Case Report/*Olgu Sunumu*

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Ultrasound-Guided Transverse Thoracic Muscle Plane Block for Awake Sternum Revision in a Post-COVID Patient

COVID Sonrası Bir Hastada Uyanık Sternum Revizyonu için Ultrason Eşliğinde Transvers Torasik Kası Plan Bloğu

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To watch the surgical videoclip, please visit https://www.youtube.com/shorts/yWCu6tg8_a0

ABSTRACT

After cardiac surgeries performed with sternotomy, neuraxial techniques, fascial plane blocks and intravenous analgesics are often used for both accelerating wound healing and early recovery of lung functions by providing effective postoperative analgesia. In this case report, we share a case of sternal revision performed with sedation and transversus thoracic muscle plane block (TTMPB) in an ASA III patient who required sternum revision after coronary artery bypass graft (CABG) surgery but had limited lung capacity due to previous COVID-19 pneumonia, considering that general anesthesia would be high-risk.

Keywords: Transversus thoracic muscle plane block, COVID-19, pneumonia, regional anesthesia

ÖZ

Sternotomi ile gerçekleştirilen kardiyak cerrahiler sonrasında hem yara iyileşmesini hızlandırmak hem de postoperatif analjezinin efektif sağlanarak akciğer fonskiyonlarının erken geri döndürülmesi için nöroaksiyel teknikler, fasyal plan blokları ve intravenöz analjezikler sıkça kullanılmaktadır. Bu olgu sunumumuzda koroner arter by-pass greft (KABG) cerrahisi sonrasında sternum revizyonu gereken ancak cerrahi sonrasında COVID-19 pnömonisine bağlı akciğer kapasitesi kısıtlı olan ASA III bir hastada genel anestezinin yüksek riskli olacağı düşünerek, sedasyon ve transvers torasik kas plan bloğu (TTMPB) eşliğinde gerçekleştirilen sternum revizyonu olgusunu paylaşmaktayız.

Anahtar sözcükler: Transvers torasik kas plan bloğu, COVID-19, pnömoni, rejyonal anestezi

INTRODUCTION

Wound infections after sternotomy emerge as a serious complication in cardiothoracic surgeries and therefore makes sternal revision surgeries necessary (1). In both primer sternotomies and revision surgeries, pain management has a critical role in wound healing, fast-track extubation, and recovery of lung functions. In the postoperative analgesia management of these surgeries, various fascial plane blocks are defined and successfully used under ultrasound guidance (2). Transversus thoracic muscle plane block (TTPB), which is one of the newly defined blocks, was first described by Ueshima et al. in 2015 and has taken its place among the postoperative analgesia methods (3).

In this case, we report the first successful use of TTMPB with sedation for surgical anesthesia in a patient with reduced lung capacity due to COVID pneumonia and scheduled for sternum revision surgery who had sternotomy due to previous coronary artery bypass graft surgery. Written consent of the patient was obtained for the publication of this letter.

CASE REPORT

A 70-year-old, 80-kg male, ASA III patient (with diabetes mellitus, hypertension and coronary artery disease) who had undergone coronary artery bypass graft (CABG) surgery one month ago and had COVID-19 pneumonia that resolved with pulmonary fibrosis two weeks after (Figure 1A-C) was scheduled for sternal revision surgery. In the operating room,

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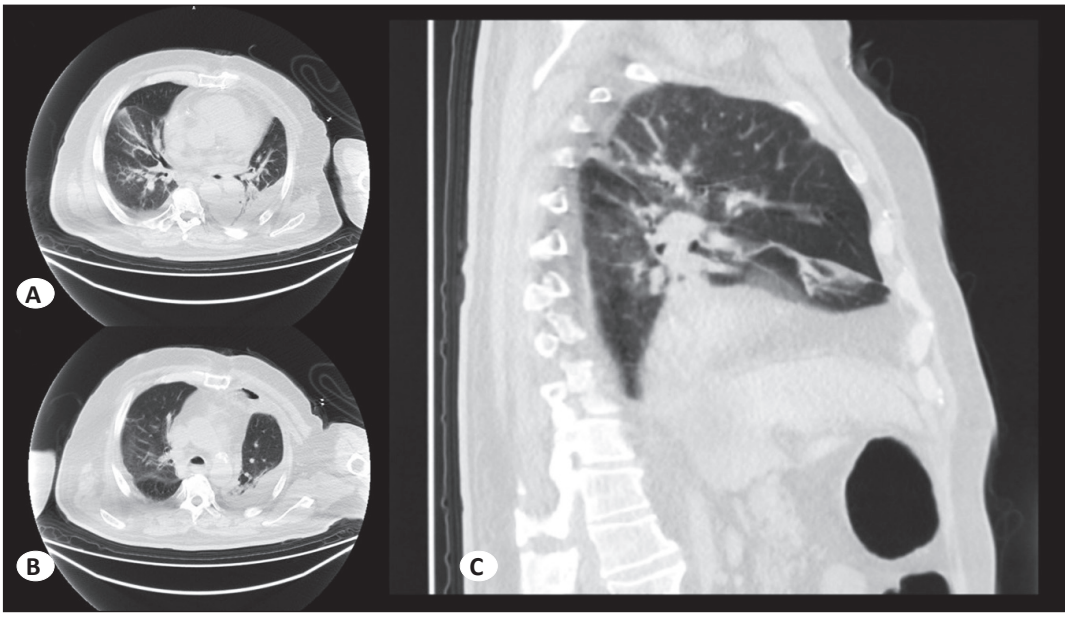

