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## CLINICAL INFORMATION

# Continuous serratus anterior plane block provides analgesia in multiple rib fractures: a case report



Fernando Calado de Oliveira Camacho<sup>a,\*</sup>, Elena Segura-Grau<sup>b</sup>

<sup>a</sup> Centro Hospitalar de São João, Serviço de Anestesiologia, Porto, Portugal

<sup>b</sup> Centro Hospitalar de Tondela e Viseu, Serviço de Anestesiologia, Viseu, Portugal

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### KEYWORDS

Regional anesthesia;  
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**Abstract** Thoracic trauma with rib fractures is a challenging condition due to the severe associated pain. Uncontrolled pain impairs breathing and an adequate pain control is necessary to provide comfort and to avoid further complications. Serratus Anterior Plane block is a procedure safe and easy to accomplish. The authors describe a case of thoracic trauma with rib fractures and respiratory compromise. Pain control was only achieved after performing a Serratus Anterior Plane block. The technique was done as described in the medical literature with placement of a catheter. Pain relief was achieved with a low concentration infusion of local anesthetic. © 2018 Sociedade Brasileira de Anestesiologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### PALAVRAS-CHAVE

Anestesia regional;  
Bloqueio do plano serrátil;  
Fraturas de costelas

### O bloqueio contínuo do plano serrátil anterior fornece analgesia em fraturas múltiplas de costelas: relato de caso

**Resumo** O trauma torácico com fraturas de costelas é uma condição desafiadora devido à dor intensa associada. O não controle da dor prejudica a respiração enquanto o seu controle adequado é necessário para proporcionar conforto e evitar maiores complicações. O bloqueio do plano serrátil anterior é um procedimento seguro e fácil de realizar. Descrevemos um caso de trauma torácico com fraturas de costelas e comprometimento respiratório. O controle da dor só foi obtido após a realização do bloqueio do plano serrátil anterior. A técnica foi realizada conforme descrito na literatura médica com a colocação de um cateter. O alívio da dor foi obtido com uma infusão de anestésico local em baixa concentração.

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\* Corresponding author.

E-mail: [fcamacho00@gmail.com](mailto:fcamacho00@gmail.com) (F.C. Camacho).

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## Introduction

Thoracic blunt trauma, especially when multiple rib fractures are associated, is challenging to manage and causes significant morbidity due to the severe pain implied.<sup>1</sup>

Patients can present with respiratory compromise as their capacity to expand the thorax is limited by pain. As a result, smaller tidal volumes are accomplished and the ability to cough and clear secretions is impaired, possibly leading to atelectasis and an increased risk of respiratory infections.<sup>2</sup>

Although multiple therapeutic options are available, pain management can be difficult.<sup>3</sup> Intravenous analgesia with opioids is commonly used, but it is associated with multiple side effects, such as suppression of the cough reflex, respiratory depression, nausea, vomiting and pruritus. Epidural analgesia provides good analgesia, but can be technically difficult at the thoracic level and has several implications and risks. Paravertebral and intercostal blocks can also be performed, but are challenging to do and not without risk.

Ultrasound-guided Serratus Anterior Plane (SAP) block is a recent technique, first described by Blanco et al. in 2013, that provides analgesia for the thoracic wall by blocking the lateral branches of the intercostal nerves from T2 to L2. It is a safe, simple to perform block with no significant contraindications or side effects.<sup>4</sup>

We present a case report of a patient with multiple rib fractures who had severe, refractory pain. The patient was successfully treated with a SAP block and placement of a catheter for continuous analgesia on a low concentration infusion of local anesthetic.

Written consent for the publication of this case report was obtained from the patient.

## Case report

A 36-year-old male, ASA I, presented to the Emergency Department (ED) with right-sided thoracic trauma in the setting of a six meters height fall.

On arrival to the ED the patient was alert and oriented, but complained of severe right-sided thoracic pain. His Glasgow Coma Scale score was 15 with no neurological deficits. His oxygen saturation was 94% on room air but he had mild respiratory distress. The patient was hemodynamically stable, with a normal heart rate and blood pressure.

On physical examination he had severe pain on palpation of the right hemithorax and slightly diminished breath sounds on the same side. The remaining of the examination was unremarkable.

His blood test results were normal. Radiological evaluation was obtained. Head and cervical spine Computed Tomography (CT) were negative for injuries. Chest radiography and thorax CT showed rib fractures of the first through the eighth ribs and concomitant ipsilateral pneumothorax and pleural effusion.

A 24 Fr tube was inserted, with drainage of hematic content in small quantity.

No surgical intervention was indicated, but due to the severe thoracic injuries he was admitted to the surgical intermediate care unit for clinical observation and pain control.

He was prescribed systemic intravenous analgesia with Paracetamol, NSAID's and IV opioids. His pain, however, remained severe, located on the right hemithorax, preventing him from moving and breathing adequately. On the fifth day, due to the inadequate pain control, the Anesthesia Acute Pain Service was consulted. Medication was reviewed and a morphine PCA was added to his therapeutics. A mild initial improvement was reported, but by the eighth day the patient was again under severe pain with a Numerical Rating Scale (NRS) score of 8. He was bedridden, uneasy, did not tolerate mobilizations and presented with pain related impaired breathing. Due to the therapeutic failure, his lung function was deteriorating, with clinical and radiological worsening (Fig. 1). After discussion, it was decided to perform a SAP block with placement of a catheter for continuous analgesia.

