International Journal of Health Sciences and Research
Vol.10; Issue: 6; June 2020
Website: www.ijhsr.org
Original Research Article *ISSN: 2249-9571*

Comparative Study of Ultrasound Guided TAP Block and Epidural Analgesia for Postoperative Analgesia in Patients Undergoing Lower Abdominal Surgeries

Kaetiki Manhas[1], C.S. Ahluwalia[2], Shaleen Trivedi[3]

[1]P.G. Student, [2]Senior Consultant & Professor, [3]Assistant Professor,
Deptt. of Anaesthesiology and Critical Care, Command Hospital (WC), Chandimandir, Panchkula, Haryana- 134107

Corresponding Author: Kaetiki Manhas

ABSTRACT

Background: TAP Block, recently has been given under ultrasound guidance with promises of better localization and deposition of the local anaesthetic with improved accuracy. Every year millions surgeries performed worldwide varying between minor to major, short to long duration on different patients and on different organs. No matter the type, time and procedure of surgery, one thing common to all surgeries is postoperative pain.
Aims and Objectives: To compare the efficacy and outcomes of ultrasound guided tap block and epidural analgesia for postoperative analgesia in patients of lower abdominal surgeries.
Material and Methods: This prospective randomised study included 80 patients with ASA status I & II aged between 20 and 65 years who underwent lower abdominal surgeries and further sub-divided into two groups, group E (n=40) and group T (n=40). Patients in group E were given epidural analgesia and patients in group T were given ultrasound guided bilateral TAP block.
Results: Pain distribution was found significant at 2 hours, 6 hours, 8 hours and 10 hours. After the 12 hour time period onwards, the pain score distribution was mild in both groups. Pain score distribution score on coughing among epidural and TAP block groups was found significant at 2 hours, 10 hours and 12 hours. Paracetamol as well as tramadol consumption was higher in TAP block group. Incidence of post-operative nausea and vomiting was seen among both groups. Heart rate was higher in the epidural group as compared to TAP block group. Mean SpO2 was significantly higher in epidural group at baseline and immediate postoperative reading. Mean SBP as well as DBP were significantly higher in the Epidural group at baseline reading whereas at 5 minutes, 15 minutes, 45 minutes, 2 hours and 4 hour reading, TAP block group had significantly higher SBP as compared to Epidural group.
Conclusion: Study concluded that ultrasound guided transversus abdominis plane block is as effective method as epidural anesthesia in providing analgesia in patients undergoing lower abdominal surgery. In terms of patient discomfort, the results differ wherein the pain at rest as well as coughing was found to be higher in TAP block. Nausea vomiting starts late in TAP block but once started it stays for longer duration.

Keywords: USG TAP block, Epidural analgesia, Postoperative analgesia, Lower abdominal surgery

INTRODUCTION

Postoperative pain has been recognized as the fifth vital sign. Traditionally the vital signs include pulse, blood pressure, respiratory rate and body temperature. In intensive care, blood pressure, pulse, respiratory rate, and consciousness are regarded as important vital signs. Nevertheless, in an effort to attract the attention of health care professionals towards patients in pain and to simplify pain assessment and monitoring, it is viewed as one of the vital signs, which needs to be measured.[1,2]

Post-surgical pain is a typical example of acute pain, pathophysiologically as well as therapeutically. Local tissue damage caused by surgical procedures causes release of prostaglandins, histamine, serotonin, bradykinin, substance P, and other mediators, production of noxious stimuli, and irritation of free nerve endings and nociceptors leading to nociceptive pain. Damage to peripheral or central neural structures during surgery also lead to pain directly, which is of neuropathic origin. About 86 percent of patients who undergo any surgery, experience pain in post-operative period. Majority of these patients experience moderate to severe pain and about 75 % patients are in pain even after discharge from the hospital.[3]

Untreated postoperative pain is a highly preventable issue. There are many methods and modalities at the disposal of treating physician/anesthetist for alleviating the suffering of post-operative patient due to pain. Postoperative analgesia is broadly divided into non pharmacological methods, systemic pharmacological methods, locoregional methods of analgesia, multimodal methods and preemptive and preventive analgesia.

Because of the complexity of surgical pain, post-operative pain cannot be adequately treated with a single medication without experiencing significant side effects. Results of several clinical trials have shown that the most effective way to treat pain and prevent the development of chronic pain syndromes is by adopting a multimodal analgesic strategy. Combining different analgesic medications allows a dose reduction of each analgesic drug thereby minimizing the risk of developing medication related side effects. Systemic opioids are the mainstay of treatment strategy for control of post-operative pain. However, avoidance of high doses of opiates is also imperative to reduce their unwanted side effects, which include nausea, vomiting, sedation, lethargy, confusion and delirium.[4]

Epidural analgesia has become a cornerstone of acute pain management. Since 1901, when 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.[5]

For lower abdominal surgeries, epidural analgesia has been gold standard and time tested technique for providing postoperative 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.

