

Ultrasound-guided Transversus Abdominis Plane Block for Postoperative Analgesia in Patient Undergoing Inguinal Hernia Repair

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ABSTRACT

Background: The Transversus Abdominis Plane (TAP) block technique is one method for inhibiting abdominal pain stimuli by blocking afferent nerves in the abdominal wall via the Petit triangle. TAP block action is frequently performed as a postoperative procedure, such as in the case of hernia repair. The goal of using ultrasound in TAP blocks is to distribute the anesthetic agent accurately in the appropriate neurovascular plane.

Case: A 66-year-old male geriatric patient with an incarcerated right inguinal hernia and a history of Hypertensive Heart Disease (HHD) was seen. The patient complained of right groin pain that spread to the right side of the abdomen. Based on the Electrocardiogram (ECG), atrial fibrillation was identified as slow ventricular response and Left Ventricular Hypertrophy (LVH). Chest X-ray revealed cardiomegaly with LVH configuration. ASA III E was assigned to the patient. Regional Anesthesia Subarachnoid Block (RASAB) was used to perform an emergency hernia repair using a regimen of Bupivacaine heavy 0.5% 7.5 mg with adjuvant Fentanyl 50 g. Bilateral TAP block administration using Ropivacaine regimen 0.25% of the total volume of 30 ml was given as postoperative analgesia management. Hemodynamic monitoring, complications and postoperative pain scale were carried out in the High Care Unit (HCU). Hemodynamically stable, pain scale was 1-2 at 24 hours postoperative and no complications.

Conclusion: TAP block is provide an effective and safe anti-pain effect in patients undergoing hernia repair with geriatric comorbidities and a history of HHD, as well as to prevent cardiovascular complications and to speed up postoperative patient mobilization.

Keywords: TAP block, postoperative pain, hernia repair

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INTRODUCTION

Surgery in hernia cases is a common procedure. The use of ilioinguinal nerve blocks can provide a good analgesic effect in post-operative patients. However, ilioinguinal nerve blocks are challenging and have a high failure rate. An alternative technique, the Transversus Abdominis Plane (TAP) block, is considered easier to perform and effective for use as a peripheral block of the abdomen which includes the ilioinguinal, hypogastric, and lower intercostal nerves (T7-T11).¹⁻³

The TAP block procedure itself is often performed as a postoperative procedure, for example in intestinal resection, appendectomy, retropubic prostatectomy, nephrectomy, hernia repair, laparoscopic cholecystectomy and caesarean section. The TAP block, as it became known, was performed by searching for landmarks without the use of tools. Having developed with time, TAP block is performed with the help of ultrasound in order to distribute the anesthetic agent more precisely to increase efficacy and minimize side effects.^{1,4}

The use of the TAP block is indicated in all operations in the lower abdominal area, such as: appendectomy, hernia repair, cesarean section, abdominal hysterectomy, and prostatectomy. The use of TAP block in laparoscopic surgery is also considered effective. Bilateral block administration can be given to surgery with a midline incision or laparoscopic surgery. Attention to the administration of anesthetic drug doses in the selection of bilateral injection sites is prohibited from exceeding the safe limit.^{1,5,6}

The TAP block is one way to inhibit pain stimulus in the abdominal region by blocking the afferent nerves in the abdominal wall through the Petit triangle. The purpose of the TAP block itself is to provide anesthetic agents in the area between the internal oblique muscles and the transversus abdominis muscles which target the spinal nerve endings in that area, so that all innervation to the skin and muscles covering the abdomen and parietal peritoneum is inhibited. Due to its nature that works to inhibit the spinal nerves, if during surgery in the

peritoneal cavity, pain due to muscle spasms or inflammation after surgery (visceral pain) can still be felt by the patient.^{1,7}

TAP block itself can be divided into two, blind and ultrasound-guided. technique blind, the entry point for the block is the triangle of Petit (which lies between the inferior border of the costal arch and the iliac crest) and is bounded anteriorly by the external oblique muscle and posteriorly by the latissimus dorsi muscle. This technique relies on the "double pops" sensation felt when the injection passes through the external and internal oblique muscles.^{2,7}

