Utility of Stellate Ganglion Block for Refractory Ventricular Arrhythmias: Proposed Mechanisms of Sympathetic Modulation

Aidan D. Faller, B.S.[1] · **Eugene Lipov, M.D.**[2,3]

[1]Midwestern University, Chicago College of Osteopathic Medicine, Downers Grove, IL , [2]University of Illinois Chicago, IL, [3]Stella Center, Chicago, IL

ASRA PAIN MEDICINE
25th Annual Pain Medicine Meeting
November 5-7, 2026 | Tampa, Florida
#ASRAFALL26

Background

Refractory ventricular arrhythmias (RVA), including electrical storm, persist despite antiarrhythmic drugs, catheter ablation, and device therapy. Sympathetic hyperactivity drives both arrhythmia initiation and maintenance.[1,2]

Stellate ganglion block (SGB), a procedure familiar to regional anesthesia and pain physicians, has emerged as a potential therapeutic strategy.[3,4]

Objective: to review the proposed mechanisms by which SGB suppresses RVA and restores electrical stability.

Methods

Focused review of **PubMed** and **Google Scholar** using:

stellate ganglion block · *SGB* · *ventricular arrhythmia* · *ventricular tachycardia* · *ventricular fibrillation*

Included: SGB clinical effects, autonomic modulation, and cardiac electrophysiology. IRB-exempt (no patient data) per Midwestern University policy.

Sympathetic Drive in RVA[1,2]

- ↑ Myocardial excitability
- ↑ Triggered activity
- Heterogeneous repolarization
- ↑ Risk of sudden cardiac death

Proposed Mechanisms of SGB

Stellate ganglia
cervicothoracic sympathetic relay

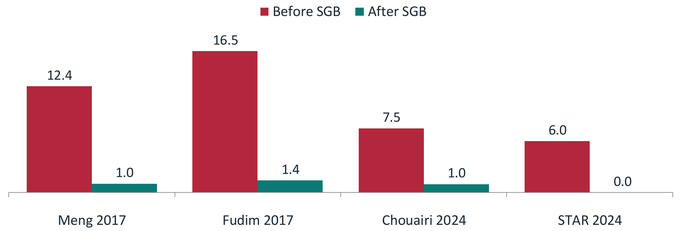
Sympathetic input to:
SA node · AV node · Coronary vasculature · Atrial & ventricular myocardium · His–Purkinje system

ARRHYTHMOGENIC SUBSTRATE	EFFECT OF SGB
Sympathetic hyperactivity ↑ Efferent outflow and cardiac norepinephrine release[1,2]	ACUTE · HOURS **Adrenergic blockade** Local anesthetic interrupts stellate outflow, lowering cardiac norepinephrine[1,8]
Neural remodeling ↑ Nerve growth factor (NGF) drives nerve sprouting and regional hyperinnervation[1,6]	PROLONGED · HYPOTHESIZED **Sympathetic nerve pruning** ↓ NGF → retraction of sprouted fibers; benefit may outlast the anesthetic[1,5]
Electrical instability Sympathetic-driven dispersion of repolarization and triggered activity[1,2]	NET EFFECT **Electrical stabilization** Less dispersion of repolarization and fewer triggered ectopic beats[1,5]
VT / VF · Electrical storm	**Rapid, potentially durable suppression**

Under investigation: *anti-inflammatory effects · ion channel regulation · central autonomic rebalancing*

Clinical Evidence

Ventricular arrhythmia episodes before vs. after SGB



n = 38[4], 35[7], 117[3], 131[9]. Means per 24 h (Meng, Fudim); medians per 24 h (Chouairi) and 12 h (STAR). Shocks fell from 10.0 to 0.05/day[4]; median defibrillations from 2 to 0 per 24 h.[3]

92% had ≥50% fewer events[9]

0.5% major complications[9]

64.6% complete storm resolution[10]

Discussion

- **Targeted:** SGB modulates the sympathetic pathways that sustain RVA.[2,8]
- **Rapid:** observational cohorts show sharp falls in VA burden and shocks within 12–24 h.[3,4,7,9]
- **Potentially durable:** NGF-mediated nerve pruning may explain benefit outlasting the anesthetic.[1,5]
- **Bridge therapy:** effect over 24–72 h buys time for ablation, sympathectomy, or transplant.[8]

Next steps: evidence is observational; randomized trials must define optimal timing, patient selection, and long-term impact of autonomic modulation.

References

1. Li CY, Li YG. Cardiac sympathetic nerve sprouting and susceptibility to ventricular arrhythmias after myocardial infarction. Cardiol Res Pract. 2015;2015:698368.
2. Benabou L, Vaseghi M. Cardiac sympathetic innervation and ventricular arrhythmias in structural heart disease. Arrhythm Electrophysiol Rev. 2025;14:e34.
3. Chouairi F, Rajkumar K, Benak A, et al. A multicenter study of stellate ganglion block as a temporizing treatment for refractory ventricular arrhythmias. JACC Clin Electrophysiol. 2024;10(4):750-758.
4. Meng L, Tseng CH, Shivkumar K, Ajijola O. Efficacy of stellate ganglion blockade in managing electrical storm: a systematic review. JACC Clin Electrophysiol. 2017;3(9):942-949.
5. Lipov EG, Joshi JR, Sanders S, Slavin KV. A unifying theory linking the prolonged efficacy of the stellate ganglion block for the treatment of CRPS, hot flashes, and PTSD. Med Hypotheses. 2009;72(6):657-661.
6. Cao JM, Chen LS, KenKnight BH, et al. Nerve sprouting and sudden cardiac death. Circ Res. 2000;86(7):816-821.
7. Fudim M, Boortz-Marx R, Ganesh A, et al. Stellate ganglion blockade for the treatment of refractory ventricular arrhythmias: a systematic review and meta-analysis. J Cardiovasc Electrophysiol. 2017;28(12):1460-1467.
8. Ganesh A, Qadri YJ, Boortz-Marx RL, et al. Stellate ganglion blockade: an intervention for the management of ventricular arrhythmias. Curr Hypertens Rep. 2020;22(12):100.
9. Savastano S, Baldi E, Compagnoni S, et al. Electrical storm treatment by percutaneous stellate ganglion block: the STAR study. Eur Heart J. 2024;45(10):823-833.
10. Motazedian P, Quinn N, Wells GA, et al. Efficacy of stellate ganglion block in treatment of electrical storm: a systematic review and meta-analysis. Sci Rep. 2024;14:24719.