Occipital Interhemispheric Transtentorial Approach to the Cerebellomesencephalic Fissure and Superomedial Cerebellum: A Clinical Series

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Introduction

The occipital interhemispheric transtentorial (OITT) approach provides direct access to the pineal region, posterior third ventricle, quadrigeminal cistern, and dorsal midbrain, yet contemporary case series remain limited. We present our institutional experience to evaluate its safety, effectiveness, and skull-base role in managing complex posterior incisural lesions.

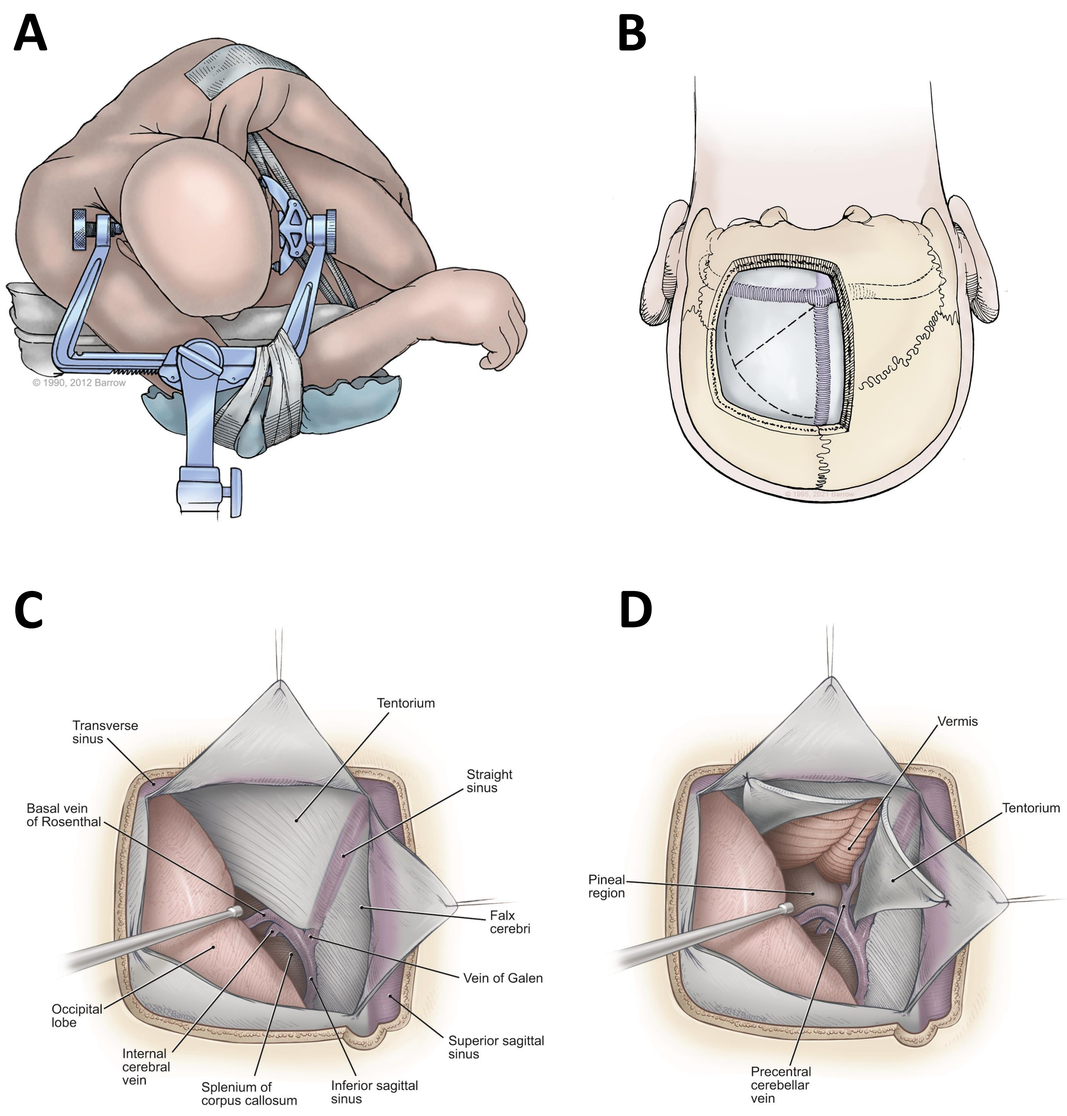

Figure 1. OITT positioning and exposure sequence. A. Three-quarter prone (park bench) positioning with operative side down and Mayfield rotation. **B.** Torcular occipital craniotomy with dural flap based on the superior sagittal and transverse sinuses. **C.** Posterior interhemispheric exposure, cisternal cerebrospinal fluid release, and identification of the straight sinus, vein of Galen, and tentorium. **D.** Tentorial incision parallel to the straight sinus entering the posterior incisural space and corridor to the pineal region.

Methods and Materials

- Retrospective case series of 9 consecutive patients treated with OITT between 2021-2024 by a single surgeon at one institution
- Pathology: 2 arteriovenous malformations (AVM), 4 cerebral cavernous malformations (CCM), 3 tumors: meningioma, solitary metastatic osteosarcoma, pineal parenchymal tumor of intermediate differentiation (PPTID)
- Indications: lesions involving the pineal region, posterior third ventricle, quadrigeminal cistern, or dorsal midbrain on preoperative MRI and/or angiography
- Primary outcomes: extent of resection, postoperative length of stay (LOS), and intraoperative complications
- Technique pearls: lateral/park-bench positioning; wide posterior interhemispheric dissection; cerebrospinal fluid (CSF) release via callosal and quadrigeminal cisterns; tentorial incision parallel to the straight sinus to enter the posterior incisural space