There are two methods of localising the transversus abdominis plane with a needle: the 'double pop' technique and the ultrasound-guided technique. In the double-pop technique, an anatomical area called the triangle of Petit is located by palpation. This triangle is situated adjacent to the iliac crest in the flank. A needle introduced into the triangle perpendicularly to the skin will provide a sensation of 'pops' or alterations in resistance as it passes through the layers of tissue, and by deduction the needle tip will be appropriately sited in the correct plane.[6] Local anaesthetic is then injected via the needle. Ultrasound-guided imaging enables direct visualisation in real time of the relevant objects: the three muscle layers, the underlying peritoneum, the advancing needle, and the injected fluid.[7]

Therefore, the present study was planned to compare the efficacy and outcomes of both these methods for postoperative pain relief in patients undergoing lower abdominal surgeries.

MATERIAL AND METHODS

This prospective randomised study was conducted in the Department of Anaesthesiology and Critical Care, Command Hospital (WC) Chandimandir. Eighty patients with ASA status I & II aged between 20 and 65 years undergoing lower abdominal surgeries were included in this study. Patients with cardiac, renal, hepatic, respiratory, coagulation dysfunction, age less than 20 years and more than 65 years of age, having infection at the site of procedure, psychological disorder, history of drug allergies, chronic use of pain medication, BMI more than 30 and not willing to give consent for the study were excluded.

Patients were divided into two groups, group E and group T by computer generated random number table. Each group comprised of 40 patients. Patients in group E were given epidural analgesia and patients in group T were given ultrasound guided bilateral TAP block.

Clinical examination

All patients were examined during preoperative visit a day prior to surgery and clinical history and physical examination was done. Routine investigations like haemoglobin, bleeding time, clotting time and urine examination were carried out in all the patients. Other relevant investigations like blood urea, serum creatinine, serum electrolytes and ECG were undertaken where ever required.

Preparation of patient

Patients were required to fast for 6 hours prior to the scheduled time of surgery. After arrival in the operating room, standard monitoring comprising of electrocardiography (ECG), SpO_2 and non-invasive blood pressure (NIBP) was established. Baseline readings of vital parameters recorded. Intravenous line was secured with appropriate size intravenous cannula.

Anaesthesia technique

In both the groups, patients were operated under general anaesthesia. Pre-medication comprised of intravenous injection ranitidine 50 ml, inj glycopyrrolate 0.2 mg and injection ondansetron 8 mg. Induction anaesthesia was achieved with inj propofol 2mg kg^{-1} body weight and inj fentanyl 2 mcg kg^{-1} body weight. Intubation was aided by inj atracurium 0.5 mg kg^{-1} body weight. Anaesthesia was maintained using sevoflurane, nitrous oxide and oxygen. Reversal of neuromuscular blockage was done using inj neostigmine 50mcg kg^{-1} body weightt and inj glycopyrrolate 10 mcg $^{-1}$ kg body weight.

Patients in group E had lumbar epidural catheter placed at L_1-L_2 or L_2-L_3. Catheter was placed with patients in sitting position, before giving the general anaesthesia. “Loss of resistance to air” technique with 18-gauge Tuohy needle was used and catheter left in situ. However, the epidural catheter was not supposed to be activated till the end of the surgery. At the end of the surgery, bolus dose of 10 ml of 0.125% bupivacaine was given followed by the epidural infusion of 0.125% bupivacaine at the rate of 3-5 ml per hour for next 48 hours.

Preparation for epidural catheter placement

Patients were made to sit straight placing the feet on a stool, head flexed and arms hugging a pillow. A number of descriptions were used to help the patient understand the position they were to assume.

Projection and Puncture

After sterile preparation was done, a skin wheal was placed at the predetermined site of insertion. Midline was identified and the needle was inserted. Blood in the needle returned if the needle was inserted further than normal. Progression of the needle was stopped and the landmarks and the needle insertion points were reassessed if the patient complained of paresthesia. Epidural needle was inserted into the ligamentum flavum.

Loss of resistance technique: The stylet was removed once the needle was placed into the ligamentum flavum. A syringe with 2-3 ml of air was attached. The needle was held steady by the non-dominant hand. The dominant hand was used to hold the syringe. Steady pressure was applied to the plunger to compress the air bubble. Slowly and steadily the needle was advanced, until the loss of resistance was noted. Once the epidural space was identified, the catheter was inserted 3-4 cm into the epidural space. A test dose consisted of 3 ml of 1.5% preservative free lidocaine with 1:200,000 epinephrine. Forty-five milligrams of lidocaine, when injected intrathecally, resulted in a spinal anesthesia. Fifteen micrograms of epinephrine, when injected intravascularly, would result in a 20% or more increase in heart rate. Blood pressure may be elevated or remain the same.

