**Comparison between continuous lumbar paravertebral, epidural and TAP blocks on postoperative analgesia after abdominal surgeries**

**Mohamed Youssry Serry MD**1 **, Mohamed Ahmed El- Rabiey MD**1**, Mohamed Fouad El- Meliegy MD**1 **, Tamer M.E.Allam M.Sc**1 **,**

1 **Department of anesthesia ,Benha faculty of medicine , Benha university.**

**Abstract**

**BACKGROUND:** The study was done to compare analgesic efficacy of ultrasound guided continuous lumbar paravertebral block ,continuous transversus abdominis plane block and continuous lumbar epidural block , on postoperative analgesia in patients undergoing abdominal surgeries (unilateral inguinal hernia repair) . We evaluated their analgesic efficacy over the first 24 postoperative, in a randomized, single-blind, clinical trial in 60 Patients divided into three equal groups , 20 patients in each group .

**METHODS:** Sixty Patients were randomized into three equal groups , 20 patients in each group Group Preceived ultrasound guided continuous lumbar paravertebral block with bupivacaine 0.5% bolus dose 20 ml, followed by continuous infusion of bupivacaine 0.25%(0.1 ml/kg/hr).Group Treceived ultrasound guided transversus abdominis plane block with 20 ml of bupivacaine 0.5% followed by continuous infusion of bupivacaine 0. 25%, (0.1 ml/kg/hr ) and Group Ereceived continuous lumbar epidural analgesia with bupivacaine 0.5% bolus dose 20 ml, followed by continuous infusion of bupivacaine 0. 25% (0.1 ml/kg/hr) . General anaesthesia was induced with fentanyl 1-2 mcg/kg and propofol 1–3 mg/kg followed by rocuronium 0.6 mg/kg . .Activation of regional block at the end of the surgical procedure with recording of parameters in the post-operative period . Each patient was assessed for morphine consumption, visual analogue scale (VAS) at rest and on movement, vital signs and presence of complications (nausea, vomiting, sedation and pruritis) postoperatively by a blinded investigator in the post-anesthesia care unit (PACU) and at one , two, 6, 12 and 24 h postoperatively.

**RESULTS:** The postoperative analgesia is more effective with group E ( the gold standard ) than group P and group T , the latter is being the least effective in postoperative pain control ( Epidural > Paravertebral > TAP). Also the postoperative consumption of morphine in group E is lower than in group P and group T . Asregard complications during the study in all groups , complications as nausea , vomiting , pruritis and drowsiness were recorded which were more in epidural than paravertebral and TAP block .

**CONCLUSION:** Continuous lumbar epidural block is more effective in postoperative analgesia when compared to continuous paravertebral and continuous transversus abdominis plane block , but regarding complications in all groups , there was a higher incidence of complications (hypotension , nausea and vomiting) in patients received epidural analgesia than in other groups

**Keywords**: Paravertebral, Epidural ,TAP block, Ultrasound guided, postoperative analgesia.

**INTRODUCTION :**

Major open upper and lower abdominal surgery, such as bowel resection, gastric bypass, gynecologic surgery and liver resection results in major morbidity for patients, including moderate to severe pain in the acute postoperative period . Data on postoperative pain after surgery consistently shows moderate-to-severe pain in the first 24 hours after surgery with traditional systemic analgesic techniques, such as intravenous or intramuscular opioids, patient-controlled opioid analgesia, and multimodal analgesia with opioids combined with acetaminophen, NSAIDs, neuropathic agents, and ketamine. 1 Despite opioid use, moderate-to-severe pain with coughing and mobilization continues to remain high in the first 72 hours after surgery, though with significant improvement after 24 hours. In addition, use of opioids may result in significant side effects such as hypoventilation, sedation, nausea and vomiting, which can worsen patient recovery . 2

Regional anesthesia and analgesia can be used to significantly reduce postoperative pain scores and spare the use of systemic opioids. Regional anesthesia can be performed at the neuraxis (epidural), the nerve root (paravertebral), and the peripheral nerve (transversus abdominis plane) level. Local anesthetic deposition at these sites will selectively block nerve conduction and result in different analgesic and side effect profiles. 3 Ultrasound (US)-guided peripheral nerve block is a safe alternative that utilizes minimal amounts of local anesthetic and minimum monitoring is essential for any procedure requiring regional block. US-guided nerve blocks have been reported extensively in the anesthesiology literature and have proven effective than the traditional landmark techniques. 4.Epidural analgesia can be a useful method of pain management at various situations . it facilitates The epidural space may be clinically further sub-divided into posterior, lateral, and anterior spaces. 5 The spinal nerves in the paravertebral space are submerged in the paravertebral adipose tissue.The paravertebral space is continuous with the epidural space medially and the contralateral paravertebral space via the paravertebral fascia . The mechanism of action of the paravertebral blockade at this level includes direct infilteration of the loca anesthetic into the spinal nerve and the medial extension through the intervertebral foramina The paravertebral block is a selective block of the nerve roots at the chosen levels . 6

