

The analgesic efficacy of continuous transversus abdominis plane block in renal transplant recipients

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Abstract

Background and Aims: Transversus abdominis plane (TAP) block is suitable for operations where parietal pain is a major cause of pain. Renal transplant recipients are ideally suited to gain maximum benefit from TAP block as the incision classically involves the lower abdomen. This study was conducted to evaluate the analgesic efficacy of continuous TAP block in transplant recipients.

Material and Methods: In a prospective double-blind study, 40 chronic renal failure patients undergoing open renal transplant were randomly divided into two groups. At the end of surgery during closure, a multiorifice epidural catheter was placed in TAP plane. Study group (Group S) received Inj bupivacaine bolus 1 mg/kg (0.25%) followed by infusion 0.25 mg/kg (0.125%) through the catheter, whereas control group (Group C) received normal saline through the catheter. Inj pentazocine (0.3 mg/kg) was given as rescue analgesic at visual analogue score (VAS) > 3 in any group at rest or on movement. The analgesic efficacy was judged by VAS, time of first rescue analgesic, and total analgesic consumption in 24 h.

Results: Patients in Group S had significant lower VAS scores, longer time to first rescue analgesic (270 ± 347.96 vs. 42.85 ± 32.27 min) and lower pentazocine consumption (9.75 ± 13.95 vs. 56.42 ± 12.46 mg) in 24 h. There was significant sedation in Group C.

Conclusion: The TAP catheter technique for postoperative pain control after renal transplant has proved to be effective in relieving the postoperative pain after renal transplant with less pentazocine requirement and less sedation.

Key words: Drugs-Bupivacaine and pentazocine, renal transplant

Introduction

Postoperative pain management is important for successful outcome of any surgery. There are various analgesic options like systemic opioids, neuraxial blocks, non steroidal anti inflammatory drugs (NSAIDs), local infiltration, and so on; however, in renal transplant patients systemic opioids are used with caution because of altered pharmacodynamics and opioid-related side effects. Neuraxial blocks are not much preferred because of altered coagulation profile. NSAIDs are avoided

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as they are nephrotoxic. Local infiltration is not very effective in relieving deep muscle pain. Hence, we decided to explore an alternative technique for postoperative analgesia in the form of continuous transversus abdominis plane (TAP) block.

TAP block was first described by Rafi in 2001.^[1] It is more suitable for operations where parietal pain is a major cause of pain. Renal transplant recipients are ideally suited to gain maximum benefit from TAP blocks as the incision involves the lower abdomen which is usually covered by this block without any intraperitoneal extension eliminating the visceral pain component.^[2]

Results of various trials suggest that the effect of single shot TAP block lasts for variable duration of time hence, we decided to insert catheter in TAP plane under direct vision to increase the duration of analgesia.^[3]

Material and Methods

After obtaining approval by the hospital ethical committee and written informed consent, 43 American Society of

Anesthesiologists risk III patients scheduled for open iliac fossa renal transplantation were enrolled in a prospective, randomized, double-blind, controlled study. This study was performed between May 2010 and August 2010. All the patients undergoing open renal transplantation were included in the study.

Patients allergic to local anesthetics drugs, opioid addicts, hepatic disease and psychiatric disorders were excluded from our study.

Patients were randomly allocated to Group S (study group) and Group C (control group) by sealed envelope method. The patients, observer, and staff providing postoperative care were blinded to group assigned.

All patients received balanced general anesthesia. Pulse, electrocardiogram, noninvasive blood pressure, peripheral oxygen saturation (spo₂), end-tidal CO₂ (ETCO₂), central venous pressure were monitored throughout the procedure and urine output was measured after clamp release. Abdominal closure was done in two layers. Transversus abdominis muscle (TA) was closed by continuous suture using Vicryl No. 1. A multiorifice epidural catheter was placed above the approximated transversus abdominis, through an epidural needle. About 5-6 cm of catheter was positioned between the TA and internal oblique muscles (IOMs). The needle was removed and surgical wound was closed. The catheter was secured to the skin and standard epidural catheter dressing was applied. [Figures 1 and 2] After closure of wound, before reversal 1 mg/kg of 0.25% bupivacaine for Group S or normal saline for Group C was given as a bolus. This was followed by an infusion of 0.125% bupivacaine at 0.25 mg/kg/h for Group S and an infusion of normal saline for Group C in postoperative room by the infusion pump.

Visual analogue score (VAS) at rest and movement was noted at the interval of 2,4,6,12 and 24 h. postoperatively.

