

Transversus Abdominus Plane Block with Ropivacaine Vs Levobupivacaine for Post-Operative Analgesia in Patients Undergoing Lower Abdominal Surgeries

P. Raghunath¹, Tailam Tanmayee², D. Anuradha³

ABSTRACT

Introduction: To compare the efficacy of 0.5% ropivacaine and 0.25% Levobupivacaine when used in Transversus Abdominus Plane block for post operative analgesia in lower abdominal surgeries.

Materials and methods: 50 ASA physical status I – II patients of either sex, more than 16 years of age with normal liver and renal functions scheduled for unilateral lower abdominal surgery in a prospective, randomized, single-blind, controlled clinical trial were studied. 25 patients in each group considering power to be 85%. Patients were randomized by Systematic Random Sampling to undergo TAPB block with 0.25% Levobupivacaine in group L (n = 25) or 0.5% Ropivacaine in group R (n = 25).

Results: The average age in group L was 43.52±15.52 yrs and in group R was 45.32±13.14 yrs. As hernia is more common in males so in both group L and group R highest percentage are males than females in both groups. In our study most of the cases are inguinal hernia in the right side which was more than left side in both groups. Among three types of surgeries, least is open appendectomy in both groups. The mean respiratory rate ranges from 14.6 ± 0.91 /minute to 15.08 ± 1.03 in group L and 14.52 ± 0.71 beats/minute to 15.24 ± 0.87 in group R. The mean pulse rate was ranges from 71.32± 4.78 beats /minute to 73.2 ± 4.28 in group B and 71.68 ± 4.63 beats/minute to 73 beats/minute in group R. The mean arterial pressure was ranges from 82.4± 12.02mmHg to 89.08 ± 12.43 mm Hg in group L and in group R ranges from 82.64 ± 11.45 to 88.72 ± 12.11. The difference was not statistically significant (p>0.05). The average duration was 419.6 ± 49.95 minutes in group L and 2140± 511.12 minutes in group R. This difference between the two groups was statistically significant (p<0.05).

Conclusion: This study concludes that 0.5% Ropivacaine provided longer duration of analgesia compared 0.25% Levobupivacaine when used in TAPB for providing post-operative analgesia after lower abdominal surgeries.

Keywords: Transversus Abdominus, Ropivacaine, Levobupivacaine, Post-Operative Analgesia, Lower Abdominal Surgeries

INTRODUCTION

The abdominal wall is a significant source of pain after abdominal surgery. Even a relatively small operation such as inguinal herniorrhaphy may be followed by a risk of a chronic pain state in about 12% of patients, with clinically significant effects on daily activities if postoperative pain is not taken care of.¹ The usual trend is to prescribe an opioid

or a NSAID for postoperative analgesia. The opioids have number of side effects such as respiratory depression, emesis, and reduction in motility of gut, sedation, etc. NSAIDs also have certain side effects like haemostasis alteration, renal dysfunction, gastrointestinal haemorrhage, etc. However in regional analgesic technique, drugs have peripheral site of action, hence minimum systemic side effects. Hence regional analgesic technique has gained widespread popularity as an important component of postoperative analgesia regimen. TAPB is gaining popularity as one of such regional blocks.² Transversus Abdominis Plane Block (TAPB) can be performed through the lumbar triangle of Petit formed by external oblique muscle anteriorly, latissimus dorsi muscle posteriorly, iliac crest inferiorly and is usually identified as a defect 1 cm above the iliac crest in midaxillary line.³ The technique involves injection of local anesthetic into the plane between the transversus abdominis muscle (TAM) and internal Oblique muscles. It allows sensory blockade of plexus of nerves supplying lower abdominal wall skin and muscles via local anesthetic drug deposition above the TAM. The usual trend is to prescribe an opioid or a NSAID for postoperative analgesia.⁴ The opioids have number of side effects such as respiratory depression, emesis, and reduction in motility of gut, sedation, etc. NSAIDs also have certain side effects like haemostasis alteration, renal dysfunction, gastrointestinal haemorrhage etc. However in regional analgesic technique, drugs have peripheral site of action, hence minimum systemic side effects.⁵ Hence regional analgesic technique has gained widespread popularity as an important component of postoperative analgesia regimen. TAPB is gaining popularity as one of such regional blocks. We planned to compare the duration of postoperative analgesia conferred by 0.25% Levobupivacaine and 0.5% Ropivacaine used in TAPB for unilateral lower abdominal

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surgeries.

MATERIAL AND METHODS

After obtaining approval by the Institutional Ethics Committee, and written informed patient consent, we studied 50 ASA physical status I – II patients of either sex, more than 16 years of age with normal liver and renal functions scheduled for unilateral lower abdominal surgery in a prospective, randomized, single-blind, controlled clinical trial. 25 patients in each group considering power to be 85%.