The transverse abdominis plane (TAP) block is a peripheral nerve block designed to anesthetize the nerves supplying the anterior abdominal wall (T6 to L1). It was first described in 2001 by Rafi as a traditional conventional landmark technique using the lumbar triangle of Petit. Local anesthetic is then injected between the internal oblique and transverse abdominis muscles just deep the fascial plane between (the plane through which the sensory nerves pass). 7 The TAP block is performed by deposition of local anesthetic between the transversus abdominis muscle and the fascial layer superficial to it. Illustration depicting the placement of the ultrasound probe along the

abdominal wall, and the ideal placement of local anesthetic. The TAP block was shown to reduce the need for postoperative opioid use, increase the time to first request for further analgesia, and provide more effective pain relief, while decreasing opioid related

Side effects such as sedation and postoperative nausea and vomiting. 8 The introduction of ultrasound has allowed providers to identify the appropriate tissue plane and perform this block with greater accuracy under direct visualization.The TAP block is a simple procedure that can be used as an adjunct for postoperative pain control in abdominal, gynecologic, or urologic surgery involving the T6 to L1 distribution.9

**PATIENTS AND METHODS:**

After obtaining approval by the Benha university Hospital Ethics Committee, and written informed consent from the patient, we studied 60 ASA physical status I and II patients scheduled for lower abdominal surgeries (unilateral inguinal hernia repair) in a randomized, single-blind, clinical trial. Patients were excluded if there was a history of relevant drug allergy ,age < 18 years old or > 60 years old, coagulopathy ,morbid obesity (BMI > 40 kg /m2). Patients were randomly allocated into three equal groups (Group P) (n=20) patients received ultrasound guided continuous lumbar paravertebral block with bupivacaine 0.5% bolus dose 20 ml, followed by continuous infusion of bupivacaine 0.25% (0.1 ml/kg/hr) ,(Group T) (n= 20) patients received ultrasound guided transversus abdominis plane block with 20 ml of bupivacaine 0.5% followed by continuous infusion of bupivacaine 0. 25%, (0.1 ml/kg/hr) and (Group E) (n=20) patients received continuous lumbar epidural analgesia with bupivacaine 0.5% bolus dose 20ml , followed by continuous infusion of bupivacaine 0. 25% (0.1 ml/kg/hr) .

Randomization was done by online program which used to generate random number list. Patient randomization numbers were concealed in opaque envelops which were opened by the study investigator. The patients, and staff providing postoperative care were blinded to group assignment. All patients received a standard general anesthesia consisting of fentanyl 1-2 mcg/kg and propofol 1–3 mg/kg followed by rocuronium 0.6 mg/kg to facilitate endotracheal intubation and was maintained with isoflurane 1.2% and rocuronium 0.15 mg/kg as a maintenance dose every 30 minutes till the end of the procedure. Insertion of lumbar paravertebral catheter / lumbar epidural catheter was done before induction of general anesthesia , while the transversus abdominis plane block was performed under general anesthesia .

Regional block techniques:-

The ultrasound used for the block in all groups , we have used (GE " LOGIQ P5" ultrasound machine) with 5 -12 MHz probe and colour Doppler imaging capability.

A - Technique of lumbar paravertebral block ( PVB ) :-

The patient was in the sitting position and supported by an attendant . A standard regional anesthesia tray was prepared with the following equipment:

* Sterile towels and 4"x4" gauze packs
* 20-mL syringes with local anesthetic .
* Sterile gloves, marking pen, and surface electrode
* One 1½" 25-gauge needle for skin infiltration
* An 18 gauge 8 cm epidural needle *(Perifix.B.BRAUNMelsungen AG)*
* Syringe pump (Fresenius Kabi)
* GE LOGIQ P5 ultrasound machine

After disinfection of the skin with an antiseptic solution, and protection of the ultrasound probe and cable with a sterile ultrasound probe cover , the lumbar paravertebral space (LPVS) was identified with ultrasound , using a 5-8 MHz curved array ultrasound transducer probe  placed over a spinous process in the mid-line in a longitudinal fashion. The probe was then moved laterally (2-3 cm) from the midline , to visualize the transverse processes and the wedge shaped paravertebral space . The best views of the paravertebral anatomy were obtained with the transducer tilted slightly obliquely, i.e., with the upper part of the transducer directed slightly medially in the sagittal axis.

Once the best image of the interspace structures was captured. Under sterile conditions, 4-6 mL of local anesthetic (Lidocaine 1 %) was infiltrated subcutaneously alongside the line where the injections was made . an 18 gauge 8 cm epidural needle *(Perifix.B.BRAUN Melsungen AG)* was utilized for locating the paravertebral space, the tip of the needle advanced under direct vision . Correct position of the needle in the paravertebral space was confirmed by injecting saline and observing distension of the paravertebral space. A 20-gauge multiple side holes epidural catheter *(B. Braun)* was inserted 5 cm beyond the tip of the needle . After securing the catheter in place and establishing negative aspiration , a test dose was given with 4 ml of Lidocaine 1% mixed with epinephrine 1:200,000.

