Original Research Article

Indian Journal of Anesthesia and Analgesia
2018; 5(10): 1715-1720
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.51018.20

The Efficacy of Transversus Abdominis Plane Block in Laparoscopic Tubal Sterilisation Surgeries: A Randomised Control Study

Satish Kumar M.N.[1], Anu Ludhia K.[2], Shreyavathi R., Raghavendra Rao R.S., Surekha C.

[1]Assistant Professor, [3]Professor [4]Professor and Head [5]Assistant Professor, Department of Anaesthesiolgy, Bangalore Medical College and Research Institute, Bengaluru, Karnataka 560002, India. [2]Registrar, Department of Anaesthesiology, Little flower Hospital and Research Centre, Angamaly, Ernakulam, Kerala 683572, India.

Abstract

Background: Transversus abdominis plane block is a safe, simple and effective technique, widely used to provide postoperative analgesia for various abdominal surgeries. We evaluated the efficacy of Transversus abdominis plane block in laparoscopic tubal sterilisation surgeries in providing intraoperative and postoperative pain relief. *Materials and Methods:* 40 ASA I and II adult female patients undergoing laparoscopic sterilisation surgeries were randomised into two groups. Group T (n=20) received TAP block with 20 ml of 0.375% Ropivacaine and Group C (n=20) received general anaesthesia with local infiltration with 10 ml of 0.375% Ropivacaine. Intraoperatively, hemodynamic parameters, Pulse oximetry, end tidal Carbon dioxide concentration and total Propofol requirement were noted. Postoperatively, the recovery profile (Modified Aldrete Score) and Visual analog scale scores were noted at emergence and at 1st, 2nd, 6th, 12th and 24 hours. *Results:* Patients who underwent surgery under TAP block had a longer time to request for rescue analgesic (Group T 313±77.61 minutes; Group C 34.77±6.72; p<0.001) with a reduced VAS at Trescue (Group T=4.00±0.00; Group C=4.32±0.89; p<0.001).The mean VAS scores of the patients in Group T were lower when compared to Group C at all time intervals. The Propofol requirement was lower in Group T (Group T =18.88±17.85 mg and Group C =119.54±9.5 p<0.001) and recovery profile better in patients in Group T. Incidence of postoperative nausea and vomiting was the same in both groups. *Conclusion:* TAP block with sedation can be considered as a suitable alternative to general anaesthesia with local infiltration in laparoscopic sterilisation surgeries.

Keywords: Laparoscopic Sterilisation; Transversus Abdominis Plane Block; Ropivacaine.

How to cite this article:

Satish Kumar M.N., Anu Ludhia K., Shreyavathi R. et al. The Efficacy of Transversus Abdominis Plane Block in Laparoscopic Tubal Sterilisation Surgeries: A Randomised Control Study. Indian J Anesth Analg. 2018;5(10):1715-20.

Introduction

Laparoscopic tubal ligation is one of the most commonly performed ambulatory surgeries, but the appropriate anaesthetic technique has not been defined [1]. General anaesthesia with endotracheal intubation or laryngeal mask airway has its set of side effects; whereas local infiltration with sedation is often inadequate due to patient discomfort [1,2].

Transversus abdominis plane block introduced by Rafi in 2001 [3], acts by blocking the somatic nerves supplying the anterior abdominal wall. It is done by depositing local anaesthetic in the neurovascular plane between internal oblique and transversus abdominis muscles. It has been used as a component of multimodal analgesia for postoperative pain relief following various surgical procedures such as large bowel resection, appendectomy, hysterectomy, caesarean section etc [4,5,6].

Corresponding Author: Anu Ludhia K., Registrar, Department of Anaesthesiology, Little flower Hospital and Research Centre, Angamaly, Ernakulam, Kerala 683572, India.
E-mail: drsats007@gmail.com

Received on 20.07.2018, **Accepted on** 31.08.2018

However few studies have evaluated its efficacy in providing intraoperative analgesia .We hypothesised that TAP block would provide longer and better quality of analgesia in patients undergoing laparoscopic tubal sterilisation surgeries, and also reduce the requirement of intravenous sedatives and anaesthetics, enabling the mother to be conscious and pain free.

Materials and Methods

After obtaining approval from the institutional ethical committee and written informed consent, two groups of 20 adult female patients of ASA I and II; scheduled for laparoscopic tubal ligation surgeries were studied. Patients with BMI more than 30, drug allergy, opioid tolerance, severe systemic diseases and history of abdominal surgeries were excluded. Primary outcome of our study was the duration of postoperative analgesia and VAS scores in the immediate postoperative period and at 1^{st}, 2^{nd}, 6^{th}, 12^{th} and 24^{th} hours .Secondary outcomes were the total Propofol requirement and recovery profile at the end of the surgery.

