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Preemptive Analgesia of Ultrasound – Guided Transversus Abdominis Plane Block Compared with Deep Wound Infiltration in Patients Undergoing Urological Surgery

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Abstract

Background: Transversus abdominus plane (TAP) block is suitable for unilateral urologic surgeries. Blind TAP block has many complications and uncertainty of its effects. Use of ultrasonography increases the safety and efficacy. This study was conducted to evaluate the analgesic efficacy of ultrasound (USG) guided TAP block compared with wound infiltration with bupivacaine (0.25%) in patients undergoing urologic surgeries.

Methods: In a prospective study, 40 patients undergoing elective unilateral urological surgeries as nephrolithotomy were divided into two groups , The TAP group (n=20) received TAP block with 0.25% bupivacaine (30mL) and infiltration group (n=20) the skin and subcutaneous tissues of the surgical incision and deep muscle layers were infiltrated with 0.25% bupivacaine (50ml). Pethidine 1 mg/kg was given as rescue analgesic at VAS more than 3 at rest and on movement.

Total dose of pethidine, VAS at rest and on movement, sedation score and the number of patients experiencing vomiting or pruritis were recorded.

Results: Patients of TAP group had significantly lower VAS score, lower pethidine consumption with less incidence of complications as vomiting and pruritis. There was insignificant difference between study groups as regards sedation score.

Conlusion: The USG TAP block is easy to perform and more effective as a postoperative analgesic regimen in urologic surgeries with opioid sparing effects and without any complications compared with wound infiltration technique.

Keywords
Transversus, Block, Infiltration, Urology, VAS, Vomiting, Pruritis, Pethidine

Introduction

Pain after urologic surgeries is common and expected so it should be treated adequately to avoid postoperative complications and the development of chronic pain [1].

The most common approach to postoperative pain relief for urologic surgeries is multimodel using non-steroidal anti-inflammatory drugs, opoids and local infiltration of anesthetic. Opioids are effective for treatment of postoperative pain but can cause adverse effects such as nausea, vomiting, decreased gastrointestinal motility, respiratory depression and sedation which further increase the morbidity of the patients. Local infiltration does not relieve deep muscular pain and NSAIDS are nephrotoxic [2].

In the last decade, a novel approach to block the abdominal wall neural afferents via the lumbar triangle of petit has been described by Ref., in (2001). Known as transverses abdominus plane block (TAP) [3]. However, landmark technique is associated with difficulties like anatomical variation of triangle of petit [4], difficulty in palpation of angle in obese patients and complications like liver injury, nerve injury and un predictable spread of local anesthetic [5].

Hebbard et al. (2007) have subsequently described the ultrasound guided approach to the TAP block [6,7]. Real time ultrasound provides reliable imaging of urea muscular layers of anterolateral abdominal wall and assessment of correct needle placement and local anesthetic injection thus increasing the success rate and safety of TAP block compared to the landmark technique [8].

The aim of our study was to evaluate the analgesic efficacy of ultrasound guided TAP block by comparing it with bupivacaine wound infiltration in patients undergoing urologic surgeries.

Patients and Methods

Following approval of the medical ethical committee of Ain Shams University, 40 patients ASA I-II physical status that were scheduled for elective urologic surgeries via abdominal wall incision under general anesthesia were included in this prospective study. All patients provided written informed consent.

Patients with known allergy to any of the study medications, receiving medical therapies producing tolerance to opoids, with coagulapolly, and psychiatric problems were excluded.

A preoperative evaluation was performed the day before surgery. Patients were divided into two groups: The TAP group (n=20) received

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TAP block with 0.25% bupivacaine (30mL) and infiltration group (n=20) the skin and subcutaneous tissues of the surgical incision and deep muscle layers were infiltrated with 0.25% bupivacaine (50ml), patients were monitored with electrocardiogram, invasive and non invasive arterial blood pressure, arterial oxygen saturation, end-tidal carbon dioxide monitoring.

All had standardised general anesthesic induced by intravenous fentanyl (1.5 μ/kg), thiopental Na (3-5 mg/kg) and rocuronium (0.25 mg/kg). Anesthesia was maintained with 100% oxygen and 1.2% Isoflurane and patients were mechanically ventilated to maintain the end expiratory carbon dioxide from 34-36 mmHg.