Aspiration before each injection was helpful, but was not always able to detect intravascular or subarachnoid placement of a catheter. Catheter migration may occur any time. This can lead to an intravascular or intrathecal injection. Before dosing, aspiration was done and dosing of epidural was done incrementally. Caution was exercised and a high index of suspicion was kept.

Monitoring

After successful placement of an epidural anesthetic, the patient was monitored continuously for block progression and complications. Heart rate, pulse oximetry, level of consciousness, and signs and symptoms of toxicity were monitored continuously. Blood pressure was taken every 3 minutes or more frequently if needed.

Patients in group T received bilateral ultrasound guided TAP block at the end of the surgery. A portable ultrasound machine with high frequency linear pro was used. The ultrasonography probe was placed transversely over the anterior abdominal wall over its anterio-lateral aspect, across the mid axillary line, and just above the iliac crest. At this location, the three muscle layers of the anterior abdominal wall were visualized.

Scanning Technique

The ultrasound guided TAP block is considered a BASIC skill level block. It is relatively simple to identify the fascial plane between the internal oblique and transversus abdominis muscles. The patients were placed in supine position and the abdomen exposed between the costal margin and the iliac crest. A linear, high-frequency transducer was used for this block, as the relevant anatomical structures are relatively shallow. Following skin and transducer preparation, the transducer was placed in an axial (transverse) plane, above the iliac crest, and in the region of the anterior axillary line. The terminal branches of the anterior rami of T7 to L1 cannot be visualized but are expected to lie within the TAP between internal oblique and the transverse abdominis muscles above the iliac crest. The three muscular layers of the abdominal wall viz. the external oblique (most superficial), the internal oblique and transversus abdominis muscles were identified. Among the three muscles, the internal oblique muscle layer is the most prominent layer. In the lower medial aspect of the abdominal wall, the external oblique muscle gives way to the external oblique aponeurosis and therefore appears as a layer of fascia instead of muscle. The peritoneal cavity lies deep to the transversus abdominis muscle layer and identified by the peristaltic movements of bowel loops.

A 16 gauge intravenous cannula was advanced in the plane from the anterior direction. After placement of the cannula in between the internal oblique at the tranversus abdominis muscle, 20 ml of 0.125% bupivacaine was injected and the spread of local anaesthetic solution visualised in real time through ultrasound. After injecting the local anaesthetic solution, the stylet was removed and the 16 gauge cannula was left in situ. The cannula was secured in place using elastoplaster.

Infusion was started at the rate of 4ml hr^{-1} bilaterally for 48 hours. Upon reaching the plane, 2 ml of saline was injected to confirm correct needle position after which 20 ml of local anaesthetic solution was injected. The transversus abdominis plane was visualized expanding with the injection (appearing as a hypoechoic space).

Patients were assessed for pain at 1, 2, 4, 6, 8, 10, 12, 16, 18, 24 and 48 hours postoperatively. Assessment of the pain was done using numeric rating scale for pain and score noted for i) Pain at rest, ii) Pain on coughing and iii) Consumption of rescue analgesic. Postoperative pain was graded in 4 categories depending upon the Numeric Rating Scale for pain score as: Nil = NRS score 0. Mild = NRS score 1-3. Moderate = NRS score 4-6 and Severe = NRS >6.

Intravenous paracetamol 1 gm infusion was used as first line rescue analgesic. Paracetamol was given to patients if there NRS score were > 3. If the patient score were > 3 even after 1 hour of IV paracetamol, then they were given injection tramadol 50 mg as slow IV infusion over 10 minutes and the total analgesic consumption at the end of 48 hours was noted. In addition, the blood pressure, the heart rate and respiratory rate were also recorded before the surgery, intra operatively, post operatively at 5, 10, 15, 30 and 45 minutes followed and thereafter at 1, 2, 4, 6, 8, 10, 12, 16, 18, 24 and 48 hrs.

STATISTICAL ANALYSIS

At the end of the study, the data was collected and analysed statistically by using Student t-test. A P-value of <0.05 was considered statistically significant.

RESULTS

In the present study, Group I had 62.5% females whereas group II had 100% female subjects. The mean age was 54.08 and 55.75 years in group I and II respectively (p>0.05). Weight in group II was higher (63.73 kg) as compared to group I (61.95 kg) (p >0.05). ASA grade I was 7.5% in group I and 18.2% in group II whereas grade II ASA was seen in 92.5% and 81.8% of subjects in group I and II respectively (>0.05).

Pain was classified as mild, moderate and no pain. Pain distribution was found significant at 2 hours, 6 hours, 8 hours and 10 hours. At other time periods the pain distribution was similar in both groups I and II. After the 12 hour time period onwards, the pain score distribution was mild in both groups with no significant difference. With regard to pain score at coughing, it was found significant at only at 2 hours, 10 hours and 12 hours. At other time periods the pain distribution was similar in both groups I and II. After the 18 hour time period onwards, the pain score distribution was mild in both groups with no significant difference.

