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Stellate Ganglion Block for Treatment of Refractory Sympathetic Storm in Severe Tetanus: A Case Report

Authors' Contribution:

Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

BCEF **Yuxin Xiao** 
ABDE **Yuan Gong** 
BCD **Kelin Chen**
ABD **Wanshu Que**
ADE **Li Xiong**
AD **Shanmu Ai** 
CDE **Fating Zhou**

Department of Emergency, Chongqing Emergency Medical Center,
Chongqing, PR China

Corresponding Author: Li Xiong, Emergency Department, Chongqing Emergency Medical Center, Chongqing, China
e-mail: 16606132@qq.com

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Patient: Male, 67-year-old
Final Diagnosis: Severe tetanus
Symptoms: Dysphagia • frequent sympathetic storms • spontaneous jerky movements in the extremities
Clinical Procedure: —
Specialty: Critical Care Medicine

Objective: Management of emergency care

Background: Severe tetanus necessitates high-dose sedatives and analgesics. However, conventional pharmacotherapy is limited, particularly when the disease is complicated by a sympathetic storm. Herein, we report a case of severe tetanus complicated by a refractory sympathetic storm that was successfully aborted with ultrasound-guided stellate ganglion block (SGB). SGB can be a valuable rescue therapy for this life-threatening autonomic complication, offering a potentially effective therapeutic option when standard medical management fails.

Case Report: A 67-year-old man presented to our hospital with a several-day history of progressive symptoms following a puncture wound to the middle finger of his left hand caused by a bamboo skewer. The foreign body had remained embedded for 3 days before being self-removed by the patient, without any subsequent systematic medical treatment. He subsequently developed neck stiffness, dysphagia, pallor, and cyanosis, leading to hospital admission. Upon admission, emergency management included endotracheal intubation, wound debridement, and administration of tetanus toxoid vaccine and human tetanus immunoglobulin. However, the combination of standard sedatives, analgesics, and muscle relaxants proved insufficient to control recurrent convulsions and sympathetic storm. An ultrasound-guided left SGB was therefore performed, which effectively aborted the sympathetic storm.

Conclusions: SGB can offer life-saving potential or clinical value for patients with severe tetanus who exhibit refractory sympathetic hyperactivity despite standard treatment. However, the causal relationship and general applicability of this intervention require further validation through additional clinical studies.

Keywords: Case Reports • Stellate Ganglion • Sympathetic Nervous System • Tetanus

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Introduction

In addition to typical muscle rigidity and paroxysmal convulsions, patients with severe tetanus often develop a sympathetic storm, resulting from the toxin's inhibitory effects on the central nervous system and consequent excessive sympathetic outflow [1]. Clinically, this manifests as uncontrollable hypertension, tachycardia, profuse diaphoresis, and hyperthermia [2], along with an exaggerated response to external stimuli. These abnormalities increase myocardial oxygen consumption, predisposing patients to arrhythmias, heart failure, and even cardiac arrest, thereby substantially complicating clinical management.

Standard treatment for tetanus relies on sedatives, analgesics, and muscle relaxants. Previous studies have indicated that high-dose administration of sedatives and muscle relaxants in patients with severe tetanus can lead to drug accumulation, thereby increasing the risk of toxicity and precipitating adverse reactions [3,4]. Although these studies are older and no recent reports have explicitly linked adverse reactions to drug accumulation, this risk should not be overlooked.

Stellate ganglion block (SGB) has been used to treat critical conditions characterized by excessive sympathetic nervous system activation, such as refractory arrhythmias [5], and autonomic dysfunction associated with post-traumatic stress disorder [6,7]. Given its clear sympatholytic effects, SGB may theoretically be applicable to the sympathetic storm caused by severe tetanus; as a life-saving adjunctive measure when conventional drug therapy proves ineffective [8] or when serious adverse drug reactions occur, it holds potential clinical value.

At present, only 1 case report has suggested that SGB may be a potential treatment for severe tetanus. Altıparmak et al used ultrasound-guided SGB to effectively control the sympathetic storm associated with severe tetanus [9]. Both their case and ours were graded as “extremely severe” tetanus according to the Ablett classification.

Compared with the cases reported by Altıparmak et al, the present case demonstrated superior control (Table 1). Therefore, it is plausible to hypothesize that with timely assessment, earlier SGB initiation and shortened intervals between treatments

Table 1. Comparison of 2 case reports on the treatment of extremely severe tetanus with SGB.