Following induction patients allocated to unilateral TAP block had these performed with alogig e ultrasound (General electric medical systems, Milwoukee, Wisconsin, USA) and a linear 7-11 MH Z ultrasound transducer.

In a sterile manner the block was performed with a 20 gauge, 100 mm Facette, tip needle using an inplane technique.

Bupivacaine was injected after negative aspiration. The drug was seen spreading in TAP as a dark oval shape while in the infiltration group, the borders of the surgical wounds were infiltrated with 10 ml of 0.25 % of bupivacaine before incision. Inj. Diclofenoc sodium 1.5 mg/kg/IM was given to every patient before extubation. After fulfilling of the criteria of recovery, patients were shifted to the post anesthetic care unit.

At the end of the surgical procedure, the surgeon infiltrated the muscle and subcutaneous layers of the wound with 40 ml of 0.25% of bupivacaine during stages of closure.

Postoperative pain was evaluated at rest and on movement using 10cm visual analogue scale where 0 = no pain and 10 = worst imaginable pain [9].

Pethidine consumption were recorded postoperatively in the post anaesthesia care unit at 24 hours. The presence and intensity of side effects (vomiting) was assessed in the post anesthesic care unit at 24 hours after surgery.

Sedation was rated using Ramsay sedation score (1 = awake and alert, 2 = quietly awake, 3 = a sleep but easily aroused, 4 =brisk response to loud auditory stimulus, 5= sluggish response to loud auditory stimulus ., 6 = deep sleep [3].

Statistical Analysis

All analysis by SPSS version 7.1. The minimal sample was less than or equal 20 by type I error 5% and type II error 10% with power of test 90% by med colcu. 7.2.

Demographic CCC, dose of postoperative analgesics, type of surgical procedures and vomiting and pruritis were compared between groups by means of t/x^2 and a P-value ≤0.05 was consider as statistical limit.

Variables were shown as mean ± SD (age, BMI and dosage of postoperative analgesics) or range variables as sex, type of surgical procedures and vomiting were shown as percentage.

VAS at rest, VAS at movement and sedation score were compared between groups by means of Mann-Whithy test and P-value ≤ 0.05 was considered as statistical limit.

Results

The demographic characteristics and surgical factors were similar between the study groups (Table 1).

The presence of vomiting was assessed in the ICU.

The number of patients who had vomiting was significantly less in the TAP group compared to the infiltration group as 24 hours total dose of rescue analgesic (pethidine) was significantly less in TAP group Compared to the infiltration group , (as shown in table 2).

The mean rescue analgesic requirement in the TAP group (122.33 ± 10.17) and the infiltration group(215 + 10.17) respectively (as shown in table 2).

Comparison of the groups for rest and movement pain scores showed a statistically significant difference between groups. The TAP group had lower rest pain scores then infiltration group at 2, 6, 10, 12, 18 hours postoperatively (as shown in table 3, figure 1).

The TAP group had significantly lower movement pain scores than infiltration group at 2, 6, 10, 12 hours postoperatively (as shown in table 4, figure 2).

Comparison of groups for sedation scores there was no significant difference between the study groups at all time points (as shown in table 5, figure 3).

Discussion

In this prospective clinical trial, patients who received unilateral TAP block had significantly less pain and reduced pethidine

Table 1: Demographic characteristics and surgical factors among the study groups.

		Groups		Test	
		TAP Group	Infiltration Group	t/X^2	P-value
Age	Range	25.000-49.000	25.000-49.000	-0.456	0.652
	Mean ± SD	33.067±8.868	34.467±7.927		
BMI	Range	25.000-56.000	23.000-30.000	1.174	0.250
	Mean±SD	29.067±7.667	26.667±1.988		
Sex	Female	8(53.33%)	9(60.00%)	0.136	0.713
	Male	7(46.67%)	6(40.00%)		
Type of surgical procedures	A	6(40.00%)	3(20.00%)	2.039	0.361
	B	6(40.00%)	6(40.00%)		
	C	3(20.00%)	6(40.00%)		

BMI=body mass index A=pyelolithotomy B=nephrolithotomy C=radical nephrectomy.