Results

- Demographics: median age 53 years (range 19-69); 5 male, 4 female
- Lesion size (mean): AVM 1.15 cm, CCM 1.30 cm, tumor 3.07 cm
- AVMs: both Spetzler-Martin (SM) grade III
- Extent of resection: gross total resection in 6/9 (67%); 3 small residual lesions (1 AVM, 1 CCM, 1 PPTID)
- Adjuvant therapy: residual AVM underwent Gamma Knife radiosurgery; residual CCM and PPTID did not require reoperation
- Safety/disposition: no intraoperative complications; median postoperative LOS 15 days (range 2-78)

Case No.	Age (yrs), Sex	Presenting Symptoms	Path Type	Side	Size (cm)	Grade/Class	Feeding Arteries	Draining Vein(s)	DVA Present	Structure Involved	Preop Embo	EBL (mL)
1	53, F	Nonspecific	AVM	Lt	1.4	SM III	SCA, AICA	TSSJ, SS	-	Sup. Cer Ped, 4th Vent	No	500
2	59, M	N/A	AVM	Lt	0.9	SM III	PCA	SS	-	Pos. Thal	No	800
3	22, F	Rt facial numbness, dizziness	CCM	Lt	0.7	-	-	-	Yes	Low Quad Mid	-	500
4	19, M	Dizziness, tingling, Lt arm/facial numbness	CCM	Rt	2	-	-	-	Yes	Low Quad Mid	-	500
5	59, M	HA, Lt facial numbness	CCM	Rt	1.2	-	-	-	No	Low Quad Mid	-	500
6	43, M	Weakness, slurred speech, ICH	CCM	Lt	Multiple	-	-	-	No	PMJ	-	500
7	69, F	Nausea, dizziness, forgetfulness	Tumor	ML	3.9	Meningioma	-	-	-	FTJ	-	500
8	27, F	Dizziness, HA	Tumor	ML	1.2	Osteo Mets	-	-	-	Cer Verm	-	500
9	59, M	Imbalance, diplopia, blurry vision	Tumor	ML	4.1	PPTID	-	-	-	Pineal Region	-	500

AVM = Arteriovenous Malformation; SM = Spetzler-Martin; EBL = Estimated Blood Loss; Cer = Cerebellar; Ped = Peduncle; Vent = Ventricle; SCA = Superior Cerebellar Artery; AICA = Anterior Inferior Cerebellar Artery; TSSJ = Transverse-Sigmoid Sinus Junction; SS = Straight Sinus; PCA = Posterior Cerebral Artery; Thal = Thalamus; CCM = Cerebral Cavernous Malformation; DVA = Developmental Venous Anomaly; Quad = Quadrigeminal; Mid = Midbrain; PMJ = Pontomesencephalic Junction; HA = Headache; Cer Verm = Cerebellar Vermis; FTJ = Falceotentorial Junction; ML = Midline; Osteo = Osteosarcoma; PPTID = Pineal Parenchymal Tumor of Intermediate Differentiation

