# New Treatments for Old Problems: Stellate Ganglion Block for Treating Symptoms of Posttraumatic Stress Disorder

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**Lunchtime Learning**

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- The author has no conflicts to report.

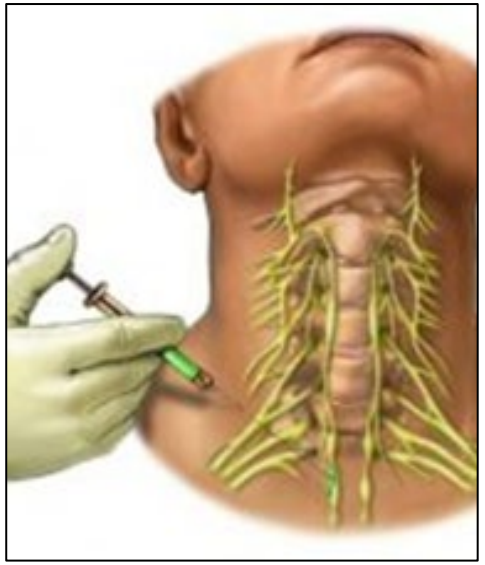
# Effective, fast-acting, and acceptable treatment options for PTSD and related mental health (MH) conditions are needed

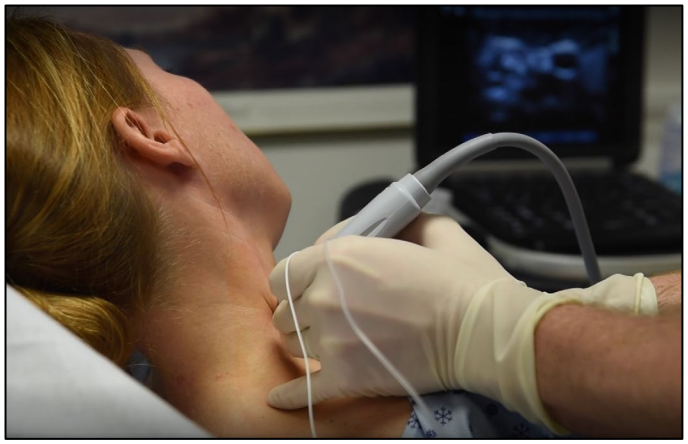
- Posttraumatic stress disorder (PTSD) affects up to 15% of active duty Service members[1] (SM) and about 7% of civilians
- First-line psychotherapies for PTSD (i.e., trauma-focused therapies) are time-intensive and associated with high dropout (up to 50%)[2]
- Pharmacotherapies for PTSD (e.g., SSRIs) can have unpleasant side effects and are less effective for combat-related PTSD[3]
- Over 80% of SM with PTSD have comorbid MH conditions such as depression (49%), adjustment disorder (37%), generalized anxiety disorder (36%), and alcohol use disorder (27%)[4]
- Untreated PTSD/MH disorders interfere with relationships, productivity, and functioning
- Treatment *acceptability* is critical to ensuring optimal outcomes

[1]Tanielian & Jaycox, 2008; [2]Lewis et al., 2020; [3]Alexander, 2012; [4]Walter et al., 2018