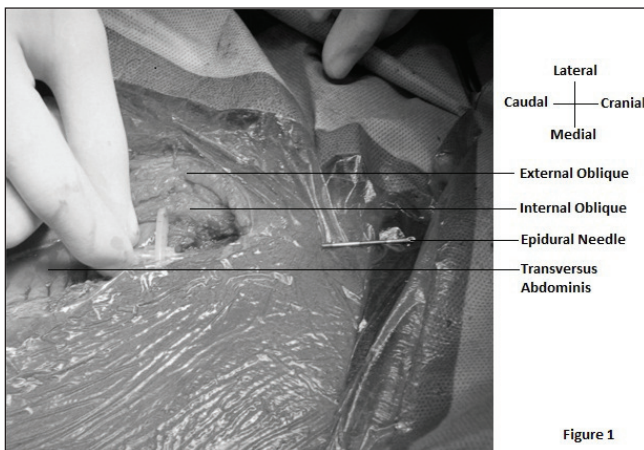


Figure 1: Insertion of epidural needle in transversus abdominis plane

When VAS score was more than 3, inj. pentazocine 0.3 mg/kg was given as a rescue analgesic. Time for the first request of rescue analgesic and total pentazocine consumption in 24 h. was noted. Side effects due to pentazocine and complications related to catheter were also noted. Sedation scores were assigned by the investigator using a sedation scale (awake and alert = 0, asleep but easily aroused = 2, deep sleep = 3).^[4] Antiemetics, that is, inj ondansetron 8 mg were given to any patient who complained of nausea or vomiting and to all patients who received pentazocine. The primary outcome measure in this study was 24 h opioid (pentazocine) consumption. Secondary outcome measures included time to first request for analgesic, VAS score, and side effects associated with pentazocine consumption like nausea and sedation score.

The sample size was calculated on the basis of 24 h pentazocine consumption for the patients undergoing open renal transplantation. We conducted a pilot study which showed 24 h pentazocine consumption of 39 ± 13.4 mg in control group versus 18 ± 16.4 mg in study group.

Based on this pilot study, we calculated 16 patients per group would be required to get a power of 95% and α error of 0.05.

Statistical analysis

Statistical analysis was performed using statistical package of social sciences, that is, SPSS version 12. Data are expressed as mean ± standard deviation for continuous variables and number (%) for categorical variables. Continuous variables were compared using independent two sample t-test. Fisher's exact test and chi-square analysis was used for comparing categorical data. P values <0.05 were considered to be statistically significant.

Results

In total, 43 patients were enrolled for the study. The catheter was blocked in one patient in each group and there was

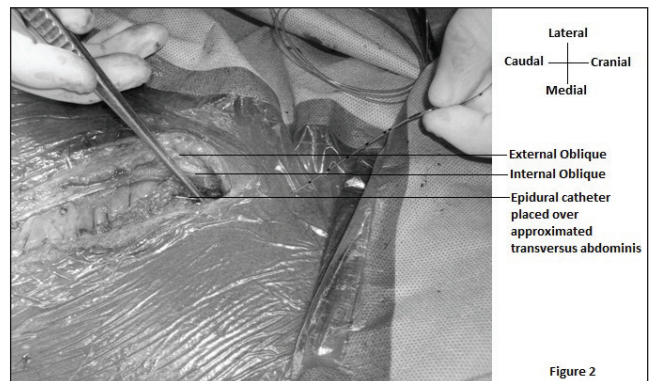


Figure 2: Placement of epidural catheter

accidental removal of catheter in one patient of Group S. So they were excluded from the study. Total 40 patients, 20 in each group were analyzed. There was no significant difference in demographic profile as well as duration of anesthesia and surgery between the two groups [Table 1].

VAS pain scores were significantly high in Group C compared to Group S at rest and on movement [Figures 3 and 4 and Tables 4 and 5]. Patients in Group S had significantly longer Time for first analgesia (TFA) request than those in Group C. Total consumption of pentazocine was higher in Group C (56.42 ± 12.46 mg) as compared with Group S (9.75 ± 13.95 mg). Total number of patients requiring rescue analgesia in Group S was only 9 as compared with Group C where all patients required rescue analgesia [Table 2].

Postoperative sedation score was higher in Group C [Table 3]. There was no hematoma or infection near surgical wound in both the groups. There were no signs of systemic toxicity of local anesthetic in any of our patients.

Discussion

Preexisting pain, anxiety, fear of graft rejection, and emotional stress increase the risk of significant postoperative pain in renal transplant patients.

Main principle of TAP block is to deposit local anesthetic in plane between IOM and transversus abdominis muscle to block the sensorimotor innervations of the anterior abdominal wall which is supplied by anterior rami of the spinal segmental T7-T11.^[4] It can be single shot or continuous via catheter to prolong its analgesic effect. TAP catheter can be placed either guided by ultrasonography or by open technique.^[5] We kept epidural catheter in TAP plane by open technique for 24 h as there is significant decline in the use of analgesics

in renal transplant recipients from the 2nd day after surgery and usually they are switched over to oral analgesics.

VAS scores were significantly higher in Group C compared with Group S both at rest and on movement all throughout 24 h. In study by Mukhtar and Khattak^[2] pain scores up to 12 h were similar to our study; however, there was no difference in pain at 24 h in two groups probably because they gave a single shot block in their study.

