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Comparison of Tap Block vs Layer by Layer Local Anesthetic Infiltration Patients Undergoing Inguinal Hernia Repair

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ABSTRACT

Objective: To compare analgesic efficacy of Transverses Abdominis plane block and layer by layer local anesthetic infiltration patients undergoing inguinal hernia repair.

Study Design: Quasi-Experimental Study.

Place and Duration of Study: Anesthesia Department, Combined Military Hospital, Rawalpindi Pakistan, from Feb to Jul 2022.

Methodology: A total of 80 patients undergoing inguinal hernia repair under spinal anesthesia were enrolled in the study after random distribution and divided into two groups receiving localized wound infiltration (Group A) and receiving Transversus abdominis plane block (Group B). The primary determinants were request to first analgesia and mean total consumption of analgesia post-operatively. Additionally, determining variables were mean postoperative pain scores at 6, 12 and 24 hours.

Results: A total of 80 patients were enrolled in the study with a mean age of 37.53±9.32 years. There was a significantly prolonged time before patient requested first analgesic dose in Transverses Abdominis plane block group as compared to WI group (244.9±66.6 mins vs. 160.3±19.9 mins with a *p*-value<0.001). Increased dosage of Injection Nalbuphine (26.5±1.74 mg vs. 20.4±1.45 mg, *p*-value<0.001) and Injection Ketorolac (75.4±6.52 mg vs. 66.7±4.66 mg, *p*-value<0.001) were consumed in WI group as compared to TAP block group respectively.

Conclusion: TAP block achieves better analgesia when compared with WI as demonstrated increased time to first request for analgesic, lower pain scores and low total analgesic use on the zero post-operative day. The reduced total analgesic consumption can also potentially lead to lower side effect profile and increased satisfaction of patient in regards to postoperative pain control.

Keywords: Analgesia, Inguinal Hernia, Transversus Abdominis Plane Block, Wound Infiltration.

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INTRODUCTION

Inguinal hernia repair remains one of the most commonly performed surgical procedures in male population,[1] and post-operative pain remains one of its most commonly reported complaints. Better pain control not only leads to increased satisfaction in surgical patients, it also leads to earlier mobilization and decreased overall complications related to the surgery (as indicated by Enhanced recovery after surgery protocol).[2,3] Usually multimodal analgesia strategy for pain control is utilized and local infiltration of anaesthetic agent and/or regional block is a part of that strategy. Other components of multimodal analgesia include oral and/or parentral NSAIDs, opioids and other analgesics. The effectiveness of the regional block is usually assessed in terms of post-operative opioid and analgesic requirement and the duration for which analgesia lasts after a regional block.

Transverses Abdominis plane (TAP) block as an abdominal field block was first brought forth in 2001 by Rafi,[5] who used a landmark guidance to achieve a regional block of the ilioinguinal, iliohypogastric and lower subcostal nerves as they travel between the iliac crest and subcostal margin. TAP block is used to provide analgesia both per-operatively and post-operatively.[6,7] Nowadays, landmark guided technique is rarely used and most centers prefer the ultrasound guided TAP block which has been shown to be more effective in controlling per-operative and post-operative pain as compared to landmark guided ilioinguinal and iliohypogastric nerbe blocks.[8] Ultrasound guided technique for TAP block was first introduced by Hebbard *et al.*, in 2007 in adults and by Frederickson *et al.*, in 2008 in pediatrics.[9,10]

Local wound infiltration (LI) of local anaesthetic is a relatively simpler method of pain control. It is also

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cheaper and requires less expertise to perform. It is usually performed by the surgeon towards the end of the surgery. Since it is done under direct vision it could be argued that it is safer as compared to TAP block (while comparing iatrogenic injuries) which is either done blindly or by ultrasound guidance (both methods not as reliable as direct vision), however, no evidence exists to support this hypothesis as limited data is available in this regard.

Since regional blocks are a relatively newer concept in anaesthesia practice in our country, especially when ultrasound guided regional blocks for abdominal surgeries are concerned. If the analgesia levels are not superior with TAP blocks and the opioid use is after TAP block is comparable to local WI of local anaesthetic then WI might be the preferred step in the multimodal analgesia ladder due to its aforementioned merits. Therefore our study intends to compare the effectiveness of ultrasound assisted TAP block and layer by layer infiltration of local anaesthetic as very limited data is available in this regard especially pertaining to our local population.

METHODOLOGY

This quasi experimental study was conducted at Combined Military Hospital, Rawalpindi Pakistan, after approval of ethical review board vide letter no. 276 over a period of 06 months from 28 Feb 2022 to 31 Jul 2022.

