

## CASO CLÍNICO

# Anesthesia Management of a Patient with Brugada Syndrome for an Urgent Procedure

## Abordagem Anestésica de um Doente com Síndrome de Brugada em Contexto Urgente

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### Palavras-chave

Anestesia; Arritmias Cardíacas; Síndrome de Brugada

### Keywords

Anesthesia; Arrhythmias, Cardiac; Brugada Syndrome

## ABSTRACT

Brugada syndrome is a cardiac conduction abnormality accounting for up to 20% of sudden deaths. It is important for anesthesiologists to be familiar with this syndrome in order to safely manage these patients. At present time, there are no definite recommendations for general or regional anesthesia. However, some anesthetic agents are noted to have an association with ST segment elevations and can result in an increased risk of arrhythmias.

The most important aspect in the anesthetic approach is careful consideration upon the administration of every drug. Besides this, back up plans should be made in advance, as for every patient undergoing any anesthetic procedure. This case report targets the challenges faced by the anesthesia providers in administering safe anesthesia to a patient with Brugada syndrome, especially in an urgent scenario, and considers alternative anesthetic agents for these patients in order to minimize their risks under anesthesia.

## RESUMO

A síndrome de Brugada consiste numa alteração da condução cardíaca que é responsável por até 20% dos casos de morte súbita. É essencial que os anestesiológicos estejam familiarizados com esta entidade, de modo a garantir a segurança destes doentes no peri-operatório. Atualmente não existem recomendações para a utilização preferencial de anestesia geral ou loco-regional. No entanto, sabe-se que alguns agentes anestésicos estão associados a alterações do segmento ST e podem aumentar o risco de arritmias.

Na abordagem a estes doentes é essencial considerar cuidadosamente o efeito de cada fármaco antes da sua administração. Devem também existir planos de atuação em caso de complicações, como em

qualquer doente submetido a um procedimento anestésico. Este caso foca os desafios com que o anestesiológico se depara ao abordar doentes com síndrome de Brugada, particularmente em situação de urgência; e considera as diferentes abordagens possíveis de maneira a minimizar o seu risco no peri-operatório.

## INTRODUCTION

Brugada syndrome is a cardiac abnormality of transmembrane conduction with autosomal dominance inheritance, which puts patients at risk for ventricular arrhythmias and accounts for up to 20% of sudden deaths in patients without structural cardiac defects. Mutations in about 10 genes have been linked to Brugada syndrome, although the most common is a mutation in *SCN5A* gene, coding for the cardiac sodium channels insensitive to tetrodotoxin, rendering enhanced inactivation of these channels. Other abnormalities include a decrease in L-type calcium current and decreased transient outward potassium current.<sup>1</sup> This leads to a distinctive electrocardiograph pattern with right bundle branch block and ST segment elevation in precordial leads V1-V3, without structural cardiac disease. Recent evidence indicates the risk of arrhythmias is low in the absence of a resting electrocardiogram (ECG) abnormality, providing that an electrical stimulation does not induce ventricular tachycardia/fibrillation. However, if the electrophysiological study is positive, the risk of sudden death is 5%-10%/year and ICD implantation is recommended as the only effective treatment.<sup>2</sup> Since patients with diagnosed and undiagnosed Brugada syndrome can present for surgery at any time, it is important for anesthesiologists to be familiar with this syndrome in order to be able to safely manage these patients. At present time, there is no definite recommendation for

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general or regional anesthesia. However, some anesthetic agents are noted to have an association with ST segment elevations and can result in an increased risk of arrhythmias. General anesthesia can be performed safely, both as inhalation and as balanced with opiates, although caution is advised on the use of any medication that may interfere with cardiac conduction. Regional anesthesia and neuroaxial blockade may be performed with caution. Since local anesthetics affect myocardial sodium channels, they may precipitate ECG alterations and arrhythmias, especially when used in large dosages and high vascularized tissues. Table 1 reviews anesthetic drug recommendations for these patients.