Patients were randomised by sealed envelope technique into two groups to either TAP block (Group T, n=20) or to receive general anaesthesia with local infiltration (Group C, n=20). A single investigator experienced in performing the blocks performed both the blocks. All patients received premedication with intravenous Midazolam 0.02 mg/kg, Glycopyrrolate 0.004mg/kg and Fentanyl 2 mcg/kg. All standard monitoring like pulse oximetry, electrocardiogram, non invasive blood pressure and end tidal carbon dioxide were monitored. Patients were familiarised with the VAS scoring scale before surgery.

For patients in Group T, bilateral TAP block was performed with 18 G blunted needle, as advocated by McDonnell et al. [5]; 20 minutes prior to skin incision using the 'double pop' technique. The lumbar triangle of Petit, located just anterior to the latissimus dorsi muscle was identified. The iliac crest was palpated and skin was pierced two inches cephalad to it in the mid axillary line. The first resistance indicated that the needle tip is traversing the external oblique muscle. On advancing the needle, a loss of resistance or pop sensation was obtained as the needle entered the fascial plane between external oblique and internal oblique. Further gentle advancement resulted in a second resistance which is the fascial extension of the internal oblique muscle. A second 'pop' indicated entry into the transversus abdominis plane. After negative aspiration to exclude vascular puncture, a test dose of 1ml of Ropivacaine 0.375% was injected .In case of any resistance, the needle was repositioned and test repeated. 20 ml of Ropivacaine 0.375% was given (not exceeding a maximum dose of 2.5 mg/kg). TAP block was then performed on the other side. A sedative dose of Propofol 0.5mg/kg was given if the patient had any discomfort or pain. The total Propofol requirement was then calculated.

In Group C, skin was infiltrated with 10 ml of Ropivacaine 0.375%; 20 minutes prior to skin incision. Following which general anaesthesia was administered with Propofol 2mg/kg, and size 3 or 4 Laryngeal mask airway(LMA) was inserted. Anaesthesia was maintained with oxygen and nitrous oxide in the ratio of 40:60, and Propofol 0.5 mg/kg was given as required; as a supplement. Nitrous oxide was discontinued after ligation of fallopian tubes and LMA removed after skin closure.

Intraoperatively heart rate, blood pressure, pulse oximetry was monitored every 5 minutes up to 10 minutes after surgery. The total Propofol required and the recovery profiles (Modified aldrete score)[15] were assessed at immediate postoperative period and 5 and 10 minutes thereafter. A score of 9 or more was considered as complete recovery. Visual analogue scores (0= no pain and 10 = worst possible pain)at the immediate post operative period, 1^{st}, 2^{nd}, 6^{th}, 12^{th} and 24^{th} hours were noted .The time to request of rescue analgesic(when VAS score ≥ 4) in the form of Injection Tramadol 1 mg/kg was noted. Any intraoperative or postoperative complications like hypotension, bradycardia, and technique related complications like local site infection, hematoma formation, peritoneal and bowel perforation and local anaesthetic toxicity were sought for. Incidence of postoperative nausea and vomiting was noted in both the groups.

A thorough review of related literature was performed from standard textbooks and related articles. We determined that a study size with a sample size of 18 per group would have an 80% power for a 30% reduction in the mean time for request for rescue analgesic. We included 20 patients in each group. All raw data were entered into a Microsoft Excel spreadsheet and analysed using standard statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver. 2.11.1 Continuous numerical data were expressed as mean and standard deviation. Categorical data were expressed as frequencies and percentages. Normally distributed data between groups were analysed using Students t test. Chi-square/ Fisher Exact test has been used for categorical data. p value ≤ 0.05 was considered statistically significant.

Results

Forty subjects were recruited into the study. Both groups were comparable in terms of baseline demographics, duration of surgery and baseline vital parameters (pulse rate, systolic and diastolic blood pressure. A summary of the baseline characteristics of the patients has been furnished below in Table 1.

Intraoperative hemodynamic changes were comparable in both the groups and have been graphically plotted in Figures 1, 2 and 3.

Patients who underwent TAP block had a longer time to request for rescue analgesic (Group T 313±77.61 minutes; Group C 34.77±6.63; p<0.001) with a reduced VAS at Trescue (Group T = 4.00±0.00; Group C=4.32±0.89; p<0.001) (Table 2) The mean VAS scores of the patients in Group T were lower when compared to Group C at all time periods.

