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Original Article

Comparison of Analgesic Efficacy Between Transversus Abdominis Plane Block and Epidural Following Abdominal Surgery

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ABSTRACT

Objective: To compare post-operative analgesic efficacy of ultrasound guided transversus abdominis plane (TAP) block versus intra-thoracic epidural catheter in patients undergoing abdominal laparotomy.

Study Design: Quasi experimental study.

Place and Duration of Study: Department of Anesthesia, Combined Military Hospital (CMH), Rawalpindi, Pakistan, from Apr to Sep 2023.

Methodology: An 18 Gauge (G) Smith epidural catheter Touhy needle was inserted pre-operatively in the epidural (T6 thoracic) space by a consultant anesthetist, under aseptic measures, with patient in the sitting position, and catheter secured after correct placement. Bilateral TAP block was performed in all patients who underwent abdominal surgery and 15 ml of 1% lignocaine with adrenaline was injected on each side of the block. Primary variable was mean time to first rescue analgesia and measurement of patient satisfaction in both groups.

Results: Mean time to first post-operative rescue analgesia requirement by patients showed a mean time of 558.38±14.53 minutes in the TAP block group versus 345.85±19.77 minutes in the epidural group (p<0.00). Mean time of stay in the High Dependency Unit (HDU) showed a mean stay of 27.80±2.35 hours in the TAP group versus 43.97±5.21 hours in the epidural group (p<0.00).

Conclusion: TAP block provided effective analgesia with better HDU stay and superior patient satisfaction when compared with epidural analgesia.

Keywords: Abdominal, Analgesia, Epidural, Surgery, TAP block.

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INTRODUCTION

Surgical stress associated with major surgeries causes several complications.[1] associated with metabolic and hormonal changes that need vigilance on part of the anesthetist both per- and post-operatively.[2] The treatment of pain remains a major focus in these cases, however, all methods of pain relief are not conducive in patients undergoing major abdominal surgeries due to derangement in normal homeostasis.[3] Renal profile, fluid status, blood loss, hypotension and coagulopathies are some of the parameters that need to be reviewed before managing pain since procedures and drugs used can lead to renal deterioration, respiratory depression, hypotension, and nausea, vomiting.[4] Epidural catheters have been used as an effective analgesic modality in major surgeries where the initial threshold of pain needs to be ameliorated for effective patient comfort.[5] They can be topped up with bolus doses, or the drug can be delivered with an infusion pump but, even though they are very effective in relieving pain, they are associated with patient discomfort, chances of the catheter to be displaced by patient positioning and a less than favorable adverse effect profile in patients having already undergone major surgeries.[6] The transversus abdominis plane block (TAP) delivers local anesthetic in the plane of abdominal muscles between internal oblique and the transversus abdominis muscle.[7] The block is relatively easy to perform and provides extended analgesia since the administered drug is absorbed from the plane of muscles slowly[8]. The adverse effect profile is usually minimal but its analgesic efficacy with the regional epidural catheters has not been compared very extensively in patients with major surgeries in our patient demographics. The objective of this study is to compare the post-operative analgesic efficacy of ultrasound guided TAP block versus intra-thoracic epidural catheter in patients undergoing abdominal laparotomy.

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METHODOLOGY

This quasi-experimental study was carried out at the Department of Anesthesiology, Combined Military Hospital (CMH), Rawalpindi, Pakistan, from June to December 2022, after approval from Ethics Review Board vide letter no. CMH/RWP/406, along with registration in Iranian Registry of Clinical Trials (IRCT.IR) via Trial ID No. 72457. A pilot study carried out before the trial included 10 patients in each group. Mean difference between both groups in first time to dose of rescue analgesia was 4.02±0.56 hours. Minimum sample size calculated for one group came out to be 50 patients, keeping the confidence interval at 95%, power of test 80% and variance at 50, therefore, 60 patients were enrolled in each group, with one to receive TAP block (n=60) and one to receive epidural analgesia (n=60) making the total study sample of 120 patients. Non-probability consecutive sampling via lottery method was used to enroll the required sample size.

Inclusion Criteria: All American Society of Anesthesiologists (ASA) I and II patients, male and female, between 20-60 years of age, presenting for elective or emergency abdominal laparotomy were included.

Exclusion Criteria: Patients with cancer, tumors or metastatic disease, low ejection fraction, respiratory compromise, post chemotherapy, allergic to bupivacaine or lignocaine, infection at site of block, coagulation disorders, patchy or failed epidural insertion and failure to perform TAP block after three unsuccessful attempts were excluded.

