



# Combined Serratus Intercostal Fascial Block (SIFB) and Rectus Sheath Block (RSB) for Chest Wall Fracture

Garagozlo CA, Sinha V, Sinha ABS and Chandrashekar A\*

Department of Anesthesiology, University of Tennessee Health Science Center, USA

\*Corresponding author: Arvind Chandrashekar, Department of Anesthesiology, University of Tennessee Health Science Center, 877 Jefferson Avenue Chandler Building, Suite 622, Memphis, TN, 38103, USA, Tel: (901) 448-5892; Email: achandr9@uthsc.edu

## Research Article

Volume 7 Issue 1

Received Date: March 07, 2023

Published Date: March 27, 2023

DOI: 10.23880/mjccs-16000322

## Abstract

**Purpose:** Rib fractures are common in patients presenting chest trauma and are associated with significant morbidity and mortality. Traditional pain management options for rib fractures include thoracic epidural and/or paravertebral blocks. However, novel regional anesthesia techniques have been demonstrated to improve pain scores and aid patient recovery. We describe the application of a combined Serratus-Intercostal Fascial (SIFB) and Rectus Sheath (RS) nerve blocks to provide analgesia for a patient with lower anterior and lateral rib fractures.

**Clinical Features:** To perform the combined block, an 18-gauge Tuohy needle was inserted deep to the rectus sheath muscle above the transversus muscle with obvious spread of local anesthetic superficial to the posterior rectus sheath where 10mls of 0.375% bupivacaine was injected. The needle continued laterally under the external oblique until it was positioned deep to the left serratus anterior muscle where an additional 15ml was injected. In both blocks, CPNB catheters were inserted beyond the end of the Tuohy needles. On postoperative day 2, the patient reported no pain in his anterior chest and abdomen with improved inspiratory capacity and was able to ambulate. After postoperative day 7 the patient no longer required his oral scheduled opioids and continued to report no chest pain.

**Conclusion:** A combined SIFB and RS block using a single-incision was effective in providing analgesia while being less invasive and providing more control over potential infection sites. The technique also allows for lower dosage of anesthetics which can be relevant in other clinical settings.

**Keywords:** Rectus Sheath Block; Serratus Intercostal Fascial Block; Rib Fractures; Pain; Pectointercostal Fascial Block

**Abbreviations:** RS: Rectus Sheath; NSAID: Non-Steroidal Anti-Inflammatory Drugs; PIFB: pectointercostal fascial plane; ATV: All-Terrain Vehicle; UTHSC: University of Tennessee Health Science Center.

## Introduction

Rib fractures are common in patients presenting chest trauma and are associated with significant morbidity and

mortality [1]. One of the most common complications is pneumonia, that develops in 6% of otherwise healthy patients and in more than 30% of elderly patients with rib fractures [1]. Adequate pain control in patients with chest trauma is critical, as it has been shown to decrease the incidence of pulmonary complications and improves patient outcomes [1]. Traditional pain management options for rib fractures include multimodal analgesia with non-steroidal anti-inflammatory drugs (NSAIDs) or opioids and thoracic

epidural and/or paravertebral blocks [2,3]. However, novel regional anesthesia techniques have been demonstrated to improve pain scores and aid patient recovery.

Several studies suggest that an ultrasound guided serratus intercostal fascial block (SIFB) is equivalent to thoracic epidurals in reducing pain scores and might help reduce the need for opioids [2-4]. However, associated regional anesthesia techniques such as the pectointercostal fascial plane (PIFB) nerve blocks often miss anterior rib fractures caudal to the pectoralis major muscle requiring further pain management [5]. Our clinical experience reveals that the RS block provides analgesia for ribs in this lower anterior distribution, and its combined usage with a SIFB could prove valuable for patients with anterior and lateral chest trauma.

The purpose of this study is to assess the outcome of a continuous nerve block combining SIFB and RS blocks using a single incision to provide analgesia for a patient with lower anterior and lateral rib fractures after an all-terrain vehicle (ATV) accident.

### Informed Consent

Patient informed consent was obtained based on exclusion criteria from University of Tennessee Health Science Center (UTHSC) and this manuscript adheres to the applicable Enhancing the Quality and Transparency Of health Research (EQUATOR) guideline. Written Health Insurance Portability and Accountability Act (HIPAA) authorization has been obtained from the patient for the publication of this case report.

### Methods and Results

A 45-year-old man presented to a Level 1 trauma center after an ATV (all-terrain vehicle) accident with multiple fractures including left C7 lamina fracture, right T1 transverse process, T12/L1 compression, right clavicle, right anterior ribs 5-7 along with a right pneumothorax. Additionally, the patient had anterior and lateral left rib fractures below the xiphoid not previously described. He was hypotensive, undergoing packed red blood cell and fresh frozen plasma transfusion prior to arrival. Also, the patient was intubated prior to arrival. He had a positive cardiac Focused Assessment with Sonography for Trauma (FAST) and an inconclusive abdominal FAST. He was then taken emergently to the operating room for planned sternotomy and diagnostic peritoneal aspiration.

