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ORIGINAL RESEARCH ARTICLE

Comparison of Epidural Analgesia with Transversus Abdominis Plane Analgesia for Postoperative Pain Relief in Patients Undergoing Lower Abdominal Surgery

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ABSTRACT

Introduction: Anesthesiologists play an important role in postoperative pain management. For analgesia after lower abdominal surgery, epidural analgesia and ultrasound-guided transversus abdominis plane (TAP) block are suitable options. The study aims to compare the analgesic efficacy of epidural analgesia and transverse abdominis plane (TAP) block.

Material and Methods: In this study 165 patients undergoing lower abdominal surgery were divided into 3 groups. Group C (Control): spinal anesthesia with hyperbaric bupivacaine 15mg (3ml of 0.5%)+ intravenous infusion of 100 ml of NS over 15 min. Group E (Epidural): epidural catheter will be inserted before spinal block. At the end of the surgery, will receive 10 ml of 0.125% bupivacaine through the epidural catheter followed by removal of the catheter. Group T (TAP): at the end of surgery bilateral TAP block will be given and 20 ml of 0.125% bupivacaine will be injected and the spread of local anaesthetic solution visualised in real time through ultrasound. Assessment of the pain will be done using visual analog scale (VAS)

Results: It was observed that comparison between the group C and group E was significant after 2 hours post-surgery. There was a large disparity between the groups T and Group C after 4 hours of surgery. The time to first rescue analgesic consumption was significantly higher in group E and group T with the majority of 41 (74.5%) patients of Group E satisfied. In present study, the pain score was measured based on the VAS scale in the three studied groups and it was found that the postoperative pain was lower significantly in the epidural group and TAP group as compared to control group ($p<0.05$)

Conclusion: According to our study, in terms of postoperative analgesia, overall analgesic intake, and time to first rescue analgesia, along with similar nausea, vomiting, and time to hospital discharge, epidural analgesia performed better than TAP block.

Keywords: Epidural analgesia, Transversus abdominis plane analgesia, Pain relief, Lower abdominal surgery.

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INTRODUCTION

Spinal anaesthesia was first used during operation at the Royal Surgical Hospital of the university of Kiel, Germany by August Bier on august 16, 1898.[1]

Spinal anaesthesia is a safe, convenient and economical form of regional anesthesia technique. It results in sympathetic blockade, sensory blockade, and motor blockade depending on the dose, concentration or volume of local anesthetic agent administered.[2]

Bupivacaine is the most common local anesthetic agent used. The desired effect is to block the transmission of nerve signals to and from the affected area.[3]

Spinal anaesthesia has many advantages over general anaesthesia which makes it the anaesthesia of choice in the present surgical practice. Its advantages include,profound muscle relaxation, decreased intra-operative blood loss, preferable in patients suffering from respiratory diseases, early return of gastrointestinal function after surgery, suppress the neuroendocrine response to surgery, better analgesia than parenteral opioids in the postoperative period, reduce perioperative morbidity and mortality in high- risk patients, reduction in hypercoagulable state associated with surgery.[4]

Spinal anaesthesia is a unique technique to provide sensory and motor blockade in the large part of the body with a lesser amount of drug, hence, very popular for lower abdominal surgeries. Usually, without any additive one can achieve 60–90 min anaesthesia with a spinal block.[5]

New trends in subarachnoid block are, use of adjuvants which reduce the complications as well as potentiate the anaesthetic effect. In order to maximize intra and postoperative analgesia, a number of adjuvants like opioids, ketamine, clonidine and neostigmine are often added either intravenously or intrathecally.[6-9]

Since 1901, Corning described the epidural space, and through the pioneering efforts of Edwards, Hingson, Pages, Dogliotti, Tuohy, and Bromage, epidurals have become a standard modality for anesthesia.[10]

For lower abdominal surgeries, epidural analgesia has been gold standard and time tested technique for providing postoperative analgesia but contraindications for same would warrant need for equally good analgesic techniques. Epidural anaesthesia involves the use of local anaesthetics injected into the epidural space to produce a reversible loss of sensation and motor function.

Complications of epidural analgesia include inadequate analgesia, excessive blockade, unintentional intrathecal or intravascular injection and its sequelae, and the potentially more serious infections or hematomas that can lead to neurologic damage.

TAP block has gained popularity as an effective pain relief technique in patients undergoing a variety of abdominal operations. An increasing number of randomized controlled trials and case reports in the literature have highlighted the analgesic effectiveness of the TAP block and proposed it as an alternative pain management technique in patients with contraindications to the use of opioids and/or neuraxial anaesthesia.

