Section: Anaesthesiology & Critical Care

Research

A COMPARISON OF EFFICACY OF TRANSVERSUS ABDOMINIS PLANE BLOCK VERSUS RECTUS SHEATH BLOCK OF BUPIVACAINE FOR POST-OPERATIVE ANALGESIA FOLLOWING TOTAL ABDOMINAL HYSTERECTOMY: A RANDOMIZED CLINICAL STUDY

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Abstract

Background: Total abdominal hysterectomy is a major surgical procedure associated with significant post-operative pain, which arises from several traumatized structures during surgery. This study compares the analgesic efficacy of transversus abdominis plane block (TAPB) versus rectus sheath block (RSB) with 0.5% Bupivacaine in providing post-operative analgesia following Total Abdominal Hysterectomy. **Materials and Methods:** This randomized clinical study was designed to determine the post-operative analgesic efficacy of TAPB versus RSB following total abdominal hysterectomy. A total of 60 patients posted for elective total abdominal hysterectomy assessed under ASA physical status 1 and 2 were randomly assigned to two groups. At the end of the surgery, 30 patients received TAPB, and the remaining 30 patients received RSB with 0.5% bupivacaine. All surgeries were done under spinal anesthesia. Visual analogue pain scores, heart rate, blood pressure and rescue analgesia were monitored at 0, 4, 8, 12, 16, 20, and 24 hours. **Result:** In the present study, it was observed that Visual analogue pain scores were less in the TAPB group when compared to the RSB group. Also, rescue analgesic requirement was less in the TAPB group compared to the RSB group. It was also observed that post-operative heart rate was less in the TAPB group compared to the RSB group. **Conclusion:** The present study concludes that TAPB provides better post-operative analgesia compared to RSB in terms of lower visual analogue pain scores, haemodynamic stability and lesser need for rescue analgesia.

INTRODUCTION

Hysterectomy, the surgical removal of the uterus, is the second most frequently performed non-obstetric surgery after cesarean section.[1] Despite advances in the medical management of gynaecological diseases, surgical removal of the uterus remains the definite management for most neoplastic and, in many instances, benign gynaecological conditions.[2] Total abdominal hysterectomy is a major surgical procedure associated with significant post-operative pain arises from several structures that are traumatized during surgery and includes somatic pain from the incision site and pain from deeper structures, including muscle pain peritoneal and visceral pain.[3,4]

Although the magnitude of pain from each compartment is difficult to define, pain from the incision site is often relatively mild compared to deeper pain from the muscles and peritoneum; specifically, pain during mobilization and coughing is multifactorial and can be very severe in the early post-operative period.[5]

Potent analgesia is required to make patients bear the surgical stress but also helps in early ambulation and limits many complications such as lung atelectasis and deep vein thrombosis. Opioid analgesics are most commonly used as parenteral agents to take of post-operative pain, but the

problem of respiratory depression remains to be considered. In addition to parenteral opioids and NSAIDS, various other methods used for post-operative analgesia are infiltration, dermal patches, patient-controlled analgesia and regional techniques.[6,7]

Regional techniques offer many advantages; pain is cured close to the damaged tissue area. In addition, when local anaesthetics are used, they provide analgesia without the side effects attributed to opioids. Since the first description of the TAPB technique, this block has been increasingly used to provide analgesia to the anterolateral abdominal wall. In 1899 Schleich first described RSB for surgeries involving the anterior abdominal wall.[8,9]

Our aim of this study is to compare the analgesic efficacy of TAPB and RSB with 0.5% Bupivacaine in providing post-operative analgesia following Total Abdominal Hysterectomy.

MATERIALS AND METHODS

The present study was conducted in the Gynaecology operation theatre, Institute of obstetrics and gynaecology, Chennai, from February 2019 to February 2020. The study design is a randomized clinical study. 60 patients posted for elective total abdominal hysterectomy under spinal anaesthesia were included in this study. Institutional ethical committee approval was obtained. Every patient had undergone pre-anaesthetic evaluation, including history taking, clinical examination, airway examination, routine blood investigations, chest X-ray, ECG and was scheduled for surgery. Height and weight were recorded. The surgical procedure, anaesthetic technique, and visual analogue scale were explained to the patients in their language, and they obtained informed written consent.