Table 1: Demographic profile

Demographic characteristics	Control	Study	P value
No. of patients	20	20	
Age (years)	44.47±12.78	37.35±11.17	0.064
Sex (M/F)	18/2	18/2	
Height	158.33±7.08	163.8±9.19	0.04
Weight	57±8.93	56.35 ±9.83	0.826

F = Female, M = Male

Table 2: Postoperative analgesic requirement in 24 h

Block characteristics	Control	Study	P value
TFA (in hours)	42.85±32.27	270±347.96	0.001
Total pentazocine consumption in 24 h	56.42±12.46	9.75±13.95	<0.0001
No. of patients requiring additional doses of pentazocine	20	9	<0.0001

Table 3: Postoperative sedation score

Group (h)	Control (n = 20)	Study (n = 20)	P value
2 h	0.61±0.74	0	0.001
4 h	0.71±0.90	0	0.0016
6 h	0.85±0.72	0.35±0.74	0.033
12 h	0.52±0.51	0.40±0.59	0.481
24 h	0.38±0.49	0	0.002

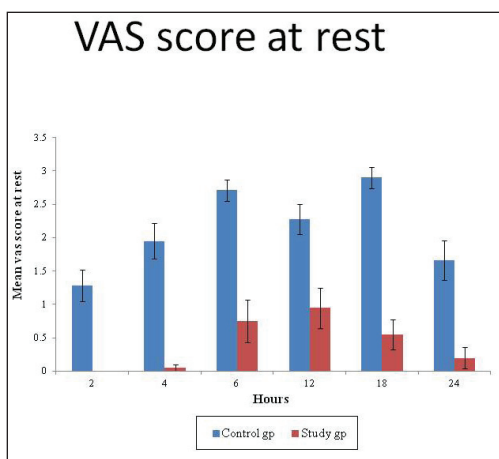


Figure 3: Graph depicting visual analogue score score at rest

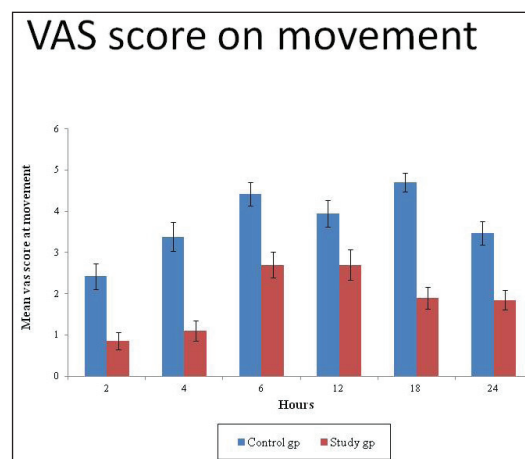


Figure 4: Graph depicting visual analogue score score on movement

Table 4: Visual analogue score at rest

Time (h)	Control	Study	P value
2 h	1.28±1.05	0.00	0.0001
4 h	1.95±1.20	0.05±0.22	0.0001
6 h	2.73±0.71	0.75±1.44	0.0001
12 h	2.28±1.00	0.95±1.35	0.001
18 h	2.90±0.70	0.55±0.99	<0.0001
24 h	1.66±1.31	0.2±0.69	0.0001

Table 5: Visual analogue score scores on movement

Time (h)	Control	Study	P value
2	2.42±1.43	0.85±0.93	0.0002
4	1.95±1.2	1.10±1.07	0.0001
6	4.42±1.24	2.70±1.38	0.0002
12	3.95±1.43	2.70±1.65	0.013
18	2.90±1.70	1.90±1.16	<0.0001
24	3.47±1.28	1.85±1.03	0.0001

The first dose of rescue analgesia was required after about 270 ± 347.96 min and total consumption of pentazocine (opioid) in 24 h was higher in Group C. In a study by Jankovic *et al.*,^[5] where they gave continuous TAP block in seven patients for renal transplant. There was 80% reduction in morphine requirement during the first 24 h.

Our result regarding opioid consumption in first 24 h is not similar to the result shown by Wong *et al.*,^[6] where unilateral TAP block was given prior to general anesthesia in renal transplant patients. In their study, median fentanyl consumption was lower at 2, 4, and 6 postoperatively in TAP block group but did not reach statistical significance.

No significant postoperative nausea vomiting (PONV) was observed in both the groups as prophylactic ondansetron was given. Sedation score was higher in control group which is similar to study done by Mukhtar *et al.*^[2]

There was no hematoma or infection near surgical wound. There was minimal chance of hematoma as catheter was placed under direct vision minimizing chances of inadvertent vascular injury. These patients are more prone to infection as they are immunocompromised. To prevent TAP catheter-related infection, the catheter was removed after 24 h and patients were switched over to oral analgesics as it is an extraperitoneal surgery.

We preferred open technique as TAP plane in renal transplant is accessed without any major dissection. Catheter placement is also very easy. It is not a blind technique with minimal probability of injury to surrounding structures or inadvertent intravascular injection. Open technique allows anatomically accurate placement of the TAP catheter and prolongs the analgesic effect of the TAP block. From this study, it seems that TAP block holds considerable promise for patients undergoing renal transplant; however, further large well-controlled studies are required in terms of its safety, optimal dose, and volume of local anesthetic before it can be implemented in routine clinical practice.^[7]

Conclusion

The transversus abdominis plane catheter technique for postoperative control after renal transplant has proved to be of equal efficacy in relieving the postoperative pain after renal transplant.

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