Case Report

Haemodynamic and analgesic control in a perioperative opioid-free approach to bariatric surgery – A case report

Address for correspondence:
Dr. Ana Veiga de Sá, Rua Adolfo Casais Monteiro, N 13, 1º Lateral, 4050-014, Porto, Portugal.
E-mail: ana.veigasa@gmail.com

Received: 26th August, 2019
Revision: 26th September, 2019
Accepted: 12th November, 2019
Publication: 04th February, 2020

Access this article online
Website: www.ijaweb.org
DOI: 10.4103/ija.IJA_620_19
Quick response code

Ana Veiga de Sá, Carla Cavaleiro, Manuel Campos
Department of Anaesthesiology, Critical Care and Emergency, Service of Anaesthesiology, Centro Hospitalar do Porto, Porto, Portugal

ABSTRACT

New approaches to bariatric surgery aim to achieve stress-free anaesthesia with sympathetic stability to protect organs and provide sufficient tissue perfusion, analgesia and rapid emergence. Opioid-free and multimodal approaches to anaesthesia provide intra- and post-operative sedation and analgesia, particularly advantageous in morbidly obese patients, but their feasibility and efficacy are still disputed. We describe the case of a female patient proposed for laparoscopic bariatric surgery, conducted under an opioid-free anaesthesia protocol, the haemodynamic, ventilatory and analgesic control, and intra- and post-operative monitoring and complications.

Key words: Bariatric surgery, multimodal analgesia, opioid-free anaesthesia

INTRODUCTION

Opioid agents have been a mainstay for both intra- and post-operative analgesia, but they are largely associated with hyperalgesia, acute tolerance, higher analgesic consumption in the post-operative period, prolonged sedation, ileus, urinary retention and prolonged length of hospital stay.[1,2] With the emergence of newer non-opioid analgesic agents and the practice of multimodal analgesia, opioid therapy could be complemented and, in some cases, replaced by these newer agents.[3,4] Several studies have been reporting encouraging results regarding the reduction of pain scores, post-operative rescue analgesic consumption and post-operative nausea and vomiting with the use of alternative non-opioid analgesic protocols, including dexmedetomidine (Dex), lignocaine, magnesium sulphate, ketamine and others.[5] Most benefits have been reported in settings like bariatric surgery for morbidly obese patients, with opioid-free and opioid-sparing anaesthesia techniques becoming part of enhanced recovery after surgery protocols all over the world.[6]

We report a case of an obese patient undergoing bariatric surgery with a perioperative opioid-free approach (POFA), and her haemodynamic, ventilatory, intra- and post-operative analgesic control, as given by the Analgesia Nociception Index (ANI®) intra-operatively and analogical numeric pain

How to cite this article: Veiga de Sá A, Cavaleiro C, Campos M. Haemodynamic and analgesic control in a perioperative opioid-free approach to bariatric surgery – A case report. Indian J Anaesth 2020;64:141-4.

scale (NPS) post-operatively, as well the development of any intra- or post-operative complication.

CASE HISTORY

A 52-year-old female patient with a history of peripheral venous insufficiency and morbid obesity (54 kg/m^2 body mass index [BMI], 158 cm of height, 84 kg adjusted body weight [ABW]), was scheduled for laparoscopic biliopancreatic diversion with duodenal switch. There was no clinical evidence of gastroesophageal regurgitation. Difficult airway markers, such as Mallampatti score 3, morbid obesity and obstructive sleep apnoea (OSA) were identified in the pre-operative evaluation.

The patient was monitored as recommended by the American Society of Anesthesiologists (ASA) standards with pulse oximetry, capnography, continuous electrocardiogram and non-invasive arterial blood pressure (BP), plus neuromuscular blockade monitor (TOF), bispectral index (BIS®) monitor, cardiac output non-invasive monitor (Starling SV®) and nociception monitor (ANI®).

