ISSN: 2377-4630

Marco and Larissa. Int J Anesthetic Anesthesiol 2022, 9:140
DOI: 10.23937/2377-4630/1410140
Volume 9 | Issue 1
Open Access

International Journal of
Anesthetics and Anesthesiology

*CASE REPORT*

# Opioid Free Anesthesia with Goal-Directed Strategies Based On Monitoring For Spine Surgery in a Patient with Opioid Intolerance: A Case Report

***Dornelles Marco*[1*] *and Dornelles Larissa*[2]**

[1]*Cova da Beira University Hospital Centre (CHUCB), Portugal*

[2]*University of Lisbon, Lisbon, Portugal*

***Corresponding author:** *Dornelles Marco, Anesthesiology Assistant, Cova da Beira University Hospital Centre (CHUCB), Portugal, Tel: (+351) 919459320*

## Abstract

This study aimed to report the use of a multimodal anesthetic (MA) regimen by combining panoply of drugs without opioids for posterior spinal fusion surgery in a patient with low-back incapacity and opioid intolerance. We report a 48-year-old woman with a history of lower back discomfort that worsened over time with movement limitations in her left leg and paresthesia on the same side diagnosed by NMR with a herniated disc between L5-S1. She relied excessively on analgesics drugs and opioids, thus finally developing an opioid intolerance. The multimodal anesthetic (MA) regimen without opioids was utilized and the surgery occurred without incidents or hemodynamic instabilities, except for a delay in waking up, reverse with extra doses of decurarizing. She did not require opioids at any time until her discharge from the hospital. On the 13th day, she was reassessed when she reported mild pain at visual analog scale (VAS 2/10) and was satisfied with the result of the surgery. This case report highlights the new concept of using manifold drugs through the use a goal-direct strategies based on monitoring showing that might prove advantageous in opioid-intolerant patients.

## Keywords

Anesthesia, Analgesia, Lumbar vertebrae, Opioid-Related disorders, Pain measurement, Postoperative.

## Abbreviations

MA: Multimodal Anesthetic; NMR: Nuclear Magnetic Resonance; VAS: Visual Analogic Scale; LIF: Lumbar Interbody Fusion; ALIF: Anterior Lumbar Interbody Fusion; PLIF: Posterior Lumbar Interbody Fusion; ERAS: Enhanced Recovery After Surgery; ANS: Autonomic Nervous System; OFA: Opioid-Free Anesthesia; BIS: Bispectral Index; TOF: Train-Of-Four; ANI: Analgesia Nociception Index; ICG: Impedance Cardiography; SV: Systolic Volume; HR: Heart Rate; CO: Cardiac Output; VET: Ventricular Ejection Time; MAC: Minimum Alveolar Concentration; PACU: Post-Anesthesia Care Unit; AHT: Arterial Hypertension; CNS: Central Nervous System.

## Introduction

Lumbar spine surgery may be performed safely using a variety of anesthetic techniques. General anesthesia is currently the most widely accepted technique for innumerous reasons. It enables longer duration surgeries, offers a secured airway in patients who are often placed in prone position, whilst achieving a greater perceived patient compliance. Spine surgery is associated with severe postoperative pain that can hinder the postoperative recovery, and it includes a high risk of persistent postsurgical pain, with a frequency ranging from 20 % to 40% [1]. Although opioids remain the cornerstone of the management of severe acute postoperative pain, intermittent opioid use may result in inadequate pain relief and substantial opioid-induced adverse effects, tolerance, and hyperalgesia [2].