Paracetamol consumption was 23 and 53 in group I and II respectively. Maximum consumption of PCM was seen at 2^{nd}hr where 6 PCM were consumed for fever in group I and 19 PCM in group II. On the other hand, only one tramadol was consumed for pain in group I and 12 in group II. Maximum consumption was seen at 8^{th} hour in group II and none in group I. Comparison of PCM consumption among group I and II shows that no PCM was consumed in 47.5% and only 15% subjects in groups I and II respectively. One dose of PCM was given among 47.5% and 42.5% in group I and II. Two doses of PCM was given only among 5% of group I of subjects whereas 37.5% of subjects had consumption of 2 PCM's in group II. Only two (5%) of the subjects had to consume 3 PCM's. The distribution of PCM consumption among the two groups I and II was statistically significant.

Similarly, total Tramadol consumption among group I and II shows that no Tramadol was consumed in 97.5% and 72.5% subjects in groups I and II respectively. One dose of Tramadol was given among only 2.5% and 25% in group I and II. Two doses of Tramadol was given only among 2.5% of group II of subjects whereas none of the subjects had consumption of 2 Tramadol's in group I.

The distribution of Tramadol consumption among the two groups I and II was statistically significant.

Incidence of post-operative nausea and vomiting was seen among two groups I and II. At 1st hour, a total of 8 (20%) subjects developed PONV episode in group I whereas 13 (32.5%) of subjects developed PONV among group II. The difference in these episode was not statistically significant (p=0.204). At 2nd hour, 16 episodes of PONV were noted in group I and none in group II. At 8th hour, 13 episode were noted in group II and none in group I.

Table 1: Comparison of heart rate between two groups

Time variable	Group	Mean±SD	P-value
Heart Rate at base line	Epidural	85.95±11.126	0.473
	TAP	84.2±10.571	
Heart rate at post op	Epidural	98.2±7.92	0.761
	TAP	97.75±4.903	
Heart rate at 5 min	Epidural	100.95±8.277	0.022
	TAP	97.7±2.919	
Heart rate at 10 min	Epidural	97.3±4.952	0.029
	TAP	95.1±3.842	
Heart rate at 15 min	Epidural	93.38±4.522	0.065
	TAP	91.53±4.32	
Heart rate at 30 min	Epidural	90.33±4.263	0.677
	TAP	90.68±3.133	
Heart rate at 45 min	Epidural	89.85±6.538	0.198
	TAP	87.95±6.555	
Heart rate at 1 hr	Epidural	88.78±7.076	0.503
	TAP	87.58±8.791	
Heart rate at 2hr	Epidural	90±8.376	0.704
	TAP	89.35±6.8	
Heart rate at 4 hr	Epidural	86.65±5.072	0.082
	TAP	84.9±3.706	
Heart rate at 6 hr	Epidural	83.35±4.737	0.205
	TAP	81.95±5.053	
Heart rate at 10 hr	Epidural	88.7±7.573	0.001
	TAP	83.75±3.629	
Heart rate at 12 hr	Epidural	81.6±5.532	0.172
	TAP	80.05±4.472	
Heart rate at 16 hr	Epidural	81.3±4.473	0.140
	TAP	79.95±3.58	
Heart rate at 18 hr	Epidural	78.25±3.848	0.063
	TAP	79.8±3.502	
Heart rate at 24 hr	Epidural	79.45±1.694	0.001
	TAP	82.35±2.392	
Heart rate at 48 hr	Epidural	78.8±1.856	0.249
	TAP	79.4±2.687	

Independent t-test

Table 1 shows the heart rate measurement at various time periods among the two groups. Heart rate was higher in the epidural group as compared to TAP group. Heart rate at 5 and 10 minutes were significantly high in epidural group than TAP group. Also at 10th hour, the heart rate was significantly higher in epidural group than TAP group. At 18th, 24th and 48th hour, the heart rate was higher in TAP group as compared. At other time periods, the heart rate was similar in both groups.