The day after the procedure the patient reported pain greater than 8/10 despite opioids. Pain limited inspiratory capacity and ambulation. The patient described pain in the

right upper anterior chest wall, the left lower anterior, the lateral chest wall below the nipple line and upper abdominal area. The acute pain service (APS) was consulted the day after the operation for escalating pain in the patient. The APS team decided that the patient had risk of opioid-related adverse drug events, impaired functional recovery, impaired pulmonary toilet and prolonged ventilator dependence. It was then decided that a multi-modal analgesia plan be implemented which included a right PIFB and a combined left SIFB and RS block with insertion of two continuous peripheral nerve block (CPNB) catheters through a continuous ambulatory delivery device (CADD) pump. We did not perform a right RS block because we did not believe the patient's abdominal pain would delay the progress of the patient's recovery based on patient's physical exam. The patient was placed on an oral oxycodone 5 mg and intravenous (IV) fentanyl (100 mcg/2 mL) pain regimen. Treatment options were discussed with the patient and informed consent for regional anesthesia was obtained.

For the combined SIFB and RS nerve block, an 18-gauge Tuohy needle was inserted deep to the rectus sheath muscle above the transversus muscle with obvious spread of local anesthetic superficial to the posterior rectus sheath where 10 ml of 0.375% bupivacaine was injected. The needle continued laterally under the external oblique until it was positioned deep to the left serratus anterior muscle where an additional 15 ml was injected. The right PIFB block was performed without any complications. In both blocks, CPNB catheters were inserted beyond the end of the Tuohy needles and were secured with bacteriostatic occlusive dressings. The CPNB catheter rate for the PIFB was initially set at 14 ml/hr, and the SIFB and RS block catheter rate was initially set at 18 ml/hr with 0.125% bupivacaine.

On postoperative day (POD) 2, the PIFB catheter rate was decreased to 12ml/hr and the SIFB and RS block catheter rate was increased to 22ml/hr. The patient reported pain of 0/10 in regards to his anterior chest and abdomen with improved inspiratory capacity and was able to ambulate. Decreased temperature sensation was demonstrated in the left anterior and lateral intercostal distributions. The patient also no longer required his scheduled IV opioids. On POD5, the PIFB catheter rate was decreased to 6 ml/hr and the SIFB and RS block catheter rate was decreased to 12 ml/hr. The catheter infusion rates remained constant throughout the patient's hospital course. On POD6 all of the patient's CPNB catheters were removed. After POD7 the patient no longer required his oral scheduled opioids and continued to report no chest pain. There were no complications from the nerve block catheters. The patient was discharged and was scheduled for an outpatient trauma surgery office visit. The patient reported no pain but did report mild numbness in his fingers and toes at the visit.

## Discussion

This case demonstrates the efficacy of a combined nerve block approach that provides chest wall analgesia specifically for lower anterior and lateral chest wall fractures utilizing a single needle approach. Besides achieving pain control in a setting in which the usage of opioids was ineffective for pain management, the procedure improved inspiratory capacity.

Newer techniques of regional anesthesia such as SIFB have become a heavily researched in the perioperative setting, especially in open heart surgery, sternotomy or chest trauma interventions [4,6,7]. Several pieces of research have shown that SIFB is effective in reducing the opioid and analgesic requirements, while providing a safer and convenient block administration [7]. However, SIFB needs to be complemented with other procedures for pain management in the subxiphoid region. This limitation is noted in the original technique presentation, as Lopez-Matamala, et al. commented on a case in which SIFB (presented together with PIFB) was successfully used on a patient with rib, vertebrae and pelvis trauma; and NSAID complements were required for pain management [4]. Similarly, SIFB is still undergoing clinical trials, and requires more research to assess its effectiveness in multiple clinical settings [8-11].

SIFB and PIFB combined with RSB has been successfully used in several case reports in the literature, often for pain management in sternotomies, exploratory laparotomies and other surgical procedures. Everett et al. used Transversus Thoracis Plane Blocks (TTPB), PIFB and bilateral RSBs in an aortic valve replacement [12]. Toscano, et al. also reported performing a combined RSB with PIFB in a patient subject to surgical mediastinal revision, referring to the technique as the Pectoralis-Intercostal Rectus Sheath block (PIRS) [13]. Jones, et al. used combined PIFB and postoperative RSB in a traumatic chest injury requiring pericardial window and a full sternotomy [5]. Tan, et al. [10] and Selvi, et al. [14] performed Serratus intercostal blocks together with bilateral RSBs in patients undergoing hepatectomies and cholecystectomies respectively. In all of these studies, the authors reported a decrease in patient postoperative opioid usage or decreased to no pain postoperatively.

