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Case Report

Abducens Nerve Palsy Following Percutaneous Radiofrequency Thermocoagulation of the Gasserian Ganglion

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Abstract

Objective: To describe a rare neuro-ophthalmic complication following percutaneous radiofrequency thermocoagulation of the Gasserian ganglion for trigeminal neuralgia and to highlight its diagnostic and management implications.

Methods: We report the case of a 72-year-old man with right-sided trigeminal neuralgia refractory to medical treatment who underwent repeat percutaneous radiofrequency thermocoagulation targeting the maxillary and mandibular divisions. Clinical data were obtained retrospectively from medical records. Neuro-ophthalmological assessment included best-corrected visual acuity, slit-lamp biomicroscopy, ocular motility examination, cover testing in primary position and fundus examination, with particular attention to associated trigeminal sensory involvement and potential ocular surface risk.

Results: In the weeks following the repeat procedure, the patient developed incapacitating horizontal binocular diplopia. Examination revealed a large-angle esotropia in primary position with complete limitation of right eye abduction, consistent with a complete right abducens nerve palsy. No other ocular motor cranial nerve involvement was identified. Visual acuity was preserved and anterior segment and fundus examination were unremarkable at presentation. Ipsilateral trigeminal hypoesthesia with dysesthetic features was also present, raising concern for ocular surface vulnerability. A staged ophthalmological approach was adopted. Botulinum toxin injection to the right medial rectus improved ocular alignment and provided symptomatic relief of diplopia at short-term follow-up, while definitive strabismus surgery was deferred pending further observation.

Conclusion: Abducens nerve palsy is an uncommon but functionally significant complication of Gasserian ganglion radiofrequency thermocoagulation. Early neuro-ophthalmic assessment is essential in patients who develop diplopia after this procedure and concomitant trigeminal sensory loss warrants proactive ocular surface surveillance to reduce the risk of vision-threatening corneal complications.

Keywords: Abducens Nerve Palsy; Trigeminal Neuralgia; Gasserian Ganglion; Radiofrequency Thermocoagulation; Neuro-Ophthalmology

Introduction

Trigeminal neuralgia is a chronic facial pain disorder characterized by severe paroxysmal attacks that may lead to substantial functional impairment and reduced quality of life. When pharmacological therapy is ineffective or poorly tolerated, several

interventional strategies are available, including microvascular decompression, stereotactic radiosurgery and percutaneous procedures targeting the Gasserian ganglion, as supported by evidence-based clinical guidelines [1].

Among percutaneous techniques, radiofrequency thermocoagulation of the Gasserian ganglion remains widely used because of its high initial analgesic efficacy and the ability to modulate lesion size through precise control of temperature, duration and cannula positioning [2]. Despite its favourable safety profile, this neurodestructive technique is associated with a spectrum of complications, predominantly sensory, including facial hypoesthesia, dysesthesia and impairment of the corneal reflex [3,4]. From an ophthalmological perspective, involvement of the ophthalmic division of the trigeminal nerve is particularly relevant because of the risk of corneal hypoesthesia or anesthesia, which may predispose to ocular surface disease and neurotrophic keratopathy, a potentially vision-threatening complication if not recognised and managed appropriately [4,5].

Beyond sensory complications, the neuro-ophthalmological relevance of Gasserian ganglion procedures is explained by the complex anatomy of the parasellar region. The ganglion is located within Meckel's cave, in close proximity to the cavernous sinus, which contains the internal carotid artery and the ocular motor cranial nerves [2,6]. This anatomical relationship provides a plausible substrate for ocular motor nerve palsies following percutaneous radiofrequency procedures, potentially related to direct thermal injury, secondary thermal spread, subtle cannula malpositioning, individual anatomical variation or local compressive phenomena such as post-procedural edema or microhemorrhage [2,6].

