

Original Research Article

COMPARATIVE STUDY OF TAP BLOCK VERSUS INTRAPERITONEAL INSTILLATION VIA PORT FOR POSTOPERATIVE ANALGESIA AFTER ELECTIVE LAPAROSCOPIC APPENDICECTOMY SURGERIES

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ABSTRACT

Background: Transversus abdominis plane block (TAP) is a novel approach for blocking the abdominal wall neural afferents via the bilateral lumbar triangle of Petit. This prospective study was designed to evaluate efficacy of post operative pain relief with bilateral TAP block compared with port site instillation done with 40ml of 0.375% Inj. Ropivacaine in patients of both groups undergoing elective laparoscopic appendectomy under general anesthesia.

Materials and Methods: 60 patients of both sex and ASA grade I, II & III, Aged between 18-60 years, weight between 40-80kg scheduled for elective laparoscopic appendectomy under general anesthesia were equally divided into two groups GROUP-P(n=30) (PORT SITE INSTILLATION) and GROUP-T (n=30) (TAP BLOCK). Both the groups were compared for effectiveness of analgesia, duration of post-operative analgesia in hours, the time when first rescue analgesia was required, hemodynamic stability and any complications.

Results: In our study VAS pain score was higher in group P than group T at 8 hr, 10 hr, 12 hr, 14 hr and 16 hrs. post operatively with statistically significant difference (p value < 0.0001). Duration of analgesia in group P was 13.06±1.61 hrs and in group T was 20.33 ±4.03 hrs which was statistically significant (p < 0.0001). There was no statistically significant difference in mean blood pressure, mean pulse rate at different time interval intraoperatively between the groups.

Conclusion: Bilateral TAP BLOCK with Inj ropivacaine after completion of elective laparoscopic appendectomy renders patients with relatively longer duration of pain free period post operatively as compared to PORT SITE INSTILLATION.

Keywords: general anesthesia, elective laparoscopic appendectomy, TAP block, Port site instillation.

INTRODUCTION

Pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage” (IASP 1979).^[1] Patients undergoing laparoscopic procedures experience postoperative pain especially in the abdomen, back, and shoulder region which require proper attention. Recently peripheral use of local anesthetics for postoperative pain relief has become a popular practice after laparoscopic surgery. Intraperitoneal instillation of

local anesthetic has been most promising to minimize postoperative pain after laparoscopy surgery. The TAP block was first described in 2004 by McDonnell and colleagues, and an ultrasound-guided technique was subsequently described by Hebbard and colleagues.^[2,3] Blocking the sensory nerve supply to the anterior abdominal wall has been reported to provide effective postoperative analgesia after laparoscopic appendectomy.^[4] The purpose of this study was to determine the analgesic efficacy, safety, onset of action, duration of action, post operative pain relief and compare the effectiveness of TAP BLOCK

with PORT SITE INSTILLATION VIA PORT after elective laparoscopic appendectomy surgery. In this study, we used Proseal LMA as an airway management device for elective laparoscopic appendectomy surgeries.

MATERIALS AND METHODS

After obtaining institutional ethical committee approval and written informed consent in vernacular language in 60 patients of either sex and ASA grade I, II & III, Aged between 18-60 years scheduled for elective laparoscopic appendectomy under general anesthesia were equally divided into two groups n=30 each.

GROUP P (n=30): PORT SITE INSTILLATION done with Inj. Ropivacaine (0.375%) 10 ml in site port and 20 ml from main port before removal of port at the end of operation by operating surgeon.

GROUP T (n=30): TAP block will be given with 20 ml Inj. Ropivacaine (0.375%) on each side with 18 G Tuohy's needle.

Inclusion criteria

- Elective laparoscopic appendectomy.
- Age between 18 - 60 year.
- Adults of ASA grade I,II,III
- Weights of patients between 40-80 kg
- Without any systemic serious disease.

Exclusion criteria

- Patient's refusal.
- ASA grade IV and above.
- Malampatti grading 4 with mouth opening less than 2 finger.
- Patients with CNS disorders, CVS disorders, metabolic disorders.
- History of allergy to local anesthetics.

All patients were thoroughly assessed and examined a day before surgery. All Routine investigation and vitals were recorded.

All patients were made familiar and explained about standard 10 cm visual analogue score (VAS) and behavior pain score (BPS), subjective pain scale (SPS) in their vernacular language. On the day of operation, all the patients were re-assessed and basal vital data like PR, BP, RR and SPO₂ were recorded. A suitable IV line was secured with 18 G or 20G intravenous cannula and inj. DNS (500ml) started. All patients were premedicated with Inj. Glycopyrrolate (0.2mg in 1ml iv slow), Inj. Ondansetron (4mg in 2ml iv slow), Inj. Midazolam (1 mg in 1ml iv slow).

