Shattering the Rock: Technique of Bilateral Optic Nerve Mobilization and Drilling Heavily Calcified Craniopharyngiomas for Its Excision

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■ BACKGROUND: **Resection of heavily calcified craniopharyngioma is quite challenging. The stretched optic nerves, perforators, and stalk are likely to be jeopardized further during attempts to break the calcified chunks, especially through narrow corridors. We describe a surgical technique to mobilize bilateral optic nerves and drill the calcified chunk to crumple it.**

■ METHODS: **This technique was used in 6 patients with heavily calcified craniopharyngiomas (2 recurrent) who had presented with progressive visual loss. Frontotemporal craniotomy was used in 5 patients, and fronto-temporo-orbito-zygomatic craniotomy was used in 1 patient with a large retrosellar component. The Sylvian fissure was widely split. The bilateral optic canal was deroofed, and the falciform ligament was cut to mobilize both optic nerves. The calcified tumor could be dissected and mobilized into the widened corridor where the tumor was drilled. Multiple holes were drilled in the calcified chunk to shatter it to small pieces. These pieces were then dissected from perforators and stalk, while protecting them.**

■ RESULTS: **Symptoms improved in all of the patients. Gross total excision could be achieved in 3 patients, near total excision in 2 patients (both recurrent), and subtotal excision in 1 patient (because of extensive skull base involvement). All of the patients had transient diabetes insipidus. Two patients who had preoperative hypopituitarism required long-term postoperative hormonal replacement. There were no approach-related complications.**

■ CONCLUSIONS: **Mobilizing bilateral optic nerves improves the exposure and allows dissection of arachnoid from calcified craniopharyngiomas. Its drilling through widened corridors helps to shatter it. Using the technique, the neurovascular structures can possibly be better preserved while achieving maximal resection.**

INTRODUCTION

Total excision of craniopharyngioma is the preferred treatment because it is associated with a good long-term outcome.[1-3] If total excision is not feasible, decompression of the optic nerves and neural structures is the next best choice.[4] Regardless of the approach, radical excision or even adequate decompression is difficult in cases of heavily calcified or rock-like craniopharyngiomas. Recurrent or previously operated craniopharyngiomas also pose a surgical challenge because of the adhesions and increased calcification.[5,6] The adjacent neurovascular structures may be injured directly or indirectly because of traction while trying to retrieve it. A technique of ipsilateral optic nerve mobilization for stalk preservation has been recently described.[7] However, unilateral optic nerve mobilization may not be enough for such heavily calcified craniopharyngiomas.

We describe a technique to achieve maximal safe resection in such heavily calcified lesions. The first step is to mobilize bilateral optic nerves. This is followed by drilling multiple holes in large calcified rock-like chunks through the widened corridor. The next step is to shatter the rock and its piecemeal removal. Finally, the tumor is dissected from the stalk while preserving it. Our experience with the technique in 5 patients has been discussed along with the merits and possible disadvantages.

METHODS

Formal written and informed consent was taken from all patients before the surgery was undertaken.

Key words
- Calcified craniopharyngioma
- Drilling tumor
- Optic nerve mobilization
- Outcome

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Table 1. Details of Patients with Craniopharyngioma Operated by the Technique Described

Age (years)/Sex	Presentation	Hormonal Workup	Visual Field/ Acuity	Site and Extent	Approach and Corridor	Extent of Resection	Follow-up and Status	Hormonal Profile	Visual Status at Follow-up
42/F	Headache, pseudobulbar palsy, right third nerve paresis, and visual loss	Normal	Left homonymous hemianopia (V/A — 6/9 bilateral)	Suprasellar and retrosellar	Right FTOZ, right extradrual optic canal deroofing, carotico-optic space transylvian, intradural petrosectomy	Gross total, transient hemiparesis, improved in 3 days	18 months, improvement in all symptoms	Transient DI immediate postop, normal at follow up	Hemianopia improved, V/A—same 6/9
11/F	Stunted growth and progressive visual loss	Hypocortisolic	Bitemporal hemianopia (V/A — 6/18 right eye and 6/24 left eye)	Suprasellar	Right frontotemporal transylvian, carotico-optic space	Gross total	12 months, symptoms improved; though height same; attained menarche	Transient DI and hypocortisolic and hypothyroid, improved partly in 6 weeks; now only on cortisol	Visual symptoms, including hemianopia improved (V/A — 6/12 right eye and 6/9 left eye)
18/M	Progressive visual loss and bitemporal headache	Normal	Bitemporal hemianopia (V/A— PL plus right eye and 6/18 left eye)	Suprasellar with erosion of sphenoid bone	Right frontotemporal transylvian, carotico-optic space	Subtotal; the portion eroding the sphenoid could not be removed	9 months, symptoms improved; radiology showed progressive destruction of base; radiotherapy	Transient DI	Partial improvement in vision (V/A — hand movements right eye, 6/9 left eye); field defects improved partially
8/M	Operated 2 years ago for headache and visual loss; postsurgery improvement in headache, but added visual deficits though acuity improved; stunted growth	Normal	Right homonymous hemianopia (V/A — 6/9 right eye and 6/6 left eye)	Suprasellar with large	Right frontotemporal, transylvian carotico-optic and lamina terminalis	Near total excision, portion adhered to vessels left	6 months	Transient DI, needed cortisol for 6 weeks	Improvement in visual fields and symptoms
20/M	Visual loss right eye over 1 year with headache	Normal	Right eye PL-ve, left eye 6/9 with temporal field defect	Suprasellar more on right side	Right frontotemporal, transylvian, carotico-optic	Gross total excision; postop improvement in right eye and transient worsening in left eye	5 months	Normal	Improvement in vision; V/A right eye — 6/18, left eye 6/9, temporal field defect
21/M	Operated 4 year ago for headache and visual loss; postsurgery marginal improvement for 1 year; presented with progressive visual loss and headache, 2 years	DI, on cortisol and thyroid replacement	Bitemporal heminaopia (V/A — 6/36 right eye and 6/24 left eye)	Suprasellar with calcified portion inferiorly (residual that increased in size)	Right frontotemporal transylvian, carotico-optic space and lamina terminalis; calcified portion hindered the view of other portion	Near total; small portion adhered to ICA and branches were left	2 months	Same; on cortisol and thyroxine replacement and desmopressin for DI	Improvement in V/A right eye — 6/12, left eye 6/18); left temporal field defect present

F, female; V/A, visual acuity; FTOZ, fronto-temporo-orbito-zygomatic; DI, diabetes insipidus, postop, postoperative; M, male; PL, perception of light; ICA, internal carotid artery.

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