However patients on sole TAP block often had mild discomfort while ligation of tubes for which Propofol 0.5mg/kg was given. Despite this the mean Propofol consumption was lower (Group T =18.88±17.85 mg and Group C =119.54±9.5, p<0.001)and recovery

Table 1: Patient characteristics

Parameters	Group T	Group C	Significance
Age (in years)	27.72±3.64	27.59±3.66	P=0.911
Weight(in kg)	58.54±2.50	59.33±3.85	P=0.47
SBP(mm Hg)	112.61±8.50	115.45±13.49	P=0.44
DBP(mm Hg)	72.33±4.07	75.23±8.26	P=0.183
PR(per min	80.67±12.78	77.86±13.87	P=0.51
Duration of surgery(minutes)	10.33±0.76	10.59±1.25	P=0.45

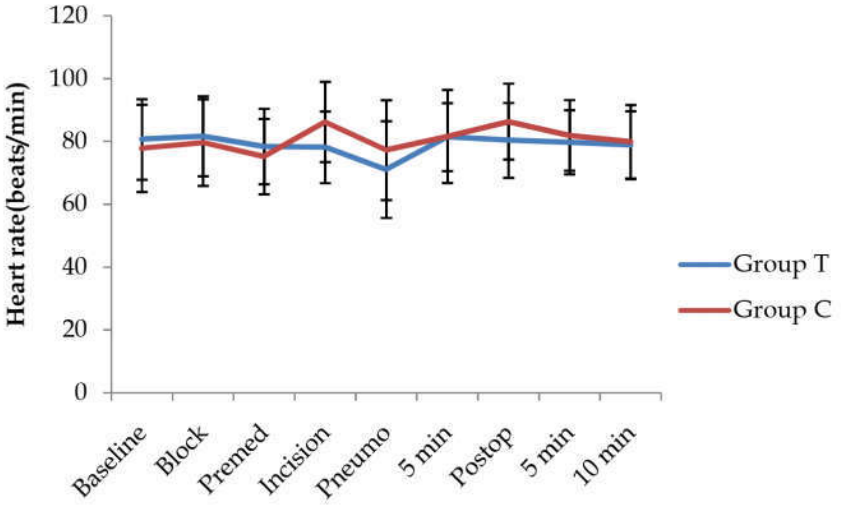

Fig. 1: Heart Rate

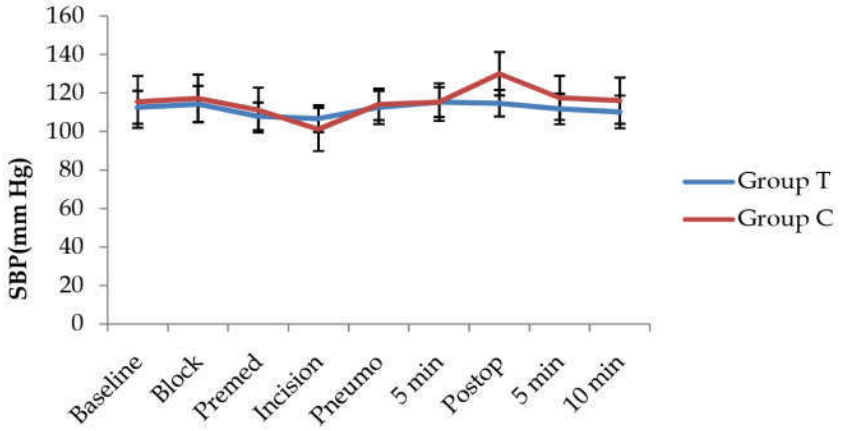

Fig. 2: Systolic blood pressure

profile (assessed by Modified Aldrete Score) better in patients in Group T in the immediate postoperative period (Group T MAS=9.77± 0.42, Group c =7.00±0.67, p<0.001) (Table 3). However, patients in both the groups had a score of 9 or more at the end of 10 minutes. Incidence of postoperative nausea and vomiting was the same in both the groups.

Discussion

The principal finding of our study was that TAP block with Ropivacaine provides effective intraoperative and postoperative analgesia for patients undergoing laparoscopic tubal sterilisation surgeries, but often has to be combined with Propofol 0.5 mg/kg for effective patient comfort.

While laparoscopic tubal ligation surgeries have been done with either general anaesthesia or procedural sedation with analgesia [2], no studies have evaluated the role of TAP block for the same. TAP block provides superior analgesia when compared to local infiltration as evidenced by the longer time to rescue analgesic while at the same time reduces the requirement of drugs like Propofol, ensuring a smooth and early recovery – an awake, pain free mother is most desirable at the end of the procedure.