Although isolated cases of ocular motor nerve involvement after Gasserian radiofrequency procedures have been reported, including abducens nerve palsy, such complications remain exceptional and are sparsely characterized in the literature [3,6,7]. We report a case of complete abducens nerve palsy following percutaneous radiofrequency thermocoagulation of the Gasserian ganglion, highlighting its neuro-ophthalmic implications and management considerations.

Case Description and Methodology

We present a retrospective case report of a 72-year-old man with right-sided trigeminal neuralgia refractory to medical treatment who underwent percutaneous radiofrequency thermocoagulation of the Gasserian ganglion targeting the maxillary and mandibular divisions, achieving initial sustained pain relief. After recurrence of facial pain, a repeat radiofrequency procedure was performed.

In the weeks following the second intervention, the patient developed subacute-onset horizontal binocular diplopia, which interfered significantly with daily activities and he was referred for ophthalmological evaluation.

Best-corrected visual acuity was preserved in both eyes. Ocular motility examination revealed a large-angle esotropia in primary position with complete limitation of abduction of the right eye, consistent with a complete right abducens nerve palsy (Fig. 1). No involvement of other ocular motor cranial nerves was identified.

Anterior segment examination showed a clear cornea without epithelial defects at presentation and fundus examination was unremarkable. Neurological reassessment demonstrated extensive ipsilateral trigeminal hypoesthesia with dysesthetic features, raising concern for potential ocular surface vulnerability.

Given the possibility of spontaneous neurological recovery, a conservative and staged ophthalmological management strategy was adopted. Botulinum toxin was injected into the right medial rectus muscle, resulting in improvement of ocular alignment and resolution of esotropia, with symptomatic relief of diplopia at short-term follow-up. Definitive strabismus surgery was deferred pending clinical stability and further follow-up. Written informed consent was obtained from the patient for publication of this case report and accompanying images.