Contents	This case	Altıparmak et al [9]	Jiaohong et al [16]
Ablett grading	Extremely severe	Extremely severe	Extremely severe
SGB start time	Day 9 of hospitalization	Day 20 of hospitalization	None (pharmacological treatment)
Cause of injury	Puncture wound by a bamboo skewer	Knife wound	Without any apparent cause
Incubation period	5 days	10 days	2 days
Patient background	1. A 67-year-old male 2. On admission, the patient was unconscious and experiencing spontaneous convulsions 3. Stiffness in the neck muscles, spasms of the throat and respiratory muscles, accompanied by difficulty swallowing and cyanosis	1. A 60-year-old male 2. On admittance he was conscious, orientation and cooperation were intact 3. There were spasms at back, abdomen and around mouth, but there was no muscle rigidity	1. A 55-year-old male 2. On admission, he was alert and able to cooperate with the examination 3. Swelling and tenderness in both submandibular regions, accompanied by limited mouth opening and slurred speech. Following admission, the condition deteriorated rapidly, with the onset of a forced smile, dyspnea, trismus and rigidity of the limbs, among other symptoms
Duration of treatment	Three times within 5 days	Three times within 10 days	-
Other treatment options	None	Five sessions of plasmapheresis	None
Duration of therapeutic effect	Within 10 minutes of SGB, blood pressure returned to the normal range and the heart rate decreased	Two hours later, approximately 20% decrease in heart rate	After 15 days of treatment, the patient's seizures decreased in frequency

to ensure adequate block duration and a sustained objective therapeutic effect may prove more effective in controlling sympathetic hyperactivity. However, whether SGB has a cumulative effect when administered at shorter intervals remains unclear.

This report describes a case of a 67-year-old man with severe tetanus complicated by a sympathetic storm, in whom ultrasound-guided SGB was performed after standard treatment had proven ineffective. Given the paucity of literature on the efficacy and safety of SGB in this setting, we show that this technique may be a potentially effective therapeutic option.

Case Report

Case subject

The patient was a 67-year-old man working in the catering industry who presented with a 1-week history of a puncture wound to the left middle finger caused by a bamboo skewer. A retained splinter was removed by the patient after 3 days, during which local redness, swelling, and marked pain were observed. No prior treatment was sought. Two days before admission, he developed neck stiffness and pain, followed by dysphagia and choking on water the next day, accompanied by paroxysmal cough with scanty white frothy sputum.

He had difficulty in spontaneous expectoration and preferred a prone position, prompting his presentation to Chongqing Jianshe Hospital. During the head and neck computed tomography scan, he became agitated and distressed, with profuse diaphoresis, pallor, and cyanosis. These symptoms partially resolved after nebulized oxygen therapy and removal of the provoking stimulus.

His past medical history was significant for appendectomy 40 years ago and surgery for intestinal obstruction and adhesions 4 years ago. He had no documented history of tetanus vaccination. He was subsequently transferred to the emergency department of the Chongqing Emergency Medical Center on January 26, 2026, with a 1-week history of lefthand injury, a 2-day history of neck pain, and a 1-day history of dysphagia.

Upon admission, he was comatose and unresponsive, with spontaneous convulsions. He presented with rigidity of the neck muscles and spasms of the throat and respiratory muscles, accompanied by dysphagia, cyanosis, respiratory distress, and clenched jaws, consistent with the “extremely severe” category in the Ablett classification. Copious oral secretions were noted, along with a self-inflicted bite wound to the tip of the tongue accompanied by bleeding. His vital signs were relatively stable (temperature 36.4°C, heart rate 110 beats per/min, blood pressure 100/60 mm Hg, and respiration 23 breaths

per/min), and renal and hepatic function parameters were normal. Serum electrolyte levels indicated acidosis (pH: 7.12, Lac: 14.3 mmol/L); cardiac enzyme levels were abnormal (Myo: 922 ng/mL, cTnI: 0.030 ng/mL, CK-MB: 14.80 ng/mL), whereas serum calcium levels were normal. Therefore, hypocalcemia was ruled out. His complete blood count results were abnormal: white blood cells $14.52 \times 10^9/L$, neutrophil percentage 87.1%, neutrophils $12.64 \times 10^9/L$, lymphocyte percentage 6.2%, lymphocytes $0.90 \times 10^9/L$, and interleukin-6 46.95 pg/mL.

Protective tracheal intubation was performed immediately. Tetanus vaccine and 6000 IU of human immunoglobulin were administered for toxin neutralization. Acidosis was corrected with sodium bicarbonate infusion, along with fluid resuscitation. Wound debridement of the left hand was performed, and diazepam 10 mg was administered for sedation. Following these initial measures, he was admitted to the emergency intensive care unit.