Figure 1.
A, B) Transverse and **C)** Coronal sections of thorax computed tomography of the patient after COVID-19 pneumonia, prior to the sternal revision surgery, sternal wires, patchy ground-glass opacities, and consolidations are seen.

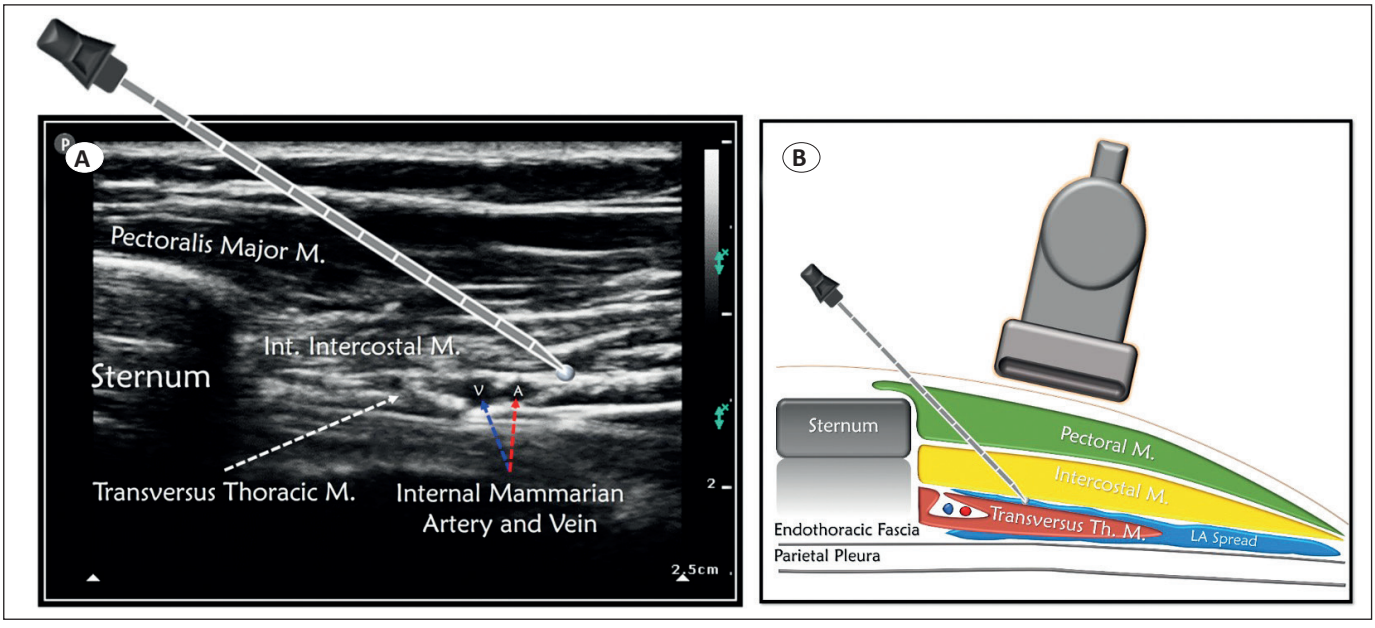

Figure 2. A) Sonographic anatomy of transversus thoracic muscle plane block. **B)** Basic illustration of transversus thoracic muscle plane block on transverse plane.

standard monitors were attached and seen as follows: Heart rate: 90 bpm, Blood pressure: 90/60mmHg, SpO_2: 80%. Considering that intubation with general anesthesia would be high-risk in the light of clinical facts and thorax computed tomography imaging, it was decided to apply TTMPB with sedation.

In the application of bilateral TTMPB, anterior T4-T5 interspace is determined by ultrasonography. Then, a high frequency linear ultrasound probe was placed in the transverse plane 1 cm lateral to the sternal border in the 4th intercostal space. The internal intercostal and transverse thoracic muscles and internal thoracic artery and vein were identified on the pleura. A 22-G, 50-mm needle is inserted till the tip of needle is under the internal intercostal muscles by using in-plane technique (Figure 2A, B). Localization was confirmed by downfall the transversus thoracic muscle and the pleura with injection of 2 mL of saline. Then, 20 mL (1:1) 0.5% bupivacaine + 2% lidocaine was injected for each side of the sternum.