TAP blocks the neural afferents of the abdominal anterior wall after spreading of the local anaesthetic agent in the neurofascial plane between the internal oblique and transversus abdominis muscle.[11]

In this study our aim is to compare the efficacy and outcomes of ultrasound-guided bilateral tap block to epidural block for postoperative analgesia in patients with lower abdominal surgeries.

MATERIALS AND METHOD

The patients were assigned to one of the following three groups, using a slip-of-paper in-box technique

Group C (Control)

Spinal anaesthesia was given using an aseptic technique in sitting position via midline approach using a 25-G Quincke needle with 3 ml of 0.5% hyperbaric bupivacaine + intravenous infusion of 100 ml of NS over 15 min.

Group E (Epidural)

Lumbar epidural catheter placed at L1–L2, or L2–L3 intervertebral space by Loss of resistance technique: The stylet removed once the needle was placed into the ligamentum flavum. A syringe with 2-3ml of air attached. Needle was steady held by non-dominant hand, and dominant hand used to hold syringe. Steady pressure was applied to the plunger in order to compress the air bubble. Slowly and steadily the needle was advanced until loss of resistance is noted. Once epidural space is identified, the catheter was inserted 3-4cm into epidural space. A test dose consisting of 3 ml of lignocaine was given. At the end of surgery, they received 10ml of 0.125% bupivacaine through epidural catheter followed by the removal of the catheter.

Group T (TAP)

At end of procedure the patients are in the supine position and the abdomen is exposed between costal margin and iliac crest. A linear, high-frequency transducer was used for this block. Following skin, and the transducer preparation, transducer placed in axial plane, above iliac crest and in region of anterior axillary line. T7 to L1 anterior rami with its terminal branches were not visualized but were expected to lie within TAP between internal oblique, and transverse abdominis muscles above iliac crest. 3 muscular layers of abdominal wall viz. external oblique, internal oblique, and transversus abdominis muscles were identified. A 16-gauge intravenous cannula was advanced in the plane from the anterior direction.

Spinal anaesthesia was given using an aseptic technique in sitting position via midline approach using a 25-G Quincke needle with 3 ml of 0.5% hyperbaric bupivacaine. The patient was then laid in the supine position and the operation table was kept flat.

After placement of cannula in between internal oblique at transverses abdominis muscle, 20ml of 0.125% bupivacaine injected and spread of local anaesthetic solution visualized in real-time through ultrasound. After injecting local anaesthetic solution, the stylet and cannula were removed.

Assessment of pain will be done using a visual analog scale (VAS), and the score noted for

- Pain at rest
- Pain on coughing
- Consumption of the rescue analgesia.

Postoperative pain was graded into 4 categories depending on the VAS scores

- Nil = VAS score 0
- Mild = VAS score 1 to 3
- Moderate = VAS score 4 to 6
- Severe = VAS score >6

IV paracetamol 1g infusion was first line analgesic. Paracetamol given to cases if VAS scores>3/10. If patient's pain score >3/10 even after 1h of IV paracetamol, then administered injection of tramadol 50mg as slow IV infusion, and total analgesic consumption at end of 48h was noted.

RESULTS

Table 1 shows the distribution of the studied patients based on complications. In Group C majority of 4 (7.3%) patients had nausea, in Group E majority of 2 (3.6%) patients had hypotension & nausea and in Group T majority of 3 (5.4%) patients had nausea. The Associations of all the groups were found to be non-significant based on complications ($p > 0.005$).

Table 2 illustrate the comparison of VAS scores at different time intervals. It was observed that comparison between the group C and group E was significant after 2 hours in postoperative period. There was a large disparity between the groups T and C after 4 hours of surgery. Table 3 shows the distribution of studied patients based on several doses of rescue analgesia in 24 hours. In Group C majority of 24 (43.6%) patients had taken 3 doses of rescue analgesia followed by 22 (40.0%) had taken 2 doses of rescue analgesia and 9 (16.4%) patients took a single dose of rescue analgesia. In Group E majority of 34 (61.8%) patients had taken a single dose of rescue analgesia followed by 14 (25.5%) who had taken 2 doses of rescue analgesia and 7 (12.7%) patients took 3 doses of rescue analgesia. In Group T majority of 29 (52.7%) patients had taken a single dose of rescue analgesia followed by 17 (30.9%) who had taken 2 doses of rescue analgesia and 9 (16.7%) patients took 3 doses of rescue analgesia.

The comparison of Group C & E for 1 and 3 doses showed statistically significant values (*p<0.001). The comparison of Group C & T for 1 and 3 doses showed statistically significant values (#p<0.001). Table 4 shows the comparison of Group E & T for a single dose showed a statistically significant value ($p<0.05). The below table shows the time to first rescue analgesia. It was found to be higher (312.5±20.6) in Group E and the majority 41 (74.5%) patients of Group E were satisfied. Table 4 shows Distribution of studied patients based on the number of doses of rescue analgesia in 24 hours. Table 5 illustrates the Distribution of studied patients based on Time to first rescue analgesia (mins).