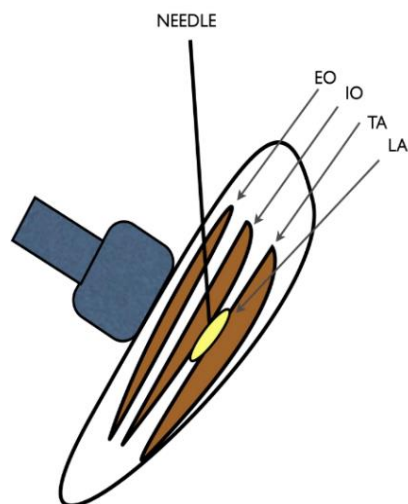


Figure 1. Schematic illustration of the transversus abdominis plane on ultrasound.⁷ EO: external oblique, IO: internal oblique, TA: transversus abdominis, LA: local anesthetic

To perform the TAP block using ultrasound, it is necessary to prepare: (1) an ultrasound with probe high-frequency a probe cover, (3) an antiseptic for skin disinfection, (4) an ultrasound sterile, (5) a needle (50mm or 80mm size), (6) 20 ml syringe with injection tube, and (7) local anesthetic drug.^{7,8}

Ultrasound use in regional anesthesia progressively ended up far reaching with the improvement of ultrasonographic (USG) innovation and expanded picture quality. In this manner, the utilization of ultrasound in peripheral nerve blocks gives us various focal points. Nerve blockade with ultrasonography diminishes complication hazards by coordinated visualization of the blocked needle and gives significant block success, lower dose of nearby anesthetic volume, decreased rescue analgesia, decreased procedural pain, and diminished chance of vascular and pleural puncture.^{9,10}

This study aims to present a case of an inguinal hernia that was given postoperative analgesia management with transversus abdominis plane block with ultrasound guidance. And to find out how the outcomes obtained from the management strategy.

CASE

A 66-year-old geriatric male patient with recurrent incarcerated right inguinal hernia and history of Hypertensive Heart Disease (HHD). In the anamnesis, the patient complained of pain in the right groin that radiates to the right abdominal area.

On physical examination, clear airway, adequate spontaneous breathing, SpO₂ 98% with room air, cardiopulmonary examination found no abnormalities, pulse rate 68x/minute, pulse regular, blood pressure 150/97 mmHg. On laboratory investigations complete blood Hemoglobin 14,

Hematocrit 43, platelet count 256, leukocyte count 7.9, Prothrombin Time (PT) 13.9, Activated Partial Thromboplastin Time (aPTT) 30, International Normalized Ratio (INR) 0.960, transient blood glucose 119, serum electrolytes within normal limits. Based on the ECG examination, slow ventricular response atrial fibrillation, 55 bpm, normal axis and Left Ventricular Hypertrophy (LVH) was found. On chest X-ray examination, there was cardiomegaly CTR of 57% with LVH configuration and left hemidiaphragm elevation. The patient was assessed as ASA III E. Emergency hernia repair was performed with Regional anesthesia subarachnoid block (RASAB) using a regimen of Bupivacaine heavy 0.5% 7.5 mg with Fentanyl 50 µg adjuvant. The patient's hemodynamics were stable during surgery. The

After the operation was completed, postoperative anesthesia management was carried out with the bilateral TAP block using the Ropivacaine regimen 0.25%, a total volume of 30 ml (Figure 2) using ultrasound guide. Local anesthetic agent deposition show in figure 3. After the operation, the patient was treated in the High Care Unit (HCU) room with the addition of the parenteral drug Paracetamol 1 gram per 8 hours. Hemodynamic monitoring, pain score, and postoperative complications were carried out.

Observation of the patient for the first 4 hours found pain by measuring the pain scale using the numeric rating scale (NRS) in patients with a value of 0-1. No complaints of nausea or vomiting were found and the patient was hemodynamically stable with a pulse frequency of 60-70 times/minute and blood pressure of 140/80 mmHg. Follow-up observation examination at 24 hours postoperatively obtained a pain scale using the NRS obtained in patients with a value of 1-2 with stable hemodynamics. There were no complaints of nausea or vomiting at 24 hours postoperatively. The patient is able to tilt left and right, and position himself half-sitting. Complaints of shortness of breath after surgery were denied.



