Section: Anaesthesiology and Critical Care

Original Research Article

POSTOPERATIVE ANALGESIC EFFICACY OF WOUND SITE INFILTRATION AND ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK WITH 0.25% BUPIVACAINE IN INFRA-UMBILICAL SURGERIES UNDER SPINAL ANAESTHESIA - A COMPARATIVE STUDY

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Abstract

Background: To study the analgesic efficiency of ultrasound-guided transversus abdominis plane block as compared to wound site infiltration after infra-umbilical surgeries under spinal anaesthesia. **Materials and Methods:** We conducted research on 70 patients age range being 18 – 65 years with ASA I-II planned for elective lower abdominal surgery. In two groups (35 each) the patients were randomized. Group I received 30 mL of wound site infiltration (15 ml for each wound site) 75-mg bupivacaine of 0.25% concentration and Group T received USG-guided TAP block with 30 mL (15 mL+15 mL, bilaterally) 75-mg bupivacaine of 0.25% concentration. Postoperative VAS Score, time for first rescue analgesia, total analgesia consumption in 24 hours, and patient satisfaction in terms of comfort from pain are noted. **Result:** In regards to demographic data there is no notable difference between the two groups. As compared to Group I, Group T has a lower VAS Score between 6-24 hours postoperatively, which was statistically significant also ($p<0.05$), also the total analgesia consumption was higher in Group I and thus having lower patient satisfaction in terms of pain relief. **Conclusion:** The comparison of both the groups in the study revealed that the post-operative VAS scores were much lower in Group T. The request for analgesia was earlier in Group I and so was the total dose of analgesic consumption. The overall patient satisfaction was higher in Group T which was statistically significant ($p<0.05$).

INTRODUCTION

Any unpleasant emotional and sensory experience due to actual or potential tissue damage or described in terms of such damage is defined as pain.[1] An overall experience of pain arises due to an intereaction between its sensory and emotional components.

Optimization of pain via a multimodal approach is an important component of the Enhanced Recovery After Surgery protocol. Surgical incisions and visceral sites are the two main sites from where most of the postoperative pain arises. [2,3] Providing excellent quality patient pain control is of prime importance.

Based on the intensity of pain several methods have been introduced for postoperative pain relief through a stepwise approach and achieve the same goals, but the relative efficacy is unknown. Reduced nausea and vomiting, urinary retention & ileus, and hyperalgesia are some of the specific benefits of minimizing the use of opioids. [4-6]

Various methods have now been introduced for providing postoperative pain relief as part of multimodal analgesia and thus reducing the need for opioids and thereby their side effects. These include intravenous or oral medications, epidural analgesia, wound site infiltration, or peripheral nerve blockade like Transversus abdominis plane block. Administration of long-acting local anaesthetics on the wound sites bilaterally, on/under the skin has

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presented to be effective for postoperative analgesia. [7-10]

Thoracolumbar nerves (T6–L1) which supply the anterior abdominal wall are blocked on infiltrating local anaesthesia into the transverses abdominis plane, as described in the study, first done by Rafi and a few other authors. The main sensory supply of the skin, muscles, and parietal peritoneum of the anterior abdominal wall is through the T10 to L1 thoracolumbar nerves which lie intricately in the fascial layer between the internal oblique and transversus abdominis muscles, as confirmed by cadaver dissection study. Thus blocking these nerves helps in alleviating pain, making it useful for lower abdominal surgeries. [11-13]

USG-guided TAP Block provides better accuracy in drug administration due to the placement of local aneasthetic & direct visualization of the needle, which might improve safety and efficacy, as compared to the landmark technique and as also seen in the study done by McDonnell and colleagues.[14]

Our aim is to study the analgesic efficiency of ultrasound-guided transversus abdominis plane block as compared to wound site infiltration after infra-umbilical surgeries under spinal anaesthesia. The objectives of the study were to assess the postoperative analgesia using the VAS Score, to assess the time when the patient first demands rescue analgesia, to assess the total analgesia consumption in 24 hours, and to assess the patient satisfaction in terms of comfort from pain.

MATERIALS AND METHODS

This study was conducted in the Department of Anaesthesia and Critical Care at Sarojini Naidu Medical College, Agra [November 2020 to April 2022], after obtaining approval of the hospital research ethical committee (IEC/2021/36) along with an informed and written consent of the patients.

Inclusion Criteria

Patients with ASA I and ll, age ≥ 18 years and ≤ 65 years scheduled for lower abdominal surgeries, elective cases with an eight-hour fast, patients with successful spinal anaesthesia, and no other systemic diseases.

