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Comparison of Efficacy of 0.25% Bupivacaine and 0.25% Bupivacaine-Clonidine Combination in Ultrasound Guided Transversus Abdominis Plane Block

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Abstract

Background and Aims: Pain is the most common symptom seen postoperatively and multiple approaches are used to overcome it. In this study, we compared bupivacaine and bupivacaine – clonidine combination in transversus abdominis plane (TAP) block for postoperative analgesia in patients undergoing inguinal hernioplasty under spinal anaesthesia. *Methods:* Sixty ASA I and II male patients in the age group of 18 to 60 years posted for inguinal hernioplasty were randomly divided into two groups (Group B and Group C). The procedure was done under spinal anaesthesia using 3 ml of 0.5% hyperbaric bupivacaine. After the surgery, ultrasound guided TAP block was given with 19.5 ml of 0.25% bupivacaine + 0.5 ml sterile water in Group B and 19.5 ml of 0.25% bupivacaine + 75 mcg of clonidine (0.5 ml) in Group C. Postoperatively, the patients' haemodynamic status, visual analogue scale (VAS) scores, dose of rescue analgesic used, duration of analgesia were recorded. Inj. Tramadol 100 mg was given intravenously as rescue analgesic when the VAS score was more than four. Data were analyzed using unpaired t test and Mann- Whitney test wherever indicated. *Results:* The heart rates recorded at 6, 8, 10, 12 and 14 hours after TAP block were significantly lower in Group C compared to Group B ($p< 0.05$). The heart rates recorded at 16 and18 hours after TAP block were significantly lower in Group B compared to Group C. The mean arterial pressures (MAP) and VAS scores recorded at 6 and 8 hours after TAP block were significantly lower in Group C compared to Group B. The mean dose of tramadol administered was significantly lower in Group C (96.67±18.25 mg) compared to Group B (186.67±34.57 mg) (p value 0.0001). The mean duration of analgesia was significantly higher in Group C (943.46±70.751 minutes) compared to Group B (413.20±45.023 minutes, p value 0.001). *Conclusion:* Addition of clonidine to 0.25% bupivacaine for TAP block significantly prolongs the duration of analgesia and reduces postoperative analgesic requirements compared to patients receiving 0.25% bupivacaine alone.

Keywords: Bupivacaine; Clonidine; Inguinal Hernioplasty; Transversus Abdominis Plane (TAP) Block.

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Introduction

Inguinal hernia surgery is one of the most commonly performed surgical procedures. Pain after open hernia surgeries will be moderate to severe and is associated with prolonged hospital stay and delayed return to normal daily activities [1]. Various approaches have been used to manage this pain, ranging from oral medication to regional blocks [2]. Among the regional blocks, the Transversus Abdominis Plane (TAP) block has been found to be very effective in reducing acute postoperative pain and the use of opioids in patients undergoing hernia repair [3].

The aim of TAP block is to deposit the local anaesthetic in the plane between the internal

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oblique and transversus abdominis muscles targeting the lower intercostal, iliohypogastric and ilioinguinal nerves [4]. The advent of ultrasound guidance for visualizing needle tip and local anaesthetic spread in regional anaesthesia techniques has resulted in greater accuracy of the TAP block and fewer complications [5].

TAP blocks are usually given with local anaesthetics like bupivacaine or ropivacaine [6]. Many adjuvants like opioids, dexamethasone, ketamine, clonidine and dexmedetomidine have been used in peripheral nerve blocks to prolong the action of local anaesthetics. In this study, we compared the quality of postoperative analgesia in two groups by giving TAP block with bupivacaine and bupivacaine-clonidine combination.

Materials and Methods

After getting approval from the institutional ethical committee and informed consent, sixty adult male ASA I & II patients in the age group of 18- 60 years, admitted to Saveetha medical college and hospital, Kanchipuram district, who were posted for elective unilateral inguinal hernioplasty, were enrolled in this prospective, randomized, double blinded study. They were allocated into two groups as Group C and Group B of 30 each using computer generated random number. Group C received ultrasound guided TAP block with 19.5 ml of 0.25% bupivacaine + 75 mcg of clonidine in 0.5 ml. Group B received ultrasound guided TAP block with 19.5ml of 0.25% bupivacaine + 0.5ml of sterile water. Patients belonging to ASA III and above, patients who were posted for bilateral hernioplasty, patients who had contraindication for regional anaesthesia (coagulation disorder, local infection, raised intracranial pressure), patients who were allergic to local anaesthetics and patients undergoing emergency surgeries were excluded from the study.

