Headache Medicine

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Gasserian ganglion balloon compression versus carbamazepine for the management of trigeminal neuralgia

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Introduction
Refractory trigeminal neuralgia (TN) causes severe, disabling paroxysmal pain. Although pharmacological escalation with carbamazepine (CBZ) is standard, prolonged drug retention despite treatment failure characterizes clinical inertia.This delayed surgical referral exposes patients to cumulative toxicity without long-term analgesic benefits, worsening functional and quality-of-life trajectories.

Objective
To systematically review how the timing of transition to Gasserian ganglion balloon compression (GGBC) impacts long-term functional recovery, recurrence-free survival, and medication burden.

Methods
A systematic review was conducted following PRISMA 2020 guidelines and registered in PROSPERO (CRD420251133911). Electronic searches were performed across PubMed, Embase, and the Cochrane Library for clinical trials and cohort studies published between 2015 and 2025 in English, Spanish,and French. Case reports, pediatric populations, and studies lacking quantitative functional outcomes were excluded. Initial screening identified 66 records, which were uploaded to the Rayyan QCRI platform for blinded, independent title and abstract selection by two reviewers. After removing 14 duplicates,45 studies were excluded during the blind screening phase for failing eligibility criteria Discrepancies were resolved by a third senior reviewer, resulting in 7 articles for final analysis. Risk of bias was independently assessed utilizing the Cochrane RoB 2 tool for randomized trials and the ROBINS-I tool for cohorts. Given the methodological heterogeneity,small sample sizes, and a pervasive lack of blinding (performance and detection bias) across the literature, a qualitative narrative synthesis approach was adopted.

Results
The 7 included studies represented a cumulative cohort of 642 patients (GGBC: n=312; CBZ: n=330; age range: 54–78 years). Synthesized data revealed that prolonged pharmacological persistence (>12 months of failed high-dose CBZ) strongly correlates with poorer long-term functional recovery and baseline sleep impairment. While GGBC achieved immediate pain remission in 82% to 91% of cases, patients subjected to earlier percutaneous transition demonstrated superior recurrence-free survival and enhanced functionality at 24 months. Conversely, persistent CBZ cohorts faced a 41% rate of severe systemic adverse events (dizziness, ataxia, cognitive slowing) and late therapeutic escape, contributing to avoidable, cumulative disability. Post-GGBC local complications (transient facial hypoesthesia in 62.1%; masseter weakness in 18.3%) resolved within a few months and did not track with long-term functional impairment.

Conclusion
Therapeutic inertia in refractory TN prolongs systemic toxicity exposure and delays durable analgesia. Shifting the clinical paradigm from using percutaneous intervention as a final rescue modality to executing an earlier, proactive strategic transition optimizes long-term functional outcomes, minimizes medication burden, and mitigates cumulative disability.

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