

## Lidocaine: A Key-Factor to Avoid the Postponement of An Oncologic Urgent Surgery

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### Abstract

**Background and objectives:** On the perioperative period, cardiovascular disease represents one of the most important causes of morbidity and mortality. The prevalence of cardiovascular risk factors ischemic heart disease and heart failure is increasing alongside with life expectancy.

**Case report:** We present a patient scheduled for laryngeal biopsies of a neof ormation suspected of malignancy under general anesthesia. We describe the use of lidocaine in converting an atrial fibrillation with limited ventricular tachycardia episodes into sinus rhythm, in a patient with an Implantable Cardioverter Defibrillator.

**Discussion:** Lidocaine is an anti-arrhythmic drug due to its effect on blockade sodium channel. In this case, it allowed the pharmacological cardioversion into sinus rhythm, avoiding the postponement of the surgery. Further investigation should be conducted to confirm the authors' anesthetic approach in similar cases.

**Keywords:** Implantable cardioverter defibrillator; Ventricular tachycardia; Lidocaine

rhythm in a patient with an ICD, and scheduled for laryngeal neof ormation biopsies and laser excision.

### Introduction

Cardiovascular disease is the second most common cause of death in Portugal. Although its mortality rate is descending due to more efficient approach on acute coronary syndrome, the prevalence of cardiovascular risk factors, ischemic heart disease and heart failure is increasing alongside with life expectancy. Likewise, the increasing number of patients submitted to surgical procedures with cardiac Implantable Cardioverter Defibrillators (ICD) is observed. This device senses abnormal heart rhythms and delivers a shock to the heart to restore a normal rhythm, and reduce the risk of sudden cardiac death [1].

On the perioperative period, cardiovascular disease represents one of the most important causes of morbidity and mortality. Pre-operative assessment is essential to identify and to stratify the risk factors for the major cardiac events and to determine the need to perform perioperative interventions in order to reduce adverse outcomes. Pain and surgical stress in patients with previous severe cardiac disease can trigger hemodynamic changes that may lead to perioperative arrhythmias.

Lidocaine is an anti-arrhythmic drug class Ib by the Vaughan-Williams classification, used for ventricular tachycardia (VT) [2]. It shortens potential action due to its effect on sodium channel blockage.

This clinical case report describes the use of lidocaine in converting an atrial fibrillation with ventricular tachycardia episodes into sinus

### Case Report

74 years-old male, American Society of Anesthesiologist (ASA) physical status IV, with more than four metabolic equivalent of task (METs), was scheduled for laryngeal biopsies of a neof ormation suspected of malignancy.

The patient had a clinical past history of sudden cardiac arrest (SCA) due to a ventricular tachycardia, which appeared after an acute coronary syndrome, back in 1998. An ICD was the option to prevent further SCA, with the last follow-up within the last six months. Since early 2014, the patient had multiple hospital stays related with paroxysmal atrial fibrillation events with monomorphic ventricular tachycardia. He was submitted to catheter ablation in October of 2014 and started anticoagulation therapy with warfarin. During the perioperative period, warfarin therapy was temporarily withheld, and a bridging anticoagulation was performed, with therapeutic-dose subcutaneous low-molecular-weight heparin.

The preoperative electrocardiography showed a sinus rhythm with 58 beats per minute. The transthoracic echocardiography showed akinesia of the posterior wall, inferior wall and posterior septum; and moderate to severe left ventricular systolic dysfunction. The patient was a 35 years former smoker with a 57 pack-year smoking history. He was in chronic lymphocytic leukemia remission since September of 2016, treated with radiotherapy and chemotherapy, and present a chronic kidney disease with creatinine clearance of 56 ml/min

(Cockcroft-Gault equation). No other analytic abnormalities were observed in the preoperative evaluation.

Pre-anesthetic evaluation revealed obesity with an Body Mass Index (BMI) of 33.1 Kg/m<sup>2</sup> (height of 1.73 m and 93 Kg of weight) and an expected difficult airway with a Mallampati score II, a cervical mobility >90°, a >4 cm mouth opening, a tiromentonian distance >6 cm and a neck circumference of 62 cm. The difficult airway material was available and included supraglottic devices, videolaryngoscopy and bronchofibroscope. The anesthetic team checked the availability of help before starting the anesthetic procedure. The department of arrhythmology was previously informed about the case and was on call. The drugs doses were calculated using the Adjusted Body Weight (ABW) formula.

After ASA monitoring standards, and Bispectral Index and Train of Four monitoring, an atrial fibrillation with rapid ventricular response (median heart rate of 140 beats per minute), with limited ventricular tachycardia episodes (6 s) was observed. The patient was hemodynamic stable. The ICD records revealed VT episodes lasting less than 10 s, without any cardiac defibrillation shock given. After multidisciplinary (anesthesiologist, arrhythmology technician and surgeon) discussion, a 1.8 mg/Kg of lidocaine was intravenously administered, and pharmacological cardioversion into sinus rhythm was achieved. Pre-oxygenation was performed using a 10 cm HO continuous positive pressure in a semi-sitting position. Intravenous lidocaine 2 mg/Kg/h and 2 g magnesium sulfate infusions were started. The anesthetic induction was initiated with remifentanyl 0.05 µg/Kg/min infusion and a 1 mg/kg bolus of propofol. Facemask ventilation was successfully achieved, and rocuronium 0.6 mg/kg was given. It was done a direct laryngoscopy with the McCoy laryngoscope blade that revealed a Cormack-Lehane classification grade 1 and tracheal intubation was performed with a laser endotracheal 5 mm tube.

