

# Serratus Anterior Plane Block as Analgesia in Post-Thoracotomy Patients: Serial Case

Nugroho Satya Parathon<sup>1</sup>, Djudjuk Rahmad Basuki<sup>2</sup>

<sup>1</sup>Anesthesiology and Intensive Therapy Specialist Program, Faculty of Medicine, Brawijaya University, Malang, Indonesia

<sup>2</sup>Department of Anesthesiology and Intensive Therapy, Faculty of Medicine, Brawijaya University, Malang, Indonesia

## ABSTRACT

**Background:** Providing analgesia in the postoperative period for those who have undergone thoracotomy is challenging because of the necessity to relieve postoperative pain and prevent pulmonary complications following thoracotomy. In this case report, we described two patients undergoing thoracotomy and received SAPB post-operatively.

**Case:** Two patients, 24 and 45 years old man, with a history of lung tuberculosis and close middle-shaft fracture of the right clavicle, respectively, underwent thoracotomy. Both patients receive serratus anterior plane block (SAPB) as analgesia for post-thoracotomy. The first patients receive SAPB using 1% of Lidocaine + 10 mg Dexamethasone with a total volume of 12 ml and are given ketorolac 30 mg 3 times daily intravenous. The second patient received 0.375% of Ropivacaine and 5 mg Dexamethasone Total Volume of 15 ml was used, and intravenous 30 mg of Ketorolac was given three times daily. On the second day post-thoracotomy, both patients experience pain relief with a Numerical Rating Scale (NRS) of 1-2 and stable hemodynamic.

**Conclusion:** SAPB was effective as post-operative analgesia after thoracotomy with good efficacy.

**Keywords:** SAPB, thoracotomy,

## Correspondence:

Nugroho Satya  
Parathon, MD\*

Anesthesiology and Intensive  
Therapy Specialist Program,  
Faculty of Medicine, Brawijaya  
University, Malang, Indonesia  
e-mail:  
nugrohokun88.ns@gmail.com



**Received:** December 2021, **Revised:** April 2022, **Published:** May 2022

**How to cite this article:** Parathon, NS, DR Basuki. Serratus anterior plane block as analgesia in post-thoracotomy patients: serial case. *Journal of Anaesthesia and Pain*. 2022;3(2): 41-43. doi: 10.21776/ub.jap.2022.003.02.05

## INTRODUCTION

Providing analgesia in postoperative period for those undergone thoracotomy is challenging, because necessity to relieve postoperative pain and to prevent pulmonary complication following thoracotomy.<sup>1</sup> Analgesic options for thoracotomy are various with each having benefits and disadvantages. It is mentioned that thoracic epidural is the gold standard for management of thoracotomy pain. Other option include paravertebral block, interpleural block, intrathecal opioid.<sup>1,2</sup> These method all successfully been used as conjunction with general anesthesia.<sup>3</sup>

Serratus anterior plane block (SAPB) is a relatively new compartment block technique for thoracic wall pain first developed in 2013 by Blanco *et al*. SAPB is a type of nerve block that offers pain relief to the same side of the chest from the second thoracic (T2) to T9 dermatomes. Typically administered with the guidance of ultrasound, the anesthetic is injected into the serratus anterior plane, positioned either above or below the serratus anterior muscle (SAM). Within this layer of connective tissue, lie the peripheral nerves branching off from the thoracic intercostal nerves.<sup>2,4-6</sup> The intercostal nerves originate from the anterior rami of the thoracic spinal nerves and travel alongside the intercostal artery within the intercostal muscles. The lateral

cutaneous branches of the intercostal nerve, crucial in SAPB, penetrate the external and internal intercostal muscles at the mid-axillary line to supply sensation to the muscles and skin of the lateral trunk.. Due to this anatomy significance, when SAPB performed, the local anaesthetic agents will deposited and spread directly to the lateral cutaneous branches.<sup>7</sup> Serratus anterior muscle is a superficial and easily identified muscle and in this case, can be considered as landmark to implement thoracic wall blocks. SAPB has been employed in various procedures, including breast surgery, thoracoscopy, rib fracture pain management, and shoulder injuries, serving as a viable alternative for pain relief following thoracoscopic surgeries.<sup>5,6,8</sup>