Lumbar interbody fusion (LIF) is an established treatment for a range of spinal disorders including degenerative pathologies, trauma, infection, and neoplasia. At this time LIF is performed using five main approaches but anterior lumbar interbody fusion (ALIF)

**Citation:** Marco D, Larissa D (2022) Opioid Free Anesthesia with Goal-Directed Strategies Based On Monitoring For Spine Surgery in a Patient with Opioid Intolerance: A Case Report. Int J Anesthetic Anesthesiol 9:140. doi.org/10.23937/2377-4630/1410140

**Accepted:** June 27, 2022: **Published:** June 29, 2022

with the patient positioned in supine position and posterior lumbar interbody fusion (PLIF) with the patient in prone position remain the more commonly performed techniques [3] . One of the main concerns during anterior-posterior spine surgery is to change the patient anesthetized from the anterior to the prone position given the possibility of incurring hemodynamic instability.

Recently, there has been an emerging interest in multimodal analgesia (MA) with an increased number of publications indexed in PubMed [4] and its use as an appropriate perioperative strategy of ERAS (enhanced recovery after surgery) protocols [5]. The concept of MA was developed based on the knowledge that postoperative pain is a complex multidimensional sensory experience and a multifactorial phenomenon, which implies a cognitive perception (pain) and nociception resulting from surgical stress response that should not be resolved with opioids alone [2]. Therefore, instead of using a single medication or technique, a combination of analgesics of different classes acting on different target sites of the autonomic nervous system (ANS) may provide superior pain relief with a lower incidence of adverse effects [2,4].

We report a case of posterior spinal fusion in which a MA regimen was successfully used to provide opioid-free perioperative analgesia in a patient with opioid intolerance.

## Case Description

We report a 48-year-old woman with a history of lower back discomfort, since 2016, that worsened over time. In 2019, she experienced movement limitations in her left leg and paresthesia on the same side. In 2020, she was diagnosed by NMR with a herniated disc between L5-S1 and progressively became unable to perform basic home activities. Over the last years, she relied excessively on analgesics drugs and opioids, thus finally developing an opioid intolerance. Currently, she uses AINES (ibuprophen), acetoaminophen, ansiolityc drugs (midazolam) and gabapentinoids to relief her pain. Surgery was indicated as only choice for dealing with her chronic pain. At preoperative the patient was assessed to identify reasons for drugs exclusion such as allergy, age, or previous intolerance to any agent. She has as a comorbidity of controlled arterial hypertension and no other medical history besides the current complaint (ASA II). She weighed 90Kg with 167cm of height, having a body mass index of 32.3 Kg/m$^2$ classifying as grade I obesity. Patient-reported unpleasant experiences with opioids in the past which were complicated by nausea, vomiting, drowsiness, and intestinal difficulties and she refused to consider any peri and postoperative opioid therapy. We proposed multimodal opioid-free anesthesia (OFA) to minimize and ideally eliminate the need for postoperative opioid analgesia. She signed the informed consent with those exceptions and agreed