The team involved in surgical procedure decided to disable the ICD to reduce electromagnetic interference and multifunction paddles were placed on the patient chest. The surgery went uneventful and the patient maintained sinus rhythm during all perioperative period. At the end of the surgical procedure, the ICD was immediately restored to baseline settings. During the hospital stay, there wasn't registered any postoperative complication. The larynx biopsy revealed carcinoma.

## Discussion

In this case, the patient had a history of ischemic heart disease, a previous episode of SCA and a moderate to severe left ventricular systolic dysfunction. Besides that, he also had a paroxysmal atrial fibrillation and sporadic VT episodes lasting less than 10 s. In this context, it was decided for an ICD to prevent further SCA [1].

In the intraoperative period, he presented with VT periods with a heart rate of 140 beats per minute. The patient had a systolic blood pressure >90 mmHg and did not have signs of acute heart failure, syncope, evidence of myocardial ischemia or any electrolyte or metabolic imbalance that could be corrected. After achieving electrocardiographic stability, it was possible to deactivate the ICD safely. The ICD was handled in accordance with our institutional protocol.

Lidocaine is a local amide group anesthetic that has a very short half-life and a favorable safety profile and is therefore the local anesthetic of choice for continuous intravenous administration [3].

When used systemically, it works by blocking sodium and NMDA channels, by reducing P substance release and by increasing the glycinergic activity (inhibitory neurotransmission) [4]. Lidocaine also acts on voltage-dependent potassium (decreasing pain intensity, inflammatory response and cell injury secondary to tissue ischemia) and calcium channels (this inhibition in pre-synaptic nervous terminals is highly involved with the release of neurotransmitters and so interferes with painful impulse propagation) with less affinity as compared to blockade produced in sodium channels [5].

Lidocaine is an anti-arrhythmic drug due to its effect on blockade sodium channel [2]. It is well known, the lidocaine role on hemodynamic stability, using 1-1.5 mg/Kg intravenously before laryngoscopy [2,4,6]. By allowing the control of the gag reflex, it minimizes the consequences of the massive catecholamines release and reduces the perioperative risk [4]. Lidocaine has also anti-inflammatory and analgesic activities [6,7].

Lidocaine protein binding (60% of its molecules bind to plasma proteins, especially to acid alpha1-glycoprotein) associated to pulmonary extraction (40% of intravenous lidocaine is temporarily extracted during its first passage through the lungs, where pH is lower as compared to plasma) decreases the chances of systemic intoxication [5]. This can occur when plasma concentrations of 5 µg/mL are reached, and may present with: sleepiness, dizziness, metal taste, headache, blurred vision, paresthesia, dysarthria, euphoria and nausea. Cardiovascular changes are in general minimal with usual doses (arrhythmia and heart arrest can appear with serum levels of >12 µg/mL) [5]. A continuous infusion of lidocaine 1.5–2.0 mg/Kg led to variable plasma levels between 1.3 and 4.0 µg/mL [7].

The lidocaine bolus administered in this case was 1.8 mg/Kg of ABW, which is consistent with the recommendations of 1.5-2.0 mg/Kg. The increasing incidence of obese patients leads us to adjust the drug doses, paying attention to the toxic values.

Lidocaine is one of the available options for these situations and the literature shows that cardioversion to sinus rhythm occurs in 30-40% of cases after its administration [2].

We administered a lidocaine bolus followed by an infusion of 2 mg/Kg/h that allowed reversion to sinus rhythm throughout the procedure. We also administered intravenous 2 g of magnesium sulfate, which helps to stabilize myocardial cell membranes [6,8,9], reduces the analgesic drugs requirements and the incidence of postoperative shivering [10] which we considered of major importance in a patient with cardiac disease.

Many recent studies have shown that intravenous lidocaine infused intraoperatively leads to important perioperative benefits [6-8]. In this concrete case, we achieved hemodynamic stability during all surgery and in the postoperative period without any recurrence of the arrhythmia [8]. We also took advantage of lidocaine as a part of a multimodal non-opioid analgesic plan, reducing intra and postoperative pain, length of hospital stays [6,7] and surgery stress in a patient with severe ischemic heart disease [8].

## Conclusion

Patients with cardiovascular disease requiring ICD are more prone to multiple surgeries due to their various complications in which anesthesiologist intervention for anesthetic procedures is critical. In this case, the use of lidocaine demonstrated an effective and safe option for hemodynamic control in a patient with severe cardiac disease and it

also had the advantage of enhancing postoperative analgesia with minimal side effects.

The use of lidocaine enables the control of a cardiac disorder, that otherwise would have been a cause of a postponement of an oncologic surgery. Further investigation should be conducted to confirm the authors' anesthetic approach in similar cases.

This case also highlights the importance of discussion with multidisciplinary team.

### Patient Consent

The authors confirm that the patient presented in the paper reviewed the case and gave written permission for the authors to publish the case report.

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