Table 2. Comparison of mean SpO2 among groups

Time variable	Group	Mean±SD	P-value
SpO2 at base line	Epidural	98.98±0.66	0.022
	TAP	98.68±0.474	
SpO2 at post op	Epidural	98.9±0.709	0.005
	TAP	98.5±0.506	
SpO2 at 5 min	Epidural	98.83±0.636	0.001
	TAP	99.35±0.736	
SpO2 at 10 min	Epidural	99.05±0.639	0.058
	TAP	99.3±0.516	
SpO2 at 15 min	Epidural	98.95±0.959	0.360
	TAP	99.13±0.723	
SpO2 at 30 min	Epidural	98.7±0.791	0.001
	TAP	98.15±0.362	
SpO2 at 45 min	Epidural	98.98±0.66	0.001
	TAP	98.35±0.483	
SpO2 at 1 hr	Epidural	99.18±0.446	0.001
	TAP	98.68±0.474	
SpO2 at 2 hr	Epidural	99.13±0.563	0.861
	TAP	99.15±0.7	
SpO2 at 4 hr	Epidural	98.93±0.73	0.163
	TAP	99.15±0.7	
SpO2 at 6 hr	Epidural	99.03±0.66	0.881
	TAP	99±0.816	
SpO2 at 10 hr	Epidural	99.18±0.446	0.001
	TAP	98.35±0.483	
SpO2 at 12 hr	Epidural	98.4±0.496	0.492
	TAP	98.33±0.474	
SpO2 at 16 hr	Epidural	98.73±0.905	0.009
	TAP	99.15±0.427	
SpO2 at 18 hr	Epidural	98.95±0.552	0.001
	TAP	99.48±0.554	
SpO2 at 24 hr	Epidural	98.68±0.474	0.115
	TAP	98.5±0.506	
SpO2 at 48 hr	Epidural	98.7±0.791	0.182
	TAP	98.5±0.506	

Independent t-test

Table 2 shows the comparison of SpO2 among Epidural and TAP groups at various time intervals. Mean SpO2 was significantly higher in epidural group at baseline and immediate postoperative reading. After 5 minutes to 15 minutes, mean SpO2 reading was higher in TAP group with significance at 5 minutes. At 30 minutes, 45 minutes and 1 hour reading, mean SpO2 was higher in the Epidural group. Again at 10th hour, the mean SpO2 reading was significantly higher in Epidural group. After that till 48th hour, the mean SpO2 readings were similar in both Epidural and TAP group except at 16th and 18th hour where mean SpO2 readings were higher in TAP group.

Table 3. Comparison of mean SBP among groups

Time variable	Group	Mean±SD	P-value
SBP at base line	Epidural	137.1±6.34	0.027
	TAP	131.25±15.10	
SBP at post op	Epidural	149.2±6.60	0.744
	TAP	149.75±8.31	
SBP at 5 min	Epidural	148.1±5.20	0.035
	TAP	150.55±5.02	
SBP at 10 min	Epidural	147.15±7.77	0.087
	TAP	143.65±10.11	
SBP at 15 min	Epidural	140.25±3.42	0.001
	TAP	144.3±4.51	
SBP at 30 min	Epidural	137.6±7.29	0.227
	TAP	139.65±7.75	
SBP at 45 min	Epidural	133.95±4.16	0.001
	TAP	138.9±5.83	
SBP at 1 hr	Epidural	132.65±9.06	0.247
	TAP	134.55±4.89	
SBP at 2 hr	Epidural	135.45±4.2	0.010
	TAP	138.85±6.95	
SBP at 4 hr	Epidural	127.2±9.72	0.003
	TAP	132.55±5.37	
SBP at 6 hr	Epidural	127.25±10.24	0.264
	TAP	129.35±5.87	
SBP at 10 hr	Epidural	128.55±7.49	0.681
	TAP	127.8±8.72	
SBP at 12 hr	Epidural	123.2±10.68	0.597
	TAP	122.2±5.27	
SBP at 16 hr	Epidural	122±12.63	0.625
	TAP	120.9±6.42	
SBP at 18 hr	Epidural	119.35±6.69	0.050
	TAP	116.7±5.13	
SBP at 24 hr	Epidural	125.05±5.65	0.235
	TAP	123.3±7.32	
SBP at 48 hr	Epidural	125.95±4.71	0.353
	TAP	127.05±5.76	

Independent t-test

Table 4. Comparison of mean DBP among groups

Time variable	Group	Mean±SD	P-value
DBP at base line	Epidural	86.3±7.62	0.058
	TAP	82.7±9.07	
DBP at post op	Epidural	98.6±3.01	0.186
	TAP	97.6±3.65	
DBP at 5 min	Epidural	99.1±6.10	0.003
	TAP	95.2±5.29	
DBP at 10 min	Epidural	89.45±2.21	0.280
	TAP	88.9±2.30	
DBP at 15 min	Epidural	86.95±3.67	0.516
	TAP	86.45±3.15	
DBP at 30 min	Epidural	82.35±3.35	0.838
	TAP	82.2±3.19	
DBP at 45 min	Epidural	81.9±4.74	0.026
	TAP	84.45±5.29	
DBP at 1 hr	Epidural	79.6±6.06	0.003
	TAP	84.4±7.99	
DBP at 2 hr	Epidural	86.2±9.56	0.430
	TAP	84.5±9.59	
DBP at 4 hr	Epidural	72.75±8.22	0.001
	TAP	81.9±6.83	
DBP at 6 hr	Epidural	81.8±11.25	0.213
	TAP	84.45±7.19	
DBP at 10 hr	Epidural	84.7±8.12	0.450
	TAP	85.9±5.83	
DBP at 12 hr	Epidural	77.8±6.68	0.025
	TAP	74.6±5.78	
DBP at 16 hr	Epidural	80.6±9.21	0.716
	TAP	80±4.79	
DBP at 18 hr	Epidural	78.2±6.43	0.610
	TAP	77.6±3.65	
DBP at 24 hr	Epidural	75±9.09	0.001
	TAP	83.65±7.44	
DBP at 48 hr	Epidural	76±9.58	0.017
	TAP	80.9±8.35	

