Journal of Case Reports and Scientific Images

E-ISSN: 2708-0064
P-ISSN: 2708-0056
IJCRS 2025; 7(2): 155-157
www.allcasereports.com
Received: 02-08-2025
Accepted: 07-09-2025

Dr. Anshul Agrawal
MBBS, DA, DNB, FIAPM, Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Dr. Dimpi Gulati
MD Fellow IAPM, Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Dr. Ashish Goyal
MD, Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Dr. Swapnil Baraskar
MD, Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Dr. Dharamvir Singh
DA, Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Dr. Abhimanyu Rana
DA, DNB, Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Dr. Piyush Agrawal
Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Dr. Sushil Jaiswal
Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Corresponding Author:
Dr. Anshul Agrawal
MBBS, DA, DNB, FIAPM, Sparsh Spine & Pain Centre, Indore, Madhya Pradesh, India

Case report: Percutaneous balloon compression of the gasserian ganglion in a case of longstanding, medically refractory trigeminal neuralgia with unusual procedural challenge

Anshul Agrawal, Dimpi Gulati, Ashish Goyal, Swapnil Baraskar, Dharamvir Singh, Abhimanyu Rana, Piyush Agrawal and Sushil Jaiswal

DOI: https://www.doi.org/10.22271/27080056.2025.v7.i2c.157

Abstract
We report the case of a 54-year-old male with a 10-year history of severe, refractory trigeminal neuralgia involving all three divisions (V1, V2, V3). Despite maximum tolerated doses of oxcarbazepine (1200 mg/day), baclofen (40 mg/day), and pregabalin (150 mg/day), his pain remained debilitating. The patient underwent Percutaneous Balloon Compression (PBC) of the Gasserian ganglion under general anaesthesia using an i-gel supraglottic airway. Intra-operatively, the foramen ovale could not be easily identified under fluoroscopy despite multiple standard approaches. After successful needle placement and completion of the procedure, postoperative evaluation revealed temporo-mandibular joint (TMJ) sub-laxation on the ipsilateral side, caused during i-gel insertion. The mandibular arch superimposition obscured the trajectory of the foramen ovale, explaining the procedural difficulty. This case emphasises the importance of airway selection and TMJ assessment during cranial base percutaneous interventions under anaesthesia, particularly when using supraglottic devices.

Keywords: Trigeminal neuralgia radio-frequency, RFA, percutaneous balloon compression, gasserian ganglion, foramen ovale cannulation

Introduction
Trigeminal neuralgia (TN) is a chronic neuropathic pain condition characterised by recurrent episodes of intense facial pain, typically affecting one or more divisions of the trigeminal nerve. It is often refractory to medical management, necessitating interventional or surgical approaches such as microvascular decompression [1], radio-frequency thermocoagulation [2], glycerol rhizotomy, gamma knife surgery, or percutaneous balloon compression (PBC) [3, 4, 5]. PBC, introduced by Mullan and Lichtor in 1983, offers a minimally invasive, effective, and durable option for patients unresponsive to medications. However, technical challenges during the procedure-especially in identifying the foramen ovale-can prolong operative time or lead to complications. We present a unique case where an undiagnosed TMJ sub-laxation secondary to i-gel insertion led to anatomical distortion and difficulty in accessing the foramen oval [6].

Case Presentation
A 54-year-old male presented with severe, electric shock-like pain over the right side of the face, involving all three divisions (V1, V2, V3) of the trigeminal nerve, for the past 10 years. The pain was paroxysmal, triggered by touch, chewing, and speaking, with no neurological deficits.

Medical History and Medications
The patient had been on multiple anti-neuralgic drugs, including:
- Oxcarbazepine 1200 mg/day
- Baclofen 40 mg/day
- Pregabalin 150 mg/day

Despite such high doses, the pain persisted (VAS 9/10), significantly impairing his quality of life and nutrition due to fear of eating and speaking.

Preoperative Evaluation
Routine investigations and an MRI brain were unremarkable. The patient was counselled for percutaneous balloon compression (PBC) under general anaesthesia. Informed consent was obtained.

Procedure: The patient was placed supine with slight neck extension. Under general anaesthesia with i-gel supraglottic airway insertion, fluoroscopic guidance was used to identify the foramen ovale for cannulation via Hartel's approach. Trigeminal balloon compression was performed as a minimally invasive surgical option.

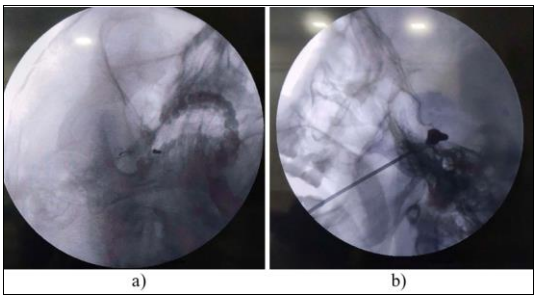

Fig 1: Image A - Showing guide needle inside the foramen oval, Image B - showing pear pear-shaped balloon inflated with Omnipaque dye for compression of the ganglion

However, multiple attempts failed to visualise the foramen ovale trajectory despite accurate needle positioning techniques and fluoroscopic angulation adjustments. Several anatomical manoeuvres-including contralateral oblique and lateral tilt-were tried before the needle successfully entered the foramen.
Following confirmation of correct placement with contrast, a No. 4 Fogarty balloon catheter was inserted and inflated with 0.7 mL of contrast-saline mixture for 90 seconds. The balloon displayed the typical pear shape, confirming correct positioning. The balloon was then deflated and the whole assembly withdrawn.