Inclusion Criteria

Patients belonging to ASA PS I and II with a weight between 40 to 80 kg who posted for elective surgery and were willing to give written informed consent were included in the study.

Exclusion Criteria

Refusing or uncooperative patients. Patients without written informed consent and uncontrolled diabetes and hypertension. Observed excessive bleeding during the procedure, and the surgical procedure lasted >3hours. Patient with known reaction to local anaesthetics. Patients undergoing emergency surgery. Patients with known coagulopathy and infection at the injection site were excluded from the study.

Materials

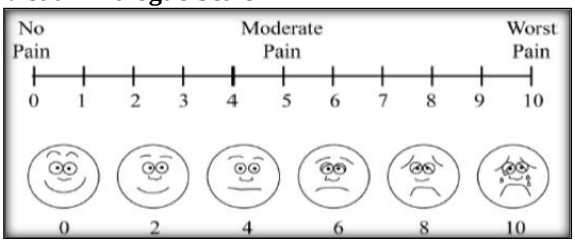
Ultrasound machine with linear probe (frequency 7.5-11MHZ). Skin disinfectant. Clear gel. Needle: 10cm needle, 20-21-gauge echogenic needle with 50cm extension tubing. 0.5% Bupivacaine and 2% Lignocaine.

Monitors – ECG, NIBP, SPO2, EtCO2, urine output.

TAPB: Ultrasound-guided TAP block was performed in 30 patients using 0.5 % bupivacaine.

GROUP RSB: Ultrasound-guided rectus sheath block was performed in 30 patients using 0.5% bupivacaine. After obtaining the informed consent, patients were shifted inside the operation theatre and connected to monitors. Intravenous access was obtained with an 18G intravenous cannula. Under strict aseptic precautions, patient in sitting position, parts painted and draped, L3-L4 space entered with 25G Quincke's needle, 0.5% hyperbaric bupivacaine given in subarachnoid space after the free flow of CSF. The bladder was catheterized, and surgery started after the spinal anaesthesia level was fixed. Intraoperatively patient's heart rate, blood pressure, saturation, blood loss and urine output were monitored. At the end of the surgery, TAPB was performed with 15ml of 0.5% bupivacaine under ultrasound guidance in 30 patients, and ultrasound-guided RSB was performed with 15ml of 0.5% bupivacaine in the remaining 30 patients. The patients were shifted to post anaesthesia care unit. Visual analogue pain scores, heart rate, blood pressure and rescue analgesia were monitored at 0, 4, 8, 12, 16, 20, and 24 hours.

Visual Analogue Scale



Statistical Analysis

The sample size was estimated based on the assumption that the primary response variable would be the decrease in analgesic intake on the first post-operative day. A power analysis identifying 30 patients per group determined that a power of 80% and a significance level of 0.05 were necessary to detect a 25% decrease in post-operative analgesia usage between the two groups. SPSS 20 (IBM SPSS, Chicago, USA) was used to evaluate the gathered data statistically. Mean and standard deviation were determined for quantitative data, and the student t-test was employed for comparison. For qualitative data, frequency and percentage were employed, and the Chi-square test was performed to compare them. The p-value <0.05 was used to determine significance.

RESULTS

In the present study majority of the subjects were in the 40 to 49 years age 24 (40%) group, followed by

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30 to 30 years 20 (33.3%). The two groups were not statistically significant (p=0.417) regarding age and were comparable [Figure 1].

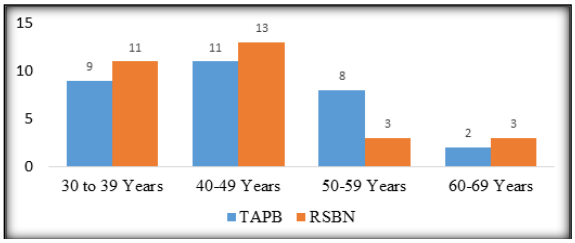

Figure 1: Comparison of age between the groups (N = 60)

The mean age of patients in the TAPB group was 46.77 ±9.107 (SD) years, whereas, in the RSB group, it was found to be 45.33 ±9.007 (SD) years. The difference observed was minimal between the two groups with respect to age and not statistically significant (p=0.542).

