

COMPARISON BETWEEN TRANSVERSE ABDOMINIS PLANE BLOCK VERSUS TRADITIONAL PARENTERAL ANALGESIA IN LOWER ABDOMINAL SURGERIES

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ABSTRACT

BACKGROUND

A revolution in the management of acute postoperative pain has occurred during the past three decades. The transverse abdominis plane block is a peripheral nerve block used to provide analgesia to anterior and lateral abdominal wall. By introducing local anaesthetic to transverse abdominis plane via the triangle of Petit, it is possible to block the sensory nerves of the anterior abdominal wall before they leave this plane and pierce the musculature to innervate the entire anterior abdominal wall. TAP block provides excellent pain relief especially in lower abdominal surgeries.

MATERIALS AND METHODS

An observational study is carried out in sixty patients who underwent lower abdominal surgeries and who were given TAP block or traditional parenteral analgesia, 30 in each group. All patients in the study group were scheduled for postoperative pain monitoring using numerical rating scale at specific times 2/6/12/24 hours postoperatively.

RESULTS

Considering socioeconomic data, there was no significant difference between the two groups with regard to age, sex and weight ($p > 0.05$). Among clinical variables, the test and control group were comparable with respect to ASA physical status and haemodynamic parameters ($p > 0.05$). There was significant difference in the pain scores of the 2 groups at 2, 6 and 12 hours, but at 24 hours, the pain scores were not significant.

CONCLUSION

We conclude that TAP block is an effective method of providing postoperative analgesia in patients who undergo lower abdominal surgeries and we recommend the same for all patients undergoing lower abdominal surgeries.

KEYWORDS

Transverse Abdominis Plane (TAP) Block, Numerical Rating Scale (NRS), Parenteral Analgesia.

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BACKGROUND

Pain is an unpleasant subjective experience that is the net effect of a complex interaction of the ascending and descending nervous system involving biochemical, physiological, psychological and neocortical processes.¹ Uncontrolled postoperative pain may produce detrimental effects, both acute effects (i.e. adverse physiological responses) and chronic effects (i.e. delayed long-term recovery and chronic pain).²

A substantial component of pain experienced by patients after abdominal surgery is derived from the abdominal wall incision.³ Attenuation of postoperative pain especially with certain types of analgesic regimens may decrease

perioperative morbidity and mortality.⁴ Anaesthesiologists are responsible not only for preoperative evaluation and intraoperative care, but also for perioperative pain relief of the patient. The analgesic regimen needs to meet the goals of providing safe and effective analgesia with minimal side effects for the patient.⁵

Opioid analgesics and Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) are often used in the treatment of many painful conditions. A revolution in the management of acute postoperative pain has occurred during the past three decades.

The TAP block is a peripheral nerve block used to provide analgesia to anterior and lateral abdominal wall⁶ by introducing local anaesthetic to transverse abdominis plane via the triangle of Petit, it is possible to block the sensory nerves of the anterior abdominal wall before they leave this plane and pierce the musculature to innervate the entire anterior abdominal wall.⁷ TAP block provides excellent pain relief especially in lower abdominal surgeries as proved by Tran et al.⁸ This study was undertaken to compare the analgesic effect of TAP block with traditional parenteral analgesia.

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Objective

The objective of this study is to compare effectiveness of TAP block versus traditional parenteral analgesia for postoperative pain relief in sixty patients aged 20-60 years, ASA physical status I and II undergoing lower abdominal surgeries.

MATERIALS AND METHODS

Study Design

Observational study- Patients were allocated randomly into 2 groups. In order to get statistically significant results, a sample size of thirty was allotted to each group.

Sample size is calculated using the formula-

$$(Z\alpha + Z\beta)^2 \times 2 \times \sigma^2.$$

$$(\mu_1 - \mu_2)^2.$$

$$\sigma^2 = S_1^2(n_1 - 1) + S_2^2(n_2 - 1).$$

$$(n_1 + n_2 - 2).$$

μ_1 - Mean score of first technique.

μ_2 - Mean score of second technique.

$Z\alpha$ at 95% confidence interval = 1.96 (α error at 5%).