B- Technique of in-plane ultrasound guided transversus abdominis plane block:-

A broad linear array probe was used, with an imaging depth of 4-6 cm using GE (LOGIQ P5) ultrasound machine. After skin disinfection and protection of the ultrasound probe and cable with a sterile ultrasound probe cover, the ultrasound probe was placed transverse to the abdomen in the midaxillary line between the costal margin and the iliac crest ( The triangle of Petit ) . Three muscle layers were clearly seen in the image . An 18 gauge 8 cm epidural needle *(Perifix.B.BRAUN Melsungen AG)*  was used. The needle is inserted in a sagital plane approximately 3-4 cm medial to the ultrasound probe (in-plane technique). The probe was moved slightly anterior to image the skin puncture and superficial course, then gradually posteriorly to the midaxillary line position, following the needle to the correct position in the transversus abdominis plane. A small volume of local anesthetic (1ml) was injected to open the plane followed by injection of the 20ml of bupivacaine 0.5% . If the 1ml dose appears to be within muscle rather than between them, needle adjustment was required. The local anesthetic injectate appeared hypoechoic on ultrasound imaging. When the needle tip was positioned correctly the injectate was seen on ultrasound to spread out in the plane between the two muscles . A multi-orifice 20-G epidural catheter was threaded where 3-5 cm of the catheter was left inside the plane , then the catheter was taped to the skin .

C- Technique of lumbar epidural block :-

Lumbar epidural space was identified with ultrasound ; Low frequency (5 MHz) curved array probe used with adjusting depth at (10 cm), gain and focus of ultrasound machine. Ultrasound probe was placed in parasagittal (PS) orientation 3-4 cm lateral to midline .Then probe was moved from lateral-to-medial direction toward the median sagittal plane .The hyperechoic laminae of the lumbar vertebrae form a “sawteeth” - like pattern in this view . The intervening gaps represent the paramedian interlaminar spaces , through which the following structures were visualized (in order, from superficial to deep) : ligamentum flavum, epidural space, posterior dura mater, anterior dura, posterior longitudinal ligament, and posterior vertebral body. The ligamentum flavum, epidural space, and posterior dura often appear as a single linear hyperechoic structure, which termed the posterior complex.

Once the examination in the sagittal plane was completed, the probe was rotated 90 degrees into a transverse orientation and centred on the neuraxial midline. If the probe lies over a spinous process, the tip of the spinous process was visible as a superficial hyperechoic line with acoustic shadowing beneath. Its position was marked by centring it on the ultrasound screen. The hyperechoic lamina was visible on either side of the spinous process, but all other structures of interest were obscured by bony acoustic shadowing.

Sliding the probe in a cephalad or caudate direction provides a transverse interlaminar view of the contents of the vertebral canal. Depending on the width of the inter-spinous space and the angle at which the spinous processes project, the transducer was tilted cephalad to optimize the image of the vertebral canal. The depth to the epidural space is then measured and also the tilt (inclination) of the transducer . Mark the interspace on the skin using indelible ink , Changes in patient positioning reduce the accuracy of the markings, the defined insertion point was infiltrated with lidocaine 1% . Remove all the gel with dry gauze and then proceed with lumbar epidural catheter placement by testing for loss of resistance in the usual sterile fashion. An 18 gauge 8 cm epidural needle *(Perifix.B.BRAUN Melsungen AG)* was utilized , A 20-gauge multiple side holes epidural catheter *(B. Braun*) was inserted 5 cm beyond the loss of resistance . After securing the catheter in place and establishing negative aspiration, a test dose was given with 4 ml of Lidocaine 1% mixed with epinephrine 1:200,000.

After the end of surgical procedure , regional block was induced as following : -

Lumbar paravertebral block :-

20 ml bupivacaine 0.5 % bolus dose , followed by maintanence dose (0.1 ml/kg/hr) of bupivacaine 0.25% ,for 24 hours postoperative.

Transversus abdominis plane block:

20 ml bupivacaine 0.5 % bolus dose , followed by maintanence dose (0.1 ml/kg/hr) of bupivacaine 0.25% ,for 24 hours postoperative.

Lumbar epidural block :-

20 ml bupivacaine 0.5 % bolus dose , followed by maintanence dose (0.1 ml/kg/hr) of bupivacaine 0.25% ,for 24 hours postoperative.

The visual analogue scale (VAS) ,morphine consumption, nausea, vomiting, sedation and pruritis were assessed systematically by an investigator. These assessments were performed in the PACU and at 1,2, 6, 12, and 24 h postoperatively. All patients were asked to give scores for their pain at rest and on movement (knee flexion) and for the degree of nausea at each time point. Pain severity was measured using visual analog scale (VAS, 10 cm line in which 0 cm = no pain and 10 cm = worst pain imaginable).

The primary outcome measure in this study was the visual analogue scale (VAS) and 24 h morphine consumption. Secondary outcome measures included vital signs, and side effects associated with morphine consumption and the procedure. Statistical analyses were performed using a standard statistical program (SPSS version 16). Quantitative data were presented as mean ± Standard deviation, and analyzed by using one way ANOVA test, while Qualitative data were presented as numbers and percentages, and analyzed by using Chi-square test , P- Value < 0.05 was considered statistically significant, P- Value < 0.01 was considered statistically highly significant.

