SUNTEXT REVIEWS

SunText Review of Surgery
ISSN: 2766-4767

Open Access
Research Article
Volume 2:1

Analgesic Control with Blockade of the Thoracic Transverse Muscle Plane in the Postoperative Period of Cardiac Surgery: Case Report

Oliveira Loyola S[1], Siqueira Elmiro G[2], Weyler Nery M[3], Henrique de Souza A[4] and Gardenghi G[5,*]

[1]*Anesthesiology Service, ENCORE Hospital, Brazil*
[2]*Anesthesiology Service, Clianest, Goiânia, Brazil*
[3]*Intensive Care Unit, ENCORE Hospital, Aparecida de Goiânia, Brazil*
[4]*Cardiovascular Surgery, ENCORE Hospital, Aparecida de Goiânia, Brazil*
[5]*Scientific Coordination, ENCORE Hospital, Aparecida de Goiânia, Brazil*

[*]**Corresponding author:** Gardenghi G, Clianest, R. T-32, 279 - St. Bueno, Goiânia - GO, Postal code: 74210-210, Brazil; Tel: +55 (62) 3604-1100; E-mail: ggardenghi@encore.com.br

Received date: 23 September 2022; **Accepted date:** 18 October 2022; **Published date:** 24 October 2022

Citation: Oliveira Loyola S, Siqueira Elmiro G, Weyler Nery M, Henrique de Souza A, Gardenghi G (2022). Analgesic Control with Blockade of the Thoracic Transverse Muscle Plane in the Postoperative Period of Cardiac Surgery: Case Report. SunText Rev Surg 3(1): 120.

DOI: https://doi.org/10.51737/2766-4767.2022.020

Abstract

Cardiac surgery with sternotomy is related to a mechanism of intense trauma with the use of a large amount of opioids, which does not always provide good analgesic control, in addition to generating chemical dependence. The persistence of pain in the thoracic region in the postoperative period is common with conventional analgesia performed only with opioids, which slows the recovery, increasing costs and morbidity. New approaches to the analgesic control of these surgeries become important as they may be related to a better response to physiotherapy and cardiopulmonary rehabilitation and, consequently, a shorter hospital stay, which would reduce the costs of the surgery in addition to ensuring a more comfortable postoperative period for patients. Blocking the thoracic transverse muscle plane has become a promising pioneering technique for analgesic control in the postoperative period of cardiac surgery. We describe a case report in which this block gave better postoperative analgesic control, compared to the usual care in the intensive care unit.

Keywords: Analgesia; Opiate substitution treatment; Thoracic surgery; Neuromuscular blockade

Introduction

Nowadays, cardiovascular surgeries are losing a large space for transcutaneous procedures. Even when the surgical indication is superior in the literature to the detriment of the transcutaneous procedure, some patients opt for these because they have a minor trauma mechanism and a much more comfortable postoperative. Thus, pain in the postoperative period becomes an important factor in the patient's therapeutic decision and thus influencing in some cases even the prognosis [1].

The sternotomy performed in myocardial revascularization surgeries is associated with an intense trauma mechanism that leads to great difficulty in controlling analgesics in the postoperative period. The use of high doses of opioids is not always effective for a good analgesic control and, in addition, it can generate chemical dependence which confers greater morbidity and expenses [1]. Adequate control of postoperative pain is fundamental for the patient's full recovery, avoiding the possible chronicity of pain, contributing to better patient satisfaction, facilitating physical therapy and cardiopulmonary rehabilitation, reducing the length of hospital stay, with a reduced risk of pulmonary infection and complications [2].

An increase in the incidence of pulmonary complications can arise with postoperative ventilation restricted by pain, which can result in hypoventilation, atelectasis, pneumonia, and increased length of hospital stay. Thus, it is important to treat surgical chest pain properly and in such a way as to minimize the need for significant opioid administration [2].

Chronic and opioid abuse, currently threatening the health of the global population, has forced health care providers to reconsider possible analgesic options. Great efforts have been made to

maximize analgesia, with the implantation of regional anesthetic techniques, in an attempt to reduce pain in multimodal analgesic techniques. These efforts were associated with improvements in ultrasound imaging technology and a renewed interest in the anatomical study that resulted in an increase in fascial plane blocks to assist in the provision of perioperative analgesia [3].