$Z\beta$ at 80% power = 0.84 (β error at 20%).

The sample size intended in this study- 30 in each group (total of 60).

Test Group- Patients who received TAP block.

Control Group- Patients who received traditional parenteral analgesia.

Study Setting- Hospital-based study, Government Medical College, Kottayam, Anaesthesia and Surgery Department.

Study Population- Sixty patients were selected to be enrolled in this study, who were scheduled for lower abdominal surgery. The patients were allocated randomly into two groups.

Inclusion Criteria

- Age 40+20.
- ASA grade I and II.
- Herniorrhaphy.
- Appendectomy.

Exclusion Criteria

- Patient refusal.
- Allergy to local anaesthetics.
- ASA grade III/IV.
- Patients with cardiac/respiratory/renal/hepatic disease.
- Emergency laparotomy.

Study Procedure

During the preoperative visit, all patients were evaluated and assessed. The study protocol was explained and written informed consent was taken from patients. Cases satisfying the inclusion criteria were included into 2 groups.

Group 1- Patients received TAP block with 20 mL, 0.25% bupivacaine.

Group 2- Patients not received TAP block, but received parenteral analgesia.

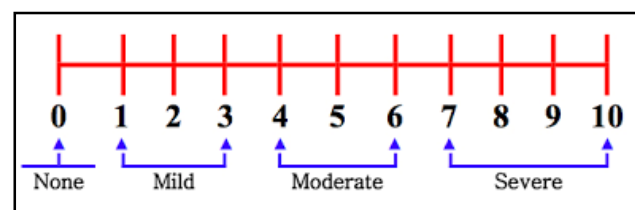
Group 1 received TAP block postoperatively.

The puncture site is just above the iliac crest and just posterior to the mid axillary line within the triangle of Petit. A 23-gauge blunt tipped spinal needle is inserted perpendicular to the skin and a give or "pop" is felt when the needle passes through the fascial extensions of the external oblique muscle. The needle tip is therefore between the fascial layers of external and the internal oblique muscle and loss of resistance technique is used. Further advancement with a second "pop" indicates that the needle has advanced into the fascial plane above transverse abdominis muscle and loss of resistance technique is used. After careful aspiration to exclude vascular puncture, 2 mg/kg of 0.25% bupivacaine solution or 20 mL 0.25% bupivacaine solution on one side was injected through the needle to a maximum dose of 50 mg.

Group 2 received injection Morphine 0.1 mg/kg IV preoperatively 15 minutes prior to surgery and injection diclofenac 75 mg IV towards the end of surgery.

Patients were given a Numerical Rating Scale (NRS) for pain assessment, which was explained to them. In group 1, TAP block was performed after completion of surgery. All patients were scheduled for postoperative monitoring using NRS scale from 0-10 at specific times 2/6/12/24 hours postoperatively and were evaluated as follows.

0 - no pain,
1-3 mild pain,
4-6 moderate pain,
7-10 severe pain,
>4 is used as a cut point at which additional analgesia was given.



RESULTS

	20 to 40 Years		40 to 60 Years		Total	Mean	SD
	N	Percentage	N	Percentage			
Group 1	18	60	12	40	30	36.90	11.28
Group 2	13	43.33	17	56.67	30	41.37	10.22

Table 1. Number and Age of Patients in the TAP Block and Traditional Parenteral Analgesia Group

Mean difference is 4.47, $t = 1.67$, $p = 0.113$.

The TAP block group and traditional parenteral analgesia group are comparable in terms of age. There is no statistical difference between the two groups as determined by the p value, 0.113.

Group	Sex of Patients				Total
	Male		Female		
	Number	Percentage	Number	Percentage	
Group 1	20	66.67	10	33.3	30
Group 2	20	66.7	10	33.3	30
Table 2, Distribution as per Gender					

Table 2. Distribution as per Gender

The TAP block group and traditional parenteral analgesia group are comparable with regard to gender as determined by t-test (p value 1.000).