Table 2: Comparison of the dose of rescue opioids and incidence of complications between the study groups.

		Groups		Test	
		TAP Group	Infiltration Group	t/X^2	P-value
Pethidine Dose	Range	100.000-150.000	200.000-230.000	-20.376	<0.001*
	Mean ± SD	122.333 ± 14.376	215.000 ± 10.177		
Vomiting		1(6.67%)	6(40.00%)	5.058	0.025*
Pruritis		0 (0.0%)	4 (40%)	3.813	0.048*

Table 3: Comparison of the VAS at rest among the study groups.

VAS at rest		Groups		Mean Rank		Mann-Whitney Test	
		Group I	Group II	Group I	Group II	Z	P-value
T 2	Range	1-2	7-8	8.000	23.000	-4.845	<0.001*
	Median (IRQ)	1(1)	7(1)				
T 6	Range	1-2	7-8	8.000	23.000	-4.845	<0.001*
	Median (IRQ)	1(1)	8(1)				
T 10	Range	3-4	7-10	8.000	23.000	-4.792	<0.001*
	Median (IRQ)	3(1)	8(1)				
T 12	Range	3-4	7-9	8.000	23.000	-4.795	<0.001*
	Median (IRQ)	3(1)	8(1)				
T 18	Range	4-5	9-10	8.000	23.000	-4.916	<0.001*
	Median (IRQ)	4(1)	9(0)				
T 24	Range	5-6	5-6	15.000	16.000	-0.372	0.710
	Median (IRQ)	5(1)	5(1)				
Friedman Test	X^2	71.018	60.493				
	P-value	<0.001*	<0.001*				

T2=2 hrs postoperative T6=6 hrs postoperative T10=10 hrs postoperative T12=12 hrs postoperative T18=18 hrs postoperative T24=24 hrs postoperative.

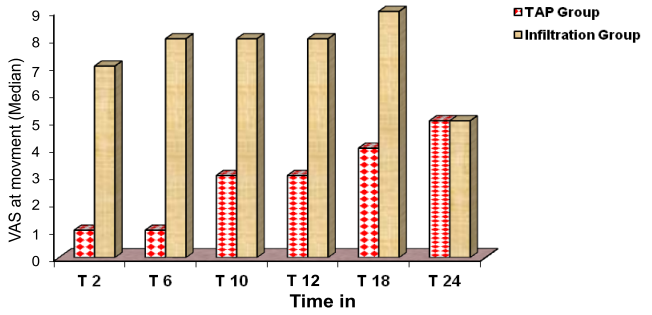

Figure 1: Comparison of the VAS at rest among the study groups.

Table 4: Comparison of VAS at movement between the study groups.

VAS at movement		Groups		Mean Rank		Mann-Whitney Test	
		Group I	Group II	Group I	Group II	Z	P-value
T 2	Range	2-7	7-10	8.033	22.967	-4.747	<0.001*
	Median (IRQ)	2(1)	8(1)				
T 6	Range	2-3	7-10	8.000	23.000	-4.819	<0.001*
	Median (IRQ)	2(1)	8(1)				
T 10	Range	3-4	7-10	8.000	23.000	-4.805	<0.001*
	Median (IRQ)	4(1)	9(1)				
T 12	Range	3-4	3-10	8.900	22.100	-4.277	<0.001*
	Median (IRQ)	4(0)	8(1)				
T 18	Range	5-6	5-6	14.000	17.000	-1.077	0.281
	Median (IRQ)	5(1)	6(1)				
T 24	Range	5-6	5-6	15.500	15.500	0.000	1.000
	Median (IRQ)	5(1)	5(1)				
Friedman Test	X^2	64.639	57.853				
	P-value	<0.001*	<0.001*				

T2=2 hrs postoperative T6=6 hrs postoperative T10= 10 hrs postoperative T12= 12 hrs postoperative T18=18 hrs postoperative T24= 24 hrs postoperative.

Table 5: Comparison of Ramsey sedation score among the study groups.