Exclusion criteria: History of sensitivity to local anesthetics, abnormal liver function, infection at injection site, clotting abnormalities.

Patients were randomized by Systematic Random Sampling to undergo TAP block with 0.25% Levobupivacaine in group L (n = 25) or 0.5% Ropivacaine in group R (n = 25). Standard monitoring, including electrocardiogram, non-invasive blood pressure, arterial oxygen saturation were used throughout. Patients were premedicated with intravenous Ranitidine and intravenous Ondansetron. Patients were preloaded with 500 ml of Ringer Lactate. All patients received a standardized spinal anaesthesia with 0.5% hyperbaric Bupivacaine 3.4 ml without any additive in lateral position without any table tilt. Level of analgesia achieved was noted. Assessment of block was done by pinprick.

Target height was T6. Patients were monitored intraoperatively. Hypotension was taken as fall in systolic blood pressure > 30% of baseline and was treated with incremental doses of Mephentermine 3 mg and bolus of 200 ml of Ringer Lactate. Bradycardia was taken as heart rate < 60 beats per minute and treated accordingly with intravenous Atropine 0.5 mg. No analgesic or sedation was given to any patient intra operatively. After completion of surgery TAPB was performed when the sensory level is below T10. The anaesthesiologist who observed the patients in PACU was blinded to the drug injected in TAPB. Patient was monitored every 15 minutes for an hour, then 2 hours and then at 4, 8, 16, 24, 48 hours postoperatively for

pulse rate, mean arterial pressure and respiratory rate, pain and complications if any. Pain was assessed according to verbal response score from 0 to 4.

Patient was given rescue analgesia in the form of intramuscular Diclofenac 75 mg at a verbal response score of 2 (i.e. fair pain relief). Recession of motor block was noted by movement of ankle and knee joint and that of sensory block by pin prick on the opposite side of block. The duration of analgesia was considered to be from the time of TAPB injection to pain score of 2 (i.e. fair pain relief). Patient was also observed for any other postoperative complications like haematoma, flank fullness, etc.

STATISTICAL ANALYSIS

At the end of study, data were pooled and analyzed using graphpad version 5 and conclusion was drawn regarding the effectiveness of TAPB in postoperative analgesia and relative efficacy of the two drugs by applying student 'T' test and chi square test.

RESULTS

The difference between the mean ages in the two groups was not statistically significant ($p > 0.789$) by chi square-test.

The difference between the mean ages in the two groups was not statistically significant ($p > 0.05$) by chi square test. Most of the cases are inguinal hernia in the right side which was more than left side in both groups. Among three least is open appendicectomy in both groups.

Respiratory rate at various time intervals. The two groups were comparable with regard to respiratory status. The mean respiratory rate ranges from 14.6 ± 0.91 /minute to 15.08 ± 1.03 in group L and 14.52 ± 0.71 beats/minute to 15.24 ± 0.87 in group R. This was not statistically significant ($p > 0.05$).

Mean pulse rate at various time intervals. The two groups were comparable with regard to cardiovascular status. The mean pulse rate was ranges from 71.32 ± 4.78 beats /minute to 73.2 ± 4.28 in group B and 71.68 ± 4.63 beats/minute to 73 beats/minute in group R. This is not statistically significant ($p > 0.05$).

Mean arterial pressure at various time intervals in the two groups. The mean arterial pressure was ranges from 82.4 ± 12.02 mmHg to 89.08 ± 12.43 mm Hg in group L and

Age (Years)	Group L	Group R
<20	3(12%)	2(8%)
21-30	2(8%)	1(4%)
31-40	4(16%)	6(24%)
41-50	6(24%)	8(32%)
>50	10(40%)	8(32%)
Total	25(100%)	25(100%)
Mean	43.52	45.32
SD	15.52	13.14
Gender		
Male	22(88%)	23(92%)
Female	3(12%)	2(8%)
Total	25(100%)	25(100%)
Type of Surgery	Group L	Group R
Open appendicectomy	3	2
Left inguinal hernia	6	9
Right inguinal hernia	16	14
Total	25	25

Table-1: Demographic distribution.