Before induction, intravenous (IV) magnesium sulphate (30 mg/kg) and a slow IV bolus of Dex (0.3 μg/kg) were loaded. Induction was achieved under infusion of Dex (0.5 μg/kg/h), initiated during pre-oxygenation, with a lignocaine bolus (2 mg/kg ABW) and propofol (1 mg/kg ABW). After successful facial mask ventilation, rocuronium (0.6 mg/kg) was administered. Due to the presence of difficult airway markers and to decrease the stimulus of laryngoscopy, the trachea was intubated by a fibreoptic scope through an i-Gel® laryngeal mask. There was a minimal haemodynamic response to the passing of the endotracheal tube through the glottis, with only a slight increase in the heart rate (HR <20% basal value). Anaesthesia was maintained under desflurane (MAC 0,8; BIS 40-50) and with infusions of Dex (0.5 μg/kg/h) and lignocaine (2 mg/kg ABW/h). A schematic presentation of our induction and maintenance protocol is given in Table 1.

We performed a protective ventilation strategy (assisted/controlled with volume control, 6 ml/kg of ABW) and lung recruitment manoeuvres with increasing positive end-expiratory pressure (PEEP) (maximum of 40 cmH_2O peak airway pressure) and a driving pressure <15. Mean peak and plateau airway pressures intra-operatively were 21 cmH_2O and 11 cmH_2O, respectively.

Table 1: Induction and maintenance protocol

Intra-operative Management		
Before Induction	**Induction**	**Maintenance**
Bolus 1: Magnesium sulphate (30 mg/kg)	Bolus 3: Lignocaine (2 mg/kg ABW)	Desflurane (MAC 0.8; BIS 40-50)
	Bolus 4: Propofol (1 mg/kg ABW)	Maintenance of Infusion 1
	Bolus 5: Rocuronium (0.6 mg/kg)	
Bolus 2: Slow IV Dex (0.3 μg/kg)	Infusion 1: Dex (0.5 μg/kg/h)	Infusion 2: Lignocaine (2 mg/kg ABW/h)

ABW – Adjusted body weight, IV – Intravenous, Dex – Dexmedetomidine

Haemodynamic and analgesic stability, as given by the Starling SV® and ANI® monitors, were maintained through the procedure, with only one transient episode (2 min) of bradycardia and hypotension (43 beats per minute [bpm]; 81/37 mmHg), requiring one bolus of ephedrine (10 mg), after induction.

Anaesthetic and surgical procedure had a duration of 3 h 20 min. Regarding ANI intra-operative analgesic monitoring during that period, we report a mean ANI value of 47.3, with 35.5% of the time with ANI >50.

Post-operative analgesia was achieved with paracetamol (1 g), parecoxib (40 mg) and local anaesthetic infiltration (100 mg of ropivacaine 0.5%) of the port site. Post-operative nausea and vomiting (PONV) prophylaxis was achieved with 5 mg dexamethasone after induction and 4 mg ondansetron at the end of surgery. Dex infusion was stopped 20 min before the end of the surgery. Emergence, after antagonism of neuromuscular blockade with sugammadex (200 mg), was calm and swift (awake extubation 7 min after final dressing). Lignocaine infusion was stopped just before leaving the operating room (OR).

In the post-anaesthesia care unit (PACU; duration of 2 h), the patient reported no pain (NPS 0), did not require any rescue analgesia and remained somnolent but easily agreeable, with no dyspnoea, respiratory depression, snoring or hypoxia. First analgesic dose requirement post-operatively was 6 h after surgery, after which the patient followed an analgesic regimen with parecoxib 40 mg 12/12 h and paracetamol 1 g 8/8 h. At 24 h post-surgery, the patient had no pain at rest (NPS 0) and mild pain at movement (NPS 2). There were no other complications in the post-operative period, including respiratory depression, hypoxia, airway obstruction, nausea or vomiting, ileus or urinary retention.

DISCUSSION

POFAs to anaesthesia offer undeniable advantages in a variety of settings, such as obese patients with OSA, obstructive pulmonary diseases, acute or chronic opioid addiction, previous opioid hyperalgesia problems and complex regional pain syndromes. Oncologic patients and those with inflammatory diseases have also been included in studies to demonstrate the superiority of OFA strategies, and there might be some indications that avoidance of opioids might be beneficial.[6]

Regarding bariatric surgery, POFA may prevent the development of acute opioid tolerance and facilitate post-operative pain management with fewer narcotics and their associated side effects.