Independent t-test

Table 3 shows the comparison of mean SBP between Epidural and TAP group. SBP was significantly higher in the Epidural group at baseline reading whereas at 5 minutes, 15 minutes, 45 minutes, 2 hours and 4 hour reading, TAP group had significantly higher SBP as compared to Epidural group. At other time periods, there was no significantly different SBP readings between the two groups.

Table 4 shows the comparison of mean DBP readings between Epidural and TAP groups. The mean DBP was higher in the epidural group as compared to TAP group with significantly different at 5 minutes. At 45 minutes and 1 hour, the mean DBP was significantly higher in TAP group. At 4th hour, 24th hour and 48th hour, the mean DBP was significantly higher in the TAP group as compared to Epidural group. At rest of the time periods the mean DBP reading was similar in both groups with no significant difference.

Comparison of mean SBP between baseline and SBP readings at various time periods in Epidural group shows that SBP was lower in the baseline reading as compared to SBP readings from immediate postoperative to 15 minutes with significantly different at postoperative, 5 minutes and 10 minutes. Thereafter, the mean SBP readings were higher in the baseline as compared to readings at different time periods with significantly higher readings at baseline at 45 minutes, 1 hour, 2 hour, 4th hour, 6th hour, 10th hour, 12th hour, 16th hour, 18th hour, 24th hour and 48th hour.

Comparison of mean DBP between baseline and DBP readings at various time periods in Epidural group shows that DBP was lower in the baseline reading as compared to DBP readings from immediate postoperative to 15 minutes with significantly different readings at postoperative, 5 minutes and 10 minutes. From 15 minutes readings to 2nd hour reading there was no significant difference between the baseline and respective time reading. The mean DBP reading was significantly higher at the baseline as compared to reading at respective time period at 4th hour, 12th hour, 18th hour, 24th hour and 48th hour.

Comparison of mean SBP between baseline SBP and SBP readings at various time periods in Epidural group shows that SBP was lower in the baseline reading as compared to SBP readings from immediate postoperative to 6th hour reading with significantly lower mean SBP readings at postoperative, 5 min, 10 min, 15 min, 30 min, 45 min, 1 hour and 2nd hour. From 10th hour onwards the mean SBP reading was higher in the baseline as compared to SBP readings at 10th hour, 12th hour, 16th hour, 18th hour, 24th hour and 48th hour. Significant higher mean SBP at baseline was seen at 12th hour, 16th hour, 18th hour and 24th hour.

Comparison of DBP at baseline with DBP at various time periods in the TAP group shows that DBP at baseline was significantly lower with readings at immediately postoperative, 5 minutes, 10 minutes and 15 minutes. Thereafter, from 30 minutes to 10 hour the DBP reading was similar with the baseline reading of DBP with no significant difference. At 12th hour to 48th hour, there was lower DBP reading as compared to baseline with significantly different readings at 12th and 18th hour respectively.

DISCUSSION

As the field of surgery advanced, the role of anaesthesiologists who understand the pathophysiology of pain and its management has increased many folds.[8] Marked reduction is being observes in anesthesia-related deaths or disabilities during or after surgery.[9] This is despite the increase in challenging operations due to surgical advancements as well as widening patient spectrum.[8] Their role has expanded from limited duration of surgical intervention to postoperative pain management. In addition, safety and advantages of regional anaesthesia over general anaesthesia were realised in terms of fewer complication rates related to respiratory and cardiovascular systems.[10] Inadequate analgesia is another issues compromising the success of surgery. Regional anaesthesia scores higher than other blocks.[10] Different techniques have evolved for analgesia following lower abdominal surgeries.[11] Epidural analgesia, TAP block, and infiltration of LA at the site of incision and nerve block are commonly used techniques. Epidural anesthesia had been ruling the choices since years and was considered as the “gold standard” for perioperative as well as operative periods. Excellent analgesic effect as well as attenuation of neurogenic contribution to inflammation made it safest choice. However, cardiovascular disturbances with concerns of epidural catheter placement and removal in patients on anticoagulants therapy have led anaesthetists as well as surgeons to explore other options.[12]

In this prospective randomized controlled trial, we examined the effectiveness of the two methods in controlling the perioperative pain and compared the outcomes in terms of BP control and rates of other complications.