**RESULTS:**

Demographic characteristics showed no difference regarding age , body mass index (BMI) , ASA physical status , or duration of surgery between groups **(table 1)**.

**Table ) 1 ( :- Demographic data and duration of surgery in all groups**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | **Group P** | **Group T** | **Group E** | **p-value** |
| **Age (Years)** | | 41.6±7.67 | 43.4±7.33 | 43.7±7.15 | 0.62 |
| **BMI (Kg/m2)** | | 28.6 ± 2.7 | 29.55 ± 2.6 | 29.95 ± 2.7 | 0.27 |
| **ASA** | **I** | 11 | 12 | 12 | 0.85 |
| **II** | 9 | 8 | 8 |
| **Duration of**  **surgery (min.)** | | 77.4 ± 9.26 | 77.9 ± 8.29 | 76.05 ± 10.5 | 0.8 |

P = Paravertebral block ,T = Transversus abdominis plane block ,

E = Epidural block , Data are presented as mean ± SD . P – Value < 0.05 = significant , P – Value < 0.01 = highly significant

VAS was measured at rest and on patient's movement (knee flexion) , at PACU, 1, 2,6,12 and 24 hours postoperative **(table 2)**.

**Table (2) :- Visual analogue scale in all groups during 24 hours post-operative**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Post-operative Visual analogue scale** | | **Group p** | **Group T** | **Group E** | **p-value** |
| **On arrival**  **to PACU** | **At rest** | 3.3 ± 1.49 | 3.06 ± 1.26 | 3.4 ± 1.37 | P= 0.5032 |
| **On movement** | 4.03 ± 1.81 | 3.6 ± 1.57 | 3.8 ± 1.8 | p= 0.3297 |
| **One hour** | **At rest** | 2.8 ± 0.83 | 3.25 ± 0.64 | 2.45 ± 0.83 | P < 0.01\*\* |
| **On movement** | 3.05 ± 0.69 | 3.65 ± 0.49 | 2.75 ± 0.85 | P < 0.01\*\* |
| **Two hours** | **At rest** | 2.05 ± 0.6 | 2.7 ± 0.65 | 1.9 ± 0.91 | P < 0.01\*\* |
| **On movement** | 2.35 ± 0.88 | 3.35 ± 0.59 | 2.3 ± 0.86 | P < 0.01\*\* |
| **6 hours** | **At rest** | 2.1 ± 0.55 | 2.4 ± 0.6 | 1.95 ± 0.76 | P= 0.08 |
| **On movement** | 2.3 ± 0.73 | 2.5 ± 0.89 | 2.25 ± 0.97 | p= 0.63 |
| **12 hours** | **At rest** | 2.15 ± 0.67 | 2.4 ± 0.6 | 2.2 ± 1 | P= 0.56 |
| **On movement** | 2.3 ± 0.86 | 2.45 ± 0.76 | 2.35 ± 0.88 | p= 0.85 |
| **24 hours** | **At rest** | 2.1 ± 0.79 | 2.75 ± 0.91 | 2.05 ± 1.15 | P= 0.04\* |
| **On movement** | 2.6 ± 1.43 | 3.8 ± 1.15 | 2.95 ± 1.36 | p= 0.016\* |

**Data were presented as mean ± SD** **\*\* Highly significant \* significant**

Current study shows significant differences between groups as regard VAS at rest and on movement at one, two and 24 hours postoperatively, but no significant difference at PACU , 6 and 12 hours in the post-operative period , as shown in **(figure 1)** and **(figure 2)**

**Figure (1) :-** VAS values at rest **Figure (2) :-** VAS values on patient's movement

During the first 24 hours in the post-operative period , the total analgesic consumption by morphine boluses used in each group (when pain score exceeds 4) despite the maximum infusion rate of bupivacaine , rescue analgesia 5 mg bolus of morphine was administered intravenously to achieve satisfactory pain control was repeated every 4 hours as needed, this shows a highly significant difference between groups. As expressed in mean ± SD , in group P it is 6.75 ± 2.45 , in group T it is 10.25 ± 1.43 and in group E it is 6.5 ± 2.85 . By these values there is a highly significant difference between groups (P- value < 0.001) , **(table 3), (Figure 3)**

**Table (3) :- Total pain rescue-analgesia consumption during 24 hours**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Groups | Group P | Group T | Group E | P - value |
| Total analgesia consumption | 6.75 ± 2.45 | 10.25 ± 1.43 | 6.5 ± 2.85 | < 0.001\*\* |

\*\* Highly significant

**Figure (3) :-** Total analgesic consumption during 24 hours (Morphine mg / 24 h)

The mean arterial blood pressure (MAP) values in group P and group T shows no significant difference from the baseline , except for a slight decrease in group P. In group E , there is a significant decrease in mean arterial blood pressure from the first hour after the bolus dose till the end of the study and statistical analysis between groups was highly significant ( p < 0.001)