In contrast to peripheral nerve blocks, fascial plane blocks depend on the diffusion of local anesthetic across fascial planes and through layers of muscle.<sup>5</sup> Usually, it is done using ultrasound-guided to promote safe and effective procedure to achieve maximal numbness<sup>3</sup>. The most common indication for SAPB in emergency room setting is for treatment of rib fracture pain.<sup>4</sup> In this case series, we described 2 patients undergoing thoracotomy and received SAPB post-operatively.

## CASE

A 24-year-old male with history of lung tuberculosis and still undergoing treatment presented for emergency room with spontaneous pneumothorax of left and right lung accompanied with subcutaneous emphysema. The patients given informed consent to include in the case report. Video-assisted thoracoscopic surgery (VATS) performed in operating room. A SAPB on the both side was performed using 1% of Lidocain + 10 mg TV 12 cc of Dexamethasone. Throughout the entire postoperative period, the patient encountered only slight discomfort when moving, with a Numeric Rating Scale (NRS) score ranging from 1 to 2 (Table 1).

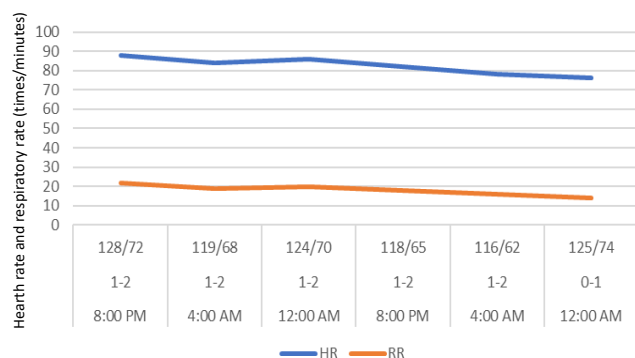
A 45-year-old man underwent P-S clavicle an clipping costae surgery after diagnosed with a close middle-shaft fracture of right clavicle, multiple right posterior rib fractures (3-8<sup>th</sup> ribs) and right lateral rib fractures (6<sup>th</sup> and 7<sup>th</sup> ribs). The patients given informed consent to include in the case report. A SAPB approach was performed using 0.375% of Ropivacaine and 5 mg 15 TV Dexamethasone with addition 30 mg of Ketorolac given three times a day. In 2<sup>nd</sup> day after surgery, additional 750 mg four times a day of Paracetamol was given. The patient had significant relief of pain with NRS score 0 – 1 when stayed still and 1 – 2 when moved. For the next day, the NRS score remain relatively smiliar (Table 1).

Both patient were assesed for subjective complaint for pain and vital sign throughout 24 hours postoperative period at the interval 8 hours (08.00 PM, 04.00 AM, 12.00 AM) for 2 days. In case severe pain emerged, we had instructed the patient to be given Fentanyl intravenous as a rescue. Post operative observation data shown on table 1, figure 1 and 2. During 2 days post operative, patients did not experiencing severe pain, thus intravenous Fentanyl were not given.

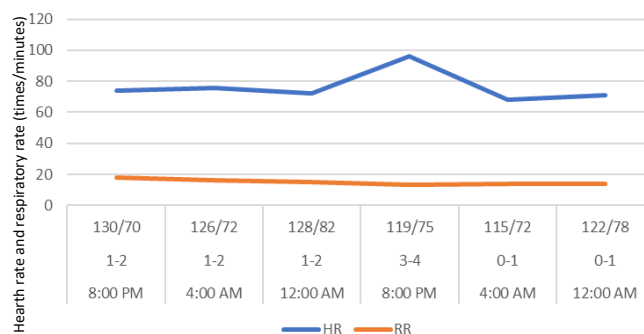
During 2 days post operative, both patient experienced less pain than the common intravenous opioid-regiment for post operative pain management. Both case had no opioid given during 2 days postsurgery. Hemodynamic were stable, no respiratory limitation due to pain were found during post operative period, thus patients could start mobilization earlier. Special condition for our 2nd patient, the surgical procedure extent to upper rib (posterior 3<sup>rd</sup>-8<sup>th</sup> rib fracture) which was very likely beyond coverage of SAPB. Therefore patient experienced discomfort found in 2<sup>nd</sup> day. After administration of paracetamol, the complaint were diminished.