# Stellate Ganglion Block (SGB) might fill this gap

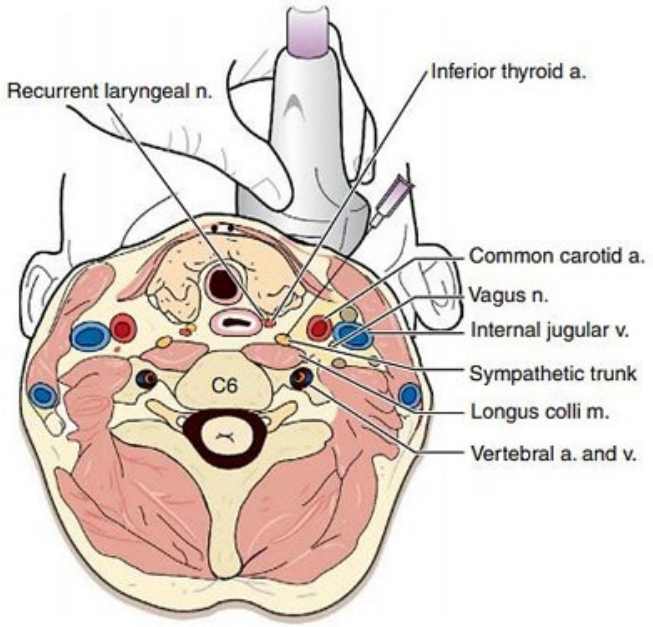
- SGB involves a minimally invasive administration of local anesthetic into the stellate ganglion area
  - SG serves as “switching station” for sympathetic nervous system; innervates side of face up into amygdala
  - Medication temporarily (6-10 hours) “blocks” the stellate ganglion, modulating sympathetic activity
  - Horner’s Syndrome (good thing)
    - Ptosis (drooping eyelid)
    - Miosis (constriction of pupil)
    - Scleral injection (red eye)





# SGB History

- SGB originally indicated for treatment of sympathetically mediated pain conditions (more than a century!)
  - Chronic Regional Pain Syndrome (formerly Reflex Sympathetic Dystrophy)
  - Nerve injury
  - Herpes zoster
- 1990- Lebovits (Case Report)
  - Multiple gunshot wounds with resulting Chronic Regional Pain Syndrome and PTSD
    - Clinically significant PTSD symptom reduction
- 2008- Lipov et al. (Case Report)
  - Immediate symptom reduction between 80 and 90%




Source: Bagherzadi.com

# SGB History (Continued)

- 2010- Mulvaney et al. (Case Series; n=2)
  - Both patients sub-threshold for PTSD diagnosis after treatment
  - One patient had repeat SGB after symptoms returned; continued relief following treatment
- 2012- Hickey et al. (Case Series; n=9)
  - All patients treatment-refractory 1 year or more
  - Single SGB- 5/9 saw clinically significant reduction of symptoms one week post-procedure
    - Symptoms returned in most within 1-2 months but at decreased severity
- 2015- Mulvaney et al. (Case Series; n=166)
  - More than 70% had clinically significant symptom reduction at 3-6 months
  - Those with more severe symptoms reported greater improvements
- 2016- Hanling et al. (RCT; n=42)
  - No significant difference between SGB and sham treatment
  - Significant methodological issues
- 2016- Summers and Nevin- Literature Review
  - "…evidence of substantial beneficial psychiatric effects…may reduce barriers to therapy, particularly among military populations."

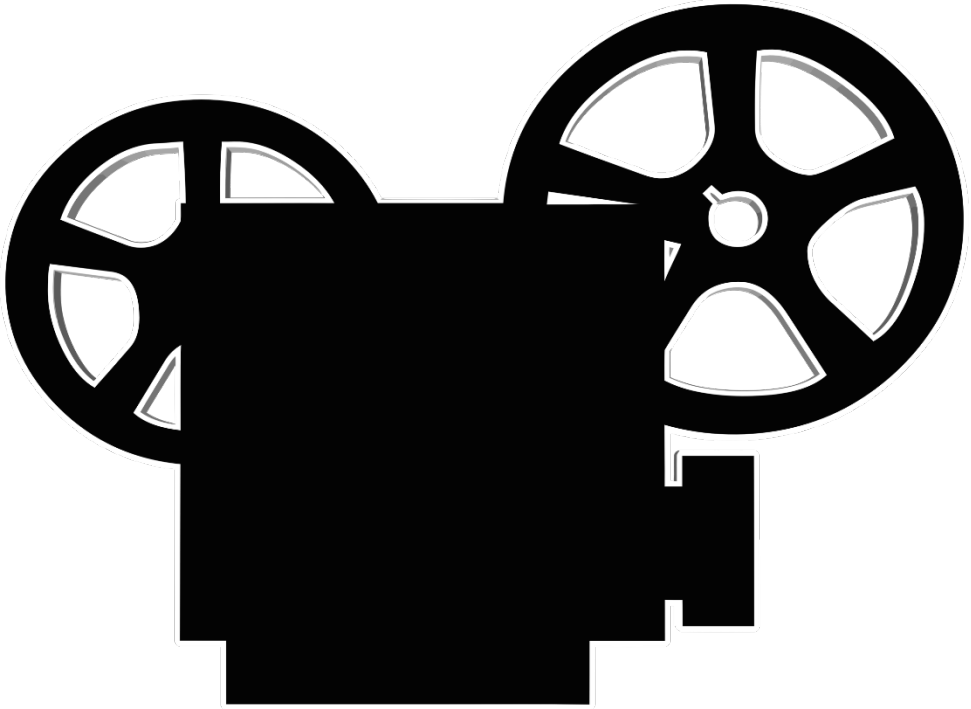
# SGB History (Continued)