Heart rate values show no significant difference in groups P and T from baseline values but in group E , there are decreased values from baseline. Asregarding complications during the study in all groups , complications as nausea , vomiting , pruritis and drowsiness were recorded ,Regarding nausea in all groups, there were 7 patients ( 35 % ) in group P , 6 patients ( 30 % ) in group T and in group E , there were 8 patients ( 40 % ) . These results are statistically non significant ( P- value = 0.8) . As regarding incidence of vomiting in all groups . there were 3 patients ( 15 % ) in group P , 1 patient ( 5 % ) in group T , but in group E , 3 patients ( 15 % ) had vomiting , no significant difference of these values ( P- value = 0.5 ) .The incidence of pruritis was 2 patients (10 %) in group P , 3 patient's in group T and 1 patient (5 %) in group E , there is no significant difference ( P- value = 0.6) .Regarding drowsiness in all groups , number of patients complaining in group P was 2 patients ( 10 % ) , in group T , 2 patients ( 10 % ) and in group E there was one patient ( 5 % ) . The results are statistically non significant ( P- value = 0.8 ) .

**DISCUSSION**

Postoperative pain, especially when poorly controlled, may produce a range of acute (i.e., adverse physiologic responses) and chronic effects (i.e., delayed long-term recovery and chronic pain). Good pain control after surgery is important to prevent negative outcomes such as tachycardia, hypertension, myocardial ischemia, decrease in alveolar ventilation, immobility, deep venous thrombosis and poor wound healing 10 Many options are available for the treatment of postoperative pain, including systemic analgesics (i.e., opioids and non-opioids ) and regional analgesic techniques (i.e., neuraxial and peripheral) . Multimodal analgesia is achieved by combining different analgesics that act by different mechanisms and at different sites in the nervous system, resulting in additive or synergistic analgesia with lowered adverse effects of sole administration of individual analgesics . It also refers to concurrent application of analgesic pharmacotherapy in combination with regional analgesia. 11

This study was held at Benha University Hospital ; to compare the efficacy of ultra-sound guided continuous lumbar paravertebral block , continuous transversus abdominis plane block and lumbar epidural block on post-operative analgesia, hemodynamics and complications in patients undergoing abdominal surgeries , in which 60 patients were enrolled in Prospective single blinded randomized clinical study in the form of three groups 20 patients in each group.

**The main outcome measures:-** The primary targets of this current study were visual analogue scale (VAS) for pain at rest and on movement (at PACU, one hour, two hours, 6 hours , 12 hours and 24 hours postoperative) and measuring the mean morphine consumption in 24 hours .

**The secondary measurements include:**- Age, body mass index , ASA status, vital signs in the form of mean arterial blood pressure , heart rate and respiratory rate at PACU,every 15 minute in the first hour then after two hours , 6 hours, 12 hours and 24 hours postoperative , time of operation and complications that occurred in all groups (nausea,vomiting, pruritis and drowsiness )

Regarding age, body mass index (BMI) , ASA physical status or duration of surgery between groups , there were no significant statistical differences.

As regard the visual analogue scale (VAS) was measured at rest and on movement at PACU , 1 , 2 , 6 , 12 and 24 hours postoperative and measuring mean 24 hours morphine consumption . Current study showed significant differences between groups as regard VAS and there was increased mean morphine consumption in the first 24 hours post-operative in group T compared with group P and group E , this is consistent with (***Pankaj N Surange , et al., 2012)*** 12 who studied comparative evaluation of continuous lumbar paravertebral with continuous infusion versus continuous epidural block , then VAS was measured at 2 ,4 ,8 ,12 ,18 ,24 ,36 and 48 hours post-operative and total post-operative analgesia consumption .They found that both routes were effective in controlling post-operative pain and didn't differ significantly reflecting good post-operative pain control in both groups, the same with ***(Messina et al., 2009)*** 13who studied the comparison of epidural versus paravertebral blockade in thoracic surgery. They founded that VAS data did not show statistically significant variability at any time point. But generally, values were lower in group B ( epidural ) compared to group A ( paravertebral ) as follow 6 hr postoperative VAS was (2±2.5 Vs 3±2.7) , 24hr postoperative (1±2.1 Vs 1±1.4) and 48 hr postoperative (2±2.0 Vs 2±3.2).

Current study goes with ***(Pintaric et al., 2011)*** 14 They founded that Pain intensity before and after respiratory physiotherapy was similar in the epidural and the paravertebral groups. ***(Gulbahar et al., 2010)*** 15 They founded no significant differences in the postoperative days 1-3 between the two groups (p = 0.943 in first 24 hours , p = 0.896 in 48 hours , p = 0.686 in 72 hours postoperative ). Also **(*Tornero-Campello G., 2007)****16* who compared intravenous PCA with morphine, TEA and TAP block in laparoscopic high anterior resection , use of TAP blocks was associated with significant reduction in mean mor­phine usage at 12 hours and 24 hours, significant difference was seen on days 4 and 5 between the TAP block group and the epidur­al group after most of the epidural catheters were removed, while cumulative opioid use was significantly lower for the epidural group at all time points up to discharge than for the PCA group and it was significantly lower up to 72 hours than for the TAP block patients; hospital length of stay was shorter in TAP group (4 days) than in TEA group (6 days). Also the study done by ***(***[***Lin Y-N***](https://www.ncbi.nlm.nih.gov/pubmed/?term=Li%20NL%5BAuthor%5D&cauthor=true&cauthor_uid=24148737) ***et al., 2013)****17* showed lower postoperative morphine consumption in patient's received paravertebral block than those who received transversus abdominis plane block .