Patients' mean weight in the TAPB and RSB groups was 57.73 ±5.47 (SD) years and 58.57 ±5.45 (SD) years, respectively. There was only a minor difference in the mean weight between the 2 groups, and this difference was statistically insignificant (p=0.557) and hence comparable [Figure 2].

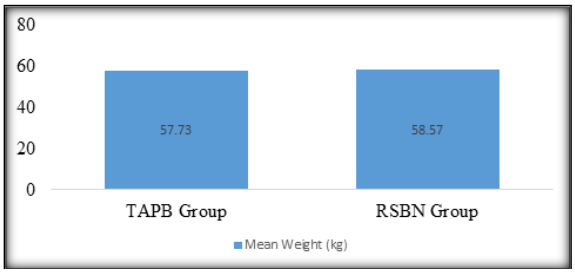

Figure 2: The mean weight comparison between the 2 groups (n = 60)

Of all 60 patients majority of the patients in both the groups belonged to ASA grade I, and they are statistically insignificant (p=0.774) and hence comparable [Figure 3].

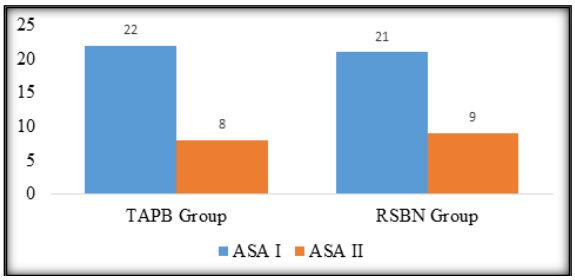

Figure 3: Comparison of ASA Grading between the groups (n = 60)

There was a statistically significant difference in VAS pain scores between the two groups during the entire post-operative period. Patients who received TAPB had lower mean VAS pain scores than patients who received RSB [Table 1].

The mean heart rate (HR) of all patients of both groups during the post-operative period was recorded. It was found that the heart rate between the groups shows statistically significant variation from the baseline to 24 hours into the post-operative period. The mean HR varies from 73.2 to 74.1 in the TAPB group, whereas in the RSB group, it varies from 80.7 to 81.6 [Table 2].

The mean systolic blood pressure (SBP) of all patients of both groups during the post-operative period was recorded. The mean SBP varies from 114.5 to 116.6 in the TAPB group, whereas in the RSB group, it varies from 116.1 to 117.5. There was no significant statistical difference between the two groups regarding post-operative mean systolic blood pressure from the baseline until 24 hours [Table 3].

The mean diastolic blood pressure (DBP) of all patients of both groups during the post-operative period was noted. The mean DBP varies from 73.3 to 76.1 in the TAPB group, whereas in the RSB group, it varies from 75.3 to 77.9. No statistically significant difference was observed in the two groups regarding diastolic blood pressure in the post-operative period from the baseline to 24 hours [Table 4].

The mean arterial pressure (MAP) of all patients of both groups during the post-operative period was noted. The MAP varies from 87.0 to 89.5 in the TAPB group, whereas in the RSB group, it varies from 89.0 to 91.1. There was no statistically significant difference in post-operative mean arterial pressure in both groups from the baseline to 24 hours [Table 5].

A higher proportion of patients who received RSB needed opioid analgesia than patients who received TAPB (26.7% vs 6.7%), and this difference between the groups was statistically significant (p<0.05) [Figure 4].

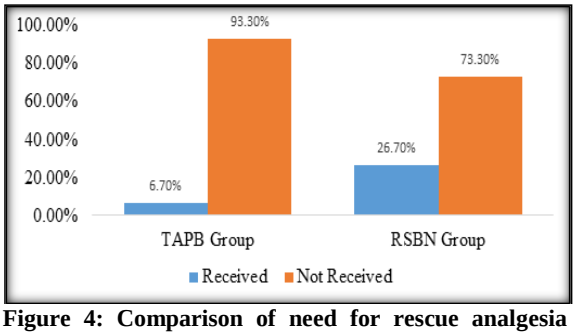

Figure 4: Comparison of need for rescue analgesia between the groups (n = 60)

