

# Anesthetic management in bilateral video-assisted thoracoscopic sympathectomy for refractory ventricular arrhythmias: A case report

### ABSTRACT

Cardiac Sympathetic Denervation (CSD) has been shown to reduce shocks and subsequent pain of implantable cardiac defibrillator (ICD) in patients with heart diseases and recurrent Ventricular Tachycardia (VT) who did not respond properly to oral therapy and ablation. A 68-year-old man who presented an idiopathic dilated cardiomyopathy with impaired ejection fraction was treated for VT. A bilateral cardiac sympathetic denervation was performed under general anesthesia. Patient was extubated in the operating room and transferred to ICU where he presented hypotension. He was discharged after five days and remained symptom-free without any incident of VT during hospital stay. Currently no definite anesthetic management is available to treat such patients. This report discusses an approach that made heart rate control and safe patient discharge possible.

**Key words:** Anesthesia; cardiac sympathetic denervation; sympathectomy; video-assisted thoracoscopy

### Introduction

The video-assisted thoracoscopic sympathectomy (VATS) was first described in 2000 and nowadays has become a therapeutic option for refractory ventricular arrhythmias (VA), with recent reviews showing a 70-80% effectiveness within the first year following the surgery.<sup>[1]</sup>

The treatment of VA aims to prevent the degeneration of cardiac myocytes, heart failure, and hence sudden death.<sup>[2]</sup> Patients with refractory arrhythmias or presenting with electrical storms, who are not responsive to pharmacological treatment

with beta blockers, thoracic epidural anesthesia, ablation, and ICD therapy, are considered candidates for VATS procedure.<sup>[3,4]</sup>


### Case Report

We obtained consent from patient for the publication of this case report. A 68-year-old man was diagnosed with idiopathic-dilated cardiomyopathy after a full history investigation in July 2019. Cardiology evaluation identified sustained ventricular tachycardia (VT) with different morphologies, despite the use of high dose antiarrhythmic

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Damasceno CB, Delgado MA, Pinheiro PA, Quadros IM. Anesthetic management in bilateral video-assisted thoracoscopic sympathectomy for refractory ventricular arrhythmias: A case report. Saudi J Anaesth 2021;15:207-9.

Access this article online	
<b>Website:</b> <a href="http://www.saudija.org">www.saudija.org</a>	<b>Quick Response Code</b> 
<b>DOI:</b> 10.4103/sja.sja_1014_20	

**CAMILA BIAZUSSI DAMASCENO, MARINA AYRES DELGADO, PAULA ALVES PINHEIRO, ISADORA MEGALE QUADROS**

Department of Anesthesia and Pain Medicine, Hospital das Clínicas da Universidade Federal de Minas Gerais, Belo Horizonte/Minhas Gerais, Brazil

**Address for correspondence:** Dr. Camila Biazussi Damasceno, Rua Professor Anibal de Mattos, 290, Santo Antônio, Belo Horizonte – MG/, CEP 30350-220, Brazil. E-mail: [camilabiazussi@gmail.com](mailto:camilabiazussi@gmail.com)