After shifting to the operation table. All monitors were attached to the patient including ECG, noninvasive BP and pulse oximeter. Baseline Pulse Rate, BP, Respiratory rate and SpO₂ were recorded. Preoxygenation done with 100% oxygen for 5 minutes. Induction with Inj. MgSO₄ 50mg/kg IV slowly (wait for 2 min). Inj. Propofol 2.5mg/kg IV slowly & Inj. Succinylcholine 2mg/kg IV bolus.

Airway was secured with Proseal laryngeal mask airway with appropriate size No. 3 or 4 according to patients body weight.

Maintenance: oxygen (33%), N₂O (66%), Inj. Atracurium 0.1mg/kg, IPPV. Intraoperatively patient was monitored for PR, BP, RR, ECG, ETCO₂, Spo₂ and urine output. All observation of vitals were recorded immediately after induction at 10 min intervals till the end of surgery. Time of completion of surgery was noted and at the end of surgery port site instillation or TAP block was performed.

IN GROUP P (PORT SITE INSTILLATION) done with Inj. Ropivacaine 0.375% 10 ml in each site port and 20 ml from main port before removing the port at the end of operation by operating surgeon.

IN GROUP T (TAP block) Under all aseptic and antiseptic precaution area over the triangle of Petit (lumbar triangle) painted and draped. A short bevel, blunt 18 G tuohy needle was used. The needle was held at right angles to the coronal plane and once the skin barrier was breached (required a large force), the needle was withdrawn back so that tip lied just under the skin. The needle is advanced through the external oblique fascia and a pop sensation was felt when the needle entered the plane between external oblique and internal oblique. We looked for a 'bounce' of the needle on the fascia before feeling the pop. Further advancement of the needle resulted in second 'pop' after it was passed through the internal oblique fascia into the transversus abdominis plane. After careful aspiration to exclude vascular puncture, drug is injected. Whenever we felt substantial resistance while giving injection, it was considered that the needle is not between fascial planes, and repositioning of the needle was done. After a negative test, dose of 20 ml Inj. Ropivacaine (0.375%) through the needle and signs of toxicity was observed closely. The TAP block was performed on the opposite side using an identical technique with 20 ml inj. Ropivacaine 0.375%.

After completion of either procedure Port site instillation or TAP block Reversal in the form of Inj. Neostigmine 50µg/kg & Inj. Glycopyrrolate 8 µg/kg was given, patient was extubated when all the criteria for extubation was fulfilled. After that patients of both the groups were transferred to the post anesthesia care unit (PACU). The presence and severity of pain and vitals were assessed systematically and documented. These assessments were performed in the PACU at 10 min, 20 min, 30 min, 45min, 1hour, 2hour, 3hour, 4hour, 5 hour, 6 hour, 8 hr, 10 hr, 12 hr, 14hr, 16hr, 18hr, 20hr, 22hr, 24 hr postoperatively. All patients were asked to give scores for their pain and pain severity as explained them earlier in their vernacular language and was measured using a visual analogue scale (VAS)5, Subjective pain scale (SPS)6 and Behavior pain score (BPS)7 documented.

Rescue analgesic in the form of Inj. Diclofenac sodium 75 mg Iv was given when one of 3 score VAS>3, BPS>3, SPS>3. Time to first request of analgesia was recorded. Duration of analgesia is defined as the mean time from end of surgery to the first analgesic requirement in the form of Inj.

Diclofenac sodium 75 mg I.V. in postoperative period.

RESULTS

After completion of study observation and results were analyzed statistically using software SPSS.

Student T test was applied for comparing the inter group results and the p value calculated. Nonparametric data were analyzed using the X2-test (chi square). Statistical significance was assumed at $P < 0.05$.

Table 1: Demographic characteristics

Characteristics	Group P (MEAN±SD) N=30	Group T (MEAN±SD) N=30	P value	INFERENCE
Age	24.26±8.62	25.50±11.59	0.6400	N.S
Weight	53.00±8.12	57.50±11.04	0.077	N.S
Male :female ratio	17:13	18:12	-	-
Duration of surgery(min)	50.66±25.02	50.00±23.66	0.916	N.S

SD- standard deviation, P value < 0.05 - Significant, S- Significant, NS – Not significant.

