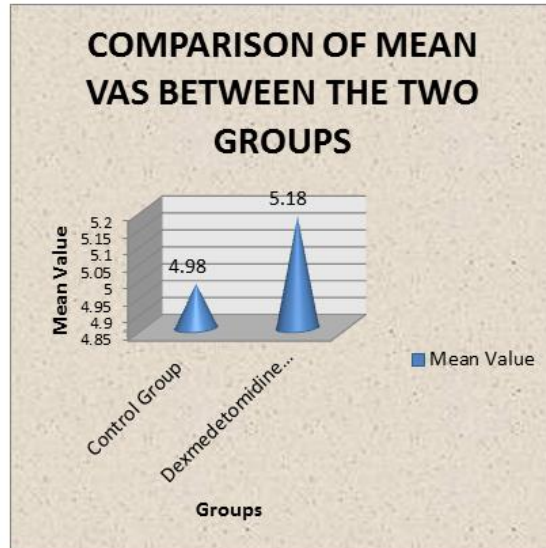
Table-01: Comparison of mean VAS between the two groups (N=100)

Group	VAS [Mean±SD]	't' value	P value
Group A(Control)	4.98 ± 0.77	-1.104, df=98	0.272, NS
Group B (Dexmedetomidine)	5.18 ± 1.02		

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

The above table shows the comparison of mean VAS between the control and dexmedetomidine group. The mean VAS in the control group was $4.98 \pm$

0.77 , while in the dexmedetomidine group was 5.18 ± 1.02 . The difference was found to be statistically not significant ($P > 0.05$), showing a comparable VAS in both the groups.



Graph-1: Cone diagram showing comparison of mean VAS between the two groups

Table-02: Comparison of mean duration of analgesia between the two groups (N=100)

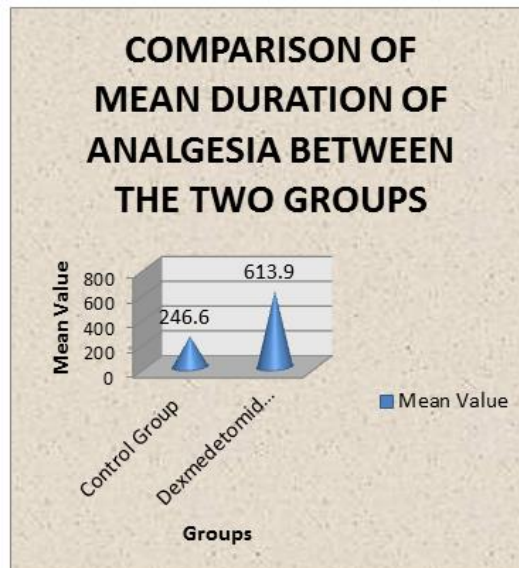
Group	Duration of analgesia [Mean±SD]	't' value	P value
Group A (Control)	246.60 ± 28.22	-35.401, df=98	0.000*
Group B (Dexmedetomidine)	613.90 ± 67.72		

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

The above table shows the comparison of mean duration of analgesia between the control and dexmedetomidine group.

dexmedetomidine group was 613.90 ± 67.72 min. The difference was found to be statistically significant (P<0.05), showing a higher mean duration of analgesia in the dexmedetomidine group.

The mean duration of analgesia in the control group was 246.60 ± 28.22 min, while in the



Graph 02: Cone diagram showing comparison of mean duration of analgesia between the two groups No. of Analgesic Dose requirement in group a – 03 dosage of Analgesia required within in 24 hours. Group B – Only 01 Dose required in 24 hours

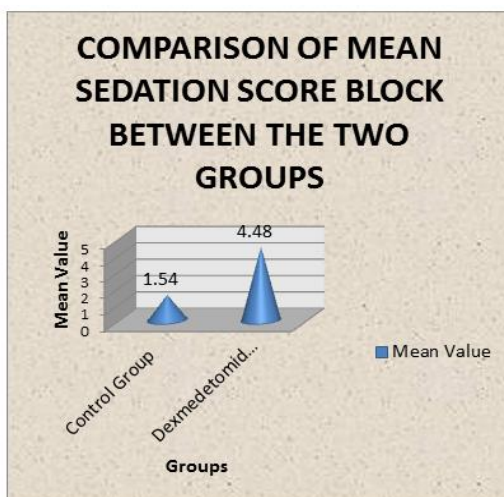
Table-03: Comparison of mean sedation score between the two groups (N=100)

Group	Sedation score [Mean±SD]	't' value	P value
Group A(Control)	1.54 ± 0.50	-21.717, df=98	0.000*
Group B (Dexmedetomidine)	4.48 ± 0.81		

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

The above table shows the comparison of mean sedation score between the control and dexmedetomidine group. The mean sedation score in the control group was 1.54 ± 0.50, while in the

dexmedetomidine group was 4.48 ± 0.81. The difference was found to be statistically significant (P<0.05), showing a higher mean sedation score in the dexmedetomidine group.