**Submitted:** 10-May-2020, **Accepted:** 02-Nov-2020, **Published:** 01-Apr-2021

drugs. Transthoracic echocardiography showed a dilated left ventricle with segmental changes in contractility and a impaired ejection fraction of 22%. Repeated episodes of VT required an implantable cardiac defibrillator (ICD) implantation. Patient presented to the health service due to a history of a four-minute syncopal episode and an ICD showing a six-minute aborted VT. Hypokalemia, hypomagnesemia and hypothyroidism were excluded as triggering factors for arrhythmias. Left Stellate Ganglion Block (LSGB) was performed using ultrasound guidance and VT incidents dramatically reduced. Considering the benefits of LSGB towards softening the VT, a bilateral cardiac sympathetic denervation was performed using VATS. Upon arrival in the operation room, his heart rate and blood pressure were 60 bpm and 100/70 mmHg, respectively. Patient did not tolerate dorsal decubitus and had to stay sit during anesthetic induction. According to pre-anesthetic evaluation, he presented predictors of difficult intubation such as limited mouth opening and large tongue. Standard monitors and invasive arterial pressure monitoring were applied. Central Venous Catheter was previously placed in the right internal jugular vein. External defibrillator paddles were placed around chest and ICD deactivated. Induction was performed with continuous infusion of Dobutamine (5 mcg/kg/min), Etomidate 20 mg, Ketamine 20 mg, Sufentanil 25 mcg, Rocuronium 50 mg and Lidocaine 100 mg. Endobronchial tube 8.0 was placed and anesthesia maintained with Sevoflurane 2%. The sympathetic ganglia were identified through pleuroscopy, dissected, and exposed using VATS approach. During the gas insufflation for the procedure, hemodynamic instability was observed and corrected with Adrenaline bolus. At the end, paralysis was reverted by using Sugamadex 200 mg and patient was extubated. The ICD was reactivated and the patient was transferred to the ICU room in use of Dobutamine (5 mcg/Kg/min). He was discharged in a hemodynamically stable condition after five days and remained symptom-free without any incident of VT during hospital stay.

## Discussion

Recent studies demonstrate that sympathetic nervous system plays an important role in the genesis of ventricular tachyarrhythmia, which are directly related to the degree of cardiac sympathetic innervation.<sup>[5]</sup> The influence of sympathetic hyperactivity in each patient is variable and depends on the mechanism of the arrhythmia, such as shortened refractory periods, abbreviated action potential duration and induced early afterdepolarizations.<sup>[3]</sup> Usually, cardiomyopathy and heart failure are followed by excess of sympathetic output and parasympathetic withdrawal, which

contribute to ventricular arrhythmias.<sup>[6]</sup> Therefore, autonomic modulation is being increasingly employed as a strategy to treat refractory tachyarrhythmia.<sup>[7]</sup>

With the first case of left VATS reported back to the 2000s, the microinvasive techniques have improved over time.<sup>[8]</sup> The mechanism behind the benefit of VATS is the disruption of afferent as well-efferent sympathetic fibers.<sup>[9]</sup> It causes an interruption in the release of norepinephrine in the heart, an increase of the ventricular fibrillation threshold; it probably results in some kind of remodeling in the cardiac sympathetic innervation and does not impair cardiac contractility.<sup>[10]</sup>

The response and benefits to sympathectomy can be evaluated comparing the incidence of ICD shocks before and after the surgery.<sup>[11]</sup> Vaseghi *et al.* showed that 50% of patients were free of ICD shocks or sustained VA for one hour after VATS; and NYHA class III or IV associated with it's continuity.<sup>[9]</sup> Some authors show that bilateral denervation approach is as effective as the left side approach alone. However, patients with bilateral denervation had a better ICD shock-free survival rate compared with the ones who had the left denervation only.<sup>[6]</sup>

Although thoracoscopic surgery is significantly less invasive, it requires general anesthesia and intubation, with possible hemodynamic instability during the induction. VATS patients typically have failed aggressive medical and catheter-based ablative therapies and received several ICD shocks.<sup>[12]</sup> The anesthetic management of these patients is quite complex and should be planned carefully together with the reprogramming of implanted devices to prevent electromagnetic interference and an external defibrillator placed before the induction of anesthesia. The procedure requires invasive monitoring, and titration of vasoactive medications such as inotropic and vasopressor. Hypoxemia, hypercapnia, hypocapnia, acidosis, and superficial anesthesia should be avoided as these conditions affect the repolarization of the cardiac myocyte and increase the sympathetic tone, precipitating arrhythmias.<sup>[13]</sup> The complications of VATS include lung injury related to surgical access, pneumothorax, changes in skin sensitivity and sweating pattern, bradycardia and transitory hypotension.<sup>[12]</sup> Difficulties to treat neuropathic pain can occur in a small proportion of cases.<sup>[8]</sup>

During thoracoscopic sympathectomy, both single-lumen and double-lumen endotracheal tubes can be used, with or without intrathoracic CO<sub>2</sub> insufflation.<sup>[13]</sup> In this report, the patient was intubated with a single-lumen endotracheal tube due to his predictors of difficult intubation. In addition, an intrathoracic insufflation was necessary to facilitate the

procedure, which induced hemodynamic instability and consequential need of vasopressors. Although the patient did not have a long-term follow-up to verify the postoperative success rate and the resolution of ICD registered shocks, additional follow up are warranted to assess the long term-results.