[Table 1] shows, there was no statistically significant difference between the two groups of patients in terms of age, weight, and duration of surgery.

Table 2: Mean Pulse Rate (/min)

Time	Group P MEAN±SD	Group T MEAN±SD	p value	INFERENCE
Before Premedication	90.73±13.26	86.53±12.90	0.218	N.S
Before Induction	95.23±11.74	91.20±12.64	0.205	N.S
After Induction				
0 min	97.03±12.55	93.06±13.94	0.251	N.S
10 min	96.63±11.26	92.76±14.93	0.261	N.S
20 min	93.73±9.20	89.10±13.59	0.127	N.S
30 min	91.13±7.79	88.9±11.66	0.387	N.S
60min	89.00±5.08	86.26±11.79	0.247	N.S
90 min	88.00±5.09	91.50±15.51	0.245	N.S
120 min	97.0±00	94.00±00	-	N.S

[Table 2] shows that there was no statistically significant difference in mean pulse rate at different time interval intraoperatively between group P and group T.

[Figure 1] shows that there was no statistically significant difference in mean blood pressure at different time interval intraoperatively between group P and group T.

[Table 3] shows VAS pain score was high In group P than group T at 120 min, 8 hr, 10 hr, 12 hr, 14 hr and 16 hrs. post operatively with statistically significant difference. Maximum duration in group P was 16 hrs And in group T was 32 hrs. One patient in group T was discharged without any rescue analgesia needed.



Figure 1: Comparison of mean blood pressure between the two groups

Table 3: VAS pain score in post operative period

Time	Group P MEAN±SD	Group T MEAN±SD	p value	INFERENCE
0 min	0.8±0.47	0.9±0.3	0.3300	N.S
10 min	0.76±0.42	0.96±0.31	0.0402	S
20min	0.86±0.42	1.03±0.40	0.1138	N.S
30min	1.0±0.51	1.03±0.48	0.8153	N.S
45min	1.06±0.57	1.06±0.51	1.000	N.S
60min	1.13±0.61	1.06±0.51	0.6315	N.S
90min	1.23±0.66	1.16±0.37	0.6143	N.S
120min	1.43±0.76	1.30±0.45	0.0003	S
150min	1.5±0.76	1.30±0.45	0.2220	N.S
3hr	1.56±0.80	1.56±0.49	1.0000	N.S
4hr	1.73±0.72	1.60±0.48	0.4140	N.S
5hr	1.86±0.66	1.63±0.48	0.1281	N.S
6hr	2.0±0.63	1.76±0.49	0.1050	N.S
8hr	2.33±0.69	1.93±0.51	0.0133	S
10hr	2.70±0.78	2.16±0.58	0.0035	S

12hr	3.20±0.87	2.36±0.54	0.0001	S
14hr	3.56±0.60	2.63±0.65	0.0001	S
16hr	4.0±0.0	2.75±0.57	0.0001	S
18hr		3.11±0.75	-	-
20hr	-	3.23±0.87	-	-
24hr	-	2.85±0.63	-	-
28hr	-	3.25±0.82	-	-
32hr	-	3.33±0.94	-	-

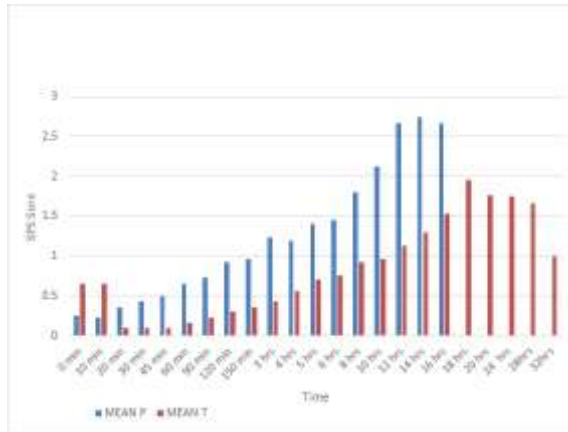


Figure 2: comparison of SPS score between the two groups.

[Figure 2] shows SPS pain score was high In group P than group T at 20 min,30 min,45 min,60 min,90 min,120 min,150min, 3 hr, 4 hr,5 hr,6 hr,8 hr,10 hr,12

hr,14 hr and 16 hrs. post operatively with statistically significant difference.