Post-Procedural Events and Findings
Upon recovery, the patient was noted to have difficulty closing his mouth. Clinical examination revealed anterior sub-laxation of the temporo-mandibular joint (TMJ) on the ipsilateral side. Immediate manual reduction was performed, with restoration of normal jaw function.
Review of the intrao-perative fluoroscopy revealed that the mandibular ramus and condylar head displacement due to TMJ sub-laxation had obscured the normal fluoroscopic appearance of the foramen ovale. This explained the unusual difficulty in cannulation encountered during the procedure.
The patient experienced expected postoperative facial numbness and mild transient masseter weakness, which resolved within weeks. Pain relief was complete (VAS 0/10) by the first postoperative day.

Outcome and Follow-Up
At 1 month, Mild numbness was noted in the right cheek, which gradually improved over several weeks.
and 6-month follow-up visits - the patient remained pain-free with no recurrence. No additional medication was required. TMJ function was normal, with no limitation of mouth opening or deviation on movement.

Discussion
Percutaneous balloon compression offers durable pain relief in medically refractory trigeminal neuralgia, with success rates exceeding 90% and low recurrence rates. The technique, however, demands precise anatomical targeting of the foramen ovale, which can be influenced by individual skull base variations or intra-operative factors.
In this case, TMJ sub-laxation caused by i-gel insertion led to anterior displacement of the mandibular condyle, obscuring the fluoroscopic view of the foramen ovale and creating misleading anatomical landmarks. This complication underscores a rarely discussed interaction between airway management and cranial base procedures.
Supraglottic devices such as i-gel, though convenient, can exert pressure on the jaw joint-especially in patients with preexisting TMJ laxity or during forceful insertion. Pre-procedural TMJ assessment and gentle airway manipulation are therefore crucial.

Conclusion & Suggestions
This case highlights
- The importance of comprehensive airway and TMJ evaluation prior to percutaneous trigeminal procedures.
- Awareness that TMJ sub-laxation during airway management can distort fluoroscopic landmarks, leading to technical challenges.
- The value of intra-operative vigilance in recognising atypical anatomical relationships during foramen ovale cannulation.

Despite the unusual complication, PBC remained a safe and highly effective intervention for this patient, offering complete and lasting pain relief.
Suggestions and Considerations with Precautions for Physicians Performing Percutaneous Procedures
Percutaneous procedures targeting the Gasserian ganglion, RF Ablation, Glycerol Rhizotomy, require stringent adherence to anatomical landmarks and imaging guidance to ensure efficacy and minimise complications.

Table 1: Procedural Precautions and Physician Guidance for Minimizing Risks in Foramen Ovale Cannulation

Precautionary Area	Consideration / Suggestion for Physicians
Anatomical Entry	Utilize fluoroscopic guidance (C-arm) in two planes (anteroposterior and lateral) to confirm accurate placement of the cannula tip within the Foramen Ovale. Incorrect placement risks injury to the internal carotid artery, cavernous sinus, or surrounding nerves.
Needle Placement Angle	The angle must be carefully measured (typically described as 2.5-3 cm lateral to the oral commissure, directed toward the ipsilateral pupil and 1 cm anterior to the tragus). Avoid overly lateral or posterior trajectories which may damage the infra-temporal fossa structures or the facial nerve.
Balloon Inflation (PBC)	The balloon should inflate into the characteristic 'pear shape', confirming its position within Meckel's cave. Non-pear inflation suggests improper placement or a breach of the dura, increasing the risk of cranial nerve injury or major hemorrhage.
Monitoring	Continuous monitoring of vital signs and a neuro-check is critical. During PBC, a brief, controlled period of hypotension is often induced to enhance the compression effect; this must be managed carefully.
Post-Procedure Care	Counsel patients extensively on expected post-procedural sensory loss (hypoesthesia or dysesthesia). Emphasize the risk of corneal anesthesia following V1 ablation, necessitating stringent eye protection to prevent neurotrophic keratitis.

Disclaimer

This information is for general knowledge and informational purposes only and does not constitute medical advice. The specific steps and outcomes of trigeminal balloon compression may vary depending on individual patient factors. Always consult with a qualified healthcare professional for diagnosis and treatment.

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How to Cite This Article
Agrawal A, Gulati D, Goyal A, Baraskar S, Singh D, Rana A, Jaiswal S *et al*. Case report: Percutaneous balloon compression of the gasserian ganglion in a case of longstanding, medically refractory trigeminal neuralgia with unusual procedural challenge. Journal of Case Reports and Scientific Images. 2025;7(2):155-157.