**Table 1.** Patients's pain complain

| Subject | Day 1   |         |          | Day 2    |         |          |
|---------|---------|---------|----------|----------|---------|----------|
|         | 8:00 PM | 4:00 AM | 12:00 AM | 8:00 PM  | 4:00 AM | 12:00 AM |
| Case 1  | mild    | mild    | mild     | mild     | mild    | mild     |
| Case 2  | mild    | mild    | mild     | moderate | mild    | mild     |



**Figure 1.** Postoperative hearth rate (HR) and respiratory rate (RR) in case 1



**Figure 2.** Postoperative hearth rate (HR) and respiratory rate (RR) in case 2

## DISCUSSION

Our case series presented two cases of SAPB performed in pneumothorax and multiple rib fractures. Results from previous study, patients that underwent SAPB had a lower VAS and lesser quantity of tramadol use.<sup>2</sup> Patients undergone thoracotomy usually experience moderate to severe pain and therefore, many deleterius effect could occur as a consequence ot this pain. Several side effect due to pain in post thoractomy such as reduced pulmonary function as patient restrict their chest movement in order to minimize pain.<sup>1</sup> In our first case, VATS provides an opprtunity to penetrate thoracic cavity by video through an incision into the chest wal. Post-operative VATS-related pain as high possibility of becoming chronic.<sup>4</sup>

Numerous reports and studies has been publishen regarding efficacy of SAPB. Successful result was presented in cases on SAPB for thoracic analgesia. Another study comparing SAPB with another technique and found that in post-operative periode, SAPB achieved successful pain relief. SAPB had similar effect on postoperative pain control compared with intercostal nerve block. However, the SAPB approach significantly reduce NSAIDs consumption for chest tube removal after VATS. Meanwhile, when compared with paravertebral block, the result is limited.<sup>2,8</sup> Meanwhile Kaushan et al. found SAPB and intercostal nerve block has similar efficacy in post-thorachotomy patients, but with longer duration and easier procedure.<sup>9</sup> Chen et al. also reported that SAPB may provide better pain relief than local anesthetic infiltration.<sup>10</sup> In 2018, a report showed that SAPB reduce pain and opioid use compared to sham procedure.<sup>11</sup> Opioids are commonly administered for postoperative Video-Assisted Thoracic Surgery (VATS) pain management. However, opioids present various drawbacks, including dose-related respiratory depression and the occurrence of nausea and vomiting.<sup>2</sup> Several previous studies reported, patients had significant pain relief post-operative and a good locoregional alternative analgesic post-thoracotomy.<sup>4,12</sup> One of the limitation of SAPB is that, due to superficial administration of anaesthetic drugs, the block less effective in controlling more visceral pain such as in patients with pelural decortication surgery.<sup>13</sup>

A key point in SAPB including quantity of local anaesthesia. Region of injection also plays key point for SAPB, whether superficial or underneath to the serratus muscle.<sup>2</sup> By assessing the distribution of the injection and sensory mapping, it was found that injection in superficial plane was more efective and easier for anaesthetic agent to spreads.<sup>6</sup> In addition, due to SAPB administer analgesic solution in much superficial layer, SAPB considered less invasive, safer and easier procedure. SAPB also showed more hemodynamic stability since serratus anterior muscle plane is a less concentrated with blood vessel, thus

anesthetic toxicity can be avoided.<sup>7,8</sup> Currently, there is lack of evidence and uniform evaluation criteria regarding volume and concentration of anaesthetic agent used in SAPB. Blanco original approach was giving 0.4 mL/kg of 0.25% ropivacaine with analgesic duration was 8 hours postoperative<sup>6,10</sup>

Our case series is subject to several limitations, notably the small sample size and the lack of systematic data collection. Consequently, there is a possibility that side effects were not adequately documented. While this case series underscores the advantages of utilizing SAPB for analgesia in post-thoracotomy patients, further research is essential to ascertain its efficacy, indications, and safety.

