USE OF DEXMEDETOMIDINE AS ADJUVANT IN OBLIQUE SUBCOSTAL TRANSVERSUS ABDOMINIS PLANE BLOCK

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ABSTRACT

Effective analgesia is desirable in ambulatory surgeries. Oblique subcostal transversus abdominis plane block is a good option for providing post-operative analgesia. Dexmedetomidine used as an adjuvant with local anaesthetic results in a longer lasting analgesia and reduces the post-operative opioid supplementation. This helps in early ambulation and early discharge of the patient. The objective of this study was to assess the efficacy of adding dexmedetomidine to 0.25% bupivacaine in bilateral ultrasound guided oblique subcostal transversus abdominis plane block in patients undergoing laparoscopic ovarian cystectomy.

METHOD

One hundred patients posted for laparoscopic ovarian cystectomy were randomly allocated in two groups of 50 each: group BD received bilateral 20ml 0.25% bupivacaine and 0.5mcg/kg (2ml) of dexmedetomidine; while Group B received 20ml 0.25% bupivacaine and 2ml normal saline. We assessed pain by VAS every 2 hours for 24 hours, time for first analgesic, i.e. morphine demand and totally used morphine doses for 24 hours. Adverse effects were also noted. It was a double blinded study.

RESULTS

There is a statistically significant difference in the time for first morphine and pain score for 24 hours between the two methods (p value < 0.05). The time for the first demand of rescue analgesia i.e. morphine was earlier in group B, 5.91±1.28 hours as compared to group BD, i.e. 10.18±2.12 hours. The total morphine consumption in 24 hours (p value < 0.05). The average VAS score for the 24 hours was lower in group BD 3.20±0.579 than in group B, i.e. 4.91±1.63. (p < 0.05).

CONCLUSIONS

Ultrasound guided oblique subcostal block using dexmedetomidine with bupivacaine provides longer analgesia with significant morphine sparing effect.

KEYWORDS

Dexmedetomidine, Bupivacaine, Oblique Subcostal Transversus Abdominis Plane Block.

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INTRODUCTION

Transversus Abdominis Plane (TAP) block is a regional anaesthetic technique that blocks neural afferents of anterolateral abdominal wall. Rafi.¹ and McDonnell et al.² were the first to describe this block. Hebbard et al.³ described an ultrasound guided approach to the TAP block. Three approaches for the TAP block described are the subcostal, mid-axillary and lumbar triangle of Petit.⁴ 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.⁵ 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.⁶ Its use with bupivacaine either epidurally or intrathecally is associated with prolongation of local anaesthetic effect.^{7,8,9,10,11} Laparoscopic ovarian cystectomy is associated with post-operative pain of moderate intensity and in the immediate postoperative period.

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.¹² 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.¹³ In this study we aim to study the efficacy of dexmedetomidine as adjuvant to bupivacaine in TAP block in patients undergoing laparoscopic ovarian cystectomy.

MATERIALS AND METHODS

After approval from the faculty ethical committee 100 ASA1 and 2 patients posted for laparoscopic ovarian cystectomy were included in this study. Exclusion criteria were patient refusal, history of cardiac or respiratory disease, coagulation disorders, local infection at the site of block, allergy to local anaesthetics, psychological disorders, chronic use of pain medications or adrenoreceptor agonists or antagonists. During the preoperative assessment, patients were familiarized with visual analogue pain scale for pain assessment 0-10, 0 meaning no pain and 10 meaning worst pain imaginable. The preoperative investigations included Hb, HCT levels, blood sugar levels, serum electrolytes, urea, creatinine, liver function tests, coagulation profile, chest x-ray and pulmonary function tests.

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The patients were randomized using a computer generated program and allocated to 2 groups- Group BD and Group B. Group BD received bilateral 20ml 0.25% bupivacaine and 0.5mcg/kg (2ml) of dexmedetomidine; while Group B received 20ml 0.25% bupivacaine and 2ml normal saline. We assessed pain by VAS every 2 hours for 24 hours, time for first analgesic i.e. morphine demand and totally used morphine doses for 24 hours. Adverse effects were also noted. It was a double blinded study. All patients were pre-medicated with Inj. glycopyrrolate 0.5mcg/kg and Inj. midazolam 0.03mg/kg. Monitoring included NIBP, HR, pulse oximetry and end tidal CO₂. Induction was with inj. fentanyl 2mcg/kg, Propofol 1-2mg/kg and vecuronium 0.1mg/kg. Tracheal intubation was done with endotracheal tube no. 7mm ID. Maintenance of anaesthesia was with N₂O, O₂ (FiO₂ 0.35) and sevoflurane (1-1.2 MAC).

Ventilatory settings were adjusted to maintain ETCO₂ between 35-40mmHg and SpO₂-95-100%. A PEEP of 5cm H₂O was used in all patients. All patients were placed in dorsal lithotomy position. Umbilical incision was made and CO₂ was insufflated through the port. Intra-abdominal pressure was not to exceed 20cm Hg. Two secondary ports were placed 5cm superior and lateral to the pubic symphysis. The cases were all done by the same surgical team and was completed in 60-75 minutes. Following skin closure, bilateral oblique subcostal transversus abdominis plane injection was performed with linear probe that was placed in the midline of the abdomen 2cm below the xiphisternum and moved laterally along the subcostal margin. The rectus abdominis and transversus abdominis muscles were identified. A 22 gauge 150mm Stimuplex needle was inserted in plane through the rectus abdominis muscle 2-3cm medial to the probe.