Chronic pain can develop after inadequate management of acute pain with isolated use of opioids, contributing to additional physiological and psychological stress and consuming disproportionate physical and financial resources3.The aim of this study was to report a case of analgesic control in the postoperative period of cardiac surgery with ultrasound-guided blockade of the thoracic transverse muscle plane (TTMP) before the physiotherapy sessions, in the intensive care unit environment. The present case report was evaluated by the research ethics committee linked to Brazil Platform and receiving its approval under number CAAE: 08 498819.8.0000.0033.

Case Presentation

A 50-year-old male patient, overweight, sedentary, ex-smoker, with multivessel coronary artery disease (CAD). Denies hypertension, diabetes and a positive history of early family CAD. Patient had cardiac catheterization on 05/29/2020 showing a right dominance pattern, with right coronary artery (RCA) with 100% lesion in the proximal third, anterior descending artery (ADA) with 90% lesion in the proximal third and another 100% lesion in the middle third, circumflex artery (CX) with lesions of 95% and 70% in the middle third.

Figure 1: *Application of the visual analogue pain scale in the postoperative period of cardiac surgery, performed before and after blocking the thoracic transverse muscle plane.*

On 06/03/2020, he underwent cardiac surgery for myocardial revascularization with left mammary bypass to diagonal and ADA, bypass for right marginal and RCA and bypass with left radial artery for first left marginal and sequential second left marginal. During surgery, neurological monitoring was performed by electroencephalographic bispectral index, mild sedation by pre-anesthetic medication, spinal anesthesia with 0.5% Bupivacaine 40mg + Dimorf 200mcg + Sufentanil 15mcg. He was intubated with sequential venous induction with Ketamin S + 1% propofol + Rocuronium, maintenance with sevoflurane. Activated clotting time (ACT) of 96 seconds and post protamine ACT of 154 minutes. Extracorporeal circulation time of 102 minutes and aortic clamping time of 76 minutes, successfully and without complications during the surgery.

In the first postoperative day, the patient evolved with significant dependent ventilatory pain, when evaluated by the service's assistance team, using the visual analogue pain scale (VAS) as demonstrated in (Figure 1), preventing physical therapy and cardiovascular rehabilitation.

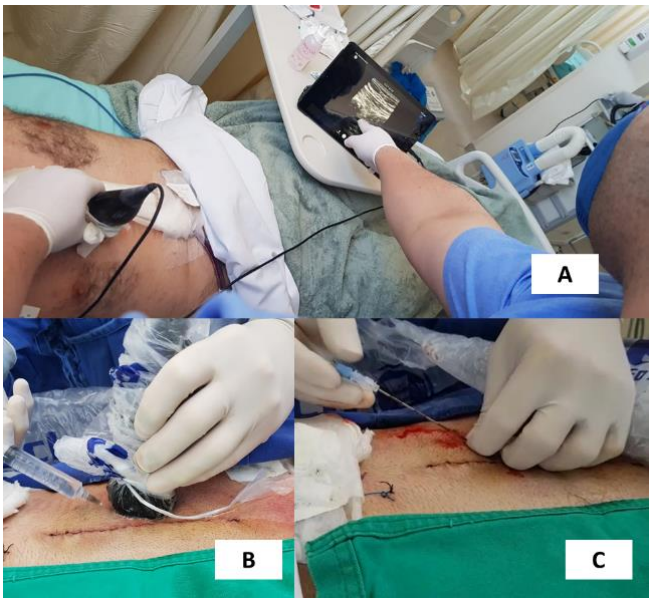

Figure 2: *Technique for performing thoracic transverse muscle plane block guided by ultrasound. A. Positioning of the linear probe 3 centimeters from the sternal border, at the level of the 4-5º intercostal space, longitudinal direction with cephalic indicator and identification of the plane; B. Performing an anesthetic button before inserting the Touhy 17G needle; C. Puncture performed in a plane and insertion of a 17G epidural catheter into the plane of the transverse thoracic muscle after injection of 20mL of anesthetic solution.*