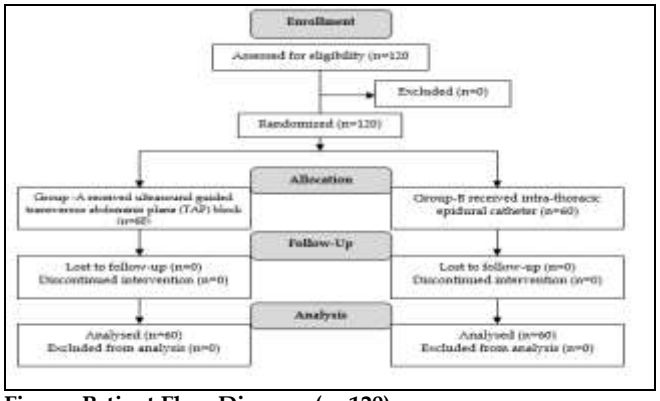

Figure: Patient Flow Diagram (n=120)

The patients were divided into the TAP group (n=60) and the epidural group (n=60). Informed written consent was taken from all patients, and patients in both groups were explained in detail about the procedure and possible complications. Standard monitoring including non-invasive blood pressure, heart rate, capnography and electrocardiogram (ECG) were attached to participants in both groups. Anesthesia was induced in both groups with intravenous (IV) propofol 2 mg/kg, IV atracurium 0.5 mg/kg with maintenance done using 50% oxygen with isoflurane at 1.0 Minimum Alveolar Concentration (MAC). In case of emergency surgery, RSI (Rapid Sequence Intubation) was done using IV propofol 2mg/kg and suxamethonium 1.5 mg/kg. Patients were extubated after neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg were given for reversal of neuromuscular block. Patients in both groups were given 10 mg of IV nalbuphine, 1 gm of IV paracetamol and 30 mg of IV tramadol as standard analgesia per-operatively. An 18G Smith epidural catheter Touhy needle was inserted in the epidural group (n=60) by a consultant anesthetist pre-operatively under aseptic measures with patient in the sitting position in the T6 thoracic space. Confirmation of correct placement was checked by hanging drop method and further confirmed by test dose of 5 ml 2% lignocaine with adrenaline. Once correct placement was confirmed, the catheter was secured, and surgery was started. No bolus dose of epidural was given until the surgery was completed. At the end of surgery, a top-up of 10 ml of 0.13% bupivacaine was given in the epidural catheter for post-op analgesia and pain relief. In the TAP block group (n=60), once the surgery was completed, a pain consultant performed the block under ultrasound guidance using standard technique furnished by New York School of Regional Anesthesia (NYSORA).[9] Bilateral TAP block was performed in all patients in the lateral approach that underwent abdominal surgery and 15 ml of 1% lignocaine with adrenaline was injected on each side of the block. Post-operatively, patients were kept in the high dependency unit (HDU) and observed for post-operative pain every hour for the next 24 hours. Primary variable observed was mean time to first rescue analgesia assessed by visual analog scale (VAS) once pain scores were >5 and objective patient satisfaction in both groups. Rescue analgesia was defined as the time to first top-up in the epidural group versus time to rescue analgesia by intravenous nalbuphine (0.1mg/kg) in the TAP block group. Patient satisfaction was evaluated and recorded at 24 hours after surgery on a 7-point Likert scale.[10] Secondary variables observed were adverse effect profile between both groups. Demographic data was statistically described in terms of mean and standard

deviation (SD), frequencies, and percentages, when appropriate. Independent samples t-test was used to compare statistically significant means between both groups. Median satisfaction scores were calculated and compared using the Mann Whitney-U test where p-value of ≤0.05 was considered statistically significant. All statistical calculations were performed using Statistical Package for Social Sciences (SPSS) 26.0.

RESULTS

A total of 120 patients were included in the study, divided into either the TAP block group (n=60) or the epidural group (n=60). Mean age of patients was 39.15±4.88 years in the TAP block group versus 39.80±4.96 years in the epidural group (*p*=0.552), mean weight of patients in the TAP block group was 67.72±3.91 kg versus 68.07±4.02 kg in the epidural group (p=0.444). These are shown in Table-I.

Table-I: Age and Height Distribution Between Both Groups (n=120)

Variable	TAP (n=60) Mean ± SD	Epidural (n=60) Mean ± SD	*p*-value
Age (Years)	39.15±4.88	39.80±4.96	0.552
Weight (kg)	67.72±3.91	68.07±4.02	0.444

Duration of surgery between both groups was 127.65±6.01 minutes in the TAP block group versus 127.30±5.62 minutes in the epidural group (*p*=0.694). When studying the primary variables, mean time for requirement of first rescue analgesia by the patients post-operatively occurred after 558.38±14.53 minutes in the TAP block group versus 345.85±19.77 minutes in the epidural group (*p*<0.001). Mean time of stay in the HDU was 27.80±2.35 hours in the TAP group versus 43.97±5.21 hours in the epidural group (*p*<0.001). Patient satisfaction for pain relief 24-hours post-surgery, as evaluated on the Likert scale, showed a median satisfaction score of 6.00 (IQR=1.00) in the TAP block group versus 4.00 (IQR=1.00) in the epidural group (*p*<0.001) as shown in Table-II.