Several studies and case reports, in agreement with this one, have shown the feasibility of OFA strategies on this sub-group of patients and its advantages in comparison with opioid-based protocols, mainly, reducing post-operative pain scores, opioid consumption, nausea and vomiting and respiratory depression and desaturation.[7-9]

POFA is based on multimodal use of different non-opioid analgesics and haemodynamic stabilisers. Dex is a selective alpha 2 (α_2) adrenoceptor agonist with analgesic and sedative properties and minimal impact on respiratory parameters, which reportedly decreases post-operative pain intensity, analgesic requirements and nausea, without prolonging recovery time.[10,11] The main adverse effects of the drug are over-sedation, which can be easily avoided by timely cessation or tapering off the maintenance infusion, and haemodynamic compromise, especially bradycardia and hypotension. In this case, only one transient episode (2 min) of hypotension was registered after induction. Lung recruitment manoeuvres during surgery were performed as required with no significant haemodynamic instability. Given its pharmacodynamic profile, Dex might have a role for post-operative pain control.[6] Regarding lignocaine, it also possesses analgesic, anti-inflammatory and anti-hyperalgesic properties. Lignocaine IV infusion in the perioperative period reduces pain scores, need for intra-operative anaesthetics, post-operative analgesic consumption and overall hospital length of stay.[12,13] Magnesium sulphate is a non-competitive antagonist of N-Methyl-d-aspartate (NMDA) receptor with anti-inflammatory effects. A recent meta-analysis and randomised control trials (RCTs) have described an opioid-sparing effect, as well as a reduction in post-operative pain scores.[14] Magnesium has an important effect in potentiating neuromuscular blocking agents, and its use in combination must always be monitored by a neuromuscular blockade monitor. In this case, neuromuscular blockade reversal did not seem to be affected by the use of magnesium sulphate at induction, given that no delay was registered upon emergence.

The optimised use of these multimodal strategies intra-operatively is the key to spare/avoid opioids in the post-operative period, as their administration here will counteract the advantages we achieved by avoiding them intra-operatively. Lignocaine and magnesium sulphate have prolonged half-lives (>1 h after administration), which will help to control pain in the post-operative period.

Despite the evidence of the beneficial effect of these strategies, mostly by reducing opioid-related side effects, we cannot neglect the need for them to be at least as effective as opioid-based protocols on intra-operative nociceptive control and haemodynamic stability. It is relatively straightforward to evaluate pain and opioid consumption post-operatively, but intra-operative nociceptive control is still determined by indirect signs of autonomic nervous system responses such as BP, HR, respiratory rate, muscle tension, body movements, etc. The ANI is a unit-less index ranging from 0 to 100 calculated from the instantaneous wavelet transform analysis of HR variability (HRV) that has recently been proposed as a surrogate marker for intra-operative noxious intensity. Previous studies have shown that HRV analysis provides information related to the autonomic nervous system activity. The HRV is mediated by the sympathetic and parasympathetic efferent change to the sinoatrial node of the heart. The ANI is sensitive to nociceptive stimuli and has recently been proposed in various clinical settings, including the prediction of post-operative pain, prediction of intra-operative haemodynamic changes or evaluation of the analgesia/nociception equilibrium. For an unconscious patient (under general anaesthesia), ANI values between 50 and 70 correspond to a good nociceptive control—values below 50 would be predictive of haemodynamic response to stimuli. Some studies have already demonstrated that the ANI can be used to adequately guide intra-operative opioid administration during surgery.[15,16] Such guidance resulted in low opioid consumption, post-operative pain rates and opioid rescue analgesia.

ANI® reflects and predicts the intra-operative haemodynamic response to stimuli (as a surrogate of "pain" or sympathetic stimulation) and can be used to manage and titrate the opioid needed to maintain stability. However, its application on guiding opioid-free strategies is debatable and in need of further validation, as the sum-effect of these different drugs on the autonomic nervous system is difficult to determine.