The patients were visited in the evening before surgery and were familiarized with a 10 mm visual analogue scale for pain. They were premedicated with Tab. Alprazolam 0.5mg in the night and two hours before surgery. On the day of surgery, the patients were shifted to the operating room and were connected to electrocardiogram (ECG), non invasive blood pressure (NIBP) and Pulse oximetry (SpO_2) monitors. An 18 G intravenous access was established for infusion of fluids. A single dose sub-arachnoid block with three ml of 0.5% hyperbaric bupivacaine was administered using a 25G Quincke tip spinal needle. The surgery was performed with the above said monitoring.

After the end of surgery, the abdominal walls of patients were scanned using a linear array transducer probe (8-16 MHz), connected to a portable ultrasound unit (Sonoscape, model S8 expo), with the patients in supine position. The ultrasound probe was initially positioned perpendicular to the anterior abdominal wall to obtain optimal images of rectus abdominis muscle at the level of umbilicus. The probe was moved laterally to get a transverse view of the layers of the abdominal wall: external oblique, internal oblique, transversus abdominis muscles and peritoneal cavity, from superficial to deep. After skin disinfection, an 80 mm, 23 G short -bevel needle was advanced from an antero-medial to a lateral direction using the in -plane insertion technique with ultrasound real -time assessment.When the tip of the needle was correctly located in the space between internal oblique and transversus abdominis muscles, patients in Group C were injected with 19.5 ml of 0.25% bupivacaine with 75 mcg clonidine (0.5ml) and patients in Group B were injected with 19.5 ml of 0.25% bupivacaine with 0.5ml sterile water. The correct placement of the needle was confirmed by expansion of the local anaesthetic solution as a dark shadow (hypoechoeic) between aponeurosis of the internal oblique (which moved anteriorly) and the transversus abdominis muscles pushing the muscle deeper. The solutions were prepared by a collaborator who was not involved in the data collection. The procedure was done by an experienced anaesthetist who was blinded and a blind observer collected the data.

The patients were monitored for a period of 24 hours postoperatively. In the postoperative anaesthesia care unit, the heart rate, systolic, diastolic, mean arterial pressures and visual analogue scale (VAS) scores were recorded every two hours for 24 hours. When the VAS score was more than four, Inj. tramadol 100mg was administered intravenously as rescue analgesic. The time of first administration of rescue medication was noted. The duration of analgesia was recorded as the time from the administration of TAP block to the time of administration of rescue analgesic. Patients were also monitored for side effects of clonidine like hypotension, bradycardia and sedation.

Statistical Analysis

Based on the existing literature, for a power of 80% at 5% significant level, the sample size to be

studied was calculated to be 30 patients in each group. Statistical analysis was done using SPSS 20 software.The demographic data (age, weight and height), heart rate, mean arterial pressure (MAP), dose of rescue analgesia and duration of analgesia were analyzed using unpaired t- test. The VAS scores were analyzed using Mann Whitney test. p value< 0.05 was considered statistically significant.

Results

There were no statistically significant differences in the age, weight and height characteristics of patients in the two groups (Table 1). The heart rates recorded at 6, 8, 10, 12 and 14 hours after TAP block were significantly lower in Group C compared to Group B. The heart rates recorded at 16 and18 hours after TAP block were significantly lower in Group B compared to Group C. There was no significant difference in the heart rates recorded at other time intervals between the two groups (Table 2). The mean arterial pressures (MAP) recorded at 6 and 8 hours after TAP block were significantly lower in Group C compared to Group B. There was no significant difference in the MAP recorded at other time intervals between the two groups (Table 3). The VAS scores recorded at 6 and 8 hours after TAP block were significantly lower in Group C compared to Group B. There was no significant

Table 1: Demographic data

	Group C	Group B	P value
Age (years)	46.47±9.477 *	48.97±10.788	0.343
Weight (Kg)	70.1 ± 10.23	67.4 ± 8.003	0.26
Height (cm)	160.87 ± 5.74	163.33 ± 4.33	0.075