Table 1: Comparison of mean Visual Analogue Scale (VAS) pain score during the post-operative period (n = 60)

Post-operative intervals	Group TAPB		Group RSB		't-test p-value
	Mean score	S.D	Mean score	S.D	
0 mins	2.0	0.9	3.9	0.6	<0.001
4 hrs	1.7	0.8	3.9	0.6	<0.001

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8 hrs	1.6	1.1	3.7	0.7	<0.001
12 hrs	1.6	0.9	3.8	0.7	<0.001
16 hrs	1.8	0.7	3.9	0.6	<0.001
20 hrs	1.9	0.8	3.9	0.4	<0.001
24 hrs	2.4	1.0	4.2	0.9	<0.001

Table 2: mean heart rate comparison during the post-operative period (n = 60)

Post-operative time	Group TAPB		Group RSB		p-value
	Mean HR	S.D	Mean HR	S.D	
0 mins	73.2	7.3	80.7	5.8	<0.001
4 hrs	73.7	7.3	81.6	6.8	<0.001
8 hrs	74.1	7.2	81.6	6.3	<0.001
12 hrs	74.0	7.3	81.5	6.2	<0.001
16 hrs	73.8	7.4	81.4	5.9	<0.001
20 hrs	73.6	7.5	81.6	5.5	<0.001
24 hrs	73.6	6.9	81.6	5.9	<0.001

Table 3: Mean systolic blood pressure (SBP) comparison during the post-operative period (n = 60)

Post-operative time	Group TAPB		Group RSB		p-value
	Mean SBP	S.D	Mean SBP	S.D	
0 mins	116.1	4.9	116.6	5.1	0.719
4 hrs	114.6	5.2	116.1	4.7	0.225
8 hrs	114.5	5.1	116.5	4.9	0.117
12 hrs	115.8	5.3	117.2	5.3	0.301
16 hrs	116.6	5.8	117.5	4.6	0.493
20 hrs	116.5	4.9	117.5	3.8	0.363
24 hrs	115.4	4.9	116.8	3.7	0.209

Table 4: Mean diastolic blood pressure (DBP) comparison during the post-operative period (n = 60)

Post-operative time	Group TAPB		Group RSB		p-value
	Mean DBP	S.D	Mean DBP	S.D	
0 mins	73.4	5.3	75.3	5.1	0.180
4 hrs	73.3	5.3	75.5	5.2	0.110
8 hrs	74.0	6.1	76.5	5.0	0.082
12 hrs	74.9	5.1	76.2	5.5	0.346
16 hrs	75.4	4.7	76.6	4.4	0.323
20 hrs	76.1	4.3	77.9	3.7	0.078
24 hrs	76.1	4.5	76.5	3.6	0.703

Table 5: Mean arterial pressure (MAP) comparison during the post-operative period (n = 60)

Post-operative time	Group TAPB		Group RSB		p-value
	Mean MAP	S.D	Mean MAP	S.D	
0 mins	87.6	5.0	89.0	5.0	0.261
4 hrs	87.0	5.0	89.1	4.9	0.106
8 hrs	87.4	5.5	89.9	4.9	0.076
12 hrs	88.4	5.0	89.9	5.4	0.272
16 hrs	89.1	5.0	90.2	4.3	0.334
20 hrs	89.5	4.3	91.1	3.6	0.105
24 hrs	89.1	4.3	89.9	3.5	0.430

DISCUSSION

Post-operative pain and discomfort are common after a total abdominal hysterectomy. TAPB and RSB are used to block sensory nerves in the anterior abdominal wall, assisting in the reduction of discomfort after lower abdominal procedures. The study compares the post-operative analgesic effect between TAPB and RSB using 0.5% bupivacaine.