Our case is the first in its type to our knowledge, as we performed both SIFB and RSB in a single incision. Our protocol shares a common advantage with separate SIFB/PIFB as it can be performed in the supine position, useful in settings in which the patient cannot be repositioned due to safety or discomfort concerns. However, the technique has the advantage of using one needle to provide analgesia to both the anterior chest wall and anterior abdominal wall. A single incision is less invasive and allows to have more control over potential infection sites. The technique also

allows lower dosage of anesthetics to be used, which could be relevant in the pediatric setting or for patients with lower body weight.

Although more clinical tests and cases using this technique are needed to assess its feasibility, our report highlights the efficiency and advantages of using a single-incision combined SIFB and RS block. Further application and study of this technique are recommended in different clinical settings.

## References

1. Ziegler DW, Agarwal NN (1994) The morbidity and mortality of rib fractures. *J Trauma* 37(6): 975-979.
2. Beard L, Hillermann C, Beard E, Millerchip S, Sachdeva R, et al. (2020) Multicenter longitudinal cross-sectional study comparing effectiveness of serratus anterior plane, paravertebral and thoracic epidural for the analgesia of multiple rib fractures. *Reg Anesth Pain Med* 45(5): 351-356.
3. Witt CE, Bulger EM (2017) Comprehensive approach to the management of the patient with multiple rib fractures: a review and introduction of a bundled rib fracture management protocol. *Trauma Surg Acute Care Open* 2(1): e000064.
4. Lopez-Matamala B, Fajardo M, Estebanez-Montiel B, Blancas R, Alfaro P, et al. (2014) A new thoracic interfascial plane block as anesthesia for difficult weaning due to ribcage pain in critically ill patients. *Med intensiva* 38(7): 463-465.
5. Jones J, Murin PJ, Tsui JH (2021) Combined Pectoral-Intercostal Fascial Plane and Rectus Sheath Blocks for Opioid-Sparing Pain Control after Extended Sternotomy for Traumatic Nail Gun Injury. *J Cardiothorac Vasc Anesth* 35(5): 1551-1553.
6. Mostafa TAH, El-Hamid AMA, Abdelgawad BM, Elbarbary DH (2021) Serratus anterior plane block for cardiothoracic surgeries: a meta-analysis of randomized trials. *Ain-Shams J Anesthesiol* 13(1): 1-9.
7. Kim Y, Oh C, Youn S, Yun S, Park H, et al. (2019) Thoracic interfascial plane block for multimodal analgesia after breast lumpectomy. *Anesth Pain Med* 14(2): 222-229.
8. Lee J, Kim S (2019) The effects of ultrasound-guided serratus plane block, in combination with general anesthesia, on intraoperative opioid consumption, emergence time, and hemodynamic stability during video-assisted thoracoscopic lobectomy: A randomized prospective study. *Medicine (Baltimore)* 98(18): e15385.

9. Fernandez Martin MT, Lopez Alvarez S, Perez Herrero MA (2018) Serratus-intercostal interfascial block as an opioid-saving strategy in supra-umbilical open surgery. *Rev Esp Anesthesiol Reanim* 65(8): 456-460.
10. Selvi O, Tulgar S, Senturk O, Serifsoy TE, Thomas DT, et al. (2020) Is a Combination of the Serratus Intercostal Plane Block and Rectus Sheath Block Superior to the Bilateral Oblique Subcostal Transversus Abdominis Plane Block in Laparoscopic Cholecystectomy? *Eurasian J Med* 52(1): 34-37.
11. De La Torre PA, Garcia PD, Alvarez SL, Miguel FJG, Perez MF et al. (2014) A novel ultrasound-guided block: a promising alternative for breast analgesia. *Aesthetic Surg J* 34(1): 198-200.
12. Everett L, Davis TA, Deshpande SP, Mondal S (2022) Implementation of Bilateral Rectus Sheath Blocks in Conjunction With Transversus Thoracis Plane and Pectointercostal Fascial Blocks for Immediate Postoperative Analgesia After Cardiac Surgery. *Cureus* 14(7): e26592.
13. Toscano A, Balzani E, Capuano P, Vaninetti A, Perrucci C, et al. (2022) Awake cardiac surgery using the novel pectoralis-intercostal-rectus sheath (PIRS) plane block and subxiphoid approach. *J Card Surg* 37(9): 2923-2926.
14. Tan S, Chen W, Liu Y, Wei L (2022) Combination of Ultrasound-Guided Serratus Anterior Plane Block and Rectus Sheath Block Provide Analgesia for Open Hepatectomy: A Report on 3 Cases. *Am J Med Case Reports* 10(3): 68-71.

