

Comparison of Analgesic Efficacy of Transversus Abdominis Plane Block Versus Infiltration of Local Anaesthetic into Surgical Wound In Emergency Laparotomies: A Randomized Control Trial

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Abstract

Objective: To compare mean pain score of bilateral TAP block versus infiltration of local anaesthetic into surgical wound on for emergency laparotomies.

Method: Randomized control trial. Emergency Operation Theatre in Department of Anaesthesiology at Mayo Hospital, Lahore from 1st April 2016 to 31st October 2016. Laparotomy 150 patients were arbitrarily allocated two groups Group T (receiving bilateral TAP block) and Group L (local infiltration) by random number table method after informed consent. TAP block was administered bilaterally by using 20ml of 0.25% bupivacaine in group T using a 21-gauge needle with the help of “Double Pop Technique” at midaxillary point at height of umbilicus. While in group L surgical incision site was injected with 20ml of 0.25% bupivacaine immediately after closure of skin. Pain was evaluated by Visual analogue scale (VAS) at 6-hour interval postoperatively. Results were statistically analysed using SPSS version 20.0 and t-test was applied to compare mean pain score of two groups.

Results: Mean pain score in patients receiving bilateral TAP block 3.000 ± 0.717 were significantly reduced (p value 0.003) versus mean scores in patients receiving infiltration of local anaesthetic into surgical wound in emergency laparotomies 6.08 ± 1.171 .

Conclusion: Bilateral TAP block reduced post-operative pain significantly in patients undergone emergency laparotomy.

Key Words: Emergency laparotomy, TAP block, local anaesthetic, bupivacaine, post-operative pain, analgesia.

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Introduction

Effective pain relief is required in patients who have undergone exploratory laparotomy since pain has many adverse effects on various systems of the body.¹ Respiratory complications are much more common due to inadequate post-operative analgesia after major abdominal surgery leading to inadequate respiratory effort that results in basal atelectasis and

retention of secretions.^{11,12} Post-operative pain if not addressed properly it may lead to delayed ambulation resulting in increased chances of deep venous thromboembolism.² Anxiety and distress related to pain affect quality of life of patient. Prolong hospital stays due to inadequate post-operative analgesia leads to financial burdens.¹³ Thus, adequate post-operative analgesia leads to prompt ambulation, increases comfort level of the patient and helps him to return to regular routine of life earlier.¹⁴

Multimodal analgesia is considered as an efficient way to cater post-surgical pain and in reducing adverse effects associated with heavy doses of opioids and NSAID's.³ With recent advancement in technology regional nerve blocks are gaining popularity. As component of multimodal analgesia, they reduce dosage requirements of analgesic drugs and many untoward side effects associated with them.¹⁵ Along

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with peripheral nerve blocks administration of local anaesthetic into surgical wound is an ancient technique that is still in use by numerous surgeons and anaesthetists. There are various peripheral nerve blocks that have been used to reduce pain post-operatively but TAP block has been found very effective in mitigating pain after major abdominal surgeries.^{10,17} The anterior abdominal wall is supplied by dermatomes from T6 to L1 and TAP block numbs those nerves. This block was originally elaborated in the “lumbar triangle of Petit” in 2001 by Rafi by using conventional landmarks. Local anaesthetic is inoculated in the fascial plane that exists between two muscles transverse abdominis muscle and internal oblique muscle through which these sensory nerves pass. TAP block is an efficient analgesic method with additional benefit of intact motor and autonomic control in all abdominal procedures and permits early mobilization.^{4,16,18} Parasa et al piloted an analysis in which efficiency of TAP block was evaluated post-operatively after open abdominal surgeries. They found pain was less intense in patients receiving TAP block (48.07 ± 6.76) in comparison to those patients who don't get block (62.63 ± 6.66). They also concluded that this results in 36% reduction in entire tramadol intake in TAP block group. Thus, TAP block being a component of multi-modal analgesia has effective part in reducing post-surgical pain and doses of other analgesic drugs.^{5,19} Though there were multiple studies available that prove pain-relieving efficacy⁹ of TAP block but there were no studies available for comparison of mean pain score of transversus abdominis plane block versus infiltration of local anaesthetic into surgical wound in emergency laparotomies. So in this trial we compared effectiveness of bilateral TAP block with infiltration of local anaesthetic into surgical wound in emergency laparotomies. This study would provide baseline data for local population and would help to mitigate post-operative pain in patients undergoing emergency laparotomies.