Sample size was calculated using WHO sample size calculator taking confidence interval 95%, margin of error 5% with a mean difference of 70 mins in the time to first analgesic request after wound infiltration and after transversus abdominis plane block.[11] The estimated sample size came out to be 66 patients. With non-probability consecutive sampling the 80 subjects were divided into two groups, i.e. Group A (LI group) with 40 patients and Group B (TAP group) with 40 patients each.

Inclusion Criteria: Patients undergoing inguinal hernia repair with American society of Anaesthesiologist status 1 & 2, between the ages of 25 and 50 years with hemodynamically stability were included in the study.

Exclusion Criteria: Patients with American society of Anaesthesiologist status 3 and above, patients with ionotropic support and patients who had previously undergone abdominal surgeries were excluded from the surgery.

A detailed interview was conducted with the patients preoperatively to check their suitability for the study. The objectives and the process of the study was explained to them in detail, all relevant questions were answered to their satisfaction and detailed informed consent was obtained.

Complete pre-anaesthesia assessment was done as per institutional protocols and patients were optimized accordingly. They were reassessed by a consultant anaesthesiologist on the day of the surgery before the surgery. All patients were given subarachnoid injection of hyperbaric bupivacaine below L1-2 interspace with a 25-gauge spinal needle after ensuring strict aseptic measures. Effectiveness of spinal anaesthesia was confirmed by inciting a potentially painful stimulus at the surgical site with an artery forceps before the incision was made.

At the completion of surgery, group A was given 0.25% bupivacaine by a 20-cc syringe as per the appropriate dosage with respect to their body weight (3mg/kg) both subfascialy and subcutaneously after negative aspiration to prevent intravascular injection of local anaesthetic. Group B was given a TAP block with the help of ultrasound guidance with a 22-guage spinal needle under ultrasound guidance using the lateral approach after preparing the skin with 2% chlorhexidine solution for antisepsis. Again, negative aspiration was first done to avoid an intravascular injection. Pain was assessed using "Visual Analog Scale(VAS)" at 6 hours, 12hours and 24 hours postoperatively.

Data was entered and analyzed by Statistical Package for the social sciences (SPSS) version 23.00. The descriptive statistics for the categorical variable were presented as frequency and percentage while the mean and standard deviation was reported for continuous variables. The categorical groups were compared by using the Chi-square test, while mean values were compared using independent samples T-test among groups. The *p*-value of ≤0.05 was considered significant.

RESULTS

A total of 80 patients were enrolled in the study with a mean age of 37.53±9.32 years. There is no significant difference between age, BMI and ASA status between the both groups thereby removing any bias related to demographic data of the patient. Demographic and preoperative clinical data of patients included in this study is presented in Table-I.

Table-I: Patient Demographics and Clinical Data

Parameters		Study Groups		*p*-value
		Group-A (WI) n=40	Group-B (TAP) n=40	
Age in years (Mean±SD)		38.6±8.71	36.42±9.89	0.295
BMI in kgm-2 (Mean±SD)		25.1±3.85	24.8±4.96	0.775
American Society of Anaesthesiology (ASA) Status n(%)	ASA-1	22(55%)	17(42.5%)	0.263
	ASA-2	18(45%)	23(57.5%)	

Time to 1st request for oral and/or parentral analgesia made by the patient along VAS at rest and movement at the time of that aforementioned request is shown in Table-II. There was significantly delayed request for analgesics in Group-B (TAP) as compared to Group-A(WI). Request for 1st analgesic was made after a mean of 244.9±66.6 mins in Group- B as compared to 160.3±19.9 mins in Group-A (*p*-value<0.001). There was no significant difference in VAS at both rest and on movement between the two groups at the time of 1st analgesic request (*p*-value: 0.429 and 0.315 respectively).

Table-II: Time to First Analgesic Request and NRS at Rest and Movement at the time of First Analgesic Request

Parameters	Study Groups		*p*-value
	Group-A (WI) n=40	Group-B (TAP) n=40	
Time to 1st Analgesic Request, mins (Mean±SD)	160.3±19.9	244.9±66.6	<0.001
VAS at Rest at 1st Analgesic Request (Mean±SD)	3.55±2.08	3.35±2.25	0.429
VAS at Movement at 1st Analgesic Request (Mean±SD)	3.80±2.54	3.50±2.33	0.315

The mean of sum of analgesic consumption on the "zero" post-operative day in both of the groups is mentioned in Table-III. There were significantly reduced analgesics consumed by patients in Group-B as compared to Group-A. There was a mean of 20.4±1.45 mg of Injection Nalbuphine (intravenous) used in Group-A whereas 20.4±1.45 mg was consumed by Group-B within the first 24 hours (*p*-value<0.001). 75.4±6.52 mg of Injection Ketorolac (intravenous) was used by Group-A as compared to 66.7±4.66 mg in Group-B which is a significant difference between the two (*p*-value <0.001).