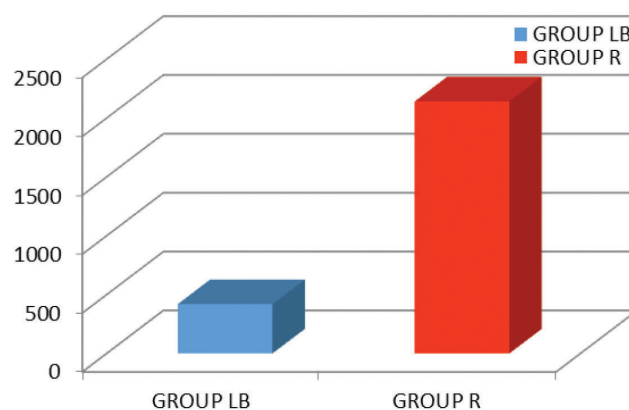


Figure-1: Duration of analgesia

Time interval	Group L		Group R		t test	p value	Significance
	Mean	SD	Mean	S.D			
0 mins	15.08	1.15	15	1.11	0.2503	0.8035	NS
15 mins	14.6	1	14.52	0.91	0.2958	0.7686	NS
30 mins	14.72	1.24	14.8	1.11	0.2403	0.8111	NS
1 hr	14.92	0.99	14.84	0.94	0.2930	0.7708	NS
2 hrs	14.72	0.97	14.6	0.91	0.4511	0.6539	NS
4 hrs	14.88	0.97	14.52	0.71	1.4974	0.1408	NS
8 hrs	15.08	1.03	15	1.04	0.2733	0.7858	NS
16 hrs	14.6	1.04	14.52	0.77	0.3091	0.7586	NS
24 hrs	15.4	1.04	15.24	0.87	0.5900	0.5580	NS
48 hrs	14.6	0.91	14.76	1.01	0.5885	0.5990	NS

Table-2: Respiratory rate in both groups

Time interval	Group L		Group R		t test	p value	Significance
	Mean	SD	Mean	S.D			
0 mins	72.12	4.08	72.32	3.77	0.18	0.8579	NS
15 mins	72.2	3.87	72.36	3.59	0.1516	0.8802	NS
30 mins	71.32	4.78	71.68	4.63	0.2705	0.7879	NS
1 hr	72.92	4.15	73	3.98	0.0696	0.9448	NS
2 hrs	72.32	3.56	72.4	3.67	0.0782	0.9380	NS
4 hrs	73.2	4.28	73.12	4.32	0.0658	0.9478	NS
8 hrs	72.8	3.92	72.92	3.68	0.1116	0.9116	NS
16hrs	72.84	3.48	72.96	3.82	0.116	0.9080	NS
24hrs	72.96	3.97	72.84	3.95	0.1071	0.9151	NS
48hrs	72.52	4.46	72.52	4.46	0.0000	1.000	NS

Table-3: Pulse rate in both groups

Time interval	Group L		Group R		t test	p value	Significance
	Mean	SD	Mean	S.D			
0 mins	82.4	12.02	82.64	11.45	0.0723	0.9427	NS
15 mins	83.6	12.34	83.52	12.20	0.0231	0.9817	NS
30 mins	84.96	11.49	84.84	11.57	0.0368	0.9708	NS
1 hr	85.32	12.51	85.16	12.06	0.0460	0.9635	NS
2 hrs	85.56	12.14	85.56	12.14	0.000	1.00	NS
4 hrs	87.2	11.39	86.04	11.56	0.3574	0.7224	NS
8 hrs	87	12.60	86.92	11.99	0.0230	0.9817	NS
16hrs	87.8	11.91	87.24	11.94	0.1660	0.8688	NS
24hrs	86.4	11.36	86.48	11.41	0.0248	0.9803	NS
48hrs	89.08	12.43	88.72	12.11	0.1037	0.9178	NS

Table-4: Mean arterial pressure.

in group R ranges from 82.64 ± 11.45 to 88.72 ± 12.11 . This difference was also not statistically significant. Hypotension or bradycardia were not observed in any of either group.

Number of patients those are verbal rating score 2 at different intervals of time after giving TAPB with levobupivacaine and ropivacaine which gives the information about duration of blockade and time where rescue analgesia given. VRS 2 maximum patients are in 6th hour in group L where as in group R are in the 36th hour.

DISCUSSION

The transversus abdominis plane (TAP) block is a new, rapidly expanding regional anaesthesia technique that provides analgesia following abdominal surgery. It involves a single large bolus injection of local anaesthetic into the