The usual pharmacological care measures were attempted orally to control pain, with no satisfactory response from the patient. He also had allodynia in the sternal region, without associated inflammatory signs, and the anesthesiology team was activated. Degermation and antisepsis were performed from the sternal region to the hemiclavicular line bilaterally with chlorhexidine and placement of sterile drapes. Positioning the longitudinally linear ultrasound probe 3 centimeters from the sternal border at the level of the 4-5th intercostal space, with a cephalic indicator on each side and the thoracic transverse muscle plane. Puncture was performed with a 17G Tuohy needle after anesthetic button

and injected 20mL of 0.25% Ropivacaine on each side. Then, a 17G epidural catheter was inserted in the same plane (visible to the ultrasound) and left 5 centimeters in the referred fascial plane. At the end, fixation was performed by means of tunneling and bandage for new injections (Figure 2).

Table 1: *Painful perception of the patient using the visual analogue pain scale before and after blocking the TTMP and during the physical therapy sessions performed after the blockage.*

		Pre	Post 30 min
1st PO day **(10.30 AM)**	1st blockage	8	2
1st physiotherapy session (14.24 PM)		2	2
1st PO day **(7.10 PM)**	2nd blockage	0	0
2nd physiotherapy session (08.00 PM)		0	0
2nd PO day **(9.20 AM)**	3rd blockage	2	0
3rd physiotherapy session (10.00 AM)		0	0

TTMP: thoracic transverse muscle plane; PO: postoperative; Data presented in absolute numbers based on the points indicated on the visual analog scale of pain by the patient.

There was a significant reduction in pain, assessed using the VAS (Table 1). Three sessions of the TTMP block were performed, two on the first postoperative day and one on the second postoperative day, achieving a 75% reduction in painful perception in the first block, which allowed physiotherapy to be performed. The exercise session did not increase the patient's pain. The second session of the blockade was performed at night, despite the patient's pain being referred to as zero, to ensure the second physical therapy session and also a good night's sleep at the same time. Again, physical therapy was performed without increasing the patient's painful perception. The next day in the morning, the third block was performed, with the patient reporting a 2-point pain in VAS that fell to zero 30 minutes after the procedure. For the third time, physical therapy was performed without increasing the patient's painful perception, allowing pulmonary and cardiac rehabilitation to be carried out without complications. After that, the patient's painful perception remained low and new blocks were not necessary, after evaluation by the anesthesiology team. The patient was discharged on the fifth postoperative day, stable and with good analgesic control.

Discussion

Our case report was able to demonstrate decreased pain levels after the adoption of the ultrasound-guided TTMP block. In the postoperative period of cardiovascular surgeries, the control of chest pain may become a major challenge. High doses of opioids are not always effective for good analgesic control and, in addition, the incidence of opioid addiction increases as larger amounts are administered postoperatively [4], which significantly increases costs and morbidity [1].

The chronic use of opioids has become a major concern, in the USA opioid dependence has already been declared a public health emergency. In 2017 there were 47,600 deaths related to its use, which already represents more deaths each year than collisions. Motor vehicles or breast cancer [4]. The prescription of opioids on discharge from the postoperative period of cardiac surgery increases the risk of chemical dependence, with approximately 1 in 10 patients undergoing cardiac surgery can develop its chronic use [4]. The TTMP block thus becomes an important adjuvant therapy not only for analgesic control, but also for reducing the need for opioids, especially after hospital discharge, and might be an option in cases like the one here described.

The persistence of pain in the thoracic region due to ineffective analgesia can limit pulmonary expansion, making it difficult to perform physiotherapy and cardiopulmonary rehabilitation in addition to increasing the likelihood of chronic pain. Poorly controlled acute surgical pain can be highly debilitating and has been associated with chronic pain seen in about 20% of patients after sternotomy [5]. Restricted postoperative ventilation can result in atelectasis, hypoventilation, pneumonia, and increased hospital stay [2]. To combat such complications, the performance of postoperative physiotherapy is essential and proves to be effective in restoring ventilatory capacity and minimizing complications, as previously demonstrated by our group [6]. In

the case presented here, the analgesia induced by the TTMP block enabled all sessions to be carried out without complications.