The patient displayed an ICD (implantable cardioverter defibrillator) at the left thoracic wall, implanted on 2006. A written informed consent was obtained. Since the patient presented with a medical history of Brugada syndrome, avoidance of sodium channel blocker medications was our priority. An interscalene brachial plexus block was planned to avoid general anesthesia and associated risks, and two wide bore IV cannula were placed. Prior to blockade, the patient was premedicated with midazolam 3 mg IV and remifentanil infusion (0.1 mcg/kg/min).

Due to short surgical procedure with reduced hemodynamic instability probability, only routine anesthetic monitoring

**Table 1. Anesthetic Drug Recommendations in Brugada Syndrome**

Safe	Avoid <sup>B</sup>	Contra-indicated
Muscle relaxants (rocuronium, vecuronium, mivacurium)	Antiarrhythmic drugs (quinidine, disopiramide, amiodarone)	Antiarrhythmic drugs (procainamide, flecainide, propafenone) <sup>C</sup>
Autonomic nervous system related drugs (ephedrine, phenylephrine, dopamine, propranolol, atropine, isoproterenol)	Autonomic nervous system related drugs (edrophonium)	Autonomic nervous system related drugs (noradrenaline, acetylcholine, neostigmine) <sup>C</sup>
Local anesthetics (lidocaine)	Local anesthetics (cocaine)	Local anesthetics (bupivacaine) <sup>C</sup>
Antiemetics (droperidol, ondansetron, dexamethasone)	Antiemetics (metoclopramide)	Central nervous system drugs (amitriptyline, clomipramine, desipramine, lithium) <sup>C</sup>
Induction agents (propofol, barbiturates, nitrous oxide, volatile anesthetics)	Induction agents (ketamine, propofol infusion)	
Analgesics (narcotics, ketorolac, paracetamol)	Analgesics (tramadol)	
Benzodiazepines		
Hypotensive agents (diltiazem, nifedipine, nitroglycerine) <sup>A</sup>		
LEGENDA: A- class III evidence; B- class IIa and IIb evidence; C- class I evidence		

The most important aspect in the anesthetic approach is careful consideration upon the administration of every drug. Besides this, back up plans should be made in advance, as for every patient undergoing any anesthetic procedure.

This case report targets the challenges faced by the anesthesia providers in administering safe anesthesia to a patient with Brugada syndrome, especially in an urgent scenario, and consideration of alternative anesthetic agents for these patients in order to minimize their risks under anesthesia.

## CASE REPORT

A 35-year old man, ASA II, diagnosed with Brugada syndrome on routine investigation (accidental discovery on an ECG), was proposed to urgent arm laceration suture following a car accident. Apart from this condition, which had been diagnosed five years before, he presented no history of other medical problems. There was no familiar history of Brugada syndrome or of sudden cardiac death. The patient had no record of previous surgical procedures and displayed an effort tolerance greater than 10 MET. Upon arrival, the patient was hemodynamically stable, conscious, oriented and eupneic. Our preoperative evaluation revealed the patient had 75 kg, 180 cm and normal airway examination. Laboratory analysis showed no electrolyte abnormalities.

was used: 5-lead ECG, noninvasive blood pressure, SpO<sub>2</sub>, EtCO<sub>2</sub>, temperature and bispectral index (BIS); although some authors recommend the use of invasive blood pressure monitoring in all cases, in order to accurately monitor hemodynamic changes.<sup>3</sup> One of the goals of the anesthetic approach was the maintenance of normothermia with the use of a temperature probe and appropriate cooling or warming strategies, as hypothermia and hyperthermia may be associated with worse outcomes in these patients.<sup>4</sup> Defibrillator was ready in the operating room with pads connected to the patient. Bearing in mind that increased vagal tone has been implicated in the development of ST segment alterations in Brugada syndrome patients, atropine was prepared to abolish any vagal effect. The interscalene brachial plexus block, ultrasound-guided, was performed with 225 mg lidocaine plus adrenaline. However, after 15 minutes of block completion, the level of surgical anesthesia obtained was incomplete. Therefore, conversion to general anesthesia ensued: 25 mg of etomidate were administered and a laryngeal mask placed. Anesthesia was maintained with sevoflurane and analgesia continued with remifentanil infusion. At the end of the procedure, 1 g intravenous paracetamol was given. Total surgery and anesthesia times were 60 and 95 minutes, respectively, and no complications (no dysrhythmia or

bradycardia) were registered. Postoperative care was given in the postanesthesia care unit, again without untoward events. Patient was discharged following an uneventful hospital stay.