The age- sex distribution was similar to other studies comparing the different techniques of anesthesia in lower abdominal surgeries. As major proportion of lower abdominal surgeries are gynaecological surgeries that may be one of the reasons that all these studies have higher percentage of female participants.

Our primary goal was to study the effectiveness of two techniques in pain control at different time periods. No significant difference was found in pain control scores of both groups. The results of other studies differ wherein analgesia at rest was found to be comparable between the groups in the first 16h. At 24 and 48 h, epidural group had significantly better analgesia at rest (P = 0.001 and 0.004 respectively).[13] Kanazi et al favored use of intrathecal morphine wherein median (range) time to first request for analgesic was 8 (2–36) h compared to 4 (0.5–29) h in the TAP group (*P* = 0.005).[14]

In addition to pain at rest, pain during coughing was assessed. In our study we did not find any significant difference in pain scores in both groups. In study by Iyer et al, patients in epidural group had significantly higher number of patients with nil or mild pain on coughing at all times.[13]

Both paracetamol and tramadol consumption was higher in group II with maximum peak 2 hours postoperatively. Tramadol which is a stringer analgesic was consumed for pain after 8th hour, which may represent complete weaning off of analgesic effect of TAP block 8 hours postoperatively In study by Iyer et al, paracetamol consumption was comparable in both groups, but tramadol consumption was significantly higher in TAP group at the end of 48 h (*P* = 0.001).[13]

The results by Belavy *et al*. contradict our findings of no significant difference as well as findings of Iyer et al who found epidural anesthesia to be more effective. Belavy *et al*. reported significantly better analgesia and reduced 24 h morphine consumption in patients who received ultrasound-guided TAP block, following cesarean section under spinal anesthesia compared to those who underwent cesarean section under spinal anesthesia but did not receive TAP block.[15] However, patient population is diverse in these studies. Belavy et al only included caesarean sections. Baaj *et al*. randomized 40 women to receive either local anesthetic (*n* = 20) or saline (*n* = 20) TAP blocks in addition to a plain bupivacaine spinal block for elective cesarean section.[16] A significant reduction in 24-h morphine requirement was observed in the local anesthetic TAP block group versus controls (26 mg ± 5 mg vs. 63 mg ± 5 mg; *P* < 0.05).

A study by Adeel et al, demonstrated absence of clinical or statistically significant difference in any of the primary and secondary outcomes related to post-operative pain management.[17]

Postoperative nausea and vomiting was found to be higher in TAP group at the end of first hour. The difference in these episode was however not statistically significant. The nausea and vomitted started in epidural group in 2nd hour. Thus implying that the anaesthesia effect causes early start of nausea and vomiting in TAP as compared to epidural anaelgesia. Another important interpretation is that at 8th hour, the nausea and vomiting appears or continues in patients of TAP whereas epidural group has no new cases. Our results are different from results by Rao et al., who report lower postoperative nausea and vomiting PONV, lower 24-h VAS scores, and higher satisfaction in the local anesthetic TAP block group. It is worthwhile mentioning here that the differences in study by Rao et al were statistically non-significant.[18] The authors also report comparable pain scores between patients in the two groups with comparable incidence of PONV.

In another study done by Kandi, evaluating the efficacy of ultrasound-guided TAP block versus epidural analgesia in pain management following lower abdominal surgery, the author has reported that TAP block provided highly effective postoperative analgesia in the first 24 h with longer analgesic free periods in the TAP group compared to the epidural group during the first 24 h postsurgery.[19] There was also a significant reduction in the number of cases needing more than 200 μg/kg of morphine in the TAP group when compared to the epidural group.

Heart rate, SpO2, diastolic and systolic blood pressure measurements were conducted at various time periods among the two groups. Heart rate as well as mean SpO2 remained consistently higher in the epidural group as compared to TAP block group. Mean SpO2 was significantly higher in epidural group at baseline and immediate postoperative reading. Blood pressure results were however variable. SBP as well as DBP were significantly higher in the epidural group at baseline reading whereas at later readings till 4 hours revealed a raised SBP reading in TAP group as compared to Epidural group. For DBP, the readings stayed raised in in TAP block group. The blood pressure readings were similar in both groups with no major statistically significant differences. Other studies also demonstrated similar pattern. Neeraj et al also demonstrated that none of the patients in either group had any complications arising from the regional technique. Both groups of patients were hemodynamically stable during the 48 h of follow-up.[20]

Our study add to limited literature on effectiveness of TAP block as compared to epidural analgesia. In a 2010 review, Charlton et al[21] lamented upon absence of studies comparing TAP block with other analgesics such as epidural analgesia. They further documented that there is only limited evidence to suggest use of perioperative TAP block reduces opioid consumption and pain scores after abdominal surgery when compared with no intervention or placebo.