This current study doesn't go with ***(Federico et al., 2014)*** 18 who studied Analgesia in patients undergoing thoracotomy, Epidural versus paravertebral technique .They founded statistical significance of VAS in favour of the PA group (P = 0.002) , this may most probably due to higher concentration of local anaesthetic in PA group and The length of surgery was 141.3 minutes for the EA group and 108.6 minutes for the PA group with a statistical significance in favour of the PA group (P < 0001) . ***(Debreceni et al., 2003)*** 19 who studied the comparison between Continuous epidural and paravertebral analgesia following thoracotomy.They founded that pain management with continuous epidural analgesia was superior to continuous paravertebral analgesia, in the early postoperative period. The statistically significant difference in the VAS scores between the two groups (up to 12 hr postoperative only), in favor of the epidural technique, this can be explained by; the large volume injected into the epidural space (0.2 ml/kg). The extent of the sensory blockade in each group was not recorded for further statistical analysis in their study. Our study doesn't go with the study done by ***(Hadzic A,et al., 2006)****20* in which they studied the different regional anesthetic techniques for inguinal hernia repair , comparing between paravertebral block (continuous infusion of bupivacaine 0.125 % at rate of 8 ml / hr ) and transversus abdominis plane block (continuous infusion of bupivacaine 0.25 % at rate of 8ml/hr ) . They stated that a similar level and quality of analgesia can be reached with PVB and TAP block, and either technique can be used to create adequate analgesia for uni- or bilateral major abdominal surgery with the addition of paracetamol, NSAIDs and morphine PCA .This can be explained by using higher concentration of bupivacaine ( 0.25 % with TAP group ) than ( 0.125 % in paravertebral group ) , also may be due to increased failure rate of catheter insertion with paravertebral than with TAP. This study doesn't go with ***(Niraj et al.,2014)****21* ***,*** who compared effects of epidural an­algesia and TAP block in 70 patients undergoing laparoscopic bowel resections, randomized to be treated with continuous epi­dural or continuous TAP block analgesia, they did not found any difference in median visual analogue scale (VAS) during coughing at 24 hours after surgery and tra­madol consumption between two groups .

As regard the mean arterial blood pressure (MAP) levels in group P and group T shows no significant difference from the baseline values , except for a slight decrease in group P , but in group E , there is a significant decrease in the mean arterial blood pressure from the first hour after the bolus dose till the end of the study and statistical analysis between groups was highly significant ( p < 0.001) . Regarding the heart rate values in group P and group T show no significant changes during the study period, but in group E , heart rate values measured during the study were significantly lower from the base line . The statistical analysis between groups was highly significant from the start of the study in the first 24 hours (p < 0.001) . This can be explained by the sympathetic blockade which occurs with the epidural analgesia in addition to sedation and presence of more reduction in the VAS score in lumbar epidural group than in other groups , also in group P , the sympathetic block is unilateral compared to bilateral in group E. ***(Dalim K B et al., 2014)*** 22who studiedAnalgesic efficacy and safety of thoracic paravertebral and epidural analgesia for thoracic surgery, a systematic review and meta-analysis from eight trials showed that PVB is associated with significantly less hypotension than TEA in both the intra- and postoperative period . Also ***Wahba and Kamal SM*** (***2014)****23*and ***(Federico R et al., 2014),****18*comparing TAP block and Epidural techniques in 44 patients undergoing laparotomic sur­geries, the Epidural group showed a reduction in mean blood pressure and increased incidence of hypotension than in TAP group due to sympathetic block which occured in epidural group.

Current study doesn't go with ***(Santhosh and Rajendran, 2003)*** 24***,*** as they founded that there was no fall in blood pressure after the first hour and the MAP between the two groups was not statistically significant. This can be explained by; in both groups only 8 ml of 0.25% bupivacaine after the completion of the surgical procedure and patient doesn’t receive intraoperative opioid analgesia while intraoperative analgesia was maintained with N2O only . Also ***(Pintaric et al., 2011)*** 14founded that both groups did not differ significantly in heart rate, mean arterial blood pressure, or systemic vascular resistance indices. This can be explained by; a greater volume of colloid infusion and phenylephrine were required in the epidural than in the paravertebral group to maintain the targeted oxygen delivery index as follow (554 ± 50 vs. 196 ± 75 mL, P = 0.04; and 40 ± 10 vs. 17 ± 4 mcg, P = 0.04).