Figure 2. The process of local anesthetic injection



Figure 3. Local anesthetic agent deposition (white arrow)

DISCUSSION

Postoperative pain occurs due to trauma to the tissue of the surgical area and inflammation. The process of trauma and inflammation can cause the release of proinflammatory cytokines which can stimulate afferent nerve endings in the nociceptive pathway, resulting in pain impulses traveling to the sensory center resulting in pain perception. Pain perception can manifest as stress and potentially increase morbidity. The use of anesthetic agents to treat postoperative pain can reduce the postoperative stress response in patients so that they can provide good and satisfying outcomes.^{5,11} TAP block uses the entry point of the triangle of Petit (which lies between the inferior border of the costal arch and the iliac crest) and is bounded anteriorly by the external oblique muscle and posteriorly by the latissimus dorsi muscle. This technique has been known since it was first applied as one of the management of post-operative analgesia since early 2000, still adhering to the landmarks (which have been described previously) even without navigational aids currently used.^{2,12} This technique relies on the "double pops" sensation felt when the injection is passed through two muscles: the external and internal oblique muscles. The aim is to position the anesthetic agent between the internal oblique and transversus abdominis muscles.^{4,13}

The use of the TAP block is considered easy and effective, suitable for surgical procedures where the parietal peritoneum is a significant component that can contribute to postoperative pain. In addition, this technique has minimal complications and can be performed when neuro-axial techniques are contraindicated. Multimodal pain regimens can also be administered in operative procedures where TAP blocks are considered inadequate. One of the drawbacks of the TAP block (which is performed blindly using landmarks) is the high incidence of failure. Even so, currently, there is an ultrasound that can be used to assist in navigating the injection of anesthetic agents, thereby increasing the success rate and reducing the failure rate because the accuracy of the distribution location of the anesthetic agent can be ensured.^{1,2}

Deposition of the anesthetic agent was considered successful if an anechoic appearance was seen between the internal obliques and transversus abdominis muscles. An anechoic picture indicates the presence of fluid in the form of an anesthetic agent which is injected with a needle that enters between the transversus abdominis fields.⁴

In this case, the patient has co-morbidities in the form of a geriatric patient with a history of HHD which is characterized by hypertension resulting in rhythm disturbances (in this case there were atrial fibrillation findings on the EKG examination) and structural (there were LVH findings on the EKG examination and LVH cardiomegaly on chest x-ray). As a result of these comorbidities, it can assess patients with ASA 3E physical status. Hemodynamics during observation in the HCU 24 hours

postoperatively were stable. technique block ensures that the anesthetic agent administered (as an effort to manage postoperative pain) does not enter the systemic circulation, so that effects on hemodynamics can be avoided, especially in patients with comorbidities related to the cardiovascular system as in this case.^{1,7}

Observation of monitoring pain Numeric Rating Scale (NRS) at 4 hours to 24 hours postoperatively. In the first 4 hours, the NRS score was 0-1 (scale 10). TAP block to provide an adequate analgesic effect, especially in abdominal region operations that manipulate the structures around the parietal peritoneum which can induce somatic pain. Administration of Ropivacaine as a local anesthetic agent can reduce the effects of local pain felt through the mechanism of ion channel inhibition along the spinal nerves. Parenteral administration of paracetamol is useful for reducing the process of pain perception in the central nervous system so that it can reduce the effects of pain due to visceral pain due to surgery.^{2,7}

Utilization of the TAP block in hernia surgery has also been reported to provide a maximum effect on patients, both from the comfort and safety aspects.⁷ Reported from a Randomized Control Trial conducted at the Universidad de Caldas, Columbia, it was concluded that the intervention group with the TAP block performed postoperatively provided an anti-pain effect that lasted from the first hour to twenty-four hours after surgery.² This is slightly different from what was found in the case discussed, where an increase in pain perception was found from 0-1 (in the first four hours after surgery) to 1-2 (during 24 hours after surgery). Nonetheless, pain perception is subjective and further comprehensive studies can be carried out in similar settings to provide a more objective picture of pain perception after a TAP block.^{4,14,15}

Apart from hernia surgery, the TAP block is also performed on operations involving the abdominal wall. One retrospective study assessing the efficacy of TAP block in patients undergoing cholecystectomy assessed that the anti-pain effect that was given could reduce the patient's perception of pain and was able to reduce the administration of additional drugs as rescue analgesics in patients who have low pain tolerance. In this case report, the administration of TAP block can provide an anti-pain effect that makes the patient comfortable so that there is no need for additional topical analgesic drugs that can be used to treat pain that disturbs the patient's comfort.^{4,14}

CONCLUSION

The use of TAP block is considered to provide an effective and safe anti-pain effect in patients undergoing hernia repair with comorbid geriatrics with a history of hypertensive heart disease (HHD), prevent cardiovascular complications, and speed up the time of postoperative patient mobilization.