- 2016- Lynch et al. (Case Series; n=32): Differential Sx response
  - First week- greatest improvement in irritability/angry outbursts, difficulty concentrating, sleep disturbance
  - 2 to 4 months- feeling distant/cut off, emotional numbing, irritability/angry outbursts, difficulty concentrating
- 2020- Mulvaney, Curtis, & Ibrahim (Case Series; n=147): C6 vs. C6 AND C4 cervical sympathetic blockade (CSB)
  - Greater improvement in CSB but not significant
- 2021- Mulvaney et al. (Retrospective Case Series; n=205 total/20 non-responders to right side SGB)
  - Of non-responders to right side, 90% responded favorably (PCL-5 mean improvement 28.3)
- 2023- Lipov & Faber (Case Series; n=4): Efficacy of CSB
  - Can't establish effectiveness or efficacy with case series
  - Clinically significant Sx reduction (mean PCL-5 from 41 to 7)

# SGB Video

(Brief view of needle insertion if you're squeamish!)

[(44) Stellate Ganglion Block procedure at WAMC - YouTube]



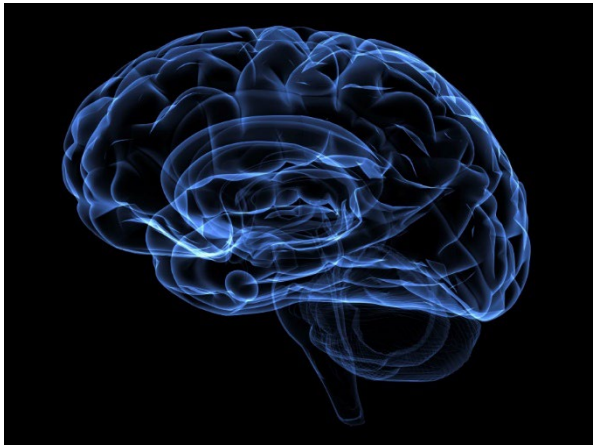
# RTI Randomized Controlled Trial: Effectiveness and Acceptability of SGB for PTSD Symptoms

- First large-scale, multi-site study of SGB for PTSD
- Study Aims
  - Evaluate whether SGB decreases PTSD symptoms
  - Evaluate whether SGB is an ***acceptable*** treatment for PTSD
- 3 Military Treatment Facilities (WAMC, TAMC, LRMC)
- Up to 240 participants total; 160 active, 80 sham
- SGB at weeks 0 and 2
- Quantitative assessments at baseline and weeks, 2, 4, 6, and 8
  - *Continued monitoring for suicidal ideation*
- CAPS-5 at baseline and 8 weeks (phone)
- Additional assessments (anxiety, depression, functioning…)
- Qualitative assessments based on enrollment
  - Focus groups, small group interviews, individual interviews
  - SMs, spouses, providers

