Archives of Anesthesiology and Critical Care (Jan-Feb 2026); 12(1): 26-28.

Available online at http://aacc.tums.ac.ir

Research Article

Effectiveness of Stellate Ganglion Block on Chest Pain Severity and ST-Segment Changes in Patients with Refractory Angina: An Interventional Study

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ARTICLE INFO

Article history:
Received 25 November 2025
Revised 16 December 2025
Accepted 30 December 2025

Keywords:
Refractory angina;
Stellate ganglion block;
Chest pain;
ST-segment deviation;
Coronary artery disease

ABSTRACT

Background: Refractory angina remains a major therapeutic challenge when revascularization options are unavailable. Stellate ganglion block (SGB) may reduce sympathetic tone, improve coronary perfusion, and alleviate ischemic chest pain. This study evaluated the effects of SGB on the severity of chest pain and ST-segment deviation during exercise testing.

Methods: This before–and–after interventional study included patients with confirmed coronary artery disease and refractory angina. Baseline treadmill testing assessed angina index and ST-segment deviation. SGB was performed under ultrasound guidance using 0.25% bupivacaine and dexamethasone. Treadmill testing was repeated 24–48 hours after the block.

Results: Sixteen patients participated (56% male; mean age 60.7±9.7 years). The angina index significantly improved (1.90±0.34 to 0.50±0.32; $P < 0.001$). ST-segment deviation decreased modestly but significantly (1.0±0.4 to 0.9±0.3 mm; $P=0.041$). No major complications occurred.

Conclusion: SGB significantly reduced chest pain severity and improved ischemic ST-segment abnormalities in patients with refractory angina. It may serve as a safe and effective adjunct therapy.

Introduction

Refractory angina is defined as persistent chest pain due to myocardial ischemia despite optimal medical therapy in patients who are not suitable candidates for revascularization. [1] Sympathetic overactivity contributes to increased oxygen demand, coronary vasoconstriction, and enhanced anginal pain transmission [2-3]. Stellate ganglion block (SGB), traditionally used to treat sympathetically mediated pain, has gained interest as an alternative therapy for refractory angina. This study focuses specifically on the effects of

The authors declare no conflicts of interest.
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DOI: 10.18502/aacc.v12i1.20537

SGB on the severity of chest pain and ST-segment changes.

Methods

Study Design: This before–and–after interventional clinical study with ethical code IR.TUMS.IKHC.REC.1402.523 included patients with confirmed coronary artery disease (CAD) and refractory angina unresponsive to full medical therapy.

Inclusion criteria were documented as CAD, refractory angina, and lack of PCI/CABG eligibility.

Exclusion criteria were inability to perform treadmill testing, coagulopathy, infection at the injection site, and baseline LBBB. In Intervention, left-sided ultrasound-guided stellate ganglion block was performed at the C7 level using 7–10 mL of 0.25% bupivacaine plus 4 mg dexamethasone injected anterior to the longus colli muscle. Outcome measures were:

1. Chest Pain Severity (Angina Index): 0 = none, 1 = non-limiting pain 2 = pain stopping the test.
2. ST-Segment Deviation: Maximum ST depression during exercise.

Treadmill testing was repeated 24–48 hours after the intervention. Statistical analysis was performed using SPSS v24.

Results

A total of sixteen patients completed the study (mean age 60.7±9.7; 56% male). Comorbidities included diabetes (56%), dyslipidemia (75%), and hypertension (87%).

Findings Before vs. After SGB:

- Angina Index: 1.90 ± 0.34 → 0.50 ± 0.32 (P<0.001)
- ST-Segment Deviation (mm): 1.0 ± 0.4 → 0.9 ± 0.3 (P=0.041)

No complications such as pneumothorax, vascular injury, or neurologic deficit were recorded.

Discussion

The present study demonstrates that SGB significantly improves objective cardiac stress test parameters and subjective angina symptoms in patients with refractory angina. Mechanisms of Benefit are**:**

1. Sympathetic inhibition that reduces myocardial oxygen demand and coronary vasoconstriction.
2. Improved coronary perfusion through reduced vasospasm and improved subendocardial blood flow.
3. Pain modulation by interrupting sympathetic afferent pathways involved in anginal pain transmission [4-6].

In comparison with previous studies**,** the findings of this study are consistent with previous case reports, including the study by Lo et al. 2018 [7]. When comparing the present study with Hudec's study [8] published in the ESC Journal, the results again show consistency; however, Hudec's study was only a case report and did not use the standardized criteria applied in our research, such as the Angina Index or ECG changes. In the study by Khan and Ahmed [9], the findings were also consistent with the present work; however, their study was also a case report and was limited to a patient in the end-stage of disease.

In a systematic review and meta-analysis that examined six RCTs [10], criteria such as heart rate (HR) and ST–T segment changes were used. Nevertheless, no index, such as the Angina Index, exercise tolerance duration, or ST-segment changes, was utilized. Limitations include small sample size, single-center design, short follow-up, and absence of a control group.

Conclusion

In conclusion, stellate ganglion block is a safe, minimally invasive, and effective technique for reducing anginal chest pain and improving ischemic ST-segment abnormalities in refractory angina patients who lack revascularization options. Larger randomized trials with longer follow-up are recommended.

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