We have found the superiority of TAP block in providing immediate postoperative analgesia as reflected by a lower VAS score. However, the present studies on TAP block are not unanimous in their opinion of whether TAP block improves postoperative pain score or not [12].

Table 2: Comparison of quality of analgesia

	Group T	Group C	Significance
Immediate postoperative VAS	2.22±1.22	4.32±0.89	P<0.001
Time to rescue analgesic	313±77.61	34.77±6.63	P<0.001
VAS at Trescue	4.00±0.00	4.32±0.89	P<0.001
PONV	6/20	6/20	P=0.66

Table 3: Mean Propofol requirement and recovery characteristics'

	Group T	Group C	Significance
Total Propofol used	18.88±17.85	119.54±9.5	P<0.001
Recovery(immediate post op)Modified Aldrete Score	9.77± 0.42	7.00±0.67	P<0.001
MAS at 5 minutes	10.00±0.00	8.89±0.61	P<0.001
MAS at 10 min	10.00±0.00	9.90±0.29	P=0.15

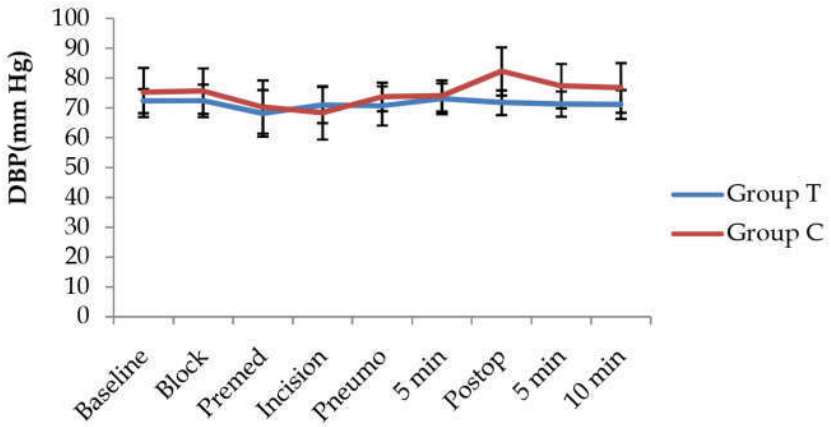

Fig. 3: Diastolic blood pressure

Our finding is consistent with that of the study done by S Bhattacharjee et al. [7] in abdominal hysterectomy and McDonnell et al. in caesarean section [4].

Sivapurapu et al in their study in patients undergoing abdominal hysterectomy under general anaesthesia have noted a significant increase in the time to rescue analgesia with lower VAS scores in the immediate postoperative period and at $1^{st,}$ 2^{nd}, 6^{th}, 12^{th} and 24^{th} hours. Also the 24 hour morphine requirement was lesser in the TAP block group [8].

Siddiqui et al. in 2011 in a meta analysis have noted that TAP block is comparable to morphine for postoperative analgesia, reduces the time for request for rescue analgesic with reduced postoperative opioids requirement [9].

However, Loane H et al. in 2012 in their study on patients undergoing Caesarean section have found that TAP block provides inferior analgesia when compared to intrathecal morphine, but with lesser opioid related side effects [10]. This was probably due to the effect of intrathecal morphine at both the parietal and visceral component of pain, while TAP block addressed only the parietal component.

In our study, the mean duration of effective analgesia was 313 minutes in the TAP block group which was consistent with S Bhattacharjee et al. [7] in abdominal hysterectomy (Median duration of analgesia was 290 minutes; with 0.25% bupivacaine; 0.5ml/kg bodyweight on either side) and Mc Donnell et al. [16] who demonstrated in their study that TAP block with 0.5% lignocaine may provide effective analgesia up to 4-6 hours. Also the reduced VAS scores for up to 24 hours in patients in TAP block group indicates a continuing analgesic action of the TAP block which may be explained the relative avascularity of the TAP, leading to delayed drug clearance [11].

All local anaesthetic techniques carry an inherent failure rate of 5- 20%, which depends on the operator skill. Inadequate analgesia after TAP block may be due to a technical failure which can be improved by using an ultrasound [6] or it may be due to visceral pain which is not addressed by TAP block.

Our study had few limitations. First use of a ultrasound in TAP block [6] is increasing; whereas we used a landmark based anatomical approach which is less efficacious. Secondly, use of patient controlled analgesia in the postoperative period would have accurately delineated the postoperative analgesic requirement. Thirdly, the response to pain is different in different patients and true blinding of the patients is not possible; which may have influenced the study.