Asregard complications during the study in all groups , complications as nausea , vomiting , pruritis and drowsiness were recorded , in group P , nausea was 7 patients ( 35 % ) , vomiting were 3 patients ( 15 % ) , pruritis 2 patients ( 10 % ) and drowsiness were 2 patients ( 10 % ) . In group T 6 patients ( 30 % ) had nausea , and vomiting in 1 patient ( 5 % ) , pruritis in 3 patients ( 15 % ) and drowsiness in 2 patients ( 10 % ) .In group E , nausea occured in 8 patients ( 40 % ) , vomiting in 3 patients ( 15 % ) , pruritis in 1 patient ( 5 % ) and drowsiness occured in 1 patient ( 5 % ) . By statistical analysis, these results were not significant. Current study goes with ***(Xibing et., 2014)*** 25meta analysis, the analyzed adverse side effects consisted of pulmonary complication, urinary retention, nausea and vomiting, hypotension, and failed rates of technique. Compared to EPI, PVB resulted in significantly less incidence rates of urinary retention , nausea and vomiting , and hypotension. ***(Davies et al., 2006)*** 26who studied a comparison of the analgesic efficacy and side-effects of paravertebral vs. epidural blockade for thoracotomy, a systematic review and meta-analysis of randomized trials. They founded that PVB was associated with a reduction in urinary retention, postoperative nausea and vomiting, and hypotension

Limitations of our study are one of the possible shortcomings of our study; the study did not include a placebo control group and the study limited assessment of postoperative analgesia to the first 24 postoperative hours. However, the blocks have been demonstrated to produce clinically useful levels of analgesia for at least 48h postoperative.

To conclude the results of this study , we found that continuous lumbar epidural block is more effective in postoperative analgesia when compared to continuous paravertebral and continuous transversus abdominis plane block , but regarding complications in all groups , there was a higher incidence of complications ( hypotension , nausea and vomiting ) in patients received epidural analgesia than in other groups ( paravertebral and TAP ) , however TAP block can be used as alternative for postoperative analgesia for patients in which epidural and paravertebral blocks are contraindicated .

**References**

**1- Marandola, M, Cilli, T, Alessandri, F, et al., 2008.** Perioperative Management in Patients Undergoing Pancreatic Surgery: The Anesthesiologist's Point of View. Transplantation Proceedings. 40, 1195-1199.

**2- Minkowitz HS, Rathmell JP, Vallow S, Gargiulo K,et al.,**Pain Med. 2007 Nov-Dec; 8(8):657-68

# 3- Linda Le-Wendling MD,Olga Nin MD,Xavier Capdevila MD, Cancer Recurrence and Regional Anesthesia: The theories, the data, and the future in outcomes , 2015,12893 .

**4- Chan VW.** Applying ultrasound imaging to interscalene brachial plexus block. Reg Anesth Pain Med. 2003;28:340–3.

**5- Grzegor Jagla, Jerzy Walocha , K. Rajda , et al,** Anatomical aspects of epidural and spinal analgesia , Adv. Pall. Med. 2009; 8, 4: 135–146.

**6- Karmakar MK , Gin T , Ho AM :** Ipsilateral thoraco-lumbar anaesthesia and paravertebral spread after low thoracic paravertebral injection . Br J Anaesth. 2001; 87:312-6

**7- Petersen PL, Mathiesen O, Torup H, Dahl JB**. The transversus abdominis plane block: a valuable option for postoperative analgesia. A topical review. Acta Anaesthesiol Scand. May 2010;54(5):529-35.

**8-** **Siddiqui MR, Sajid MS, Uncles DR, Cheek L, Baig MK**. A meta-analysis on the clinical effectiveness of transversus abdominis plane block. J Clin Anesth. Feb 2011;23(1):7-14.

**9- Aveline C, Le Hetet H, Le Roux A., Vautier P, Cognet F, Vinet E, et al**. Comparison between ultrasound-guided transversus abdominis plane and conventional ilioinguinal/iliohypogastric nerve blocks for day-case open inguinal hernia repair. Br J Anaesth. Mar 2011;106(3):380-6.

**10- Vadivelu N, Mitra S, Narayan D (2010).** Recent advances in postoperative pain management. Yale J Biol Med, Vol.83, No.1 (Mar), pp.11-25, Review, ISSN 0044-0086.

**11- Elviret-Lazo OL, White PF** **(2010).** Postoperative pain management after ambulatory surgery: role of multimodal analgesia. Anesthesiol Clin, Vol.28, No.2 (Jun), pp.217-24, ISSN 1932-2275.

**12- Pankaj N Surange , Brig Chadalavada &Venkata Rama Mohan**Comparative Evaluation of Continuous Lumbar Paravertebral Versus Continuous Epidural Block for Post-Operative Pain Relief in Hip Surgeries. Anesth Pain. 2012;1(3): 178-183. DOI: 10.5812/kowsar.22287523.3348

**13- Messina M, Boroli F, Landoni G, Bignami E, et al :** A comparison of epidural Vs. paravertebral blockade in thoracic surgery. Minerva Anestesiol. 2009; 75: 616–621.

**14- Pintaric TS, Potocnik I, Hadzic A, Stupnik T, Pintaric M and** [**Novak JV**](http://www.ncbi.nlm.nih.gov/pubmed?term=Novak%20Jankovic%20V%5BAuthor%5D&cauthor=true&cauthor_uid=21490523): Comparison of continuous thoracic epidural with paravertebral block on perioperative analgesia and hemodynamic stability in patients having open lung surgery. Reg Anesth Pain Med. 2011; 36: 256–60

**15**- **Gulbahar G, Kocer B, Muratli SN, Serife NM, Erkan Y, Ozlem G, Koray D and Unal S:** A comparison of epidural and paravertebral catheterisation techniques in post-thoracotomy pain management. *Eur J Cardiothorac Surg*. 2010; 37:467-472.