DISCUSSION

As the field of surgery advanced, the role of anaesthesiologists who understand the pathophysiology of pain and its management has increased many folds. Marked reduction is observed in anesthesia-related deaths or disabilities during or after surgery. This is despite the increase in challenging operations due to surgical advancements along with the widening patient spectrum. Their role has expanded from limited duration of surgical intervention to postoperative pain management. In addition, the safety and advantages of regional anaesthesia over general anaesthesia were realized in terms of fewer complication rates related to respiratory and cardiovascular systems. Inadequate analgesia is another issue compromising the success of the surgery.[10] Different techniques have evolved for analgesia after the lower abdominal surgeries. EA, TAP block and infiltration of LA at site of incision and nerve block are commonly used techniques. Epidural anesthesia had been ruling the choices for years and was considered the "gold standard" for perioperative along with postoperative periods. However, hemodynamic disturbances and risk of hematoma formation with concerns of the epidural catheter placement, and removal in the patients on anti-coagulants therapy or with bleeding disorders have led anaesthetists as well as surgeons to explore other options.

In this prospective randomized controlled trial, we examined the effectiveness of the three methods (group C=spinal analgesia, group T=Transversus Abdominis Plane and Group E= Epidural analgesia) in controlling the postoperative pain and compared the outcomes analgesic efficacy in adult patients undergoing lower abdominal surgery including a total of 165 patients

In present study, the pain score was measured based on the VAS scale in the three studied groups and it was found that the postoperative pain was lower significantly in the epidural group and TAP group as compared to control group (p<0.05). Hypotension and Nausea were in 3.6% of cases in epidural group E whereas in TAP group T hypotension was in 1.4% and nausea was in 5.4%, vomiting in 3.6% and shivering in 1.4% of TAP group but difference was statistically insignificant (p>0.05). According to Manhas K et al[12] post-operative nausea, and vomiting were found to be higher in TAP at the end of first hour. The difference in these episodes was however not statistically significant. Nausea and vomiting started in the epidural group in 2nd hour. Thus, implying that the anaesthesia effect causes an early start of nausea and vomiting in TAP as compared to epidural anaelgesia. Another important interpretation is that at the 6th hour, nausea and vomiting appear or continue in patients of TAP whereas the epidural group has no new cases. Our results are different from the results by Kadam VR et al[13], who report lower post-operative nausea, and vomiting, lower 24h VAS scores and higher satisfaction in local anesthetic TAP group. It is worthwhile mentioning here

Table 1: Distribution of studied patients based on group

Groups	*No. of patients (n = 165)*	*Percentage*
Group C (Control)	55	33.3%
Group E (Epidural)	55	33.3%
Group T (TAP)	55	33.4%

Table 2: Distribution of the studied patients based on complications (P value * Group C & E, P value # Group C & T and P value $ Group E & T)

Complications	*Group C*	*Group E*	*Group T*	*p-value**	*p-value#*	*p-value$*
Hypotension	3 (5.4%)	2 (3.6%)	1 (1.4%)	0.646	0.308	0.558
Bradycardia	2 (3.6%)	0 (0.0%)	0 (0.0%)	0.153	0.153	1.00
Nausea	4 (7.3%)	2 (3.6%)	3 (5.4%)	0.401	0.695	0.646
Vomiting	3 (5.4%)	1 (1.4%)	2 (3.6%)	0.308	0.646	0.558
Shivering	2 (3.6%)	1 (1.4%)	1 (1.4%)	0.558	0.558	1.00

Table 3: Distribution of studied patients based on comparison of VAS Score between the groups (P value * Group C & E; P value # Group C & T; and P value $ Group E & T)

VAS	*Group C*	*Group E*	*Group T*	*p-value**	*p-value#*	*p-value$*
At 1 hour	2.97 ± 0.95	2.97 ± 1.0	2.37 ± 1.33	1.000	0.007	0.008
At 2 hours	3.5 ± 1.31	2.5 ± 0.97	2.70 ± 1.26	<0.001	0.001	0.353
At 3 hours	2.75 ± 1.05	2.47 ± 0.97	2.53 ± 1.25	0.149	0.319	0.779
At 4 hours	2.27 ± 1.10	3.80 ± 1.13	2.70 ± 1.34	0.001	<0.001	0.001
At 5 hours	3.73 ± 1.29	3.70 ± 1.09	3.15 ± 1.42	0.895	0.014	0.024
At 6 hours	2.43 ± 1.25	2.27 ± 0.98	3.9 ± 1.37	0.456	<0.001	<0.001

that the differences in the study were statistically non-significant. They report similar pain scores between two groups with a comparable PONV incidence. Bhagasra S et al[14] reported that 2 (5.71%) and 3 (8.57%) patients in TAP group and Epidural group respectively had nausea. 1 (2.86%) and 2 (5.71%) patients in TAP group and Epidural group respectively had vomiting and 0 (0%) and 2 (5.71%) patients in TAP group and Epidural group respectively had a headache. The incidence of nausea & vomiting was more in epidural group as compared to group A, however, this difference was statistically not significant