Exclusion Criteria

Patients of age below 18 years and above 65 years, ASA lll and above, emergency cases, patients with spinal anaesthesia contraindications (such as: coagulopathy, puncture site infection), patients not granting approval for spinal anaesthesia, allergy to local anesthetics, patients with psychiatric illness.

The patients were randomized into two groups, Group I and Group T after obtaining informed and written consent from them.

Randomization was achieved with sealed envelopes containing group allocation numbers that were opened after the enrolment of the patients.

An 18 or 16-gauge (G) intravenous cannula was used to gain peripheral vascular access preoperatively in all patients and preloading was done with 8 mL kg-1 h-1 RL (Ringer Lactate). Preparation for general anaesthesia was done for all patients. Emergency drugs for hypotension and bradycardia following spinal anaesthesia were also prepared and kept ready. When taken to the operating table, standard monitoring was applied. Noninvasive methods were used for vital monitoring. After the administration of spinal anaesthesia to patients posted for infra-umbilical surgeries, the surgery was done. On completion of the surgery, for postoperative analgesia:

Group I received Wound site infiltration with 30 mL (15 ml for each wound site) 75-mg bupivacaine of 0.25% concentration.

Group T received a USG-guided TAP block with 30 mL (15 mL+15 mL, bilaterally) 75-mg bupivacaine of 0.25% concentration.

Technique for USG-guided TAP Block

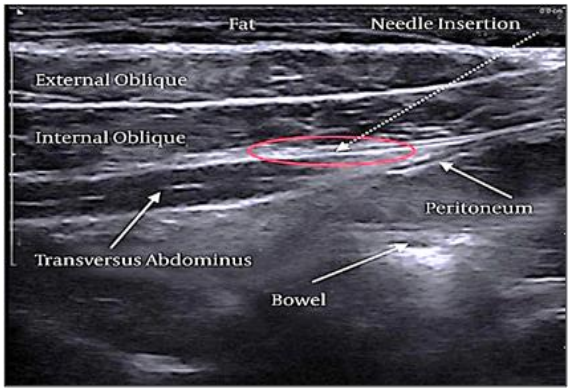

Figure 1: Ultrasound image of the abdominal wall

On completion of the surgery, in Group T, the linear array probe (38mm, 7-12 MHz frequency) of the USG device (Sonosite my lab 40) was prepared under sterile conditions and after sterilizing the site for the block as well, the probe was placed above the iliac crest in the lateral abdominal wall, with the patient lying supine. The external oblique, internal oblique and transversus abdominis muscles were identified. With a 100 mm 23-G peripheric blockage needle using the in-plane technique, a local anaesthetic drug was administered over the transversus abdominis muscle. 75-mg bupivacaine of 0.25% concentration, thirty mL (15 mL+15 mL, on each side) was administered in Group T patients. The same co-investigator prepared all the local anaesthetics as well as assisted during the whole TAP block procedure.

Technique for Local wound site infiltration

75-mg bupivacaine of 0.25% concentration was administered for subcutaneous wound site infiltration of the patients in Group I on completion of the surgery, in total thirty mL (15 ml for each wound site).

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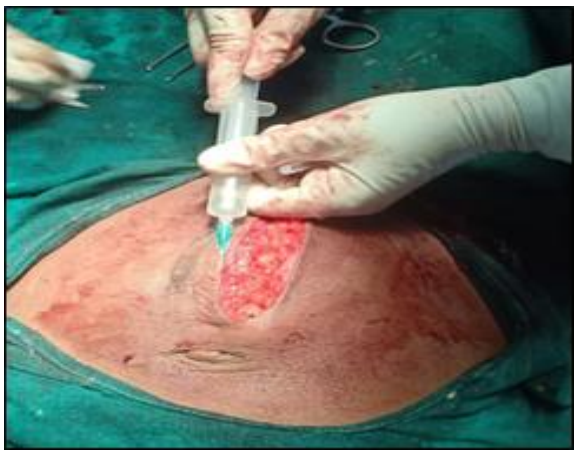


Figure 2: Local Wound site infiltration

The record was made of any complications that occurred intraoperatively and postoperatively (nausea, vomiting, hypotension, and bradycardia). The total analgesic requirement and time for the first request of rescue analgesia were noted. Patient satisfaction was assessed by verbally asking the patients to say how satisfied he/she was with the control of pain. A record of patient satisfaction was made after 24 hours with a Verbal response numerical scale (VRNS)

0-1 = awful; 2-3 = very poor; 4 = poor; 5-6 = average; 7 = good; 8-9 = very good; 10 =Excellent