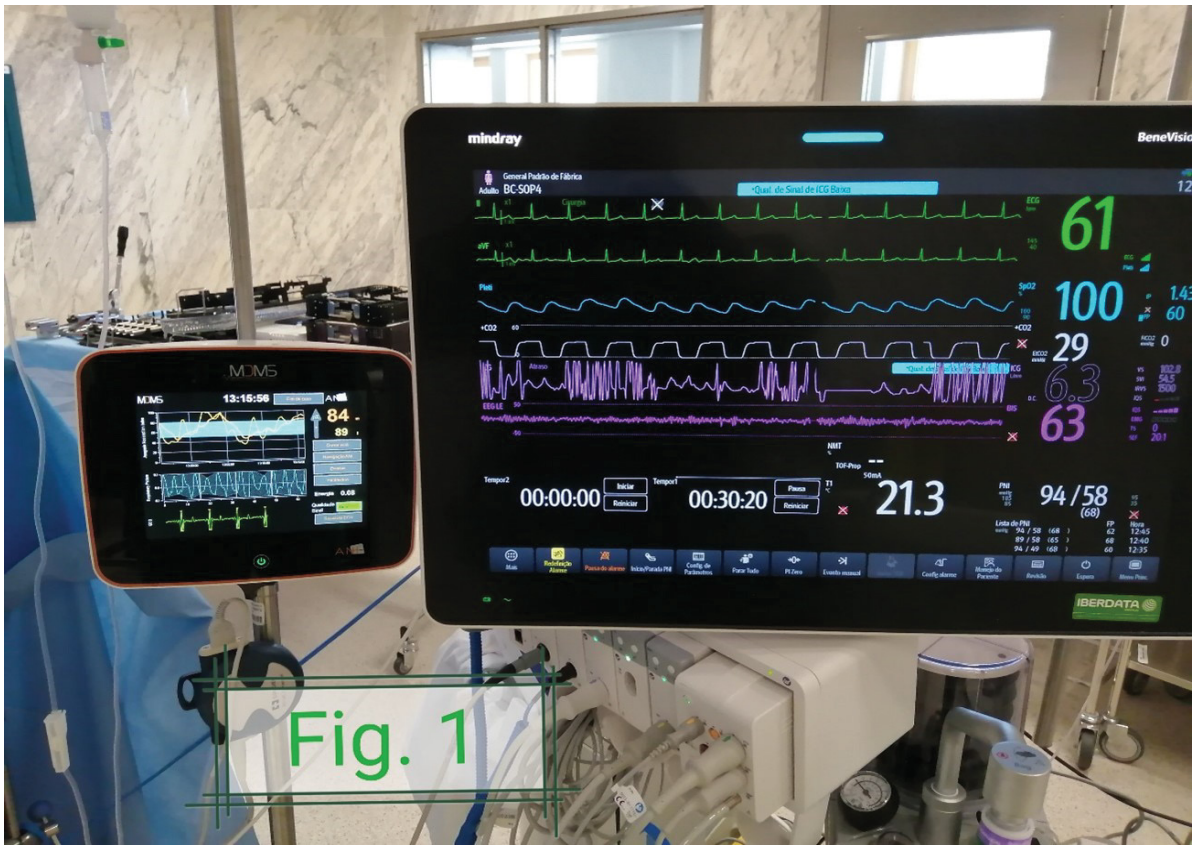


**Figure 1:** The Opioid Free Anesthesia goal-directed strategies are based on monitoring: ECG; ANI; ICG; TOF; BIS. [Analgesia Nociception Index (ANI); Impedance cardiography (ICG); Acceleromyograph (by using Train-Of-Four [TOF] ratio; Bispectral Index (BIS)].

with the proposed anesthesia and the manuscript complies with the Care guidelines.

In the operating room, routine monitoring of noninvasive blood pressure, electrocardiogram, oxygen saturation, Bispectral Index (BIS), acceleromyograph (by using Train-Of-Four [TOF] ratio) was established, and a urinary catheter was placed to control urinary output. We also used the following specialty monitoring (Figure 1): ANI: Analgesia Nociception Index monitor (MDMS, Loos, France) works based on raw ECG data that is derived from the use of two ANI electrodes applied on the chest. The values between zero to 100 are displayed and reflect predominance in parasympathetic tone, with low numbers being low tone and high numbers being high parasympathetic predominance. In addition, ANI can accurately differentiate between hypertension related to an excess of nociception and hypertension response to stress [6]. ICG: Impedance cardiography is a non-invasive technology that measures the total electrical conductivity of the thorax processing a series of cardio dynamic parameters, such as systolic volume (SV); heart rate (HR); cardiac output (CO), and ventricular ejection time (VET) [7]. In our case, the CO was monitored during the surgical procedure and during the change to a prone position and it remained unchanged, with no occurrence of hypotension.

