Case Report

The usefulness of stellate ganglion block with ultrasound-guided lateral paracarotid approach in ventricular arrhythmias: A case series

ABSTRACT

Ventricular arrhythmias are life-threatening cardiac events. Sympathetic nervous system blockade represents a crucial therapeutic method for refractory ventricular arrhythmias. Ultrasound (US) imaging for stellate ganglion block (SGB) suggests potential for its application to safer and more accurate methods. We had thirteen patients diagnosed with refractory ventricular arrhythmia and referred to the pain clinic for SGB. We visited the intensive care unit (ICU) and performed SGB with the lateral paracarotid approach technique in the ICU. Using a new approach, we easily performed SGB and felt the convenience of the procedure in the ICU. In eleven cases, we also confirmed that the effect of the block with the new technique was satisfactory. SGB, with the new technique, revealed efficiency in the recovery process of the patients. We recommended the lateral paracarotid approach technique for SGB when a patient in an ICU showed ventricular arrhythmias and should be treated with SGB.

Key words: Lateral paracarotid approach, stellate ganglion block, ventricular arrhythmias

Introduction

Ventricular arrhythmias, critical electrical storms in the heart, are life-threatening cardiac events. Established treatments for ventricular arrhythmias are antiarrhythmic medications, cardiac defibrillation, catheter ablation, and mechanical circulatory support. In addition, sympathetic nervous system blockade represents a therapeutic method for refractory ventricular arrhythmias. The sympathetic ganglions provide efferent sympathetic outputs to the cardiac autonomic systems. Therefore, a stellate ganglion block (SGB), which is the fusion of the inferior cervical and first thoracic sympathetic ganglions, can reduce myocardial inotropy and chronotropy, resulting in the management of ventricular arrhythmias. Nowadays, ultrasound (US) imaging for SGB suggests great potential for its applications to safer and more accurate methods.

We performed the lateral paracarotid approach for US-guided SGB in patients with ventricular arrhythmias. We have suggested that the lateral paracarotid approach is a new technique for SGB.[1] This method is an easy and convenient technique that can be performed on a patient lying in a supine position in an intensive care unit (ICU). Therefore, we describe the clinical experience of SGB with a new technique

Access this article online	
Website: https://journals.lww.com/sjan	Quick Response Code
DOI: 10.4103/sja.sja_657_23	

How to cite this article: Ryu H, Kim H. The usefulness of stellate ganglion block with ultrasound-guided lateral paracarotid approach in ventricular arrhythmias: A case series. Saudi J Anaesth 2024;18:276-9.

Hansung Ryu, Hyuckgoo Kim

Department of Anesthesiology and Pain Medicine, College of Medicine, Yeungnam University, Daegu, Republic of Korea

Address for correspondence: Dr. Hyuckgoo Kim, Department of Anesthesiology and Pain Medicine, College of Medicine, Yeungnam University, Hyeonchung-ro, 170, Nam-gu, Daegu, 705-703, Republic of Korea.
E-mail: rlagurrn@ynu.ac.kr

Submitted: 28-Jul-2023, **Revised:** 31-Jul-2023, **Accepted:** 01-Aug-2023, **Published:** 14-Mar-2024

to stabilize ventricular arrhythmias in patients receiving intensive care.

Case

Thirteen patients between 36 and 83 years, diagnosed with refractory ventricular arrhythmia, and referred to the pain clinic for SGB between 2018 and 2022 were included in this report. The patients had been treated in the ICU, and some patients had been treated under ventilator care.

We performed SGB with the lateral paracarotid approach in the ICU. The procedure was performed as follows. The patient did not change their position, only slightly being an extension of the neck and head during the procedure. An ipsilateral paratracheal transverse scan was acquired at the C6 level with a linear probe. The probe was moved laterally, scanning the thyroid, carotid artery, internal jugular vein, longus colli muscle, and the transverse process of the C6, placing the carotid artery in the middle of the view. Light pressure was applied to the probe posteromedially to displace the carotid artery medially and compress the internal jugular vein. The needle was inserted out-of-plane between the lateral margin of the carotid artery and the Chassaignac's tubercle, traversing the collapsed internal jugular vein and targeting the longus colli beneath the prevertebral fascia.[1] 6 mL of 0.2% ropivacaine was injected for each procedure after a negative aspiration test was confirmed [Figure 1]. All procedures were performed by a single physician.