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CONFLICT OF INTEREST

The author declare there is no conflict of interest.

REFERENCES

1. Venkatraman R, Abhinaya RJ, Sakthivel A, Sivarajan G. Efficacy of ultrasound-guided transversus abdominis plane block for postoperative analgesia in patients undergoing inguinal hernia repair. *Local Reg Anesth.* 2016;9:7-12. doi:10.2147/LRA.S93673
2. Tsai HC, Yoshida T, Chuang TY, et al. Transversus Abdominis Plane Block: An Updated Review of Anatomy and Techniques. *Biomed Res Int.* 2017;2017:8284363. doi:10.1155/2017/8284363
3. Tran DQ, Bravo D, Leurcharusmee P, Neal JM. Transversus Abdominis Plane Block: A Narrative Review. *Anesthesiology.* 2019;131(5):1166-1190. doi:10.1097/ALN.0000000000002842

4. Aguirre-Ospina, OD, Gómez-Salgado JC, Chaverra D, Alzate ,M. TAP block in inguinal hernia repair. Randomized controlled trial. *Rev Colomb Anesthesiol.* 2017; 45(3):159-165. doi:10.1016/j.rcae.2017.04.001.
5. Canakci E, Cihan M, Altinbas A, Cebeci Z, Gultekin A, Tas N. Efficacy of ultrasound-guided Transversus Abdominis Plane (TAP) block in inguinal hernia surgery and the immunomodulatory effects of proinflammatory cytokines: prospective, randomized, placebo-controlled study. *Braz J Anesthesiol.* 2021;71(5):538-544. doi:10.1016/j.bjane.2021.02.005
6. Özdilek A, Beyoğlu ÇA, Demirdağ Ç, et al. Perioperative Analgesic Effects of Preemptive Ultrasound-Guided Subcostal Transversus Abdominis Plane Block for Percutaneous Nephrolithotomy: A Prospective, Randomized Trial. *J Endourol.* 2020;34(4):434-440. doi:10.1089/end.2019.0766
7. Mukhtar K,. Transversus Abdominis Plane (TAP) block. *The Journal of New York School of Regional Anesthesia.*2020;12: 28-33.
8. Honnannavar KA, Mudakanagoudar MS. Comparison between Conventional and Ultrasound-Guided Supraclavicular Brachial Plexus Block in Upper Limb Surgeries. *Anesth Essays Res.* 2017;11(2):467-471. doi:10.4103/aer.AER_43_17
9. Radiansyah A, Sitepu JF, Bisono L. Combined Axillary Block with Spinal Block Anaesthesia. *Solo Journal of Anesthesia, Pain and Critical Care (SOJA).* 2022; 31:2(2):61.
10. Mavarez AC, Ahmed AA. Transabdominal Plane Block. [Updated 2022 Oct 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK560527/>
11. Abrahams M, Derby R, Horn JL. Update on ultrasound for truncal blocks: A review of the evidence. *Reg Anesth Pain Med.* 2016;41(2):275–88.
12. Liu R, Qin H, Wang M, Li K, Zhao G. Transversus abdominis plane block with general anesthesia blunts the perioperative stress response in patients undergoing radical gastrectomy. *BMC Anesthesiol.* 2019;19(1):205. doi:10.1186/s12871-019-0861-0
13. Mallan D, Sharan S, Saxena S, Singh TK, Faisal. Anesthetic techniques: Focus on transversus abdominis plane (TAP) blocks. *Local Reg Anesth.* 2019;12:81–8.
14. Karasu D, Yilmaz C, Ozgunay SE, Yalcin D, Ozkaya G. Ultrasound-guided transversus abdominis plane block for postoperative analgesia in laparoscopic cholecystectomy: A retrospective study. *North Clin Istanbul.* 2020;8(1):88-94. doi:10.14744/nci.2020.84665
15. Rahimzadeh P, Faiz SHR, Latifi-Naibin K, Alimian M. A Comparison of effect of preemptive versus postoperative use of ultrasound-guided bilateral transversus abdominis plane (TAP) block on pain relief after laparoscopic cholecystectomy. *Sci Rep.* 2022; 1;12(1).