Prior to the procedure, the patient reported a Visual Analog Score (VAS) of 4/10 pain. Before induction, it was administered Magnesium Sulphate 2g (23mg/Kg), Tranexamic acid 900mg (10 mg/Kg) for 15 min. each, and dexamethasone (4mg). After 3 minutes of preoxygenation anesthesia was induced with droperidol (1,25mg), midazolam (2mg), lidocaine (60mg), ketamine (30mg), and propofol (200mg). Muscle relaxation was obtained with rocuronium (40 mg) and the patient was maintained with sevoflurane (MAC 1%), N2O, and an oxygen mixture (BIS 40-60). A lidocaine infusion was started immediately after induction and ran at 2mg/Kg/h (0,1mg/Kg) until extubation when it was changed to 1mg/Kg/h (0,05mg/Kg) in the Post-anesthesia care unit (PACU). The usual precaution necessary for a prone position (eyes, nose, arms, breasts, genitals, etc.) was taken, and light anesthesia during the change was maintained to avoid hypotension. This process was controlled by ICG and no hemodynamic instability occurred. Our goal-directed antinociception protocol was the following: Mean blood pressure, Bispectral Index, TOF, and ANI were set to be greater than 70mmHg, between 40 and 60, up to 1, and between 50 and 70, respectively and with these targets [2,4,5]: If ANI »60 plus arterial hypertension (AHT) then we use Esmolol (10 mg); If ANI « 60 plus AHT then we use Ketamine (20mg). If BIS »60 then we use Propofol (bolus 50 mg); If ICG reduction: increased crystalloids; reduced Lidocaine; use of Ephedrine or Phenylephrine. If TOF » 1 : Rocuronium bolus (20mg). The patient received IV acetaminophen (1g) before incision and dexamethasone (4mg), ketorolac (30mg) and ondansetron (4mg) associated with anesthetic infiltration of the operative wound at the end of surgery. After the detection of a TOF ratio of 0% with the neuromuscular monitor, sugammadex (2mg.kg-1) was administered as a reversal agent. However, the patient was still unconscious (BIS: 56), but she was spontaneous breathing although TOF ratio was 100%. Following a second sugammadex dose (total of 400 mg) administration the patient regained consciousness (BIS: 90) and was extubated in the operating room. She arrived at the PACU with a blood pressure of 130/65 mmHg, heart rate of 67 bpm, and pulse oximetry of 96% with mask oxygen at 2 L/min.

At the PACU the patient remained drowsy but alert when stimulated and she was discharged 150 minutes after admission with no complaints (VAS 2/10). Aside from a two-hour infusion of lidocaine (1mg/Kg/h), acetaminophen (1g) and metamizole (2g) were administered as analgesics. During the following days the patient received oral acetaminophen 1 g 6-hourly and metamizole 2g 8-hourly which maintained resting and dynamic pain scores at 0 to 1/10 and 2 to 3/10 respectively, and she did not require opioids at any time until her discharge from the hospital. On the 13th day, she was reassessed when she reported mild pain (VAS 2/10) and was satisfied with the result of the surgery.

## Discussion

Increasing evidence indicates that pain is insufficiently treated following surgical procedures and spine surgery has been associated with higher levels of pain compared to other surgical procedures [1]. Multimodal analgesia is most likely an important strategy in reducing postoperative pain by combining panoply of drugs with several levels of action in the CNS, as it develops a state of modulation of nociceptive processing in the dorsal horn. In addition to that, the avoidance of opioid-induced hyperalgesia may significantly reduce the need for postoperative opioid analgesia [4]. Our protocol with complete omission of opioids in the perioperative anesthesia may have been a determinant factor in the patient's rapid recovery in the PACU. Furthermore, it fulfilled the criteria of the ERAS protocol for an opiate-free post-operative recovery [5]. Equipment monitoring was used to titrate administration of anesthetic medication, to detect physiologic perturbations, and allow intervention before the patient suffers harm. In addition to conventional monitoring, we added new monitoring possibilities (ANI/ICG) with the objective of better control of pain (ANI) and guarantee patient security during the change to the prone position (ICG). We were still able to stabilize the patient's nociception-antinociception balance and maintained the ANI between 50 and 70 until the end of surgery without any intraoperative hemodynamic instability. We can highlight the following drugs that produced perioperative analgesic stability and potentiated post-