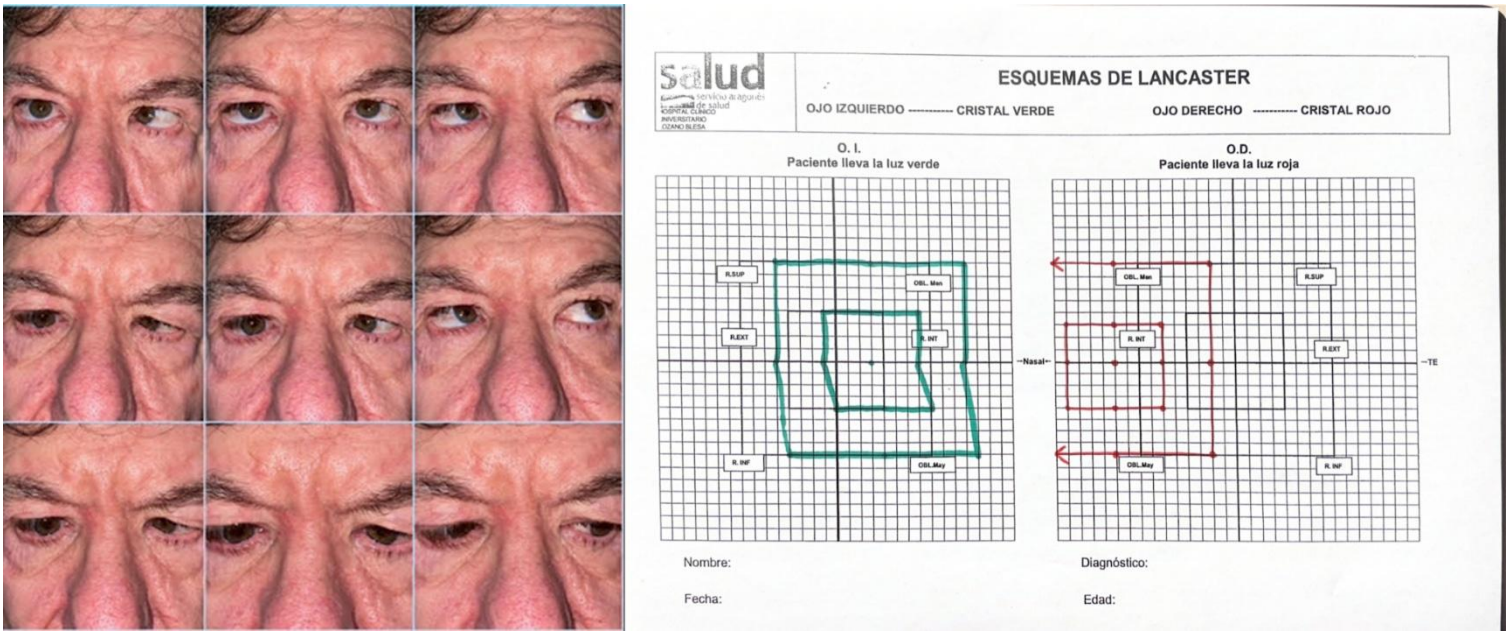

Figure 1: Ocular motility in the nine diagnostic positions of gaze and Lancaster red-green test: large-angle esotropia with limitation of right eye abduction.

Discussion

Percutaneous radiofrequency thermocoagulation of the Gasserian ganglion is an established treatment for medically refractory trigeminal neuralgia, offering high rates of initial pain relief [1,2]. However, owing to its neurodestructive nature and the anatomical complexity of the parasellar region, its application entails a spectrum of complications that, while predominantly sensory, may occasionally extend beyond the trigeminal system. Among these, ocular motor cranial nerve palsies represent a rare but clinically significant adverse event with substantial functional impact [2,3].

The occurrence of an isolated abducens nerve palsy following a Gasserian radiofrequency procedure is anatomically plausible given the close relationship between Meckel's cave and the cavernous sinus. The abducens nerve, due to its long intracranial course and medial position within the cavernous sinus, is particularly vulnerable to local pathological processes. Proposed mechanisms include direct thermal injury or secondary thermal spread, subtle malpositioning of the cannula, individual anatomical variations and local compressive phenomena such as post-procedural edema or microhemorrhages [2,3]. Small deviations in trajectory, depth or thermal dose may therefore contribute to injury of adjacent neural structures despite apparently appropriate targeting of the trigeminal divisions [2,6].

Although early series of retrogasserian radiofrequency procedures acknowledged the possibility of transient non-trigeminal cranial nerve deficits, systematic characterization of ocular motor involvement has remained limited [2]. Subsequent systematic reviews have highlighted considerable heterogeneity in technique, outcome reporting and complication definitions, suggesting that rare events such as abducens nerve palsy are likely underreported [3,7]. More recent large cohorts and meta-analyses continue to confirm that severe complications are uncommon, yet ophthalmic adverse events-including diplopia and corneal complications-persist despite technical refinements and standardization of procedural parameters [5,8].

A focused review of the available literature suggests that isolated ocular motor nerve palsies after Gasserian radiofrequency procedures are rare and only sparsely reported, with limited emphasis on their neuro-ophthalmological features and ophthalmic management implications.

From a diagnostic standpoint, the development of diplopia after a Gasserian procedure warrants careful evaluation. While temporal relationship and concordant laterality strongly suggest an iatrogenic mechanism, alternative causes such as parasellar mass lesions or cavernous sinus vascular pathology should be considered, particularly in older patients or when additional neurological signs are present [1,3]. Targeted neuroimaging of the skull base and cavernous sinus may therefore be appropriate to support causal attribution and exclude potentially serious alternative diagnoses.