CONCLUSION

POFA seems to be advantageous and feasible to apply on an individual basis in certain settings, such as to reduce pain scores, enable earlier mobilisation, enhance rehabilitation, faster discharge and improve patient satisfaction. Optimised opioid-free multimodal anaesthesia and analgesia protocols used in the intra-operative period will probably ensure good analgesic control and comfortable recovery post-operatively, avoiding the need to use opioid rescue analgesics. Larger trials are needed to evaluate POFA performance in comparison with opioid-based strategies.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to b`e reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. White, PF. The changing role of non-opioid analgesic techniques in the management of postoperative pain. Anesth Analg 2005;101(Suppl):S5-22.
2. Oderda G, Evans R, Lloyd J, Lipman A, Chen C, Ashburn M, *et al*. Cost of opioid-related adverse drug events in surgical patients. J Pain Symptom Manage 2003;25:276-83.
3. Mulier J. Opioid free general anesthesia: A paradigm shift?. Revista Española de Anestesiología y Reanimación (English Edition). 2017;64:427-30.
4. Frauenknecht J, Kirkham K, Jacot-Guillarmod A, Albrecht E. Analgesic impact of intra-operative opioids vs. opioid-free anaesthesia: A systematic review and meta-analysis. Anaesthesia 2019;74:651-62.
5. Mulier JP. Why and how to give opioid free anaesthesia (OFA). The Bruges approach. American Society of Anaesthesiologists Annual Meeting 2014, New Orleans. 2014.
6. Sultana A, Torres D, Schumann R. Special indications for OFA, patient and procedure related. Best Pract Res Clin Anaesthesiol 2017;31:547-60.
7. Ziemann-Gimmel, P, Goldfarb AA, Koppman J, Marema RT. Opioid-free total intravenous anaesthesia reduces postoperative nausea and vomiting in bariatric surgery beyond triple prophylaxis. Br J Anaesth 2014;112:906-11.
8. Aronsohn J, Orner G, Palleschi G, Gerasimov M. Opioid-free total intravenous anesthesia with ketamine as part of an enhanced recovery protocol for bariatric surgery patients with sleep disordered breathing. J Clin Anesth 2019;52:65-6.
9. Mauermann E, Ruppen W, Bandschapp O. Different protocols used today to achieve total opioid-free general anesthesia without locoregional blocks. Best Pract Res Clin Anaesthesiol 2017;31:533-45.
10. Brown E, Oswald K, Pellegrini J. Dexmedtomidine in bariatric surgery: A useful opioid adjunct? an evidence-based review. Bariat Nurs Surg Pat 2012;7:70-4.
11. Panchgar V, Shetti AN, Sunitha HB, Dhulkhed VK, Nadkarni AV. The effectiveness of intravenous dexmedtomidine on perioperative hemodynamics, analgesic requirement, and side effects profile in patients undergoing laparoscopic surgery under general anesthesia. Anesth Essays Res 2017;11:72.
12. Vigneault L, Turgeon AF, Côté D, Lauzier F, Zarychanski R, Moore, L, *et al*. Perioperative intravenous lidocaine infusion for postoperative pain control: A meta-analysis of randomized controlled trials. Can Journal Anesth 2011;58:22-37.
13. De Oliveira GS Jr, Fitzgerald P, Streicher LF, Marcus RJ, McCarthy RJ. Systemic lidocaine to improve postoperative quality of recovery after ambulatory laparoscopic surgery. Anesth Analg 2012;115:262-7.
14. De Oliveira GS, Castro-Alves LJ, Khan JH, McCarthy RJ. Perioperative systemic magnesium to minimize postoperative pain a meta-analysis of randomized controlled trials. Anesthesiology 2013;119:178-90.
15. Gruenewald M, Herz J, Schoenherr T, Thee C, Steinfath M, Bein B. Measurement of the nociceptive balance by analgesia nociception index and surgical pleth index during sevoflurane-remifentanil anesthesia. Minerva Anestesiol 2015;81:480-9.
16. Daccache G, Caspersen E, Pegoix M, Monthé-Sagan K, Berger L, Fletcher D, *et al*. A targeted remifentanil administration protocol based on the analgesia nociception index during vascular surgery. Anaesth Crit Care Pain Med 2017;36:229-32.