operative analgesia: Lidocaine, Ketamine, and Esmolol [2,4]. As a side effect or limitation of our procedure, we highlight a prolongation of the patient's recovery of consciousness, possibly due to the additive effect of Magnesium with successive doses of rocuronium, which was promptly recovered with a new administration of sugammadex (a total of 400mg). In many MA protocols, dexmedetomedine is part of the procedures but was not used due to associated hemodynamic problems, namely hypotension and bradycardia that could cause serious alterations to the patient during the prone position [8]. The use of our protocol in a few cases is a limitation of the technique, as well as the utilization of multiple interventions drugs simultaneously, makes it challenging to know which drug or drugs intervention is responsible for the observed effect. Despite these limitations, our case study showed that might prove advantageous in opioid-intolerant patients and highlights the new concept of using manifold drugs through the use a goal-direct strategies based on monitoring.

## Conclusion

This case report demonstrates that the combination of non-opioid analgesics is a good option of the MA in spine surgery and in opioid-intolerant patients. However, current knowledge is based on studies exploring many different drug combinations and doses in relatively small trials with low statistical power, and heterogeneity in outcome measures. Future prospective studies may be necessary to establish optimal routes of drugs administration and determine the utility and safety of OFA for moderate to severe postsurgical pain [2,4] . We believe that the success of MA must be associated with good monitoring of the patient and the adjustment and balance of drugs used in the perioperative period to maintain the patient's hemodynamic stabilization.

## Acknowledgements

Not applicable.

## Funding

None.

## Author's Contributions

MD: (Conceptualization; Data curation; Investigation; Supervision; Validation; Writing – original draft; Writing-review & editing).

LD: (Investigation; Writing – original draft; Writing-review & editing).

Availability of data and materials: All the peer-reviewed publications and methods are mentioned with references.

## Declarations

Ethics approval and consent to participate: The patient assigned an informed consent approving the use of her image in any digital support.

## Consent for Publication

Not applicable.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Competing Interests

The authors declare that they have no competing interests.

## References

1. Christelis N, Simpson B, Russo M, Stanton Hicks M, Barolat G, et al. (2021) Persistent spinal pain syndrome: A proposal for Failed Back Surgery Syndrome and ICD-11. Pain Med 22: 807-818.
2. Basto T, Machado HS (2020) Effect of opioid-free anaesthesia on perioperative period: a review. Int J Anesthetic Anesthesiol 7: 104.
3. Mobbs RJ, Phan K, Malham G, Seex K, Rao PJ (2015) Lumbar interbody fusion: Techniques, indications and comparison of interbody fusion options including PLIF, TLIF, MI-TLIF, OLIF/ATP, LLIF and ALIF. J Spine Surg 1: 2-18.
4. Bugada D, Lorini LF, Lavand`homme P (2021) Opioid free anesthesia: Evidence for short and long-term outcome. Minerva Anestesiol 87: 230-237.
5. Soffin EM, Wetmore DS, Beckman JD, Sheha ED, Vaishnav AS, et al. (2019) Opioid-free anesthesia within an enhanced recovery after surgery pathway for minimally invasive lumbar spine surgery: A retrospective matched cohort study. Neurosurg Focus 46: E8.
6. Logier R, De Jonckheere J, Delecroix M, Keribedj A, Jeanne M, et al. (2011) Heart rate variability analysis for arterial hypertension etiological diagnosis during surgical procedures under tourniquet. Conf Proc IEEE Eng Med Biol Soc 3776-3779.
7. Saugel B, Cecconi M, Wagner JY and Reuter DA (2015) Noninvasive continuous cardiac output monitoring in perioperative and intensive care medicine. Br J Anaesth 114: 562-575.
8. Beloeil H, Garot M, Lebuffe G, Gerbaud A, Bila J, et al. (2021) Balanced opioid-free anesthesia with dexmedetomidine versus balanced anesthesia with remifentanil for major or intermediate noncardiac surgery. Anesthesiology 134: 541-551.