Graph-03: Cone diagram showing comparison of mean sedation score between the two groups

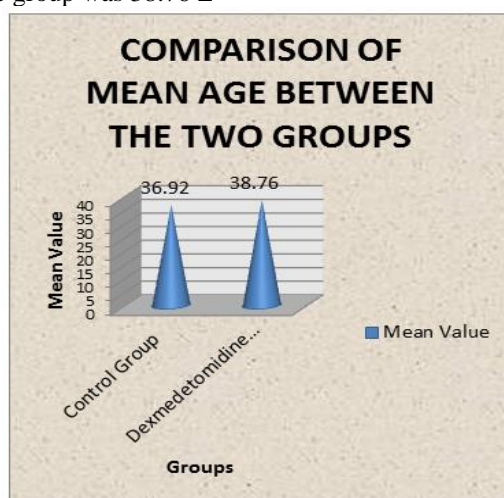
Table-04: Comparison of mean age between the two groups (N=100)

Group	Age[Mean±SD]	't' value	P value
Group A (Control)	36.92 ± 11.99	-0.856, df=98	0.394, NS
Group B (Dexmedetomidine)	38.76 ± 9.35		

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

The above table shows the comparison of mean age between the control and dexmedetomidine group. The mean age in the control group was 36.92 ± 11.99 years, while in the dexmedetomidine group was 38.76 ±

9.35 years. The difference was found to be statistically not significant (P>0.05), showing that age was comparable between the two groups.



Graph-04: Cone diagram showing comparison of mean age between the two groups

RESULTS

There is a statistically significant difference in the time for first analgesic and pain score for 24 hours between the two groups (p value < 0.05). The time for the first demand of rescue analgesia was earlier in group A, 246.60 ± 28.22 min as compared to group B, i.e. 613.90 ± 67.72 min. (p value < 0.05). The average VAS score for the 24 hours was lower in group A 4.98 ± 0.77 than in group B, i.e. 5.18 ± 1.02 . ($p < 0.05$).

VAS score shows the average score 3 in which perceives pain is delayed in group B which is statistically very significant. Group A patients had pain very early, which in turn increases the requirement of analgesic. one patient had vomiting in group A (3.3%), in group B one patient had bradycardia (3.3%), in group B with a p 0.368 which was statistically insignificant.

CONCLUSION

The addition of dexmedetomidine to local anesthetic agent in TAP block helps achieve better analgesia and decreases the total dose of analgesics required post-operatively without any major side-effects.

Dexmedetomidine induces vasoconstriction through an action on α_2 adrenoceptors; this might contribute to the longer duration of action.

Dexmedetomidine is also said to have third mechanism of action through α_2 adrenoceptors agonist effects like analgesia, mild sedation, and decreased release of norepinephrine rather than vasoconstriction.

Dexmedetomidine contributed to the direct effect on the peripheral nerve activity. The mechanism of dexmedetomidine's action seems to potentiate the local anaesthetic effect and prolongs the analgesic duration.

DISCUSSION

Management of post-operative pain still remains an enigma. Paradoxically after all the efforts taken to make the intra operative period pain free and stress free. Patient is left to fend themselves in the postoperative period.

In recent times, transversus abdominis plane block relief of postoperative pain promises a new platform in abdominal surgeries. Based on the observation and results obtained in our study involving 50 patients with 25 patients in each group, results of this study was discussed in detail by comparing with the obtained data and available evidence in the literature.

The major finding of this study is that addition of dexmedetomidine to lignocaine and bupivacaine in Transversus abdominis plane block provides prolonged and better pain control than local anesthetic alone. The duration of LA was longer, VAS was lower and the

need for rescue analgesia doses was less when dexmedetomidine was added to lignocaine and bupivacaine.

Masaki *et al.*[10] suggested that dexmedetomidine induces vasoconstriction through an action on α_2 adrenoceptors in the human forearm and this might contribute to the longer duration of action⁸. Other investigators have supported a third mechanism of action through α_2 adrenoceptors agonist effect rather than vasoconstriction. They contributed that to the direct effect on the peripheral nerve mechanism of dexmedetomidine's action, it seems that it potentiates the local anaesthetic effect and prolongs the analgesic duration.

McDonnell *et al.*[1] in their study correlated the prolonged effect of ropivacaine in Transversus abdominis plane block to the relatively poorly vascularised Transversus abdominis plane resulting in a slower rate of drug clearance. In this study, the addition of dexmedetomidine to bupivacaine in Transversus abdominis plane block led to further prolongation of analgesia, less requirement of rescue analgesia and lower VAS pain scores. Similar to our finding, many investigators reported that the addition of dexmedetomidine to different types of LA agents in various types of peripheral nerve blocks resulted in prolongation of analgesic effect.

In our study there were no complications during the procedure, one patient had vomiting in group B, in group A one patient had bradycardia with a p Value of 0.368 which was statistically insignificant. The adverse effects pertaining to the transversus abdominis plane block have been reported in the literature.

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