

Local Papaverine as a Novel Adjunct for Delayed Vision Loss After Tuberculum Sellae Meningioma Resection



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CONTEXT

Tuberculum sellae meningiomas (TSMs) are benign intracranial neoplasms that frequently impinge upon the optic apparatus due to their anatomical proximity, often resulting in progressive visual deficits and necessitating surgical intervention. A rare yet significant postoperative complication is delayed-onset vision loss following an initially uncomplicated immediate postoperative period.¹

The exact mechanism of this complication remains unknown, but ischemic injury is hypothesized to be the primary pathological process. Arterial vasospasm, venous congestion, and reperfusion injury are also thought to be major contributors to this condition.²⁻⁴ Despite its clinical significance, current therapeutic options are limited, with no proven efficacy.

OBJECTIVE

To investigate an innovative therapeutic approach for managing delayed postoperative vision loss following TSM resection.

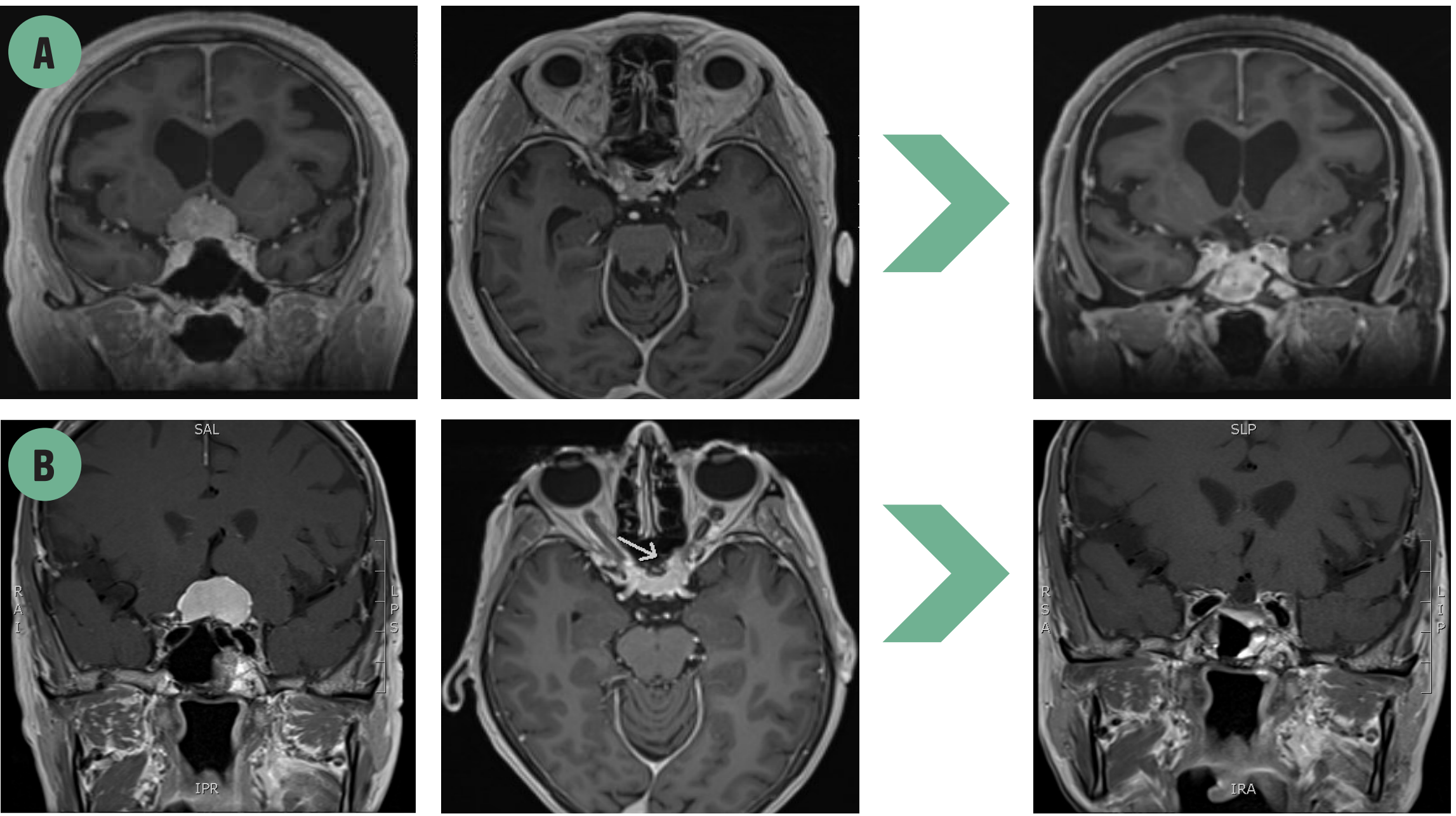
METHODS

The authors present a technical note on the use of local papaverine in two cases of delayed vision loss following endoscopic endonasal TSM removal.