The patient was monitored with pulse oximetry, ECG and non-invasive blood pressure. With the patient in supine position, we used a linear ultrasound transducer (SonoSite M-Turbo) to scan over the right hemithorax to locate the fifth rib at the midclavicular line. We dislocated the probe laterally, identifying the serratus anterior muscle over the fifth rib. After anesthetising the skin with 2 mL of lidocaine 2%, an 18 gauge Touhy needle was introduced in-plane, under direct visualization, to the plane immediately deep to the serratus anterior muscle. After negative aspiration, 20 mL of levobupivacaine 0.25% were injected. Afterwards, a 20 gauge peripheral nerve catheter was easily threaded into the space. The needle was removed and the catheter secured with adhesive (Fig. 2). Five minutes after the Local Anesthetic (LA) administration, the patient started feeling a significant relief of pain. After a few more minutes he no longer had difficulty breathing and reported almost complete cessation of pain at rest. A levobupivacaine 0.12% infusion at a rate of 5 mL.h<sup>-1</sup> by a Drug Infusion Balloon (DIB) was started, and the patient remained under observation at the intermediate care unit. On the following day, he was able to stand up and sit on the bedside chair and reported a NRS score of 0 at rest, with a NRS score of 3 with mobilization. On the 3rd day after placement of the catheter, due to his favorable outcome, he was transferred to the surgical

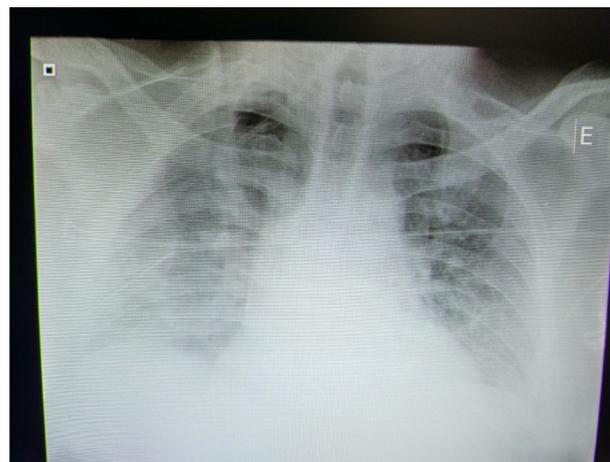


Figure 1 Clinical and radiological worsening.



**Figure 2** The needle was removed and the catheter secured with adhesive.

ward. The LA infusion was maintained for a total of five days, after which it was removed. He was kept on Paracetamol and NSAID's, but did not require opioid therapy after the placement of the catheter. The patient remained comfortable at all times and able to mobilize as well. On the third day post removal of the catheter, he was discharged home, without pain or other complications whatsoever.

## Discussion

This case report intends to demonstrate the complexity of pain management in thoracic trauma with associated rib fractures.

Current gold standard for management of pain in blunt thoracic trauma is the placement of a thoracic epidural catheter. However, many patients are elderly, with multiple comorbidities, and are on anticoagulant or antiplatelet therapy, limiting its feasibility. The risk of hypotension due to the bilateral thoracic sympathectomy is also a concern, and it can be technically difficult to place an epidural catheter at a thoracic level. Development of novel approaches, such as SAP block, is promising, as it carries fewer risks and contraindications; it is easy to perform under ultrasound guidance and provides adequate analgesia. In our case, a multimodal intravenous analgesia protocol was implemented initially, with no success after several days of treatment, hence our choice to place a SAP catheter.

This a technique first described by Blanco et al.<sup>4</sup> In the original study, they administered 0.4 mg.kg<sup>-1</sup> of levobupivacaine 0.125% under ultrasound guidance to four volunteers, achieving analgesia from T2 to T9. It evolved from the Pecs I and II blocks described by the same authors, and was intended to provide analgesia for patients undergoing surgery involving the thoracic wall, specifically for breast surgery. It has since been described in the medical literature for other purposes, such as providing analgesia in thoracic trauma patients, particularly those with multiple rib fractures.<sup>5</sup>

In this case report, we chose not to place a thoracic epidural catheter due to the fact that the patient was under severe pain and it would be difficult to position him for the procedure. A paravertebral block could possibly worsen the

respiratory function in the event of an iatrogenic pneumothorax. As so, we opted to perform a SAP block with placement of a catheter for prolonged analgesic effect, although there are few studies in the medical literature for the continuous technique in the setting of thoracic trauma with rib fractures. After the LA administration, the patient improved in a matter of minutes, as described in other reports.<sup>5</sup> He could again breathe deeply without pain and mobilize his right arm. His mood improved instantly. He remained pain free for the duration of the LA infusion and was able to perform physical rehabilitation, which were the goals of our treatment.

Although the patient was healthy, his prolonged bedridden status was starting to take a toll, as he was having difficulty to adequately breathe, cough and mobilize secretions. His serial chest radiography's showed developing opacities in both lung fields, suggestive of atelectasis. He had repeated a chest tomography at the 8 day post hospital admission that confirmed the diagnosis. Pain control was necessary to prevent further complications, such as respiratory infection and failure.

Ultrasound-guided continuous SAP block is a relatively recent technique to provide analgesia in cases of multiple rib fractures. The optimal analgesic regimen is not well defined, but we chose an infusion of a low concentration of LA, minimizing potential risks associated to LA toxicity, while still providing adequate analgesia.

This case report and the current literature suggest that continuous SAP block is an effective method for analgesia in cases of multiple rib fractures. It is a technique that can easily be accomplished at bedside, inclusively at the ED. We believe it is an option to take into account in difficult cases such as this, being able to provide adequate analgesia with minimal complications. However, more studies are required to help ascertain the ideal site for the placement of the catheter, the optimal concentration and dosage of the LA and to compare its efficiency with other methods of analgesia.

## Conflicts of interest

The authors declare no conflicts of interest.

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