Visual analogue scale (VAS)

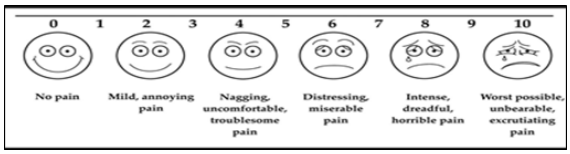


Figure 3: Visual Analogue Scale for Pain

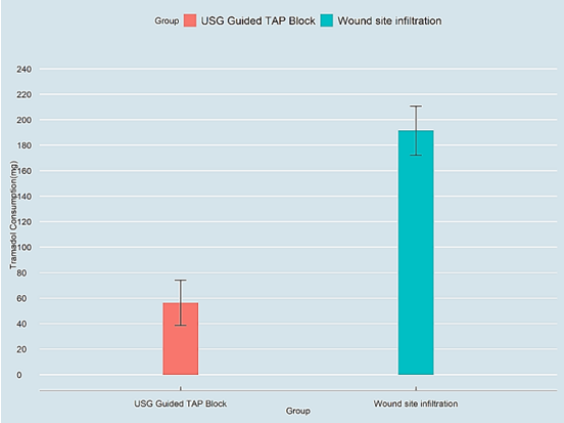
Patient pain was evaluated by Visual Analogue Scale (VAS). VAS0 (zero) was the time at which local anaesthesia was infiltrated in Group I and USG-guided TAP block was given in Group T. A co-investigator, who was blind to the method used evaluated the patients at 2, 6, 12, 24th hours and on mobilization for the first time and recorded all their pain responses. Mobilization of all the patients was done 8 hours after the completion of the surgery. If the patient reported pain at any hour, with VAS≥4, 50 mg of tramadol was given intramuscularly.

Statistical Analysis

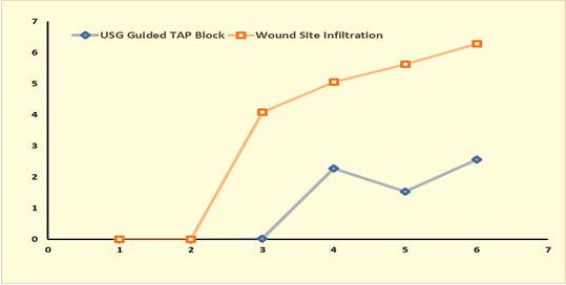
The data on relevant study variables were collected and stored in pre-designed Microsoft Excel datasheets. Data were examined and verified with original proforma or any missing observations. Data were described by mean and standard deviation or in percentage as applicable. Two sample-independent t-tests were used to compare mean levels between groups. All tests were carried out with a 5% level of significance as two-sided unless stated otherwise. The software IBM SPSS Statistics v 22.0 for Windows (Armonk, NY, USA) was used for statistical analysis

The assumption of a possibility of at least a 35% difference between the two groups was made while calculating the sample size. Thus, in order to obtain an alpha error of 5% and statistical power of 80%, 35 patients were allocated into each group. When p value was under 0.05, the results were considered statistically significant.

RESULTS



Graph 1: Bar graph depicting Total Analgesic Consumption in 24 hours in Group T & I



Graph 2: Pain assessment at different time intervals between TAP Block and Wound Site Infiltration

Patient characteristics in both groups were comparable in regard to the demographic data. The total analgesic (injection tramadol) consumption in 24 hours was much less in the USG-guided TAP Block group in comparison to Wound Site Infiltration and the difference was statistically significant($p<0.05$). Higher scores in patient satisfaction were found in the USG-guided TAP block as compared to Wound Site Infiltration group, and statistically the mean difference was significant ($p<0.05$) [Table 1].

Pain scores were 0 in both the groups at 0 and 2 hours postoperatively (maybe due to the effect of spinal anaesthesia). Patients in Wound Site Infiltration group reported more pain on VAS scoring from the 6th hour postoperatively as compared to the USG-guided TAP block group. The pain was significantly less in the USG-guided TAP block group [Table 2].

The request for rescue analgesia for the first time was earlier and with a higher proportion in Wound Site Infiltration subjects in comparison to the USG-guided transverses abdominis plane block group at all

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the studies recorded time periods i.e., 6 hrs., 8 hrs., 12 hrs., and 24 hrs. The proportion was significantly low ($p<0.05$) for requests for rescue analgesia in USG-guided TAP Block subjects [Table 3].