Sedation score		Groups		Mean Rank		Mann-Whitney Test	
		Group I	Group II	Group I	Group II	Z	P-value
T 2	Range	1-6	1-6	15.133	15.867	-0.234	0.815
	Median (IRQ)	2(4)	2(3)				
T 6	Range	1-6	1-6	14.367	16.633	-0.729	0.466
	Median (IRQ)	2(2)	2(1)				
T 10	Range	1-5	1-6	14.967	16.033	-0.340	0.734
	Median (IRQ)	2(3)	2(3)				
T 24	Range	1-6	1-6	14.233	16.767	-0.822	0.411
	Median (IRQ)	2(2)	2(2)				
Friedman Test	X^2	1.626	1.219				
	P-value	0.654	0.749				

T2=2 hrs postoperative T6=6 hrs postoperative T10= 10 hrs postoperative T24=24 hrs postoperative.

requirements with less rate of vomiting and pruritis compared with wound infiltration with bupivacaine so TAP block proved to be a more effective method.

There are many other studies showing the efficacy of TAP blocks in different patient populations. Although Griffiths et al. reported that TAP block was not effective in reducing postoperative pain after gynaecological cancer surgery [10]. Carney et al. Compared TAP block with placebo after TAH and found it effective [11].

We Compared TAP block with incisional local anaesthetic a technique which is controversial. Wound infiltration was found to be effective in reducing rest pain where as TAP block was effective against both rest and movement pain for longer duration [12].

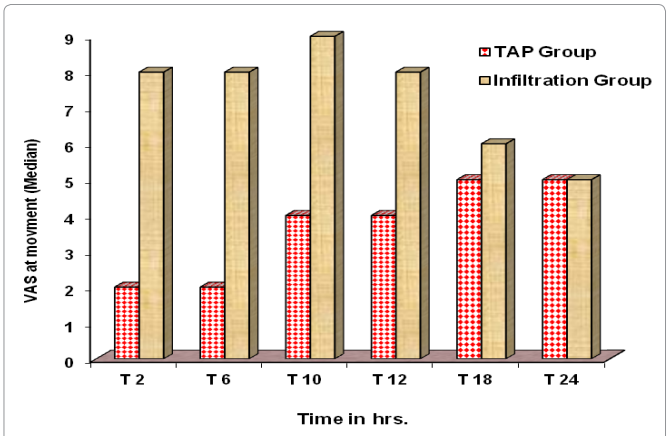

Figure 2: Comparison of the VAS at movement among the study groups.

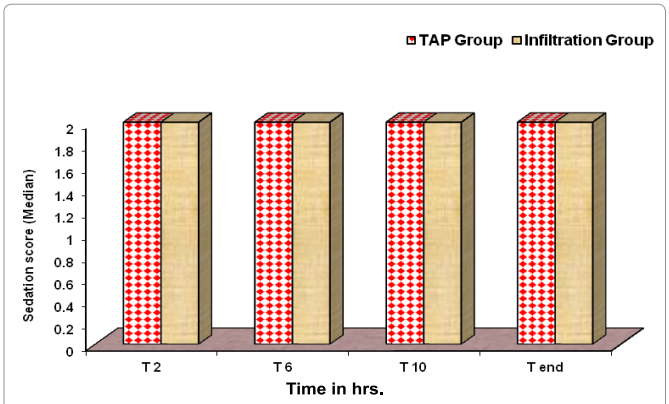

Figure 3: Comparison of sedation score among the study groups.

A more likely explanation is that pain arising from viscera is of greater significance than that arising from cutaneous and muscle layer of a wound incision, so ,infiltration is not so effective in reducing post operative pain in patients undergoing renal surgeries.

The USG-guided sensory block of anterior abdominal wall with local anesthesia for postoperative pain relief is on a attractive and successful method. USG-guided TAP block has been shown to be a promising technique for provided analgesic after surgery involving anterior abdominal wall and no complications related to the procedure were observed. Recently a subcostal injection technique was described by Hebbard et al. in which local anaesthetic is delivered in the same plane with insertion of needle at the xiphoid and the needle path to the costal margin [7]. Lee et al. compared the extent of sensory block following posterior and Subcostal approaches to ultrasound guided TAP block and considered approach was appropriate for lower abdominal surgeries [13-15].

Conclusion

On conclusion in this study ultrasound guided TAP black reduced postoperative rest and movement pain and analgesic requirement after urologic surgeries and was more effective than wound infiltration.

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