On hospital day 2, he underwent a tracheostomy, with continuous infusion of high-dose remifentanyl, midazolam, dexmedetomidine hydrochloride, sufentanil citrate, and propofol. Intravenous administration of metronidazole 0.5 g every 6 hours and ceftriaxone sodium 2 g every 12 hours was performed. On hospital days 2 to 7, he had persistent seizures, which were relieved following bolus administration of sedatives. On hospital day 7, acetazolamide was intermittently administered for muscle relaxation in addition to other supportive measures.

On hospital day 8, he developed a sympathetic storm (heart rate [HR]: 133-171 bpm; blood pressure [BP]: 185-249/100-137 mm Hg; ventilator-controlled respiratory rate: 15 breaths per minute) without documented evidence of sustained ventricular or supraventricular tachyarrhythmias on continuous ECG monitoring and electrocardiograms. Thus, the clinical phenotype was predominantly attributed to excessive sympathetic outflow rather than to a primary arrhythmic event. Magnesium sulfate 5 g and short-acting beta-blockers (25 mg metoprolol tartrate tablets) were administered with minimal response. On hospital day 9, an ultrasound-guided left SGB was performed using 10 mL of 0.1% ropivacaine (Figure 1). Subsequent SGBs were repeated every other day on hospital days 11 and 13. During the block period, the frequency of stimulus-induced seizures markedly decreased. Within 10 minutes of each SGB, BP normalized to 94-137/55-84 mm Hg and HR decreased to 100-115 bpm, with restoration of sinus rhythm and overall clinical stabilization. The procedure was discontinued after 3 SGB sessions. Although occasional sympathetic storms recurred, each episode resolved within 10 minutes after rescue medication (Figure 2). The specific dosages of medication during the SGB period are shown in Figure 3.

Ultrasound-guided SGB was performed by advancing a needle laterally into the fascial plane superficial to the longus colli



Figure 1. Schematic diagram of the stellate ganglion block Site (3 obstructive images from left to right).