*Mean ± Standard deviation
p < 0.05 statistically significant

Table 2: Heart rate after TAP block

Time	Group C (beats/minute)	Group B (beats/minute)	P value
2 hours	67.27 ± 4.533 *	69.87 ± 5.704	0.055
4 hours	71.83 ± 4.410	70.87 ± 4.805	0.057
6 hours	70.80 ± 4.745	73.20 ± 3.388	0.028
8 hours	69.53 ± 4.805	75.27 ± 4.085	0.000
10 hours	71.13 ± 4.158	75.67 ± 4.003	0.000
12 hours	72.20 ± 3.727	74.80 ± 4.597	0.019
14 hours	73.20 ± 2.952	76.67 ± 4.795	0.001
16 hours	84.67 ± 7.246	77.13 ± 4.805	0.000
18 hours	80.27 ± 8.497	76.60 ± 4.174	0.038
20 hours	77.13 ± 4.447	78.87 ± 4.158	0.124
22 hours	78.33 ± 3.642	79.20 ± 5.423	0.470
24 hours	80.33± 5.067	79.87 ± 4.424	0.705

*Mean ± Standard deviation
p < 0.05 statistically significant

Table 3: Mean Arterial Pressure (MAP) after TAP block

Time	Group C (mm Hg)	Group B (mm Hg)	P value
2 hours	74.53± 2.675 *	74.80± 4.080	0.546
4 hours	77.87 ±2.623	77.60± 3.654	0.747
6 hours	75.67± 2.578	91.27± 4.118	0.000
8 hours	71.47± 7.592	85.47± 5.752	0.000
10 hours	79.47 ± 3.481	78.73 ± 5.401	0.752
12 hours	78.20± 3.943	76.93± 5.765	0.654
14 hours	78.80± 4.021	77.87±5.981	0.742
16 hours	87.60 ±7.691	88.07± 4.218	0.772
18 hours	76.27± 3.513	77.60±4.530	0.208
20 hours	75.87±2.874	76.00±3.562	0.874
22 hours	76.20±2.747	77.40±5.922	0.318
24 hours	74.80±2.497	74.60±2.737	0.769

*Mean ± Standard deviation
P < 0.05 statistically significant

Table 4: VAS Score after TAP block

Time	Group C	Group B	P value
2 hours	2.20±0.610 *	2.67±0.959	0.059
4 hours	2.37±0.765	2.43±0.850	0.064
6 hours	2.53±0.776	6.90±1.296	0.000
8 hours	2.73±0.691	5.60±0.932	0.042
10 hours	3.03±0.765	2.67±0.884	0.095
12 hours	3.07±0.828	2.67±0.959	0.093
14 hours	3.40±0.621	3.70±0.750	0.060
16 hours	5.27±1.639	5.97±1.520	0.082
18 hours	5.00±2.101	5.23±1.194	0.074
20 hours	2.47±0.730	2.80±0.961	0.121
22 hours	2.57±1.073	2.80±0.997	0.407
24 hours	2.50±1.042	2.37±1.129	0.597

*Mean ± Standard deviation
$p < 0.05$ statistically significant

Table 5: Postoperative Analgesia

Parameter	Group C	Group B	P value
Dose of rescue analgesic (mg)	96.67 ± 18.25*	186.67 ± 34.57	0.0001
Duration of postoperative analgesia (minutes)	943.46 ± 70.751	413.20 ± 45.023	0.001

*Mean ± Standard deviation
$p < 0.05$ statistically significant

difference in the VAS scores recorded at other time intervals between the two groups (Table 4). The mean dose of rescue analgesia (tramadol) administered was significantly lower in Group C (96.67±18.25 mg) compared to Group B (186.67±34.57 mg) (p value 0.0001). The mean duration of analgesia was significantly higher in Group C (943.46±70.751 minutes) compared to Group B (413.20±45.023 minutes, p value 0.001) (Table 5). No patient experienced any side effects like sedation, hypotension or bradycardia in Group C.

Discussion

The TAP block gives an effective analgesic option for post hernia repair pain. The ultrasound guidance reduces the incidence of complications, improves the accuracy of the block and the use of adjuvant provides prolonged postoperative analgesia without any complication. In our study, the basis of the dose of clonidine was chosen from the systematic review by Mccartney et al. [7], where they analyzed and reported that clonidine at a dose lesser than 150 mcg reduced the systemic side effects and prolonged the postoperative analgesia.

In our study, the mean duration of analgesia was significantly higher in Group C (943.46±70.751 minutes) compared to Group B (413.20±45.023 minutes, p value 0.001). This observation was similar to the finding reported by Singh et al [8] who noted that the addition of 1 mcg/kg clonidine to 20 ml of 0.25% bupivacaine for TAP block significantly prolonged postoperative analgesia following caesarean section compared to patients receiving 0.25% bupivacaine alone for TAP block.