*"RTI International to test PTSD treatment for U.S. service members…"*

# Inclusion/Exclusion Criteria

- Inclusion (we check this)
  - Active duty status with anticipated stable assignment to installation
  - Stable dosing for at least 3 months if taking psychotropic meds
  - *Offered* A-level treatment for PTSD symptoms prior to enrollment
  - PCL-C score of 32 or greater (cutpoints for PCL-5 not yet established at the time)
- Exclusion (we check this)
  - Prior SGB
  - History of bleeding disorder, glaucoma, schizophrenia, other psychotic disorder, bipolar disorder, or personality disorder
  - Allergy to anesthetics; pregnancy; current anticoagulant use; infection/mass at injection site; myocardial infarction within 6 months of procedure; hoarseness
  - Moderate/severe Traumatic Brain Injury or Substance Use Disorder
  - Suicidal Ideation during past 2 months
  - Undergoing Medical Board/Retirement (important!)
  - Any other condition deemed relevant by treating physician



Research

# JAMA Psychiatry | Original Investigation

## Effect of Stellate Ganglion Block Treatment on Posttraumatic Stress Disorder Symptoms A Randomized Clinical Trial

Kristine L. Rae Olmsted, MSPH; Michael Bartoszek, MD; Sean Mulvaney, MD; Brian McLean, MD; Ali Turabi, MD; Ryan Young, MD; Eugene Kim, MD; Russ Vandermaas-Peeler, MS; Jessica Kelley Morgan, PhD; Octav Constantinescu, MD; Shawn Kane, MD; Cuong Nguyen, MD; Shawn Hirsch, MPH; Breda Munoz, PhD; Dennis Wallace, PhD; Julie Croxford, BSN, MPH; James H. Lynch, MD; Ronald White, MD; Bradford B. Walters, MD, PhD

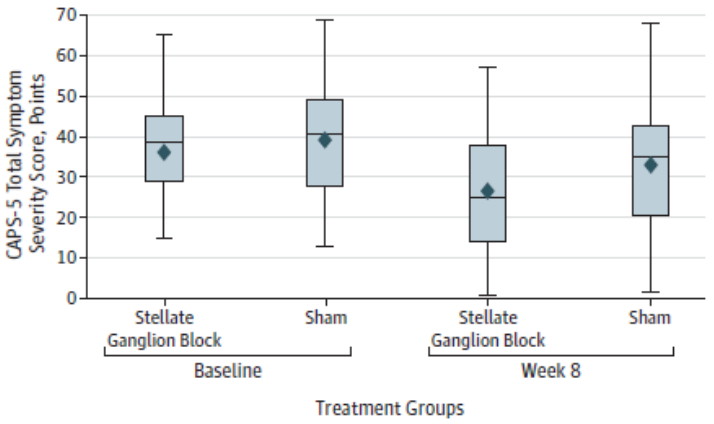
JAMA Psychiatry, 77(2), 130–138.
https://doi.org/10.1001/jamapsychiatry.2019.3474

# Findings

As reported in *JAMA Psychiatry:*[1]

- No significant differences between groups in baseline characteristics
  - Marital status
  - Rank
  - Age
  - Site
  - Concurrent therapy
  - Time since Dx
  - CAPS-5 and PCL-5 scores
- SGB superior to sham injection, with medium effect size (12.2-pt vs. 5.8-pt reduction, $d$ = 0.56, 95% CI [0.38, 0.73])

**Figure 2. Unadjusted Clinician-Administered Posttraumatic Stress Disorder Scale for *DSM-5* (CAPS-5) Total Symptom Severity Score at Baseline and Week 8 by Treatment Group**




Within each box plot, the top of the box represents the 75th percentile, the diamond represents the mean, the horizontal line within the box represents the median, and the bottom of the box represents the 25th percentile. The upper and lower ends of the whiskers correspond to the highest value and the lowest value, respectively.