Table 1. Characteristics of patients who underwent the OITT approach

Illustrative Cases

Case 1. Vermian AVM (SM III)

53-year-old female with 3 weeks of occipital pressure headache, vertigo, imbalance, nausea, and left-sided sensory symptoms. Angiography showed a left vermian AVM, SM III, supplied by the superior cerebellar artery (SCA) with anterior inferior cerebellar artery (AICA) contribution and superficial plus deep venous drainage. OITT via torcular craniotomy with cisternal CSF release, tentorial incision, and limited vermian lobule resection enabled circumdissection and en bloc removal. No intraoperative complications. Postoperative angiography showed no residual. Transient encephalopathy and mild right weakness resolved. Discharged on postoperative day (POD) 15.

Case 5. Midbrain CCM

59-year-old male with low-grade B-cell lymphoma in remission presented with intermittent headaches and left facial numbness. MRI showed a 1.2x1.0 cm CCM in the right quadrigeminal midbrain with T1 hyperintense blood products and a hemosiderin rim, partially exophytic into the quadrigeminal cistern. OITT via right torcular craniotomy with cisternal release and tentorial incision parallel to the straight sinus. Dissection beneath trochlear nerve, vertical entry below the inferior colliculus, piecemeal removal. No intraoperative complications. Postoperative MRI showed no residual. Uncomplicated post-surgical course; discharged POD 2 without new deficits.

Discussion

- OITT offers direct, gravity-assisted exposure to the posterior incisural space and dorsal midline with cisternal CSF release minimizing fixed retraction
- Indications in this series included AVM, CCM, and select tumors when a posterior midline trajectory provided optimal visualization
- Series outcomes demonstrate high rates of complete or near-complete removal with favorable postoperative disposition

Conclusions

OITT affords effective exposure for lesions of the posterior incisural space and dorsal midline. In this series, gross total resection was achieved in most patients, with no intraoperative complications and acceptable postoperative LOS. Modern navigation and intraoperative imaging support safe application and may broaden indications for OITT.

Contact

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References

1. Chi JH, Lawton MT. Posterior interhemispheric approach: surgical technique, application to vascular lesions, and benefits of gravity retraction. Neurosurgery. 2006;59(1 Suppl 1):ONS41-ONS49. doi:10.1227/01.NEU.0000219880.66309.85
2. Moshel YA, Parker EC, Kelly PJ. Occipital transtentorial approach to the precentral cerebellar fissure and posterior incisural space. Neurosurgery. 2009;65(3):554-564. doi:10.1227/01.NEU.0000350898.68212.AB
3. McLaughlin N, Martin NA. The occipital interhemispheric transtentorial approach for superior vermian, superomedian cerebellar, and tectal arteriovenous malformations: advantages, limitations, and alternatives. World Neurosurg. 2014;82(3-4):409-416. doi:10.1016/j.wneu.2013.07.075
4. Matsushima K, Yagmurlu K, Kohno M, Rhoton AL Jr. Anatomy and approaches along the cerebellar-brainstem fissures. J Neurosurg. 2016;124(1):248-263. doi:10.3171/2015.2.JNS142707
5. Matsuo S, Baydin S, Güngör A, et al. Prevention of postoperative visual field defect after the occipital transtentorial approach: anatomical study. J Neurosurg. 2018;129(1):188-197. doi:10.3171/2017.4.JNS162805
6. Alexander AY, Leonel LCPC, Agosti E, Celda MP, Lanzino G. The precuneal interhemispheric, trans-tentorial corridor to the pineal region and brainstem, surgical anatomy, and case illustration. Acta Neurochir (Wien). 2022;164(4):1095-1103. doi:10.1007/s00701-022-05167-0
7. Poppen JL. The right occipital approach to a pinealoma. J Neurosurg. 1966;25(6):706-710. doi:10.3171/jns.1966.25.6.0706