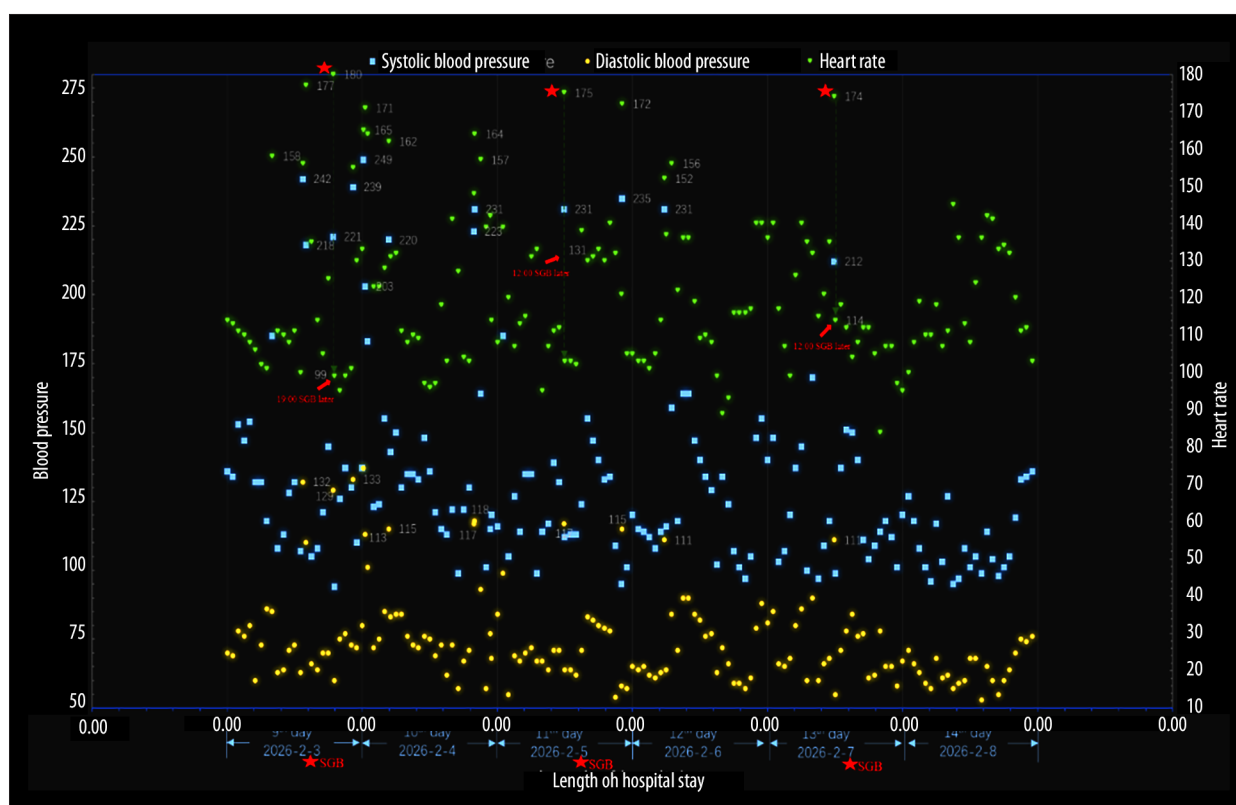


Figure 2. Time-series plots of heart rate and blood pressure during SGB.

muscle. After negative aspiration for blood or cerebrospinal fluid, 10 mL of ropivacaine was injected. The puncture site was then covered with a dressing, and manual pressure was applied for approximately 5 minutes.

During the subsequent course, no further sympathetic storms occurred, allowing gradual reduction of muscle relaxants and sedative-analgesics. On hospital day 34 (the 8th day of tapering), he regained full consciousness, and sedative-analgesics were completely withdrawn by hospital day 38. No further arrhythmias were documented, and his clinical status remained stable.

On hospital day 42, weaning training was initiated with high-flow nasal oxygen therapy and humidification, while

maintaining the tracheostomy. Following successful weaning, the tracheostomy tube was occluded and subsequently removed on hospital day 51, with the patient demonstrating adequate spontaneous cough and secretion clearance. Respiratory muscle training, passive and active limb rehabilitation, and swallowing function training were also implemented.

On hospital day 56, he was transferred to the general ward for continued rehabilitation. He was discharged on March 28 (hospital day 62). Pre-discharge evaluation revealed improved clinical status: he was alert and conscious, with stable vital signs and no seizures or fever. He was able to walk independently at the bedside, although with mild unsteadiness.