Table 1: Demographic data, 24 hr. analgesia consumption, patient satisfaction

Parameter	USG-guided TAP Block (N=35)	Wound Site Infiltration (N=35)	p Value
Age (Mean±SD)	43.80±14.34	40.77±14.05	0.683
Sex %			
Male	74.3	60	
Female	25.7	40	
24 hrs. Analgesia Consumption (Mean±SD)	56.25±19.67	191.43±19.11	<0.05
Patient Satisfaction (Mean±SD)	8.74±0.71	6.90±0.65	<0.05

Table 2: VAS score AT 0, 2, 6, 8, 12 & 24 hours postoperatively Descriptive Statistics

	Group	N	Mean ± Std. Dev	Statistical Significance (p-value)
VAS_0	USG-guided TAP Block	35	0 ± 0	-
	Wound Site Infiltration	35	0 ± 0	
VAS_2	USG-guided TAP Block	35	0 ± 0	-
	Wound Site Infiltration	35	0 ± 0	
VAS_6	USG-guided TAP Block	35	0.03 ± 0.17	<0.05
	Wound Site Infiltration	35	4.09 ± 0.66	
VAS_8	USG-guided TAP Block	35	2.29 ± 0.71	<0.05
	Wound Site Infiltration	35	5.06 ± 0.68	
VAS_12	USG-guided TAP Block	35	1.54 ± 0.66	<0.05
	Wound Site Infiltration	35	5.63 ± 0.55	
VAS_24	USG-guided TAP Block	35	2.57 ± 0.95	<0.05
	Wound Site Infiltration	35	6.29 ± 0.62	

Table 3: Time of first request of rescue analgesia

			Group		Total
			USG-guided TAP Block	Wound Site Infiltration	
Time to first request (hrs.)	6 hr.	Count	0	29	29
		% within Time to first request(hrs)	0.0%	100.0%	100.0%
	8 hr.	Count	0	6	6
		% within Time to first request(hrs)	0.0%	100.0%	100.0%
	12 hr.	Count	1	0	1
		% within Time to first request(hrs)	100.0%	0.0%	100.0%
	24 hr.	Count	7	0	7
		% within Time to first request(hrs)	100.0%	0.0%	100.0%
Total		Count	8	35	43
		% within Time to first request(hrs)	18.6%	81.4%	100.0%

DISCUSSION

The observations and results in both groups were tabulated and analyzed using various statistical tests. The analysis of the study is as follows.

The two groups were comparable with regard to the demographic profile. Thus any error in the interpretation of data, which could arise as a result of demographic differences was eliminated. Our results were similar to the results of the study done by Abdel Z et al (2018) and Paul D et al (2020) in which no statistically significant difference between the two groups regarding demographic data was found ($p >0.05$).[14,15]

In Group T and Group I at hour zero and two hours in the postoperative period, the mean VAS score was 0, which may be attributed to the effect of spinal anaesthesia. The mean VAS score in Group I was significantly higher than Group T from the 6th hour postoperatively and thereafter till 24 hours which was statistically significant ($p<0.05$). Also, the total analgesic requirement in 24 hours in the TAP block group was much lower than the local wound infiltration group, as found in the comparison of their means. The difference was strongly significant statistically with $p < 0.05$. It was observed that at hours 0 and two postoperatively neither of the group asked for rescue analgesia. It was observed, that the total number of patients requesting the first dose of rescue analgesia, their proportion was higher in Wound Site Infiltration subjects in comparison to the TAP Block group at all the studied recorded time periods i.e. 6 hrs, 8 hrs, 12 hrs, and 24 hrs. The proportion was significantly low ($p<0.05$) for the first request of analgesia in TAP Block subjects. The results corroborated with the results in the study done by Gorkem et al and Aydogmus MT et al.[16,17] Our study was also supported by the results of the study done by Abdel Z et al,[15] Mankikar MG et al,[18] and Nanze Yu et al,[19] who conducted a meta-analysis of randomized control trials.

The mean patient satisfaction score was higher in the USG-guided TAP block in comparison to the Wound Site Infiltration group, which was statistically significant ($p<0.05$). The result correlates with the study of Belavy D et al,[4] and Tan et al,[20] who reported that patients who received the TAP block had statistically significant higher satisfaction scores.

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CONCLUSION

Thus on the basis of the data collected and the result computed it was inferred that the USG-guided transverses abdominis plane block provided much better analgesia and better patient satisfaction, with much less requirement for rescue analgesia and total analgesia consumption in 24 hours as compared to local wound site infiltration. It is concluded that the postoperative analgesic efficacy of USG-guided TAP block is better than local wound site infiltration.

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