[1]JAMA Psychiatry, 77(2), 130–138. https://doi.org/10.1001/jamapsychiatry.2019.3474

# Findings (Continued)

Table 2. Unadjusted Means and Effect Size for Primary and Secondary Outcomes by Treatment Groups

| Outcome Measure | Unadjusted Mean Score (SD) | | |
|---|---|---|---|
| | Sham Treatment (n = 39) | Stellate Ganglion Block (n = 74) | Effect Size[a] (SD) [95%CI] |
| **Primary Outcome** | | | |
| Clinician-Administered PTSD Scale for *DSM-5* total symptom severity scores[b] | | | |
| Baseline[c] | 39.82 (14.23) | 37.61 (11.13) | NA |
| 8-wk follow-up[d] | 33.68 (15.6) | 25.67 (14.13) | NA |
| Mean change[d,e] | −5.79 (8.19) | −12.16 (12.86) | 0.56 (0.09) [0.38-0.73] |
| **Secondary Outcomes** | | | |
| PTSD Checklist for *DSM-5*[f] | | | |
| Baseline | 43.23 (18.13) | 41.54 (14.03) | NA |
| 8-wk Follow-up | 38.11 (18.23) | 29.49 (19.29) | NA |
| Mean change | −5.16 (13.99) | −12.63 (14.34) | 0.53 (0.20) [0.14-0.91] |
| PTSD Checklist-Civilian Version[f] | | | |
| Baseline | 54.95 (15.67) | 53.30 (13.64) | NA |
| 8-wk Follow-up | 50.65 (17.04) | 42.41 (17.47) | NA |
| Mean change | −4.30 (14.17) | −11.45 (13.40) | 0.52 (0.20) [0.14-0.91] |
| Patient Health Questionnaire-9[f] | | | |
| Baseline | 12.69 (6.61) | 12.57 (6.05) | NA |
| 8-wk Follow-up | 11.76 (6.25) | 8.68 (6.02) | NA |
| Mean change | −0.92 (4.78) | −4.11 (5.55) | 0.60 (0.20) [0.21-0.99] |
| Generalized Anxiety Disorder 7-Item Scale[f] | | | |
| Baseline | 12.49 (5.50) | 12.39 (5.35) | NA |
| 8-wk Follow-up | 11.19 (6.38) | 8.11 (6.02) | NA |
| Mean change | −1.22 (4.93) | −4.42 (5.80) | 0.58 (0.20) [0.19-0.97] |
| K-6 Distress Scale[f] | | | |
| Baseline | 10.33 (6.01) | 10.08 (5.55) | NA |
| 8-wk Follow-up | 10.00 (6.25) | 7.80 (6.41) | NA |
| Mean change | −0.16 (4.59) | −2.52 (4.86) | 0.49 (0.20) [0.11-0.88] |

# Strengths and Limitations

Dings

- Sample “too clean” (limited clinical generalizability)
- Short follow-up period
- Challenges with blinding (Physicians; Horner’s syndrome)
  - Although no evidence of differential “unblinding”
    - Confidence intervals between groups re: which intervention they believed they received included 0.5)
- Inclusion of sub-threshold PTSD (although we view this as a strength)

Kudos

- Multi-site trial
- Standardization of procedures across sites
- Double blinded (participants and assessors)
- Effective randomization (illustrated statistically)

# Additional Questions

- For how long does SGB's effects last?
- How many SGBs are people getting, and on what schedule?
- Are there particular PTSD symptoms that are most impacted?- YES (in press)
- What about symptoms of other behavioral health conditions?- YES (in process)
- What do people think of SGB- would they do it again?- YES (in process)
- How is sleep impacted? (Wearables)
- How is neurocognitive function impacted?
- Can subjective data (online and in-person assessments) and objective data (wearables; models designed using large, extant datasets) be combined to identify PTSD "subtypes"?
- Enter the…

# SGB Prospective Cohort Study

**Aims:** Evaluate the therapeutic durability, optimal timing, and multi-diagnostic symptom trajectories associated with SGB for PTSD and *other non-pain conditions*