## ACKNOWLEDGMENT

-

## CONFLICT OF INTEREST

None

## REFERENCES

1. Madabushi R, Tewari S, Gautam SKS, Agarwal A, Agarwal A. Serratus anterior plane block: A new analgesic technique for post-thoracotomy pain. *Pain Physician*. 2015;18:E421–424.
2. Ökmen K, Metin Ökmen B. Evaluation of the effect of serratus anterior plane block for pain treatment after video-assisted thoracoscopic surgery. *Anaesth Crit Care Pain Med*. 2018;37:349–353.
3. Chu GM, Jarvis GC. Serratus Anterior Plane Block to Address Postthoracotomy and Chest Tube-Related Pain: A Report on 3 Cases. *A A case reports*. 2017;8:322–325.
4. Lin J, Hoffman T, Badashova K, Motov S, Haines L. Serratus Anterior Plane Block in the Emergency Department: A Case Series. *Clin Pract Cases Emerg Med*. 2020;4:21–25.
5. Mayes J, Davidson E, Panahi P, Eljelani F, Womack J, Sharma M. An Anatomical Evaluation of the Serratus Anterior Plane block. *Anaesthesia*. 2016;71:1064–1069.
6. Blanco R, Parras T, McDonnell JG, Prats-Galino A. Serratus plane block: A novel ultrasound-guided thoracic wall nerve block. *Anaesthesia*. 2013; 68:1107–1113.
7. Jadon A. Serratus Anterior Plane Block failed to relieve Pain in Multiple Fractured Ribs: Report of Two Cases. *J Recent Adv Pain*. 2017;3:52–55
8. Kim S, Bae CM, Do YW, Moon S, Baek SI, Lee DH. Serratus Anterior Plane Block and Intercostal Nerve Block after Thoracoscopic Surgery. *Thorac Cardiovasc Surg*. 2021;69:564–569.
9. Kaushal B, Chauhan S, Saini K, et al. Comparison of the Efficacy of Ultrasound-Guided Serratus Anterior Plane Block, Pectoral Nerves II Block, and Intercostal Nerve Block for the Management of Postoperative Thoracotomy Pain After Pediatric Cardiac Surgery. *J Cardiothorac Vasc Anesth*. 2019;33:418–425.
10. Chen G, Li Y, Zhang Y, Fang X. Effects of serratus anterior plane block for postoperative analgesia after thoracoscopic surgery compared with local anesthetic infiltration: A randomized clinical trial. *J Pain Res*. 2019;12:2411–2417.
11. Park MH, Kim JA, Ahn HJ, Yang MK, Son HJ, Seong BG. A randomised trial of serratus anterior plane block for analgesia after thoracoscopic surgery. *Anaesthesia*. 2018;73:1260–1264.
12. Reyad RM, Shaker EH, Ghobrial HZ, Abbas DN, Reyad EM, Abd Alrahman AAM, et al. The impact of ultrasound-guided continuous serratus anterior plane block versus intravenous patient-controlled analgesia on the incidence and severity of post-thoracotomy pain syndrome: A randomized, controlled study. *Eur J Pain (United Kingdom)*. 2020;24:159–170.
13. Semyonov M, Fedorina E, Grinshpun J, Dubilet M, Refaely Y, Ruderman L, et al. Ultrasound-guided serratus anterior plane block for analgesia after thoracic surgery. *J Pain Res*. 2019;12:953–960.

## CONCLUSION

This case series found that SAPB was an effective as post-operative analgesia after thoracotomy with good efficacy. Additional research is required to elucidate the role of SAPB in managing various patients with acute pain conditions and to comprehend potential side effects that may arise.