The majority of the subjects were 41 to 50 years, followed by 31 to 40 years. The two groups are comparable as there was no statistically significant difference observed in these groups with age. The mean age was 46.77 years in the TAPB group and 45.33 years in the RSB group. These findings in the present study are in accordance with earlier reported studies.[10]

There was only a minor difference in the mean weight between the two groups, which was not statistically significant. Therefore, the two groups are comparable with regard to weight. Petersen et al. also reported similar findings in their studies.[11]

In the present study majority of the patients in both groups belonged to ASA grade I. The group TAPB reported 73.3% patients, whereas the RSB group found 70% patients with ASA grade I. These observations are in accordance with earlier reported studies.[12]

The mean visual analogue pain scores of the TAPB group range from 1.7 to 2.4, lower than RSB group patients, ranging from 3.7 to 4.2, which signifies that TAPB group patients had better post-operative pain control than RSB. It is statistically significant, which correlates with Ayman et al. study.[13]

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Karatepe et al. observed that TAPB guided by ultrasound conducted after spinal anesthesia leads to decreased VAS ratings and analgesic usage.[14] Additionally, Carney et al. observed that TAPB was helpful in patients having a complete abdominal hysterectomy. The VAS pain score was lower in the TAP block group at most time points evaluated.[15] Whereas Costello et al. observed that TAPB did not reduce post-operative pain after cesarean delivery. The probable reason for that dispute is the use of TAPB as a part of a multimodal analgesic regimen.[16]

The mean post-operative heart rate of TAPB patients was lower than RSB patients, ranging from 80.7 to 81.6, signifying that TAPB group patients had better analgesia than the RSB block group. In addition, the MAP measured postoperatively in at 8 hr and 12 hr in the TAPB group was found to be slightly lower than in RSB group patients. These findings corroborated those of Ripollés et al., who concluded that TAPB is an effective approach for lowering opioid usage postoperatively after colorectal surgery, hysterectomy, caesarean section, cholecystectomy, and bariatric surgery.[17]

The mean systolic blood pressure measured postoperatively in the first 24 hours in the TAPB group ranges from 114.5 to 116.6, comparable to the RSB group with a post-operative mean systolic blood pressure of 116.6 to 117.5. The mean diastolic blood pressure measured postoperatively in the first 24 hours in the TAPB group ranges from 73.3 to 76.1, comparable to the RSB group with a post-operative mean diastolic blood pressure of 75.3 to 77.9. These findings in the present study agree with the findings of earlier reported studies.[18]

These findings revealed that patients receiving TAPB had a higher grade of post-operative analgesia and a longer duration of analgesia than those receiving RSB. This could be explained by the fact that the RSB technique is used to block the terminal branches of the 9th, 10th, and 11^{th} intercostal nerves, which run between the internal oblique and transverse abdominal muscles, penetrate the posterior wall of the rectus abdominal muscle and terminate in an anterior cutaneous branch that supplies the umbilical area's overlying skin. Local anesthetic deposition bilaterally inside the posterior rectus sheath produces thick and predictable analgesia throughout the midline of the anterior wall, from the xiphoid process to the symphysis pubis; it is therefore employed for surgery, including a midline (or paramedian) abdominal incision. RSB is more successful than TAPB in the midline and paramedian abdominal incisions above the umbilicus, but TAPB is more effective in transverse or Pfannenstiel incisions below the umbilicus. In TAPB, a single injection is sufficient for many days, but regular dosing is necessary for bilateral RSB, necessitating the insertion of rectus sheath catheters.[19]

These findings corroborated those of Jadon et al. They established that the median duration from the first analgesic request was significantly longer in the TAP group than in the control group ($p<0.0001$). In addition, the TAP group ingested considerably fewer tramadol dosages than the control group. The study group's pain levels were lower throughout the trial at every stage, both at rest and during activity. The research indicated that when used in conjunction with other analgesic modalities for pain reduction after caesarean section, TAP block alleviates pain, prolongs the duration of analgesia, and decreases supplementary opioid intake.[20] Additionally, Pratheeba et al. showed that the TAPB's analgesia quality, together with the reduced need for rescue analgesics and their associated side effects, makes it a viable and safer alternative for lower abdominal gynaecological operations.[21]

Limitations of the Present Study

Firstly, we only performed a single-injection technique. We did not place any continuous catheters. This study needs to be done. Secondly, we only studied the effect of 0.5% ropivacaine. Best volume and concentration, as well as compatibility studies, have not been performed.

CONCLUSION

The present study concludes that transversus abdominis plane block provides better post-operative analgesia than rectus sheath block in lower visual analogue pain scores, haemodynamic stability, and lesser need for rescue analgesia.

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