Table-II: Comparison of Operative Parameters Between Both Groups (n=120)

Variable	TAP (n=60)	Epidural (n=60)	*p*-value
Mean Duration of Surgery (Minutes) ± SD	127.65±6.01	127.30±5.62	0.694
Mean Time to First Rescue Analgesia (Minutes) ± SD	558.38±14.53	345.85±19.77	<0.001
Mean HDU Stay (Hours) ± SD	27.80±2.35	43.97±5.21	<0.001
Median Patient Satisfaction Score For Pain Relief (24 Hours)	6.00 (IQR=1.00)	4.00 (IQR=1.00)	<0.001

**HDU: High Dependency Unit*

Satisfaction scores on the Likert scale showed 2(3.30%) patients with a score of 5, 36(60.00%) with a score of 6 and 22 (36.70%) with a score of 7 in the TAP block group versus 4(6.70%) patients with a score of 3, 40(66.70%) with a score of 4 and 16 (26.70%) patients with a score of 5 on the satisfaction scale in the epidural group as shown in Table-III.

Table-III: Satisfaction Score For Pain Relief After 24 Hours (n=120)

Likert Scale Score	TAP (n=60)	Epidural (n=60)
1 (Extremely Dissatisfied)	-	-
2 (Very Dissatisfied)	-	-
3 (Dissatisfied)	-	4(6.70%)
4 (Neither Satisfied Nor Dissatisfied)	-	40(66.70%)
5 (Satisfied)	2(3.30%)	16(26.70%)
6 (Very Satisfied)	36(60.00%)	-
7 (Extremely Satisfied)	22(36.70%)	-

The incidence of adverse effects showed that nausea was seen in 6(10.00%), vomiting in 3(5.00%) and sedation in 6(10.00%) patients in the TAP block group, whereas nausea was seen in 14(23.30%), vomiting in 10(16.70%) and sedation seen in 20 (33.30%) patients in the epidural group, as shown in Table-IV.

Table-IV: Distribution of Side Effects Between Both Groups (n=120)

Variable	TAP (n=60)	Epidural (n=60)
Nausea	6(10.00%)	14(23.30%)
Vomiting	3(5.00%)	10(16.70%)
Post-Op Sedation	6(10.00%)	20(33.30%)

DISCUSSSION

The study was carried out with the aim of finding alternatives to conventional methods of pain relief in practice, as, with the advent of regional anesthesia, the management of pain has taken a paradigm shift[11]. Our study was aimed at finding not only alternatives for pain relief in major surgeries but also their comparison to conventional methods among patients who presented to us for abdominal laparotomy for intestinal obstruction. In literature that the procedure is associated with considerable incidence of pain with scores reaching as high as 8-9 on the visual analog scale[12]. Not only does it require good analgesia per-operatively, but the post-operative pain management is also of prime importance since delay or ineffective pain management is associated with complications affecting patient mobilization and subsequent hospital stay[13]. Even though studies showed that both these

methods were effective in providing good depth of analgesia[14], however, our study showed that the time required to give that dose was significantly better in the TAP block group. Studies done for the same to compare the effectiveness in different surgeries also showed similar results to ours, concluding that depth and quality of analgesia provided by both modalities was similar[15], however, TAP proved to be more effective in prolonging the time of analgesia provided when compared to epidural. Similar results were seen by a local study [16] when comparing both procedures in patients presenting for hysterectomy. Our study also showed that mean HDU stay was considerably decreased in the TAP block group, in-line with other studies showing a clear advantage of the procedure in early mobilization and discharge of patients[14] admitted for laparoscopic procedures. Apart from analgesia point of view, the delay is attributable to the monitoring and care required to keep the epidural in-situ which requires HDU care to counter possible complications like nausea, vomiting and sedation[17]. Local studies have shown similar results with hypotension and vomiting being the two most important adverse effects preventing shifting of patients to the ward and subsequent discharge[18]. When comparing patient satisfaction, the major reason for increased satisfaction in the TAP block group was that it did not require rigorous monitoring or postural discomfort of the in-situ epidural catheter while decreased level of satisfaction was mainly attributable to the physical presence of the catheter with discomfort associated with a guarded posture to prevent the catheter from displacement[19]. The adverse effect profile results in our study were also in line with findings in literature[17]. The incidence to nausea, vomiting and sedation was considerably better in the TAP block group attributed to very slow and gradual absorption of drug from the abdominal layers to the bloodstream resulting in minimal to no side effects.

LIMITATIONS OF STUDY

This study is limited by its single-center design, which restricts generalizability to broader patient populations. Additionally, the technical expertise required for successful block administration necessitates prolonged patient preparation time and experienced regional anesthesiologists, who remain scarce in our setting.

CONCLUSION

TAP block demonstrated superior post-operative analgesic efficacy compared to thoracic epidural analgesia in patients undergoing abdominal laparotomy, as evidenced by a significantly longer time to first rescue analgesia and a notably shorter HDU stay.

Conflict of Interest: None.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

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

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

AYZ & TM: 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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