**16-Tornero-Campello G.***Transversus abdominis plane block should be compared with epidural for postoperative analgesia after abdominal surgery.* Anesth Analg. ***2007***; vol. 105, pp. 281–282.

**17-Lin Y-N, Li Q, Yang R-M, Mao Z-X, Liu J-C**. Addition of dexmedetomidine to ropivacaine improves cervical plexus block. Acta Anaesthesiol Taiwan. 2013; 63–6.

**18- Federico R, Alessandro R, Andrea L, Piero D M, Ugo C and Alessandro Bi:** Analgesia in patients undergoing thoracotomy, Epidural versus paravertebral technique. J Thorac Cardiovasc Surg. 2014; 147:469-741.

**19- Debreceni G, Molnar Z, Szelig L and** [**Molnár TF**](http://www.ncbi.nlm.nih.gov/pubmed?term=Moln%C3%A1r%20TF%5BAuthor%5D&cauthor=true&cauthor_uid=12969101): Continuous epidural or intercostals analgesia following thoracotomy: a prospective randomized double-blind clinical trial. Acta Anaesth Scand. 2003; 47:1091-1095.

**20- *Hadzic A, Kerimoglu B, Loreio D, Karaca PE, Claudio RE, et al.,*** *Paravertebral blocks provide superior same-day recovery over general anesthesia for patients undergoing inguinal hernia repair.* Anesth Analg. ***2006****;* vol. 102, pp.1076–1081.

# 21- [Niraj G](https://www.ncbi.nlm.nih.gov/pubmed/?term=Niraj%20G%5BAuthor%5D&cauthor=true&cauthor_uid=24641640), [Kelkar A](https://www.ncbi.nlm.nih.gov/pubmed/?term=Kelkar%20A%5BAuthor%5D&cauthor=true&cauthor_uid=24641640), [Hart E](https://www.ncbi.nlm.nih.gov/pubmed/?term=Hart%20E%5BAuthor%5D&cauthor=true&cauthor_uid=24641640), [Horst C](https://www.ncbi.nlm.nih.gov/pubmed/?term=Horst%20C%5BAuthor%5D&cauthor=true&cauthor_uid=24641640), [Malik D](https://www.ncbi.nlm.nih.gov/pubmed/?term=Malik%20D%5BAuthor%5D&cauthor=true&cauthor_uid=24641640), [Yeow C](https://www.ncbi.nlm.nih.gov/pubmed/?term=Yeow%20C%5BAuthor%5D&cauthor=true&cauthor_uid=24641640), [Singh B](https://www.ncbi.nlm.nih.gov/pubmed/?term=Singh%20B%5BAuthor%5D&cauthor=true&cauthor_uid=24641640), [Chaudhri S](https://www.ncbi.nlm.nih.gov/pubmed/?term=Chaudhri%20S%5BAuthor%5D&cauthor=true&cauthor_uid=24641640). 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 trial. [Anaesthesia.](https://www.ncbi.nlm.nih.gov/pubmed/24641640) 2014 Apr;69(4):348-55. anae.12546.

**22- Dalim K B, Puneet K and Souvik M**: Analgesic efficacy and safety of thoracic paravertebral and epidural analgesia for thoracic surgery, a systematic review and meta-analysis. CardioVascular and Thoracic Surgery 18 (2014) 626–636 .

**23-** [**Wahba SS**](https://www.ncbi.nlm.nih.gov/pubmed/?term=Wahba%20SS%5BAuthor%5D&cauthor=true&cauthor_uid=24375223)**, [Kamal SM](https://www.ncbi.nlm.nih.gov/pubmed/?term=Kamal%20SM%5BAuthor%5D&cauthor=true&cauthor_uid=24375223),** Analgesic efficacy and outcome of transversus-abdominis plane block versus low thoracic-epidural analgesia after laparotomy in ischemic heart disease patients. [J Anesth.](https://www.ncbi.nlm.nih.gov/pubmed/24375223) 2014 Aug;28(4):517-23. doi: 10.1007/s00540-013-1774-6. Epub 2013 Dec 28.

**24- Santhosh Kumar T and Rajendran R**: Comparative evaluation of thoracic epidural versus thoracic paravertebral block for post thoracotomy pain relief with 0.25% bupivacaine. Indian J. Anaesth. 2003; 47(4):269-274.

**25- Xibing D, Shuqing J, Xiaoyin N, Hao R, Shukun F and Quan L:** A Comparison of the Analgesia Efficacy and Side Effects of Paravertebral Compared with Epidural Blockade for Thoracotomy: An Updated MetaAnalysis. 2014: 5: e96233.

**26- Davies R. G, Myles P.S and Graham J.M**: A comparison of the analgesic efficacy and side-effects of paravertebral vs epidural blockade for thoracotomy, a meta-analysis of randomized trials. Br J Anaesth 2006; 96: 418–26.