Historically, TTMP block was initially used in the resection of breast cancer with contraindication to general anesthesia. It can be done by injecting 15 mL of levobupivacaine (0.15%) between the transverse thoracic muscle and the internal intercostal muscle between the third and fourth left ribs in connection with the sternum. A landmark to identify the TTMP is the short-axis view of the internal thoracic artery and vein, which superficially locates the transverse chest muscle. When the tip of the needle is considered to achieve TTMP on the ultrasound image, a small amount (less than 2 mL) of the local anesthetic test dose is injected after confirmation of negative aspiration. If the local anesthetic spreads are seen above the costal cartilage in the sagittal parasternal view, then the local anesthetic was injected superficially into the internal intercostal muscle. The local spread of the anesthetic deep in the costal cartilages indicates an appropriate block [7].

It is important to highlight that the TTMP blocks are not free of drawbacks. Potential complications are rare and include bleeding, infection, pneumothorax and local anesthetic intoxication [8]. Because this technique is performed with ultrasound guidance, it greatly reduces the risk of both pneumothorax and bleeding and poisoning by local anesthetic, it also has the advantage of not entering the neuroaxis and thus not presenting contraindications in relation to the use of anticoagulation [9].

Thus, TTMP blocks may become an optional analgesia modality in cardiovascular surgeries, considering that it not only provides better analgesic control, sparing opioids, reducing chronic pain and length of hospital stay, but also has an exceptionally low rate of possible complications. In order to obtain better pain control in the postoperative period of cardiac surgeries, involving other professionals in the discussion about therapeutic options, as in the case in question, where the anesthesiology team was called, was essential for the presentation of a new path that made it possible to decrease the patient's pain, since the conventional analgesic measures proposed by the attending physician in the intensive care unit were not effective.

The major limitation of this article is the fact that it is only a case report involving a single patient. For TTMP blocks to be considered a therapeutic option at massive levels, randomized clinical trials are necessary and shall be performed in the future.

In the present case, the TTMP block was effective in reducing pain in the postoperative period of cardiac surgery and may be a tool in the anesthesiology arsenal.

Abbreviations

TTMP: Thoracic Transverse Muscle Plane; CAD: Coronary Artery Disease; ADA: Anterior Descending Artery; RCA: Right Coronary Artery; CX: Circumflex Artery; ACT: Activated Clotting Time; VAS: Visual Analogue Pain Scale

References

1. Dewan KC, Dewan KS, Idrees JJ, Navale SM, Rosinski BF, Svensson LG, et al. Trends and outcomes of cardiovascular surgery in patients with opioid use disorders. JAMA Surg. 2019; 154: 232-240.
2. Nachiyunde B, Lam L. The efficacy of different modes of analgesia in postoperative pain management and early mobilization in postoperative cardiac surgical patients: A systematic review. Ann Card Anaesth. 2018; 21: 363-370.
3. George R, Dahl K, Blair de Haan J. Transversus Thoracic Plane Block: How I Do It. American Society of Regional Anesthesia and Pain Medicine. 2019.
4. Brown CR, Chen Z, Khurshan F, Groeneveld PW, Desai ND. Development of persistent opioid use after cardiac surgery. JAMA Cardiol. 2020; 17: e201445.
5. Kevala M, Alfirevic A, Bustamante S, Hargrave J, Marciniak D. Regional anesthesia in cardiac surgery: an overview of fascial plane chest wall blocks. Anesth Analg. 2020; 131: 127-135.
6. Barros GF, Santos CS, Granado FB, Costa PT, Límaco RP, Gardenghi G. Respiratory muscle training in patients submitted to coronary arterial bypass graft. Rev Bras Cir Cardiovasc. 2010; 25: 483-90.
7. Murata H, KumiKo H, Hara T. Transverse thoracic muscle plane block tricks and tips to accomplish the block. Regional Anesthesia Pain Medicine. 2016; 41: 411-412.
8. Ueshima H, Kitamura A. Blocking of multiple anterior branches of intercostal nerves (Th2-6) using a transversus thoracic muscle plane block. Reg Anesth Pain Med. 2015; 40: 388
9. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: a novel analgesic technique in thoracic neuropathic pain. Reg Anesth Pain Med. 2016; 41: 621-627.