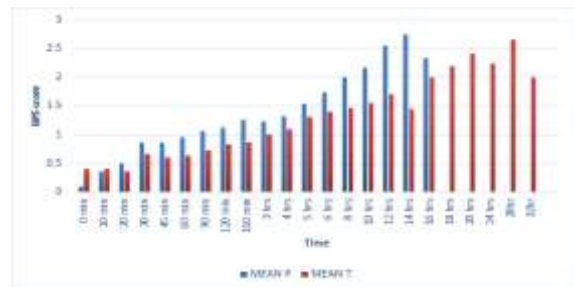


Figure 3: comparison of BPS score between the two groups.

[Figure 3] shows BPS pain score was high In group P than group T at 45 min,60 min,90 min,120 min,150min, 3 hr,6 hr,8 hr,10 hr,12 hr,14 hr and 16 hrs. post operatively with statistically significant difference

Table 4: Duration of analgesia

Duration of analgesia	Group P MEAN±SD	Group T MEAN±SD	p value	INFERENCE
Time (hr)	13.06±1.61	20.33±4.03	0.0001	S

[Table 4] shows the duration of analgesia was longer in group T (20.33±4.03 hr) than Group P (13.06 ±1.61 hr) with statistically significant difference. (p<0.0001). Minimum duration of analgesia in group P was 10 hrs and in group T was 14 hrs post

operatively. Maximum duration of analgesia in group P was 16 hrs and in group T was 32 hrs. One patient in group T did not require any analgesia up to 32 hrs then after patient was discharge from hospital.

Table 5: Perioperative complication.

Type of complication	Group P	Group T
Nausea and vomiting	3(10%)	2(6.6%)
Bradycardia	-	1(3.3%)
Tachycardia	3(10%)	-
Hypertension	2(6.6%)	1(3.3%)
Needle trauma	-	-
Neural ischemia	-	-
Inadvertent intravascular injection	-	-
Local anesthetic toxicity	-	-
Convulsion	-	-

[Table 5] shows the side effects observed in both groups.

DISCUSSION

Post operative pain is a major concern for day care surgeries like laparoscopic appendectomy. In addition to parenteral route of analgesic use, instillation of local anesthetics intraperitoneally is attaining popularity for better pain relief. Transversus abdominis plane block (TAP) is a novel approach for blocking the abdominal wall neural afferents via the

bilateral lumbar triangle of petit. This prospective study was designed to evaluate efficacy of post operative pain relief with bilateral TAP block with 0.375% 40 ml Inj.Ropivacaine (20ml on each side) compared with port site instillation done with 0.375% 40 ml Inj.Ropivacaine in patients undergoing elective laparoscopic appendectomy under general anesthesia.

Pernille Lykke Petersen et al.⁸ used ultra sound guided posterior bilateral TAP block with 20 ml of 0.5% Ropivacaine on each side after laparoscopic cholecystectomy under general anesthesia adjuvant

to oral acetaminophen, ibuprofen and i.v. morphine. They concluded that TAP block after laparoscopic cholecystectomy may have some beneficial effect in reducing pain.

Ryoko Kawahara et al,^[9] performed USG guided bilateral TAP block with 20 ml of 0.375% Ropivacaine with midaxillary approach after gynecological laparoscopic surgery under general anesthesia adjuvant to patient-controlled analgesia (PCA) with tramadol. They concluded that postoperative pain, nausea and PCA consumption were significantly lower in patient with TAP block in early postoperative stage.

Above studies show that local anesthetic agent, volume, concentration and delivery method differ between studies, these regimens have not yet been compared against each other. TAP block require large volume of local anesthetics and to achieve pain relief without local anesthetic toxicity we decided to use 20 ml of 0.375% ropivacaine on each side in TAP block.

In our study, effectiveness of analgesia was evaluated by comparison of VAS pain score, SPS score, BPS score post operatively at different intervals in both group.

Visual Analogue Score: There is no statistically significant difference in VAS pain score in group P and group T at 0 min, and 20 min,30 min,45 min,60 min,90 min,150 min,3hr,4 hr,5 hr and 6 hr post operatively due to effect of both port site instillation and effect of TAP block.

VAS pain score was higher In group P than group T at 8 hr,10 hr,12 hr,14 hr and 16 hrs. post operatively with statistically significant difference.(p value 0.0001)

Siddharth Parmar et al,^[10] in his study found that VAS pain score was lower at 0 min, 2,4 and 6 hrs. in TAP group with 0.5% bupivacaine which was statistically significant. Again at 8, 12 and 24hrs. VAS pain score was comparable in both group. They observed that TAP reduced visual analogue scale for pain on emergence and at all postoperative time points up to 12 hours. (p<0.0009) This shows that TAP block provides better post operative analgesia which was assessed by VAS score which is comparable with our study.