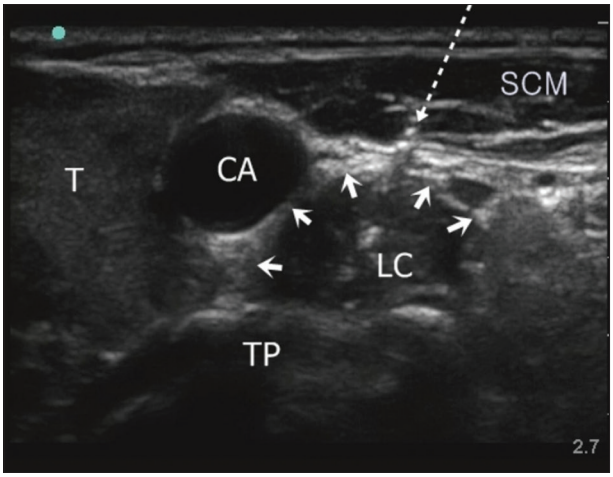

Figure 1: Sonogram of the real-time ultrasound-guided stellate ganglion block performed with a lateral paracarotid approach. The longus coli muscle shows circular expansion, elevating the prevertebral fascia and pushing away the carotid artery (small arrows) after injecting 6 mL of 0.2% ropivacaine. T: thyroid, CA: carotid artery, LC: longus coli muscle, TP: transverse process of C6. SCM: sternocleidomastoid muscle. Dotted arrow points at the needle and its path

In thirteen patients, SGB was performed with the lateral paracarotid approach technique on the left ganglion or both sides. The clinical diagnosis and status before and after the SGB of patients who underwent the procedure are presented in Table 1. In eleven cases, SGB with the new approach technique revealed efficiency in the recovery process of the patients. In five cases, the frequency of ventricular tachycardia (VT) decreased significantly after SGB. In six cases, VT disappeared after SGB. Two of thirteen patients died because heart disease and arrhythmia did not recover properly despite appropriate treatment. The two patients could not confirm the effect of SGB and died eventually.

Discussion

Ventricular arrhythmias are electrical storms with high mortality in the cardiac conduction system. There are various treatment options, including correction of the causative factors, antiarrhythmic medications, implantable cardiac defibrillator (ICD), and sympathetic denervation. SGB is an effective method for denervation of efferent sympathetic output to the cardiac and autonomic nervous systems.[2] The patients in need of SGB due to frequent VT stay in an ICU and receive close monitoring due to unstable hemodynamic status. In the ICU, positional change in patients is very limited, especially during ventilator care. In addition, it may be dangerous for the patient to move out of the ICU for the procedure and go to the operating room. Therefore, performing SGB in an ICU is challenging for pain physicians.

The use of US imaging for SGB suggests great potential for its applicability as a safe and accurate method.[3] For example, because patients with ventricular arrhythmia are anticoagulated, US can easily visualize vascular structures and be helpful in avoiding vessel injury within needle pathways. Therefore, it is believed that the best way to perform SGB for patients in an ICU is US-guided blockade. Gofeld *et al*.[4] presented the lateral approach with in-plane needle insertion for US-guided SGB. The lateral in-plane approach is a convenient method that provides a wide, safe space for needle insertion and can be done more easily.[5,6] However, in the lateral in-plane approach, because of the direction of needle insertion, it is easier to perform the procedure in the semi-lateral or lateral position. This posture change may cause discomfort to the patient in the ICU and may require the cooperation of several medical personnel for the posture change. Therefore, we have implemented the lateral paracarotid approach for US-guided SGB for patients in the ICU. During SGB with the lateral paracarotid approach,

Table 1: Diagnosis and status of patients before and after stellate ganglion block

Patient Number	Sex	Age	Diagnosis	Arrhythmia Patient status	Patient status after SGB
29810000	M	36	Acute lymphocytic myocarditis	VT storm VT per 1~3 min	VT per 30~60 min; transfer after stabilizing
23780000	M	79	DCMP	VT 3 times	VT subside EPS examination
24490000	M	54	DMD ICD insertion	VT 6 times per day	Admission 2 times SGB 2 times VT 3 times per day
28280000	M	77	STEMI Ischemic severe myopathy	Recurrent polymorphic VT VT 10 times per day	VT 1 time per day
28100000	M	87	SCMP NSTEMI	VT 5 times per 2 days	VT 3 times per 3 days
28350000	M	43	Heavy alcoholics Hypokalemia	QT prolongation Recurrent VT, 3 times	Tachycardia No additional VT
16340000	F	69	CHF DCMP	Refractory VT	VT subside HR 52~60 bpm
28760000	M	67	Severe aortic stenosis s/p TAVI	VT after TAVI	Intermittent PVC Stable vital signs
24750000	M	60	Acute promyelocytic leukemia Angina	Drug refractory VT	Chest discomfort relieved
26230000	M	63	DCMP HF, AVR, MVR	VT with ICD A, fib, HR 60~68 bpmtkakd Chest discomfort	HR 48~50 bpm Symptom relieved
25850000	F	87	Angina Heart failure	VT 5 times Intubation with sedation	VT disappeared
28950000	F	83	NSTEMI s/p PCI	Asystole during PCI VT	Both SGB ECMO Die after 3 days
10600000	M	72	Ischemic CMP Heart failure	VT storm	Refractory VT Several times SGB Die