## DISCUSSION

In anesthesia, drugs that interact with cardiac ion channels are routinely administered. It is easy to understand then, that, when undiagnosed, this condition imposes potential risks (induction of malignant arrhythmias) under anesthesia, when the providers are unaware of this condition.

Evidence regarding administration of general anesthesia in Brugada syndrome is still limited at the present, and although general anesthesia was not our primary anesthetic plan, it became necessary, highlighting the importance of defining back-up plans whenever an anesthetic technique is required. As mentioned above, the primary concern regards the safe administration of drugs: in fact, various reports involve anesthetic agents triggering malignant arrhythmias. For instance, class I anti-arrhythmic drugs must be avoided, given their blockade of the cardiac sodium channel, as well as the systemic administration of local anesthetics, as they can potentially inhibit the generation and conduction of action potentials, related to its sodium channel blocking effects. The most commonly used hypnotic agent, propofol, although successfully used to induce general anesthesia, should be avoided as an infusion, due to a potential development of propofol infusion syndrome and ion channel dysfunction. Regarding the reversal of neuromuscular blockade, neostigmine is best avoided as it may augment ST segment elevation and sugammadex should be considered instead. Therefore, regarding general anesthesia, safe drugs for induction include midazolam, opioids and etomidate; for maintenance, volatile anesthetics, opioids and muscle relaxants. Surprisingly, despite the recommendation for isoflurane to be avoided in patients with prolonged QTc syndrome, it has been used in patients with Brugada syndrome without adverse events noted. Regional anesthesia can be considered if the total dose of local anesthetic and systemic absorption is limited, with lidocaine being the drug of choice.<sup>5</sup> In this patient, we intended to avoid unrecommended drugs and general anesthesia altogether with an attempt to perform an interscalene brachial plexus block, with limited doses of lidocaine plus adrenaline, to limit systemic absorption. In total, 225 mg were administered, which lag far behind the upper limit of 525 mg of lidocaine with adrenaline (7 mg/kg) in this patient with 75 kg, limiting the possibility of high systemic concentrations and arrhythmias. As the level of anesthesia was incomplete to perform the surgical procedure, an alternative approach was designed: general anesthesia with induction with etomidate and analgesia with remifentanyl perfusion. A laryngeal mask was placed and maintenance was achieved with sevoflurane and remifentanyl perfusion continued throughout the procedure. Although no invasive

monitoring was considered given the patient's good health status and relatively minor surgical procedure, monitoring included five-lead electrocardiogram and ST trend analysis, which continued postoperatively. Also, defibrillator pads were attached to the patient since the beginning of the anesthetic technique. Despite the evidence that in any patient with an ICD, the device must be disabled immediately before surgery,<sup>2</sup> this was not the case with our patient. The immediate recovery period took place in an anesthesia care unit, with discharge to the ward after a few hours. The recommendation for recovery in a high-dependency unit applies only to patients in whom no ICD has been fitted.<sup>6</sup> In this case report, we intend to emphasize the cardiovascular risks involved with anesthesia administration in Brugada syndrome patients and the importance of vigilance and close cooperation between surgeons, cardiologists and anesthesiologists in formulating pre and post-operative plans. As this concerns an increasingly prevailing disorder, in which perioperative management remains a challenge, it is imperative that further efforts can be implemented to achieve an ideal anesthetic plan, as well as acknowledging in-depth understanding of the physiology of this syndrome. Besides avoiding potentially dangerous drugs, this case also reminds us of the importance of having a back-up plane for every situation, even so in an urgent scenario with limited time for pre-evaluation.

### Responsabilidades Éticas

**Conflitos de interesse:** Os autores declaram não possuir conflitos de interesse.

**Suporte financeiro:** O presente trabalho não foi suportado por nenhum subsídio ou bolsa.

**Confidencialidade de dados:** Os autores declaram ter seguido os protocolos do seu centro de trabalho acerca da publicação dos dados de doentes.

**Consentimento:** Foi obtido o consentimento para publicação.

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