Methods

After endorsement from Ethical committee, randomized control trial was performed at Emergency department of Mayo Hospital, Lahore. Patients were included with non-probability consecutive sampling. Patients of either gender between 20 to 80 years, ASA I,II,III scheduled for emergency laparotomy for vis-

cous perforation were included. Sample size of 150 cases (75 in each group) was calculated with 95% confidence interval, 80% power of test and taking expected mean \pm standard deviation of mean pain scores in both groups at 6 hour post-operatively with 3.33 ± 1.51 in TAP block group versus 5.67 ± 1.31 in control group in patients undergoing emergency laparotomies.⁵ Patients with established allergy to the study drug, with past account of opioid use or intolerance, obese (BMI > 40), known bleeding disorder or renal or hepatic disease, known psychiatric disorder, infection at site of injection were excluded from the study. Informed consent was obtained. Brief history was taken and related physical examination was performed. Investigations (complete blood count, platelet count, coagulation screening, and renal and liver function tests) were analysed. Patients were allocated randomly to Group T (receiving bilateral TAP block group) or Group L (local infiltration group) by using random number table in accordance with division ratio of 1:1. After shifting the patient to operating table, monitoring devices that includes pulse oximetry, electro-cardiographic monitoring and non-invasive blood pressure (NIBP) were attached and base line readings were obtained. Two large intravenous line were secured. Anaesthesia was induced with rapid sequence induction technique using injection propofol (2–3 mg/kg) and injection succinylcholine (1.5mg/kg). For analgesia injection nalbuphine (0.1 mg/kg) was given just before incision. Anaesthesia was continued with isoflurane and 50% nitrous oxide in concentration of 50% in oxygen according to need of the patient.

After completion of surgery for patients with viscous perforation, just before extubation, TAP block is performed with blunted 21-gauge needle in group T using “double pop technique” in supine position of patient by single administrator experienced in blind technique of TAP block. In above mentioned technique the skin and subcutaneous tissue was penetrated in midaxillary plane at the height of umbilicus at right angle to the skin till resistance is felt. The needle was forced slightly through this resistance till it penetrated the external oblique aponeurosis. With slight further penetration second loss of resistance could be appreciated as needle passed through aponeurosis of internal oblique. To check the desired plane 1 ml of drug was injected after careful aspiration. The feeling of considerable resistance on injecting drug indicated

misplaced needle tip obviating the need to reposition it. After readjustment 20 ml of 0.25% bupivacaine was infiltrated. The same method was used to administer block on other side. While in group L surgical incision site was injected with 20 ml of 0.5% bupivacaine before skin closure by surgeon. In both groups dose did not exceed more than 1mg/kg/side of 0.5% bupivacaine.

All patients were extubated and transferred to the postoperative ward. Patients were shown and instructed about VAS in the preoperative period. One end of which was marked as '0' representing no pain and the other one as '10' signifying severe most pain. Patients were requested to highlight the value that best contemplated their pain. Postoperative pain was measured by VAS at 6-hour interim post-operatively and pain scores were collected. Inj Tramadol 50 mg was administered as rescue analgesia if VAS was more

grading and mean pain score 6 hour post-operatively to deal with effect modifiers. Post-stratification t-test was applied.

Results

In this study 150 patients that underwent emergency laparotomies were studied. There were no patients that were excluded from study. There were 10 ASA II patients, 134 ASA III and 6 ASA IV patients. (Table 2) Out of these 110 were males and 40 were females. (Table 3)

Mean age in TAP block group patients was 56.85 ± 8.725 and mean age in patients receiving local anaesthetic infiltration into surgical wound was 57.71 ± 10.686 . Mean pain score in TAP block group was 3.00 ± 0.717 and mean pain score in patients getting local anaesthetic infiltration into surgical wound was 6.08 ± 1.171 . This difference in mean pain score was significant as p-value is 0.003 (p-value < 0.005).

Discussion

The result of our study shows there is considerable reduction in mean pain scores in TAP block group in comparison to patients receiving infiltration of local anaesthetics. Mean pain scores in patients with TAP block were 3.000 ± 0.717 as compared to group of patients receiving local anaesthetic infiltration 6.08 ± 1.171 with p value 0.003. Thus, TAP block causes more reduction in pain scores on VAS scale when compared to infiltration of local anaesthetic into surgical wound in emergency laparotomies. Paras et al. conducted a randomized control trial they include 60 patients from ASA state I to III that under-went emergency laparotomy. They administer TAP block before surgery in lumbar triangle of "Petit". They divided patients into two groups; one received 25ml of 0.25% bupivacaine and other got normal saline administered bilaterally. For post-operative pain tramadol was used along with intramuscular diclofenac sodium. Tramadol was administered with PCA (patient controlled analgesic) pump while dose of diclofenac sodium adjusted 12-hourly. The tramadol requirement at 2 hour and total given in 24 hours was measured along with assessment of pain and side effects of opioids. They found that TAP block group had mean pain scores 48.07 ± 6.76 with total tramadol intake in 24 hours 281.33 ± 69.66 mg when compared to the control group having mean scores for pain

Table 1: Frequency Distribution of Asa Grading

ASA	Frequency	Percent
ASA II	10	6.7%
ASA III	134	89.3%
ASA IV	6	4.0%
Total	150	100.0%