RESULTS

Patients experienced delayed vision loss at 12 and 16 hours postoperatively. Both underwent surgical field re-exploration on their first postoperative day (POD) and received intraoperative local papaverine irrigation on the optic nerve. Following its administration, both patients demonstrated immediate postoperative improvement. Patient management also included hyperdynamic therapy, chemical angioplasty with verapamil, and corticosteroid taper. Patient management and outcomes are summarized in Table 1. Pre and postoperative MRIs are presented in Figure 1.

Figure 1. Preoperative and postoperative imaging findings



A Preoperative magnetic resonance imaging (MRI) of Patient 1 demonstrating a TSM in T1 gadolinium-enhanced coronal and axial planes. A follow-up MRI performed 4 months after surgery confirmed complete resection.

B Preoperative T1 gadolinium-enhanced head MRI of Patient 2 revealing a TSM with extension towards the left optic canal. Complete resection was also confirmed at 4-month follow-up.

CONCLUSION

Our study suggests that vasospasm is a significant contributor to delayed vision loss following TSM resection. We observed improved visual function in both patients after local antispasmodic papaverine therapy as part of a multimodal treatment approach. This novel treatment option aligns with the current understanding of the complication and introduces a potentially effective therapeutic alternative. Further research is warranted to validate these findings and optimize management strategies for this challenging complication.

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Table 1. Comparison of delayed postoperative vision loss management and clinical outcome

Patients	PO vision loss	PO imaging at surgical site	Treatment modalities	Clinical outcomes
73yo F	@16 hours: Total right-sided loss of light perception	Head CT POD 1 Pneumocephalus Hyperdense areas 3,3 x 2,4cm, venous bleed vs hemostatic material Head CT POD 2 Decreased pneumocephalus, hemorrhagic and inflammatory components. Absence of acute intracranial event Head MRI POD 2 Complete tumor excision Right parasellar component partly congestive, also ischemic over almost 2cm with a slight hemorrhagic phenomenon towards the prechiasmatic and orbital regions right > left, and associated edema	POD 1 Surgical revision and papaverine injection POD 2 PM-3 PM Hyperdynamic therapy initiated for 24 hours POD 3 AM Chemical angioplasty with verapamil POD 0-15 Corticosteroid taper	POD 2 AM : Right hemianopsia, recovery of visual acuity PM: Complete right vision loss recurrence pre-hyperdynamic therapy POD 3 PM Transient slight right-sided light perception PO 2 weeks-5months Absence of right light perception Left temporal visual field deficit and altered color perception
		Head CT POD 1 Pneumocephalus ≤13 mm Expected non compressive microhemorrhages Head & Neck CTA PO2 Mild vasospasm of left A2 anterior cerebral arteries MRI PO 4 months Complete tumor resection	POD 1 Surgical revision Papaverine injection POD 2 Chemical angioplasty Intra-arterial verapamil POD 1-5 Hyperdynamic therapy POD 0-10 Corticosteroid taper	POD 2 Improved visual acuity PO 4 months Complete recovery Visual fields improved compared to preoperative evaluation

Yo F: year-old female; A: angiography; PO: postoperative; POD: postoperative day; CT: computed tomography; MRI: magnetic resonance imaging.
N.B. All ophthalmological findings reported were corroborated by ophthalmologists.

DISCUSSION

The optic nerve is supplied by an end-arterial system composed of watershed areas rendering it vulnerable to any flow disturbances.¹ During TSM resection, a thickened arachnoid layer is usually left on the optic nerve to prevent its devascularization.

Vasospasm is a form of transient ischemia, and suspected major contributor to delayed vision loss.²⁻⁴ Indeed, both patients had at least transient visual improvement after local papaverine irrigation, an antispasmodic agent, and intra-arterial verapamil, a calcium channel blocker. Patient 1's fluctuating vision loss suitably correlates with repeated short-lived ischemic events. Of note, vasospasm is often not possible to detect due to the small caliber of blood vessels on the optic apparatus, as it may have been the case for both patients.

In addition, the inflammatory cascade, venous congestion, and surgical site edema likely contributed to the delayed presentation of vision loss. To that effect, papaverine is also thought to play a protective role against reperfusion injury.⁵

Proposed therapeutic modalities:

1. Initiation of empiric hyperdynamic therapy at symptom onset ^{2,4}
2. Routine perioperative use of high-dose corticosteroids ⁴
3. Repeat imaging to rule-out any intracranial complication to be addressed
4. Intraoperative local papaverine irrigation to optic nerve and its vicinity with revision surgery
5. Early intra-arterial verapamil injection ^{2,4}

LIMITATIONS

The retrospective nature of this study subjected authors to selection bias. As the authors relied on patient charts, there was fortunately no missing information. This mitigated the effect of any recall bias.