In conclusion, bilateral VATS decreased ICD shock recurrence and it's a therapeutic option for patients with refractory VA. Anesthetic management of the patient is essential and requires cardiac monitoring, handled with intraoperative hemodynamic instability in addition to a satisfactory postoperative pain control.

#### 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 be 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. Téllez LJ, Garzón JC, Vinck EE, Castellanos JD. Video-assisted thoracoscopic cardiac denervation of refractory ventricular arrhythmias

- and electrical storms: A single-center series. *J Cardiothorac Surg* 2019;14:17.
2. Lai Y, Yu L, Jiang H. Autonomic neuromodulation for preventing and treating ventricular arrhythmias. *Front Physiol* 2019;10:200.
3. Waldron NH, Fudim M, Mathew JP, Piccini JP. Neuromodulation for the Treatment of Heart Rhythm Disorders. Vol. 4, *JACC: Basic to Translational Science*. Elsevier Inc; 2019. p. 546-62.
4. Basantwani S, Shinde SR, Tendolkar B. Management of ventricular storm with thoracic epidural anesthesia. *Ann Card Anaesth* 2019;22:439-41.
5. Stavrakis S, Kulkarni K, Singh JP, Katritis DG, Armoundas AA. Autonomic Modulation of Cardiac Arrhythmias: Methods to Assess Treatment and Outcomes. Vol. 6, *JACC: Clinical Electrophysiology*. Elsevier Inc; 2020. p. 467-83.
6. Bradfield JS, Ajijola OA, Vaseghi M, Shivkumar K. Mechanisms and management of refractory ventricular arrhythmias in the age of autonomic modulation. *Hear Rhythm*. 2018;15:1252-60.
7. Dusi V, Zhu C, Ajijola OA. Neuromodulation Approaches for Cardiac Arrhythmias: Recent Advances. Vol. 21, *Current Cardiology Reports*. Current Medicine Group LLC 1; 2019.
8. Witt CM, Bolona L, Kinney MO, Moir C, Ackerman MJ, Kapa S, *et al.* Denervation of the Extrinsic Cardiac Sympathetic Nervous System As a Treatment Modality for Arrhythmia. Vol. 19, *Europace*. Oxford University Press; 2017. p. 1075-83.
9. Vaseghi M, Barwad P, Malavassi Corrales FJ, Tandri H, Mathuria N, Shah R, *et al.* Cardiac sympathetic denervation for refractory ventricular arrhythmias. *J Am Coll Cardiol* 2017;69:3070-80.
10. Polavarapu KC, Patil A, Mistry R. Video-assisted thoracoscopic cardiac sympathetic denervation for prolonged QT syndrome—a case report. *Indian J Thorac Cardiovasc Surg* 2018;34:56-60.
11. Cardona-Guarache R, Padala SK, Velazco-Davila L, Cassano A, Abbate A, Ellenbogen KA, *et al.* Stellate ganglion blockade and bilateral cardiac sympathetic denervation in patients with life-threatening ventricular arrhythmias. *J Cardiovasc Electrophysiol* 2017;28:903-8.
12. Kumar S, Tedrow UB, Stevenson WG. Adjunctive Interventional Techniques When Percutaneous Catheter Ablation For Drug Refractory Ventricular Arrhythmias Fail: A Contemporary Review. Vol. 10, *Circulation: Arrhythmia and Electrophysiology*. Lippincott Williams and Wilkins; 2017.
13. Upadya M, Misquith JCR, Rao R. Anaesthesia for left thoracoscopic sympathectomy for refractory long QT syndrome: Three case reports. *South African J Anaesth Analg* 2016;22:156-9.