Table-IV describes VAS score noted post-operatively at 6, 12 and 24 hours.

Table-III: Mean of total Analgesics Consumption in 24 Hours

Analgesic (mg)	Study Groups		*p*-value
	Group-A (WI) n=40	Group-B (TAP) n=40	
Nalbuphine (Mean±SD)	26.5±1.74	20.4±1.45	<0.001
Ketorolac (Mean±SD)	75.4±6.52	66.7±4.66	<0.001

Table-IV: VAS Score Post-Operatively

Parameters	Study Groups		*p*-value
	Group-A (WI) n=40	Group-B (TAP) n=40	
VAS at 6 hours (Mean±SD)	4.9±1.80	2.25±1.31	0.099
VAS at 12 hours (Mean±SD)	3.80±2.54	1.80±1.04	0.036
VAS at 24 hours (Mean±SD)	3.88±1.52	1.80±0.93	0.019

DISCUSSION

Our study shows that TAP block achieves better analgesia when compared with WI as demonstrated increased time to first request for analgesic, lower pain scores and low total analgesic use on the zero post-operative day. The reduced total analgesic consumption can also potentially lead to lower side effect profile related to the analgesic drugs.

Our study showed a reduced time to first analgesic request in WI group as compared to the TAP block group which was in conjunction with other studies.[12,13] Reduced time to first analgesic in WI group was reported by Amjad *et al.*, in their study which showed 301±157 min in WI group as compared to 472±110 min in the TAP group. However, abdominal surgeries are quite heterogenous and there could have been a difference in the level of pain with respect to the type of surgery performed. Our study however, removed that particular bias by including only inguinal hernia surgeries. Better analgesic outcomes by TAP block has been demonstrated by other authors also.

Kanazi *et al.*, showed similar results where time to first analgesic request by the patient with TAP block is concerned.[16] However, it is prudent to note that they were not comparing TAP block to localized wound

infiltration of local anaesthetic rather they were comparing it to subarachnoid morphine. It is also worthy of note that the epinephrine was added to bupivacaine in this study which might have increased the duration of TAP block. Still, it was not comparable to the duration of analgesia provided by intrathecal morphine.

The level and duration of analgesia may also depend upon the approach used for TAP block. Frassanito *et al*., found that VAS pain scores were significantly reduced when the patients were given TAP block as compared to ilioinguinal and iliohypogastric nerve blocks.[17] VAS scores were also lower in TAP group upon coughing at the end of surgery and upon discharge of the patient from the hospital. There was also reduced parentral analgesia consumption in TAP group as compared to the nerve block group in their study.

In contrast to this a meta-analysis done by Youfa *et al*., showed no statistical difference between TAP block and ilioinguinal/iliohypogastric nerve block with respect to post-operative opioid consumption, time to request for first analgesic, common post-operative anaesthesia and analgesia related complications and patient satisfaction.[18] Pain scores were more or less the same in both groups over the post-operative period. Talib reported significantly reduced incidence of nausea/vomiting post operatively in the TAP block group as compared to local wound infiltration group (21,7% vs. 78.3% respectively) while also reporting lower mean pain scores (2.1±1.2 and 4.8±1.5) in TAP block and local wound infiltration group respectively. In one study patients also reported increased satisfaction with pain control with TAP block as compared to WI.

Limitations of our study included lack of financial calculations with regards to post-operative stay of patient of both groups. Further studies can explore this avenue and find out if TAP block for inguinal hernia surgeries reduces hospital stay of patient too.

CONCLUSION

TAP block achieves better analgesia when compared with WI as demonstrated increased time to first request for analgesic, lower pain scores and low total analgesic use on the zero post-operative day. The reduced total analgesic consumption can also potentially lead to lower side effect profile and increased satisfaction of patient in regards to postoperative pain control.

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Authors' Contribution

Th following authors have made substantial contributions to the manuscript as under:

MHS & SQAS: Data acquisition, data analysis, critical review, approval of the final version to be published.

MHB & KB: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AYZ & FH: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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