Assessment was made by the loss of sensation to pin-prick 20 min after the TTMPB. And T2-T6 dermatome area was checked on both sides of sternum starting from sternal edge

to areola. Just before starting the surgical procedure, a loading dose of dexmedetomidine was administered at 0.75 µg kg^{-1} in 10 min, followed by 0.5 µg kg^{-1} h^{-1} of dexmedetomidine maintenance, and propofol 1-2.5 mg kg^{-1}, to reduce anxiety and increase patient compliance. At the beginning of the surgical procedure, propofol infusion was stopped and conscious sedation was provided. Pain response at the incision and during the operation was evaluated based on hemodynamic parameters and communication with the patient (video-1. mov). The operation time was approximately 110 minutes. For postoperative pain management in terms of multimodal analgesia, 1 gr paracetamol (4x1) was administered additionally. In the postoperative follow-up, there was no pain in the surgical area for 20 hours.

DISCUSSION

Intercostal nerves originating from the spinal cord is formed by anterolateral extension of ventral branches that arise from the spinal cord. To summarize, nerve blockage at any level from the spinal cord to the intercostal nerves can be used to provide appropriate analgesia in sternotomies. In TTMPB, blockade of T2-6 originating intercostal nerves is targeted. Successful results of regional techniques such as erector spinae plane blocks, pectoral nerve blocks, paravertebral, and parasternal blocks targeting T2-T6 nerve roots can be used to reduce sternotomy pain after cardiothoracic surgeries.

When comparing all of these techniques there are advantages and disadvantages. Due to close relationship of the internal mammary artery and the endothoracic fascia, risk of arterial injury is a concern for both anesthesiologist and the surgeon during TTMPB. (4). However, TTMPB is a safe method when performed in safe hands under ultrasound guidance and also it is a goal-directed attemption when compared with its alternatives. Both TTMPB and parasternal blocks target the anterior branch of the intercostal nerves at T2-T6 dermatomes; the only difference between the two-block is the injection site (5). To prevent infection, we choose TTMPB for a considerably longer distance from the surgical region in this case. Erector spinae plane block is the one of the powerful alternatives for pain management when administered with high volumes of local anesthetics however in this scenario it was not possible to position the patient appropriately for block application.

As stated by Hamed et al. postoperative opioid consumption can significantly be reduced with TTMPB and as reported by Ueshima et al. time to first analgesic request can be prolonged whereas earlier patient recovery could be obtained (6,7). However, to the best of our knowledge, this is the first case report of ultrasound guided TTMPB block for awake sternum revision surgery.

CONCLUSION

Transversus thoracic muscle plane block has been shown to be an alternative analgesia management for postoperative analgesia in sternal surgeries. With this report, we think that TTMPB can also be used for surgical anesthesia in sternal revision surgeries for selected cases, but more clinical studies are needed on this subject.

AUTHOR CONTRIBUTIONS

Conception or design of the work: YEK, ENM, MSO

Data collection: YEK, ENM, MSO

Data analysis and interpretation: YEK, MSO, MEA

Drafting the article: YEK, AA

Critical revision of the article: MEA, AA

Other (study supervision, fundings, materials, etc): YEK, AA

All authors (YEK, ENM, MSO, MEA, AA) reviewed the results and approved the final version of the manuscript.

REFERENCES

1. Dell'Amore A, Congiu S, Campisi A, et al. Sternal reconstruction after post-sternotomy dehiscence and mediastinitis. Indian J Thorac Cardiovasc Surg 2020;36(4):388-96.
2. Macaire P, Ho N, Nguyen T, et al. Ultrasound-guided continuous thoracic erector spinae plane block within an enhanced recovery program is associated with decreased opioid consumption and improved patient postoperative rehabilitation after open cardiac surgery-a patient-matched, controlled before-and-after study. J Cardiothorac Vasc Anesth 2019;33(6):1659-67.
3. Ueshima H, Kitamura A. Clinical experiences of ultrasound-guided transversus thoracic muscle plane block: A clinical experience. J Clin Anesth 2015;27(5):428-9.
4. Aydin ME, Ahiskalioglu A, Ates I, et al. Efficacy of ultrasound-guided transversus thoracic muscle plane block on postoperative opioid consumption after cardiac surgery: A prospective, randomized, double-blind study. J Cardiothorac Vasc Anesth 2020;34(11):2996-3003.
5. Fujii S. Transversus thoracis muscle plane block and parasternal block. Reg Anesth Pain Med 2020;45(4):317.
6. Hamed MA, Boules ML, Sobhy MM, Abdelhady MA. The analgesic efficacy of ultrasound-guided bilateral transversus thoracic muscle plane block after open-heart surgeries: A randomized controlled study. J Pain Res 2022;15:675-82.
7. Ueshima H. Transversus thoracic muscle plane block. Asian J Anesthesiol 2018;56(4):153.