CONCLUSION

The ultrasound guided transversus abdominis plane (TAP) block is as effective method as epidural anesthesia in providing analgesia in patients undergoing lower abdominal surgery. Patient in both groups stay hemodynamically stable. In terms of patient discomfort the results differ wherein the pain at rest as well as coughing was found to be higher in TAP block. Nausea vomiting starts late in TAP block but once started it stays for longer duration. TAP block as well as epidural anesthesia lead to almost similar results, so both can be chosen depending upon availability of resources. Similar randomized controlled trial with higher sample size would give more power to the results. Cost effectiveness studies should be conducted alongside the trials comparing efficacy of two types of anaesthesia.

REFERENCES

1. American Pain Society Quality of Care Committee. Quality improvement guidelines for the treatment of acute pain and cancer pain. JAMA 1995;274:1874-80.
2. Levy N, Sturgess J, Mills P. Pain as the fifth vital sign" and dependence on the "numerical pain scale" is being abandoned in the US: Why? Br J Anaesth 2018;120:435-8.
3. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. Anesth Analg 2003;97:534-40.
4. Drewes AM. Definition, diagnosis and treatment strategies for opioid-induced bowel dysfunction–Recommendations of the Nordic Working Group. Scand J Pain 2016;11:111-22.
5. Gorelick PB, Zych D, James L. Corning and the early history of spinal puncture. Neurology 1987;37:672-4.
6. Rafi AN. Abdominal field block: a new approach via the lumbar triangle. Anaesthesia 2001;56:1024–6.
7. Hebbard P. Subcostal transversus abdominis plane block under ultrasound guidance. Anesth Analg 2008;106:674–5.
8. Verma R. Anesthesiologist: The silent force behind the scene. Anesth. Essays Res 2015;9:293.
9. Braz LG. Perioperative cardiac arrest: a study of 53 718 anaesthetics over 9 yr from a Brazilian teaching hospital. Br J Anaesth 2006;96:569-75.
10. Hopkins PM. Does regional anaesthesia improve outcome? Br J Anaesth 2015; 115:26-33.
11. Gadsden J. Evolution of transversus abdominis plane infiltration techniques for postsurgical analgesia following abdominal surgeries. Local Reg Anesth 2015;8:113.
12. Rawal N. Epidural Technique for Postoperative Pain. Reg Anesth Pain Med 2012;37:310-17.
13. Iyer SS, Bavishi H, Mohan CV, Kaur N. Comparison of epidural analgesia with transversus abdominis plane analgesia for postoperative pain relief in patients undergoing lower abdominal surgery: a prospective randomized study. Anesth Essays Res 2017;11, 670-5.

14. Kanazi GE. The analgesic efficacy of subarachnoid morphine in comparison with ultrasound-guided transversus abdominis plane block after cesarean delivery. Anesth Analg 2010;111:475–81.
15. Belavy D, Cowlishaw PJ, Howes M, Phillips F. Ultrasound-guided transversus abdominis plane block for analgesia after caesarean delivery. Br J Anaesth 2009;103:726-30.
16. Baaj JM, Alsatli RA, Majaj HA, Babay ZA, Thallaj AK. Efficacy of ultrasound-guided transversus abdominis plane (TAP) block for postcesarean section delivery analgesia--a double-blind, placebo-controlled, randomized study. Middle East J Anaesthesiol 2010;20:821-6.
17. Adeel S. Ultrasound-guided transversus abdominis plane block: An evaluation of its efficacy in reducing post-operative opioid requirements in caesarean section. J Obstet Anaesth Crit Care 2017;**7:**81.
18. Kadam VR, Van Wijk RM, Moran JL, Miller D. Epidural versus continuous transversus abdominis plane catheter technique for postoperative analgesia after abdominal surgery. Anaesth Intensive Care 2013;41:476-81.
19. Kandi Y. Efficacy of ultrasound-guided transversus abdominis plane block versus epidural analgesia in pain management following lower abdominal surgery. Ain-Shams J Anaesthesiol 2015;8:653.
20. Niraj G. Comparison of analgesic efficacy of four-quadrant transversus abdominis plane (TAP) block and continuous posterior TAP analgesia with epidural analgesia in patients undergoing laparoscopic colorectal surgery: an open-label, randomised, non-inferiority tri. Anaesthesia 2014;69:348–55.
21. Charlton S, Cyna AM, Middleton P, Griffiths JD. Perioperative transversus abdominis plane (TAP) blocks for analgesia after abdominal surgery. Cochrane Database Syst Rev CD007705 (2010). doi:10.1002/14651858.CD007705.pub2.

How to cite this article: Manhas K, Ahluwalia CS, Trivedi S. Comparative study of ultrasound guided TAP block and epidural analgesia for postoperative analgesia in patients undergoing lower abdominal surgeries. Int J Health Sci Res. 2020; 10(6):1-11.

******