TAP, an anatomical space between the internal oblique and transversus abdominis muscles. TAP block significantly reduces pain associated with lower abdominal surgery, regardless of whether it is used as the primary anaesthetic or for pain control after general or spinal anaesthesia. Using local anaesthetic agents in TAPB is a simple and effective analgesic technique, appropriate for surgical procedures where parietal pain is a significant component of postoperative pain. The local anaesthetic agents in TAP block have been demonstrated to provide excellent analgesia to the skin and musculature of the anterior abdominal wall in patients undergoing colonic resection surgery involving a midline abdominal wall incision, 6 patients undergoing caesarean delivery, and patients undergoing radical prostatectomy. Moreover, since less blood vessels are located in the TAP, the risk of systemic toxicity from

the local anesthetics, which may be caused by blood vessel puncture, the complication that frequently occurs during other peripheral nerve block procedures, can be reduced. The simplicity of the procedure can also provide an advantage for clinical use. The duration of the procedure in this study was approximately 4-5 minutes. McDonnell et al,⁶ reported that the dose of morphine used during postoperative 24 hours in the patients who underwent the large bowel surgery with the TAP block that was performed with 0.375% levobupivacaine 20 ml, 10 ml injected to each side, decreased by 70%. McDonnell et al. also reported that the total dose of morphine injected by the IV-PCA to the patients who underwent Cesarean section for 48 hours after the operation was reduced by the TAP block that conducted with 0.75% ropivacaine 1.5 mg/kg (Max. 150 mg), as compared to the total dose of morphine used in the controls. In our study 0.5% ropivacaine was used for postoperative analgesia and also for monitoring haemodynamics. Analgesia was maintained for 36 hrs without any discomfort and haemodynamics were stable till the above mentioned period. Bhavna et al,⁷ conducted study in 2012 on fifty women to undergo bilateral TAP block with ropivacaine 0.5%(N=25) versus placebo (N=25). In our study, duration of analgesia was 36 hrs with 0.5%ropivacaine,when compared to Bhavna et al study, which is for 24 hrs. Priya sharma et al,⁸ in 2013 conducted on Sixty patients (mean age 36.2 ± 9.6 years) of either sex of ASA grade 1 and 2 who underwent major gynecological or surgical operation were randomized either to receive standard care, including patient-controlled tramadol analgesia (n = 30), or to undergo TAP block (n = 30) with 20 ml of 0.375% levobupivacaine. The TAP block reduced Visual Analog Scale pain scores at most (2, 4, 6, 12, 24 h), but not at all time (36, 48 h) points assessed. Patients undergoing TAP block had reduced tramadol requirement in 24 h (210.05± 20.5 vs. 320.05 ± 10.6; P < 0.01) and 48 h (508.25 ± 20.6 vs. 550.25 ± 20.6; P<0.01), and a longer time to the first PCA tramadol request (in minutes), compared to the control group (178.5 ± 45.6 vs. 23.5 ± 3.8; P < 0.001). This study demonstrates that TAP is superior in providing analgesia when compared to opioids or other intravenous medications. In our study, 0.25% Levobupivacaine was used for TAP block which provided analgesia for 8 hrs post operatively and also lesser requirements for iv analgesic medication. Sooyoung Cho, Youn-Jin Kim, Dong-Yeon Kim, and Soon-Sup Chung⁹ in 2013 conducted study on forty-four patients undergoing appendectomy were assigned either to undergo a right sided-TAP block (group I, n = 22), or to receive standard care (group II, n = 22). All patients received standard anesthetics, and the TAP block group received ultrasound-guided right side TAP block using 20 mL of 0.5% levobupivacaine after induction of anesthesia. The TAP block group with levobupivacaine compared to the control group reduced VNRS significantly up to 12 hours postoperatively. At end of surgery performed under spinal anesthesia unilateral TAPB on side of surgery was performed using 20 ml of 0.5% ropivacaine or 0.25% bupivacaine or saline. Mean duration of analgesia was 420.6

minutes with SD of +14.01 in Bupivacaine group and 2187 minutes with SD of +1011.09 in Ropivacaine group which was found to be statistically significant. Our study is similar to the above study in duration of analgesia and haemodynamic parameters. Whereas our study used 0.25% Levobupivacaine and 0.5% Ropivacaine. In addition, Niraj et al¹¹ used 0.5% bupivacaine with a TAP block in an open appendectomy, and the morphine requirements and pain scores decreased in the first 24 hours. As Bupivacaine and Levobupivacaine has similar sensory and motor properties,our study used levobupivacaine in the place of bupivacaine with half the concentration of bupivacaine used in the above study. Baaj et al. randomized 40 women to receive either local anesthetic (n=20) or saline (n=20) TAP blocks in addition to a plain bupivacaine spinal block for elective cesarean section. A significant reduction in 24-hour morphine requirement was observed in the local anesthetic TAP block group versus controls (26 mg ± 5 mg versus 63 mg ± 5 mg.). (p<0.05) Although the authors report lower PONV, lower 24- hour VAS scores, and higher satisfaction in the local anesthetic TAP block group, no statistical measures were reported.

CONCLUSION

Thus this study concludes that 0.5% Ropivacaine provided longer duration of analgesia compared 0.25% Levobupivacaine when used in TAPB for providing post-operative analgesia after lower abdominal surgeries.

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