The neuro-ophthalmological implications of this complication extend beyond ocular motility. Concomitant trigeminal sensory loss significantly increases the risk of ocular surface disease due to impaired corneal sensation and reduced protective reflexes. Corneal hypoesthesia and keratitis have been consistently reported following Gasserian-level procedures and vigilance for early epithelial compromise is essential [4,5]. Large contemporary series have quantified these complications and in rare cases, have even reported permanent visual impairment secondary to corneal involvement, underscoring the clinical relevance of systematic ocular surface surveillance. Proactive ocular surface protection may prevent progression to neurotrophic keratopathy, a rare but vision-threatening complication [5].

Management of abducens nerve palsy in this context should follow a staged and conservative approach. Initial symptomatic measures are often sufficient to control diplopia. Botulinum toxin injection to the ipsilateral medial rectus muscle represents a useful bridging strategy to improve alignment in primary position and mitigate secondary muscle contracture while neurological recovery is monitored [9]. From an ophthalmological perspective, this approach allows functional improvement while avoiding premature surgical intervention during the potential recovery phase. Definitive strabismus surgery should be reserved for stable deviations persisting after an adequate observation period, as partial or complete spontaneous recovery may occur [9].

Conclusion

Abducens nerve palsy is an uncommon but clinically relevant complication of percutaneous radiofrequency thermocoagulation of the Gasserian ganglion. This case highlights that new-onset diplopia after ganglion-level procedures for trigeminal neuralgia warrants prompt neuro-ophthalmic evaluation to confirm the ocular motor deficit, exclude alternative causes and guide management. In addition, associated trigeminal sensory loss should alert clinicians to the risk of ocular surface compromise and the need for proactive corneal surveillance. Early recognition and a staged ophthalmological approach, including botulinum toxin injection when appropriate, may improve symptoms while allowing time for possible spontaneous recovery.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore was exempt.

Informed Consent Statement

Informed consent was obtained from all participants included in the study.

Authors' Contributions

All authors contributed equally to this paper.

References

1. Gronseth G, Cruccu G, Alksne J. Practice parameter: The diagnostic evaluation and treatment of trigeminal neuralgia (an evidence-based review). Neurology. 2008;71(15):1183-90.
2. Onofrio BM. Radiofrequency percutaneous Gasserian ganglion lesions: Results in 140 patients with trigeminal pain. J Neurosurg. 1975;42(2):132-9.

3. López BC, Hamlyn PJ, Zakrzewska JM. Systematic review of ablative neurosurgical techniques for the treatment of trigeminal neuralgia. Neurosurgery. 2004;54(4):973-83.
4. Kanpolat Y, Savas A, Bekar A, Berk C. Percutaneous controlled radiofrequency trigeminal rhizotomy for the treatment of trigeminal neuralgia: Long-term results in 1600 patients. Neurosurgery. 2001;48(3):524-32.
5. Zhao W, Yang L, Deng A, Chen Z, He L. Long-term outcomes and predictors of percutaneous radiofrequency thermocoagulation of Gasserian ganglion for maxillary trigeminal neuralgia: A retrospective analysis of 1070 patients with minimum 2-year follow-up. Ann Med. 2022;54(1):2420-30.
6. Smulders PSH, Terheggen MAMB, Geurts JW, van Dongen RTM. Percutaneous radiofrequency treatment of the Gasserian ganglion for trigeminal neuralgia complicated by trochlear nerve palsy: A case report. Reg Anesth Pain Med. 2021;46(11):1002-5.
7. Chatterjee N, Chatterjee S, Roy C. Abducens nerve palsy after percutaneous radiofrequency ablation of Gasserian ganglion. J Neurosurg Anesthesiol. 2014;26(1):89-90.
8. Wu Z, Zhao Y, Liu J, Fan Y, Yang Y. Comparison of the safety and efficacy of radiofrequency thermocoagulation with percutaneous balloon compression for treating trigeminal neuralgia: A systematic review and meta-analysis. Front Neurol. 2023;14:1178335.
9. Scott AB. Botulinum toxin injection into extraocular muscles as an alternative to strabismus surgery. J Pediatr Ophthalmol Strabismus. 1980;17(1):21-5.

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