Mir et al. [9] compared the efficacy of TAP block with bupivacaine and bupivacaine- clonidine combination in patients undergoing lower abdominal surgeries and concluded that the addition of clonidine increases duration of postoperative analgesia and reduces postoperative analgesic consumption. This again was similar to the observation noted in our study.

A recent meta-analysis of randomized trials has shown that clonidine when added to local anaesthetics, significantly prolongs the duration of the motor block and postoperative analgesia when used for peripheral nerve and plexus blocks [10]. The reason for the prolongation of analgesic effect by clonidine is not clear as $\alpha 2$ adrenoceptors are not present on peripheral nerve axons [11]. The prolonged analgesia could be due to systemic absorption of clonidine from the TAP block site [12].

The heart rates recorded at 6, 8, 10, 12 and 14 hours after TAP block were significantly lower in Group C compared to Group B. This could be attributed to the earlier onset of pain in Group B compared to Group C while the higher heart rates

at 16 and 18 hours in Group C could be due to the onset of pain in Group C while Group B patients had received rescue analgesics by then.

No patient had bradycardia or hypotension during the study duration in Group C. This was in correlation with the systematic review by Mccartney et al. [7] whose observations revealed that clonidine at this dose did not cause systemic effect when used as an additive.

Conclusion

Hence we conclude that the addition of 75 mcg of clonidine to 0.25% bupivacaine in TAP block for inguinal hernia repair prolongs the duration of analgesia and reduces the postoperative analgesic consumption compared to patients receiving 0.25% bupivacaine alone for TAP block without any adverse effect.

References

1. Callesen T, Bech K, Nielsen R, Andersen J, Hesselfeldt P, Roikjær O, et al. Pain after groin hernia repair. British Journal of Surgery. 1998 Oct 1;85(10):1412–4.
2. Joshi GP, Rawal N, Kehlet H, Bonnet F, Camu F, et al. Evidence-based management of postoperative pain in adults undergoing open inguinal hernia surgery. Br J Surg. 2012;99:168–85.
3. Siddiqui MR, Sajid MS, Uncles DR, Cheek L, Baig MK. A meta-analysis on the clinical effectiveness of transversus abdominis plane block. J Clin Anesth. 2011;23:7–14.
4. Mukhtar K. Transversus Abdominis Plane Block. The Journal of NYSORA 2009;12:28-33.
5. Hebbard P, Fujiwara Y, Shibata Y, Royse C. Ultrasound-guided transversus abdominis plane (TAP) block. Anaesth Intensive Care. 2007;35(4):616–7.
6. Abdallah FW, Halpern SH, Margarido CB. Transversus Abdominis Plane block for postoperative analgesia after caesarean delivery performed under spinal anaesthesia. A systematic review and meta-analysis. Br J Anaesth. 2012;109:679-87.
7. Mccartney C, Duggan E, Apatu E. Should We Add Clonidine to Local Anesthetic for Peripheral Nerve Blockade? A Qualitative Systematic Review of the Literature. Regional Anesthesia and Pain Medicine. 2007;32(4):330–8.
8. Singh R, Kumar N, Jain A, Joy S. Addition of clonidine to bupivacine in transversus abdominis plane block prolongs postoperative analgesia after cesarean section. J Anaesthesiol Clin Pharmacol 2016;32:501-4.
9. Mir TA, Mir AH, Gani TT, Yousuf A, Ahmad SI. Evaluation of efficacy of bupivacaine and bupivacaine plus clonidine in transversus abdominis plane (TAP) block for postoperative analgesia: a prospective, randomized, double blind, comparative study. Int J Res Med Sci 2017;5:4588-94.
10. Pöpping DM, Elia N, Marret E, Wenk M, Tramèr MR. Clonidine as an adjuvant to local anesthetics for peripheral nerve and plexus blocks: A meta-analysis of randomized trials. Anesthesiology 2009;111:406-15.
11. Eisenach JC, De Kock M, Klimscha W. Alpha (2)-adrenergic agonists for regional anesthesia. A clinical review of clonidine (1984-1995). Anesthesiology 1996; 85:655-74.
12. Griffiths JD, Le NV, Grant S, Bjorksten A, Hebbard P, Royse C. Symptomatic local anaesthetic toxicity and plasma ropivacaine concentrations after transversus abdominis plane block for caesarean section. Br J Anaesth 2013;110:996-1000.