Once the tip was seen between the rectus muscle and transversus abdominis muscle and after negative aspiration the drug was injected and hydrodissection demonstrated. The drug injectant was loaded by another Anaesthetist and handed to the investigator. At the end of procedure, neuromuscular blockade was reversed with inj. Neostigmine 50mcg/kg and atropine 0.01mg/kg. All patients were given inj. Dexamethasone 8mg and Ondansetron 4mg intravenously for anti-emetic prophylaxis. All patients were extubated uneventfully and kept in PACU for 24 hours. Postoperatively all patients were investigated for pain scores for 24 hours and whenever VAS $\geq$ 3, Inj. Morphine 2mg was administered. Hemodynamic monitoring and any adverse effects were looked for. The time for the first requirement of morphine and the cumulative dose of morphine for 24 hours were noted. Assuming at least a mean difference of 190 minutes.¹³ between group BD and group B in the time of first rescue analgesia requirement, with a power of 80%, an alpha level of 5%, a sample size of 33 in each group has been calculated.

STATISTICAL ANALYSIS

The statistical analysis has been performed using SPSS version 21. All the demographic variables are represented using percentages, mean $\pm$ SD. normally distributed variables (Time of rescue analgesia, total morphine requirement) between the groups were compared using independent sample student t test. VAS score between the two groups were represented using median and interquartile range and the comparison has been made using Mann Whitney U test.

RESULTS

One hundred patients took part in this study and were randomly assigned to the two groups. All ultrasound guided oblique subcostal transversus abdominis plane block were performed as described without any complications. Patient characteristics and perioperative data are shown in Table 1. There were no large differences between in the two groups.

Variable	Group BD	Group B	P value
AGE	42.36 $\pm$ 9.44	42.3 $\pm$ 8.49	0.083
ASA(1/2)	32/1.8	30/2.0	1.00
Height(cm)	156.80 $\pm$ 6.22	157.88 $\pm$ 5.26	0.578
Weight(kg)	58.09 $\pm$ 4.60	57.09 $\pm$ 3.92	0.098
IO Fentanyl (mcg)	59.8 $\pm$ 23.1	16.4 $\pm$ 21.28	0.067

Table 1

Time of first demand of Morphine (hrs.)	10.18 $\pm$ 2.12	5.91 $\pm$ 1.23	0.039
Av VAS Score	3.20 $\pm$ 0.579	4.91 $\pm$ 1.63	0.041
24hr Morphine Requirement	5.96 $\pm$ 1.08	11.18 $\pm$ 2.23	0.047

Table 2

As shown in the above table, there is a statistically significant difference in the time for first morphine and pain score for 24 hours between the two methods. (P value $<$ 0.05).

(*Independent sample t test has been used for the comparison.

** Z test for comparison of two proportions has been used).

The time for the first demand of rescue analgesia, i.e. morphine was earlier in group B, 5.91 $\pm$ 1.28 hours as compared to group BD, i.e. 10.18 $\pm$ 2.12 hours. The total morphine consumption in 24 hours (p value $<$ 0.05). The average VAS score for the 24 hours was lower in group BD 3.20 $\pm$ 0.579 than in group B, i.e. 4.91 $\pm$ 1.63. (p $<$ 0.05).

Graph 1: Time of 1st dose of Morphine

Graph 2: Total 24 hr. Morphine consumption

Graph 3: Average VAS Score

DISCUSSION

This study shows that Dexmedetomidine supplemented in the bilateral oblique subcostal block with 0.25% bupivacaine in patients undergoing laparoscopic ovarian cystectomy definitely prolonged pain free period postoperatively thus reducing the requirement of morphine. Studies have shown that TAP blocks were associated with early post-operative visual analogue pain score both at rest and during mobilization.¹³ Ultrasound guided oblique subcostal transversus abdominis plane block after laparoscopic sleeve gastrectomy has shown to be a safe and effective method for post-operative analgesia with significant morphine sparing effect.¹⁴ Brummett et al.¹¹ have reported that perineural administration of dexmedetomidine with bupivacaine enhanced local anaesthetic block in rat without inducing neurotoxicity.

There is no study of dexmedetomidine being used in oblique subcostal block for laparoscopic gynaecological studies. Various studies have shown that addition of dexmedetomidine to different local anaesthetic agents in various types of nerve block resulted in prolonged analgesia.^{15,16} Masuki et al.¹⁷ suggested that dexmedetomidine causes vasoconstriction through alpha 2 adrenergic receptors agonist effect that leads to longer duration of action. Other investigators have suggested a third mechanism of action through alpha 2 adrenergic effect. They attributed it to direct effect on the peripheral nerve activity.¹⁸

A major disadvantage of oblique subcostal transversus abdominis plane block is the inability to block visceral pain making it suitable for post-operative analgesia in laparoscopic surgeries. In conclusion oblique subcostal transversus plane block is a good alternative for providing analgesia during the post-operative period in laparoscopic ovarian cystectomy surgeries. Ultrasound guided oblique subcostal block using dexmedetomidine with bupivacaine provides longer analgesia with significant morphine sparing effect.

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