Group	Sex of Patients				Total
	ASA PS 1		ASA PS 2		
	Number	Percentage	Number	Percentage	
Group 1	23	51.1	7	46.7	30
Group 2	22	46.7	8	53.3	30
Table 3. ASA Physical Status Distribution in the Two Groups					

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$$\chi^2 = 0.089; P = 0.766.$$

There is no statistical difference in the ASA physical status in the TAP block group and traditional parenteral analgesia groups determined by Chi-square test (p value - 0.786).

Weight	Number of Cases	Mean	SD
Group 1	30	62.33	11.49
Group 2	30	66.37	13.82

Table 4. Distribution of Weight in the Two Groups

$$\text{Mean difference} = 4.04, t = 1.23, P = 0.314.$$

The two groups are comparable with respect to weight as determined by t-test, p value being 0.314.

	Group	N	Mean	SD	t	P
PR	TAP block	30	88.5	10.385	1.84	0.070
	Parenteral analgesia	30	83.6	10.351		

Table 5. Distribution of Pulse Rate in the Two Groups

$$\text{Mean difference} = 4.9.$$

There is no statistically significant difference between pulse rate of patients in the two groups as determined by t-test (p value = 0.070).

	Group	N	Mean	SD	t	P
Pain score 2 hrs.	TAP block	30	1.03	0.85	6.53	0.00
	Parenteral analgesia	30	3.07	1.484		

Table 6. Data and Result of the Difference in the Pain Score 2-hour between TAP Block and Traditional Parenteral Analgesia Groups

$$\text{Mean difference} = 2.04, \text{ *significant at 0.05 level.}$$

From the above table, we infer that the pain score at 2 hours of the patients who received TAP block was significantly lower than those who received parenteral

analgesia. The test of significance used here is t-test, p value being 0.000, which is statistically significant.

	Group	N	Mean	SD	t	P
Pain score 6 hrs.	TAP block	30	2.37	0.964	12.85	0.000
	Parenteral analgesia	30	5.57	0.971		

Table 7. Data and Result of the Difference in the Pain Score 6 Hours between TAP and Traditional Parenteral Analgesia Groups

$$\text{Mean difference} = 3.2.$$

From the above table, we infer that the pain score at 6 hours of the patients who received TAP block was significantly lower than those who received parenteral analgesia. The test of significance used here is t-test, p value being 0.000, which is statistically significant.

	Group	N	Mean	SD	t	P
Pain score 12 hrs.	TAP block	30	3.30	0.794	12.8	0.000
	Parenteral analgesia	30	5.60	0.675		

Table 8. Data and Result of the Difference in the Pain Score 12 Hours between TAP and Traditional Parenteral Analgesia Groups

$$\text{Mean difference} = 2.3; \text{ *significant at 0.05 level.}$$

From the above table, we infer that the pain score at 12 hours of the patients who received TAP block was significantly lower than those who received parenteral analgesia. The test of significance used here is t-test, p value being 0.000, which is statistically significant.

	Group	N	Mean	SD	T	P
Pain score 24 hrs.	TAP block	30	5.70	1.264	1.54	0.121
	Parenteral analgesia	30	6.17	1.020		

Table 9. Data and Result of the Difference in the Pain Score 24 Hours between TAP and Traditional Parenteral Analgesia Groups

$$\text{Mean difference} = 0.47.$$

From the above table, we infer that the pain score at 24 hours of the patients who received TAP block was not significant when compared with those who received parenteral analgesia. The test of significance used here is t-test, p value being 0.121, which is statistically insignificant. Hence, it is found that there is no added benefit of TAP block at 24 hours postoperatively.

DISCUSSION

The data was collected using a prestructured proforma. Data analysis and interpretation was done using SPSS 22 version. Data was expressed as mean \pm SD. T-test is used to find out the significant difference between the two means. To test the statistical significance of the difference in the percentages with respect to categorical variable among the two groups, Chi-square test was done. A p value of <0.05 was considered significant.

At 2 hours, the TAP block group had mean pain score of 1.03 with a SD 0.85 and that of traditional parenteral analgesia was 3.07 ± 1.484 . The p value calculated by t-test was 0.000, which is statistically significant.