VT: Ventricular tachycardia, DCMP: Dilated cardiomyopathy, EPS: Electrophysiological study, DMD: Duchenne muscular dystrophy, ICD: Implantable cardioverter defibrillator, STEMI: ST-elevation myocardial infarction, SCMP: stress-induced cardiomyopathy, NSTEMI: Non-ST-elevation myocardial infarction, CHF: Congestive heart failure, AVR: Aortic valve replacement, MVR: Mitral valve replacement, ECMO: Extracorporeal membrane oxygenation, PCI: Percutaneous coronary intervention

the patients kept lying in the supine position and extended their heads and necks slightly. In conclusion, the patients can successfully receive the procedure in the supine position without any positional change for SGB. We published a paper about the lateral paracarotid approach for US-guided SGB in 2017.[1]

Although SGB at the sixth cervical level (C6) is a convenient method and Lee *et al*.[7] reported that a 2 mL dose was sufficient for spread below the seventh cervical (C7) and first thoracic junction when performing US-guided SGB at C6, we are concerned about the weak effect of the sympathetic blockade in the cardiac autonomic system. We studied SGB at the C6 and C7 levels using the lateral paracarotid approach for sympathetic blockade in the upper extremity.[8] As a result, the new blockade technique using a 4 mL dose at C6 has demonstrated less efficient sympathetic block in the upper extremity than at C7. Therefore, we chose a 6 ml dose for the lateral paracarotid approach with US-guided SGB at C6 in managing ventricular arrhythmias. Furthermore, the SGB at C7 may be a less safe approach than that at C6 because there are several important anatomical structures, including the esophagus and blood vessels.[9] In addition, there are coupled stellate ganglions in humans, but the left ganglion contributes a more sympathetic effect to the heart.[10] We performed SGB on the left side, and if the patient took ventilatory care, we performed SGB on both sides.

In eleven cases, SGB had a therapeutic effect; however, in two cases, the severity of the underlying heart disease and acute exacerbation led to death despite appropriate treatment. In conclusion, using a new technique, we easily performed SGB and felt the convenience of the procedure in the ICU. We also confirmed that the effect of the block with the new technique was satisfactory. We recommended the lateral paracarotid approach for SGB when a patient in an ICU showed ventricular arrhythmias.

Declaration of patient consent

The authors declare that they have obtained consent from patients. Patients have given their consent for their images and other clinical information to be reported in the journal. Patients understand that their names 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. Kim H, Song SO, Jung G. A lateral paracarotid approach for ultrasound-guided stellate ganglion block with a linear probe. J Anesth 2017;31:458-62.
2. Ganesh A, Qadri YJ, Boortz-Marx RL, Al-Khatib SM, Harpole DH Jr, Katz JN, *et al*. Stellate ganglion blockade: An intervention for the management of ventricular arrhythmias. Curr Hypertens Rep 2020;22:100. doi: 10.1007/s11906-020-01111-8.
3. Narouze S. Ultrasound-guided stellate ganglion block: Safety and efficacy. Curr Pain Headache Rep 2014;18:424. doi: 10.1007/s11916-014-0424-5.
4. Gofeld M, Bhatia A, Abbas S, Ganapathy S, Johnson M. Development and validation of a new technique for ultrasound-guided stellate ganglion block. Reg Anesth Pain Med 2009;34:475-9.
5. Kumar A, Sinha C, Kumar A, Sinha AK. Ultrasound-guided stellate ganglion block for resistant ventricular tachycardia. Saudi J Anaesth 2017;11:372-3.
6. Ghai A, Kaushik T, Kundu ZS, Wadhera S, Wadhera R. Evaluation of new approach to ultrasound guided stellate ganglion block. Saudi J Anaesth 2016;10:161-7.
7. Lee MH, Kim KY, Song JH, Jung HJ, Lim HK, Lee DI, *et al*. Minimal volume of local anesthetic required for an ultrasound-guided SGB. Pain Med 2012;13:1381-8.
8. Baek J, Kim BS, Yu H, Kim H, Lim C, Song SO. Comparison of ultrasound-guided stellate ganglion block at 6^{th} and 7^{th} cervical vertebrae using the lateral paracarotid out-of-plane approach for sympathetic blockade in the upper extremity. Yeungnam Univ J Med 2018;35:199-204.
9. Bhatia A, Flamer D, Peng PW. Evaluation of sonoanatomy relevant to performing stellate ganglion blocks using anterior and lateral simulated approaches: An observational study. Can J Anaesth 2012;59:1040-7.
10. Savastano S, Schwartz PJ. Blocking nerves and saving lives. Left stellate ganglion block for electrical storms. Heart Rhythm 2023;20:1039-47.