Conclusion

TAP block with sedation can be considered as a suitable alternative to General anaesthesia with local infiltration in laparoscopic sterilisation surgeries; as it provides superior analgesia, better recovery profiles and reduces the requirement of Propofol supplementation.

Conflict of Interest

None

Abbreviations

HR-Heart rate, SBP-Systolic blood pressure, DBP-Diastolic blood pressure, VAS: Visual analog scale, MAS-Modified Aldrete Score, PONV= postoperative nausea and vomiting, Trescue- time of rescue analgesic, LMA-Laryngeal Mask Airway.

References

1. American Society of Anaesthesiologists Task Force on Obstetric Anaesthesia. Practice guidelines for obstetric anaesthesia: An updated report by the American Society of Anaesthesiologists Task Force on Obstetric Anaesthesia. Anaesthesiology 2007;106:843-63.
2. Lokesh Gupta, SK Sinha, Maitree Pande, and Homay Vajifdar Ambulatory Laparoscopic Tubal Ligation: A Comparison of General Anaesthesia with Local Anaesthesia and Sedation J Anaesthesiol Clin Pharmacol. 2011 Jan-Mar;27(1):97–100.
3. Rafi AN. Abdominal field block: A new approach via the lumbar triangle. Anaesthesia 2001;56:1024s-6.
4. McDonnell JG, Curley G, Carney J, Benton A, Costello J, Maharaj CH, et al. The analgesic efficacy of transversus abdominis plane block after cesarean delivery: A randomized controlled trial. Anesth Analg 2008;106:186-9.
5. McDonnell JG, O'Donnell B, Curley G, Heffernan A, Power C, Laffey JG. The analgesic efficacy of transversus abdominis plane block after abdominal surgery: A prospective randomized controlled trial. Anesth Analg 2007;104:193-7.
6. El-Dawlatly AA, Turkistani A, Kettner SC, Machata AM, Delvi MB, Thallaj A, et al. Ultrasound-guided transversus abdominis plane block: Description of a new technique and comparison with conventional systemic analgesia during laparoscopic cholecystectomy. Br J Anaesth 2009;102:763-7.
7. Sulagna Bhattacharjee, Manjushree Ray et al. Analgesic efficacy of transversus abdominis plane block in providing effective perioperative analgesia in

patients undergoing total abdominal hysterectomy: A randomized controlled trial. Journal of Anaesthesiology Clinical Pharmacology 2014;30(3):391-96.

8. Vijayalakshmi Sivapurapu, Arumugam Vasudevan, Sumanlata Gupta, Ashok S Badhe. Comparison of analgesic efficacy of transversus abdominis plane block with direct infiltration of local anesthetic into surgical incision in lower abdominal gynecological surgeries Journal of Anaesthesiology Clinical Pharmacology 2013;29(1):71-75.
9. Siddiqui MRS, Sajid MS, David R, Uncles MB, Cheek L, Baig MK. A meta-analysis on the clinical effectiveness of transversus abdominis plane block. J Clin Anesth 2011;23:7-14.
10. Loane H, Preston R, Douglas MJ, Massey S, Papsdorf M, Tyler J. A randomized controlled trial comparing intrathecal morphine with transversus abdominis plane block for post-cesarean delivery analgesia. Int J Obstet Anesth. 2012 Apr;21(2):112-8.
11. Carney J, McDonnell JG, Ochana A, Bhinder R, Laffey JG. The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. Anesth Analg. 2008;107:2056–60.
12. Griffiths JD, Middle JV, Barron FA, Grant SJ, Popham PA, Royse CF. Transversus abdominis plane block does not provide additional benefit to multimodal analgesia in gynecological cancer surgery. Anesth Analg. 2010;111:797–801.
13. Bardahl PE, Raeder JC, Nordentoft J, Kirste U, Refsdal A. Laparoscopic sterilisation under local or general anaesthesia? A randomised study Obstet Gynecol. 1993 Jan;81(1):137-41.
14. Ban C.H Tsui, Richard W Rosenquist Chp 35: Clinical Anesthesia Paul G Barash: 7th edition, Lippincott Williams & Wilkins pg974-75.
15. Ian smith, Mark Skues, Beverly K Philip Chapter 89 Ambulatory Anaesthesia: Miller,s Anaesthesia; 8th edition, pg 2631-2632.
16. McDonnell JG, O'Donnell BD, Farrell T, Gough N, Tuite D, Power C, et al. Transversus abdominis plane block: A cadaveric and radiological evaluation. Reg Anesth Pain Med. 2007;32:399–404.