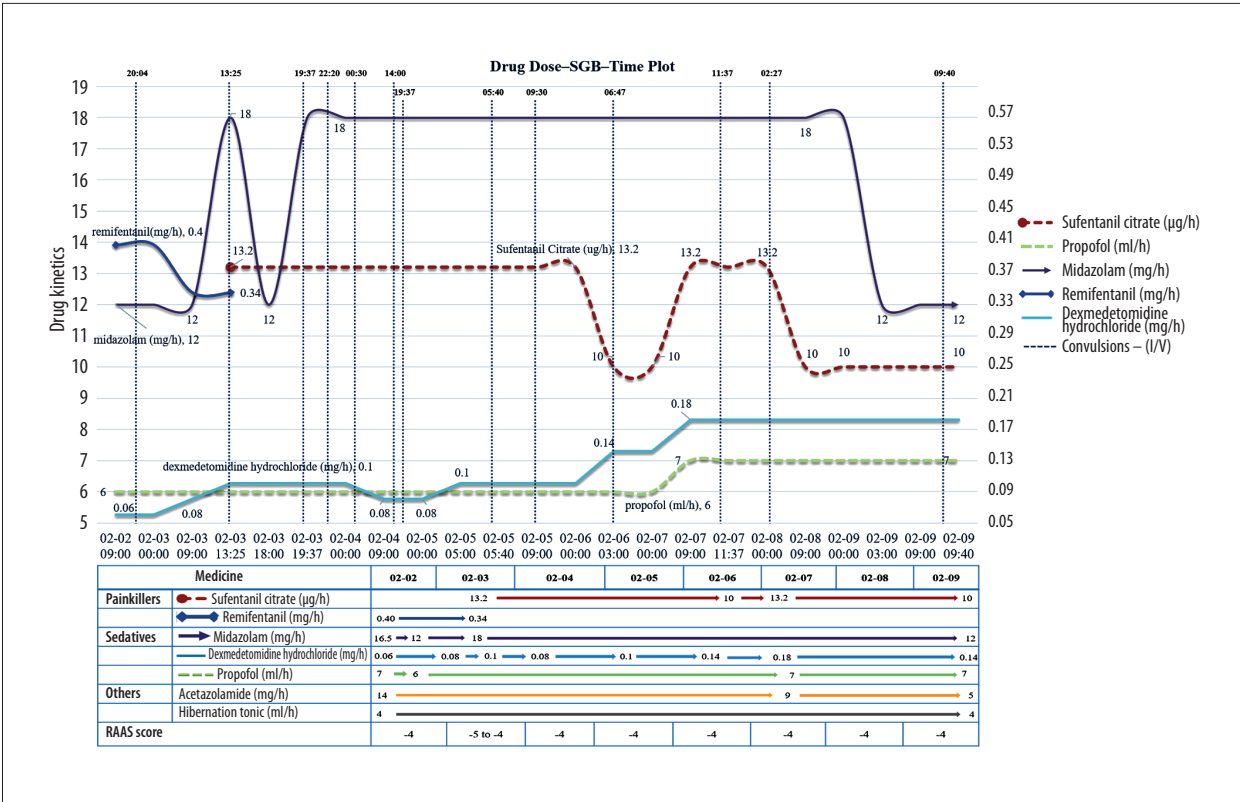


Figure 3. Time-series graph of sedative-analgesic drug doses during SGB.

At discharge, health education was provided. Home medications included paroxetine hydrochloride 10 mg once daily and olanzapine 5 mg once nightly, with regular psychiatric follow-up recommended for dose adjustment. He was also advised to continue rehabilitation exercises, avoid prolonged bed rest, and maintain effective airway clearance.

At 1-week follow-up, he was alert, responsive, and cooperative with physical examination. Vital signs were stable, with no episodes of convulsions or muscle rigidity. He was able to walk independently with assistive devices and was making satisfactory recovery.

Discussion

In recent years, SGB has been increasingly employed in the management of severe sympathetic overactivity [5,10-12]. Zhao Xi et al [13] reported a benefit in post-traumatic paroxysmal sympathetic hyperactivity after traumatic brain injury. Zhang Jiaojiao et al [14] demonstrated enhanced hemodynamic stability during coronary artery bypass grafting. A systematic review and meta-analysis [11] confirmed a significant reduction in arrhythmia burden during sympathetic storms. Overall, SGB can help control excessive sympathetic activity across different conditions.

SGB offers distinct advantages in extremely severe tetanus complicated by refractory sympathetic storm. By direct injection of local anesthetics into the perisellar region, SGB achieves rapid sympathetic denervation within minutes [15]. Moreover, its efficacy at a lower anesthetic dose makes it a safe and effective rescue option for patients who fail to respond to high-dose sedativeanalgesics combined with muscle relaxants.

In this study, we effectively controlled sympathetic storm by shortening the interval between SGB treatments. Furthermore, compared with treatment relying solely on medication (Table 1), SGB can alleviate autonomic dysfunction in patients within a shorter timeframe [16]. This provides new insights for the future clinical implementation of SGB. SGB has potential efficacy for treating severe tetanus complicated by refractory sympathetic hyperactivity. However, whether SGB has a cumulative effect when administered at shorter intervals remains unclear.

SGB is not a standalone treatment intervention but rather an integral component of a multidisciplinary approach (MDT) for comprehensive management [17]. When performing SGB, anesthesiologists and intensive care physicians must ensure precise drug dosing while carrying out the procedure. In this case, the patient did not develop any nosocomial infections, thrombosis, or skin problems during the hospital stay, which is a testament to the collaborative efforts of the MDT. Furthermore, although sedatives,

analgesics, and muscle relaxants in doses exceeding those recommended in the guidelines [18] were used to manage the relevant symptoms, fortunately, no adverse reactions—such as the risk of drug accumulation or toxicity—were observed in this study; however, this should not be disregarded, and blood drug concentration monitoring should be considered when necessary.

In addition, nursing staff must closely monitor vital signs, with particular attention to changes in BP, HR, and other relevant parameters before and after SGB. Any abnormalities or concerning findings must be reported promptly to the intensive care physician to facilitate timely and effective interventions.

This case report demonstrates the efficacy of SGB as a therapeutic option for severe tetanus complicated by refractory sympathetic storm. However, the applicability of this therapy in early-stage disease, non-refractory cases, or diverse patient cohorts remains unclear. Robust multicenter studies are urgently required to establish a more definitive evidence base.

Conclusions

Within multidisciplinary care, SGB is a possible adjunctive rescue measure when standard treatment measures fail. However, this case report focused solely on patients with severe tetanus complicated by refractory sympathetic storm; its applicability to other patient populations remains unclear.

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Limitations

Although short-acting beta-blockers were used to control symptoms, the unopposed α -effect that can result from the use of beta-blockers alone was not considered.

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Department and Institution Where Work Was Done

Department of Emergency, Chongqing Emergency Medical Center, Chongqing, PR China.

Patient Permission/Consent Declarations

Informed written approval was acquired from the patient for publication.

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