**H1:** PTSD symptoms will decrease after receiving SGB

- **H1A.** Self-reported (PCL-5) PTSD symptoms will decrease from baseline to 2-months post-SGB
- **H1B.** Clinician-rated (CAPS-5) PTSD symptoms will show sustained decrease from baseline to 6-months post-SGB

**H2:** SGB-related PTSD improvements will decay over time

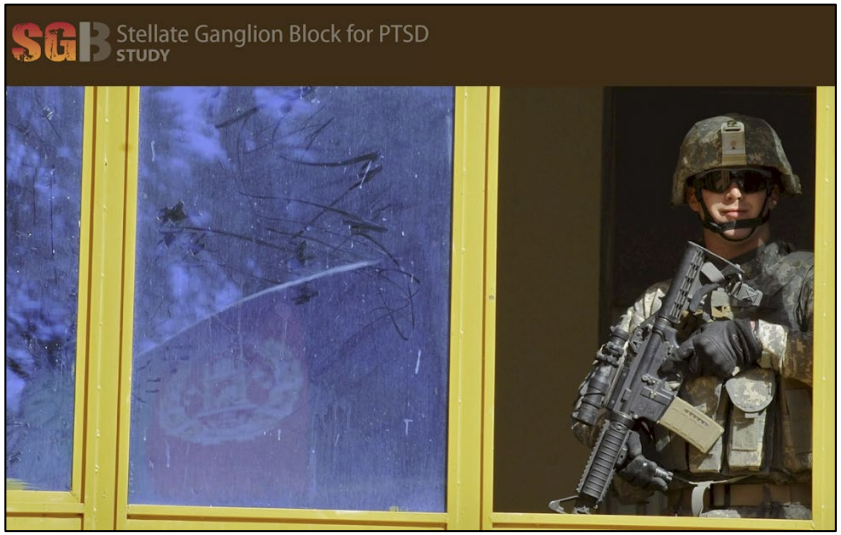
**H3:** SGB will not negatively affect neurocognitive performance

**H4:** Sleep quality will improve after SGB procedure

# SGB Prospective Cohort Study

**Participants and Procedure**

- ~300 SMs and Veterans scheduled for clinically indicated SGB to treat PTSD or *other non-pain conditions*
- Recruited from 4 MTFs
- Assessed immediately pre/post SGB and out to 12-month follow-up
  - Clinical interview, self-report surveys, and neurocognitive test




**Outcomes**

- PTSD symptoms (CAPS-5, PCL-5)
- Neurocognitive functioning (CPT 3)
- Sleep quality (PROMIS Sleep Disturbance, Garmin Fenix 6 indices)
- MH symptoms and tinnitus (PHQ-9, GAD-7, AUDIT, K6, SF12, THI)

# SGB Prospective Cohort Study

**How it's going**

Significant IRB challenges (largely due to transition to Defense Health Agency)

- BRANY
- OHRO
- Sites

207 enrolled to date (anticipated enrollment end May 2024)

- Very few enrollment issues (oh the joys of an observational study!)

Anticipated data collection end May 2025

Anticipated final analysis and reporting Fall 2025

Two out of 4 sites no longer enrolling

Assessment, sleep, and neurocognitive data merging appropriately

# So What?/Next Steps

- TONS of research taking place (currently 8 studies enrolling or not yet enrolling)
  - Combination of SGB with other modalities
  - Right and left side CSB
  - Veteran and first responder populations
- Scalability?
  - Large influx of individuals seeking SGB
  - Tons of anesthesiologist and pain docs but insufficient SGB experience
  - Marketing machines- patients and referrers beware
- Clinical Practice Guidelines
  - DoD/VA CPG panel for PTSD every 5 years; latest issued this year
  - "The Giant SGB Study"
    - RCT for long-term effectiveness
    - Clinical climate among stakeholders
      - Perceived gaps in health status (patients and providers re: areas needing clinical improvement)
      - Gaps in patient satisfaction
      - Gaps in provider satisfaction
      - Perceived organizational concerns (systemic barriers)
    - Cost Analysis

# Thank you!

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