According to Iyer SS et al[15], all patients were assessed for post-operative pain at rest at 8h, 16h, 24h, and 48h, and the pain scores were documented using VAS. Pain scores were similar in groups at 8h and 16h post-surgery. Though, at end of 24h and 48h, patients in EA had significantly better analgesia than TAP group (P=0.001 and p=0.004, respectively) with the higher number with nil pain at rest, and fewer patients reporting mild to moderate pain.

In present study, time of the first rescue analgesia was higher significantly in epidural (312.5±20.6) than in TAP (264.0±15.3) (p<0.05). The number of doses of rescue analgesia in 24 hours was lower significantly in epidural (i.e., 3 doses in only 7(12.7%)) than in TAP (3 doses in 16.7%). Our findings were consistent with Iyer SS et al[15] who reported that total consumption of paracetamol over 48h was found comparable in groups. Though, found that all cases in TAP group ultimately required paracetamol whereas 5 of 36 cases in EA didn't need rescue analgesia. Overall requirements of the tramadol were lower significantly in EA than TAP block group (P=0.001), with few patients in EA even requiring tramadol. Niraj G et al[16] depicted that the rescue analgesia with tramadol was higher significantly in TAP block (400mg) group than epidural group (200mg) (p=0.002).

Table 4: Distribution of studied patients based on the number of doses of rescue analgesia in 24 hours (P value * Group C & E, P value # Group C & T and P value $ Group E & T)

No. of doses	Group C	Group E	Group T	p-value*	p-value#	p-value$
1	9 (16.4%)	34 (61.8%)	29 (52.7%)	<0.001	<0.001	0.035
2	22 (40.0%)	14 (25.5%)	17 (30.9%)	0.104	0.319	0.525
3	24 (43.6%)	7 (12.7%)	9 (16.7%)	<0.001	<0.001	0.588

Table 5: Distribution of studied patients based on Time to first rescue analgesia (mins)

Variables	*Group C*	*Group E*	*Group T*	*p-value**	*p-value#*	*p-value$*
Time to first rescue analgesia	66.8 ± 13.6	312.5 ± 20.6	264.0 ± 15.3	<0.001	<0.001	<0.001

*(P-value * Group C & E, P value # Group C & T and P value $ Group E & T)*

El-Malla et al[17] reported that as regards the analgesic parameters recorded in the current study, the VAS was significantly lower in group A (Epidural) when compared with that of group B (TAP block), and showed a marked significant difference between both groups at 15, 30, 45 and 60 minutes postoperative and significant difference between both groups at 2nd, 4th, 6th and 12th hours postoperatively with significantly longer time to 1st rescue analgesia in group E (epidural) compared to that of group T (TAP) and significantly higher total rescue analgesic consumption in 1st 12hours post-operatively TAP than EA denoting better pain control in EA than TAP group. Findings of current study agree with Yiquan W et al[18] reported Group epidural was superior to TAP regarding the VAS pain at all the points of comparison (PACU, 1h, 3h, 6h, 24h, 48h, 72hours) and less consumption of morphine over 24hours.

Limitations of the study

- Relatively smaller sample size.
- We are not sure as to whether epidural and TAP block given together would have improved the duration of post-operative analgesia and covered "early"/ "late" pain as well as "sensory" and "visceral" pain.

Recommendations of the study

- Due to limited number of the studies evaluating analgesic efficacy of two methods, more randomized trials required to performed to reach any definite conclusion.
- The equivalent analgesic efficacy of both techniques should be properly balanced with consideration of the risk of hypotensive episodes associated with epidural analgesia and the reduced length of stay in patients receiving a TAP block demonstrated in this meta-analysis. While these outcomes may favor TAP block, it should be emphasized that neither technique is without drawbacks.

CONCLUSION

The present study was done to compare the efficacy and outcomes of ultrasound-guided bilateral tap block compared to epidural block for postoperative analgesia in patients of lower abdominal surgeries

Both modalities in surgery are important for postoperative analgesia. In addition, the hemodynamic parameters were also found to be more stable in the TAP block group with comparable SPO2.

According to our study, in terms of postoperative analgesia, overall analgesic intake, and time to first rescue analgesia, along with similar nausea, vomiting, and time to hospital discharge, epidural analgesia performed better than TAP block.

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