S Tolchard, R Davies, and S Martindale (2012),^[11] studies in 43 patients for the Efficacy of the subcostal transversus abdominis plane block in laparoscopic cholecystectomy after general anesthesia and They do Comparison with conventional port-site infiltration for post op analgesia. They found that in TAP block group there was reduction in postoperative pain and analgesic requirement compared with conventional port site infiltration which is comparable with our study.

Pernille Lykke Petersen, Pia Stjernholm, et al. (2012),^[8] conducted a study in 80 patients undergoing laparoscopic cholecystectomy under general anesthesia in day-care surgery unit were allocated to receive either bilateral ultrasound guided posterior TAP block (20 mL 0.5% ropivacaine) or placebo

block in adjuvant to postoperative treatment with oral acetaminophen, oral ibuprofen, i.v. morphine and oral ketobemidone. They observed VAS pain score while coughing was significantly reduced in TAP group compared to placebo (p=0.04) at 0hr,2hr,4hr,8hr,12hr but VAS pain score at rest showed no significant difference between two groups. They concluded that TAP block after laparoscopic cholecystectomy may have some beneficial effect in reducing pain while coughing and on opioid requirements.

Similarly, in our study post operatively more reduction in VAS score was observed in group T compared to group P at 8hr,12 hr,14 hr,16 hrs.

Subjective Pain Scale: SPS pain score was high In group P than group T at 20 min,30 min,45 min,60 min,90 min,120 min,150min, 3 hr, 4 hr,5 hr,6 hr,8 hr,10 hr,12 hr,14 hr and 16 hrs. post operatively with statistically significant difference.(p<0.0001)

But at 0 min and 10 min post operatively there is high SPS pain score in group T than group P with statistically significant difference.

Behavior Pain Assessment Scale: BPS pain score was high In group P than group T at 45 min,60 min,90 min,120 min,150min, 3 hr,6 hr,8 hr,10 hr,12 hr,14 hr and 16 hrs. post operatively with statistically significant difference.(P<0.0001) but at 10 min and 20 min,30 min,4 hr and 5 hr post operatively there is no statistically significant difference in BPS pain score in group P and group T.

McDonnell JG, et al,^[12] also in his study consisting TAP block after caesarean delivery observed categorical pain score were lower in patients who received TAP block with ropivacaine 1.5 mg/kg at all postoperative time points up to 48 hours postoperatively similar result was obtained in our study in term of post operative SPS pain score was lower up to 16 hr post operatively in group T than group P. In our study operative procedure was laparoscopic appendicectomy under general anesthesia we used SPS pain score, VAS score, BPS pain score to evaluate the effectiveness of analgesia in both group.

Duration Of Analgesia: Duration of analgesia defined as the mean time from end of surgery to the first analgesic requirement in the form of intravenous inj. Diclofenac sodium 75 mg.

Ruchi Saxena, Saurabh Joshi et al,^[13] (2016) done a study aimed to compare the efficacy of ultrasound guided abdominal field blocks (USAFB) with port site infiltrations for post operative analgesia in terms of quality of pain relief. Numeric rating scores (NRS) were measured postoperatively to primarily assess the pain severity and opioid requirements. The study group (Group B,USAFB group) had significantly reduced NRS and opioid consumption over 24 h. The overall fentanyl consumption in patients receiving port infiltrations was approximately twice (200 ± 100 µg) as compared to patients in USAFB group (120 ± 74 µg) (P < 0.0001). There was no statically significance difference in NRS between two group at 1hr post operatively but at 2hr,4hr,6hr,12hr,24hr

there was statically significance difference in NRS between two group.($p<0.0001$).Superior post operative analgesia was observed with USAFB than port site infiltration which is comparable to our study. In our study VAS pain score was higher In group P than group T at 120 min,8 hr,10 hr,12 hr,14 hr and 16 hrs. post operatively with statistically significant difference($p<0.0001$) mean duration of analgesia in group P and group T was 13.06+1.61 and 20.33 +4.03 hrs respectively, Which is statically significant ($p<0.0001$). Maximum duration of analgesia in group T was 32 hrs and group P was 16 hrs.

CONCLUSION

From the present study, we conclude that bilateral TAP BLOCK with inj ropivacaine after completion of elective laparoscopic appendicectomy renders patients relatively longer duration of pain free period post operatively as compared to PORT SITE INSTILLATION with inj ropivacaine, although hemodynamic parameters and side effects were comparable in both the groups. TAP BLOCK has a potential to become important tool in managing in post operative pain as it is easy to perform, safe and has definite clinical utility.

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