Table 2: Frequency Distribution of Gender Between Both Groups

Gender	Count/ percentage	Study groups		Total
		Local Infiltration	TAP Block	
Male	Count	56	54	110
	%	51%	49%	
Female	Count	19	21	40
	%	47.5%	52.5%	

Table 3: Mean Age of The Patients with Standard Deviation

Study groups	N	Mean	Std. Deviation
LOCAL INFILTRATION	75	57.71	10.686
TAP BLOCK	75	56.85	8.725

Table 4: Comparison of Mean Pain Scores of The Patient

Study groups	N	Mean	Std. Deviation	P - value
LOCAL INFILTRATION	75	6.08	1.171	0.003
TAP BLOCK	75	3.00	0.717	

There was statistically significant difference between MEAN PAIN SCORES of two study groups

than 5 at 6 hour interval postoperatively. Designated proforma was used to collect all data.

All statistical data was recorded and analysed in SPSS version 20.0. Data was stratified for age, gender, ASA

62.63±6.66 and tramadol intake 439±68.59 mg. Thus, our study is in consistency with the fact that TAP block significantly reduces mean pain scores but, in our study, comparison is made between TAP block and local anaesthetic infiltration. Similarly Vijayalakshmi et al. conducted study in patients undergoing gynaecological procedures in which open abdominal surgical approach used.⁶ He randomly allocated patients into group receiving TAP block and other group receiving local anaesthesia into surgical site. He administered 0.25% bupivacaine at dose of 0.6ml/kg bilaterally at height of umbilicus in triangle of “petit” after completion of surgery while other group got infiltration of local anaesthetic into surgical lesion just before extubation after placement of skin sutures. They recorded time at which patient demanded rescue analgesia and monitored intensity of pain at that moment by using VAS scale. They used morphine as rescue analgesia at dose of 0.1mg/kg and it was continuously administered thereafter with PCA pump for 24 hours. Total amount of morphine consumed in period of 24 hours post operatively calculated. They concluded that In Group T patients demanded foremost dosage of morphine considerably later and at that moment pain was not much intense as compared to other group (P = 0.001 and 0.003 respectively). Total intake of morphine in group receiving local anaesthetic was more as compared to TAP block group so the side effects of morphine also predominated in this group. Thus conclusion of their study was that transversus abdominis plane block is an effective modality to reduce pain with few adverse effects and their results are in line with our conclusion but we have done comparative study in patients undergoing exploratory laparotomy. Likewise, Priya et al conducted study in 60 patients who underwent major abdominal operations. They calculated doses of tramadol required post operatively at 24 hour time interval and at 48 hour time interval. According to their study, total amount of tramadol consumed in patients in TAP block in 24 hour time duration (210.05 ± 20.5 vs. 320.05 ± 10.6; P < 0.01) and at 48 hour interval (508.25 ± 20.6 vs. 550.25 ± 20.6; P < 0.01). They also concluded that time at which patient demanded first dose of analgesic drug was more as compared to other group (178.5 ± 45.6 vs. 23.5 ± 3.8; P < 0.001). Pain intensity measured at different

intervals in 24 hours period post operatively. Pain scores were significantly less in TAP block group contrary to other group.⁷ Thus, TAP block is very effective modality with crucial role in mitigation of pain post operatively. The results of our study add significance to above mentioned study and prove it to be more effective as compared to ancient technique of wound infiltration with local anaesthetic. Ejas et al. performed randomized control trial in patients who underwent single incision laparoscopic cholecystectomy.⁸ They performed TAP block under USG guidance with ropivacaine in concentration of 0.375% bilaterally in mid axillary plane in one group while other group received local anaesthetic infiltration at site of insertion of ports. They calculated amount of morphine required post operatively in 24 hours. Morphine requirement in group receiving TAP block was 34.57+14.67 mg as compared to other group in which values were 32.76+14.34 mg. They found TAP block did not cause significant reduction in post-operative analgesic requirement as compared to conventional methods. This is contrary to our result in which we found TAP block more effective. There are certain limitations of our study that it does not measure time of administration of first dose of analgesia, total dosage requirements of analgesia 24 hour post-operatively and incidence of nausea and vomiting.

Conclusion

Outcome of our study shows substantial reduction in mean pain scores after bilateral TAP block infiltration in patients with emergency laparotomy. Mean pain scores remain less than 4 on VAS pain scale in patients with TAP block. Hence it is concluded that TAP block significantly reduces pains score on VAS scale as compared to surgical wound infiltration with local anaesthetic in patients with emergency laparotomies. TAP block is better modality as part of multi-modal analgesia to reduce post-operative pain as compared to surgical wound infiltration with local anaesthetic.

Conflict of Interest: None

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preparation and editing, literature review

HNA: Manuscript preparation, proof reading and critically reviewed the article

LRB: Statistical analysis of the data

SNK: Data collection

FA: Data collection

Author's Contribution

AA: Concept, Conduction of study, manuscript