The pain score at 6 hours of the test group was 2.37 ± 0.964 and that of control group was 5.57 ± 0.971 . The p value was 0.000, which was also statistically significant.

At 12 hours, the mean \pm SD of TAP block group was 3.3 ± 0.794 and that of control group was 5.6 ± 0.675 , p value being 0.000, which was also statistically significant.

The mean \pm SD of pain scores at 24 hours of TAP block group was 5.7 ± 1.264 and the traditional parenteral analgesia group was 6.17 ± 1.02 , p value 0.121, this is not statistically significant. Hence, it is found that there is no added benefits of TAP block at 24 hours postoperatively.

Thus, it is observed that patients who received TAP block had lesser pain during the first 12 postoperative hours compared to those patients who received parenteral analgesia.

There were no apparent side effects of TAP block such as haemodynamic instability, inadvertent intraperitoneal or intravascular injection. None of the patients had drug adverse reaction or overdose.

The Transverse Abdominis Plane (TAP) block is a relatively new regional anaesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall. It has a high margin of safety and is technically simple to perform, especially under ultrasound guidance.⁹ Most reports demonstrate efficacy of TAP blocks by highlighting some combination of reduced postoperative opioid requirement, lower pain scores and/or reduction in opioid-related side effects.

Bharti et al¹⁰ randomised 40 patients undergoing colorectal surgery to standard treatment (diclofenac and intravenous morphine) and bilateral intraoperative TAP block with either 0.25% bupivacaine (n=20) or saline (n=20). The bupivacaine group has a significant reduction in 24-hours morphine requirement (6.45 ± 3.26 mg versus 17.55 ± 5.78 mg; $P=0.0001$) as well as significant reduction in early postoperative sedation scores were significantly lower in the

bupivacaine group and patient satisfaction was higher (6.8 ± 1.1 mg versus 3.5 ± 1.5 mg; $P<0.001$).¹⁰

In a study by Dr. Arpita Saxena et al from Department of Anaesthesiology and Critical Care, SN Medical College, Agra, Uttar Pradesh, 60 patients of ASA grade I and II who underwent major gynaecological or lower abdominal surgeries were randomised to receive patient controlled tramadol analgesia (n=30) or to undergo TAP block (n=30). The TAP block reduced visual analogue scale pain scores at most (2, 4, 6, 12, 24 hrs.), but not at all time (36, 48 hrs.) points assessed. Patients undergoing TAP block had reduced tramadol requirement in 24 hrs. (210.05 ± 2.5 mg versus 320.05 ± 10.6 ; $P<0.001$) and 48 hrs. (508.25 ± 20.6 mg versus 550.25 ± 20.6 ; $P<0.01$) and a longer time to the first PCA tramadol request time to the first PCA tramadol request (in minutes) compared to the control group (178.5 ± 45.6 mg versus 23.5 ± 3.8 ; $P<0.001$), they concluded that TAP block holds considerable promise as part of a multimodal analgesia regimen after abdominal surgeries. The TAP block was easy to perform and provided reliable and effective analgesia in the study and no complication due to the TAP block were detected.¹¹

Liver injury and intraperitoneal injection have been reported after landmark-guided TAP block.¹² An Ultrasound-Guided (US) approach to the TAP block has been described by McDonnell and colleagues. It offers the advantage of direct visualisation of the needle and the placement of local anaesthetic, which might improve safety and efficacy.⁹

Limitations of the Study

Landmark technique is used for performing the block. Ultrasound guidance can improve the safety and certainty of the block by confirming the position of the needle. But, merits of landmark technique using "double pop" method regarding safety and certainty has been proved in literature.

CONCLUSION

The study was done to prove the effectiveness of TAP block over traditional parenteral analgesia for postoperative pain relief. From this study, we found that patients who received TAP block had lesser postoperative pain especially in the early postoperative hours (upto 12 hours) compared to those who received parenteral analgesia. There were no significant complications associated with TAP block. We conclude that TAP block is an effective method of providing postoperative analgesia in patients who undergo lower abdominal surgeries and we recommend the same for all patients undergoing lower abdominal surgeries.

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