Multicompartment intracranial epidermoids - Surgical approaches and role of endoscope

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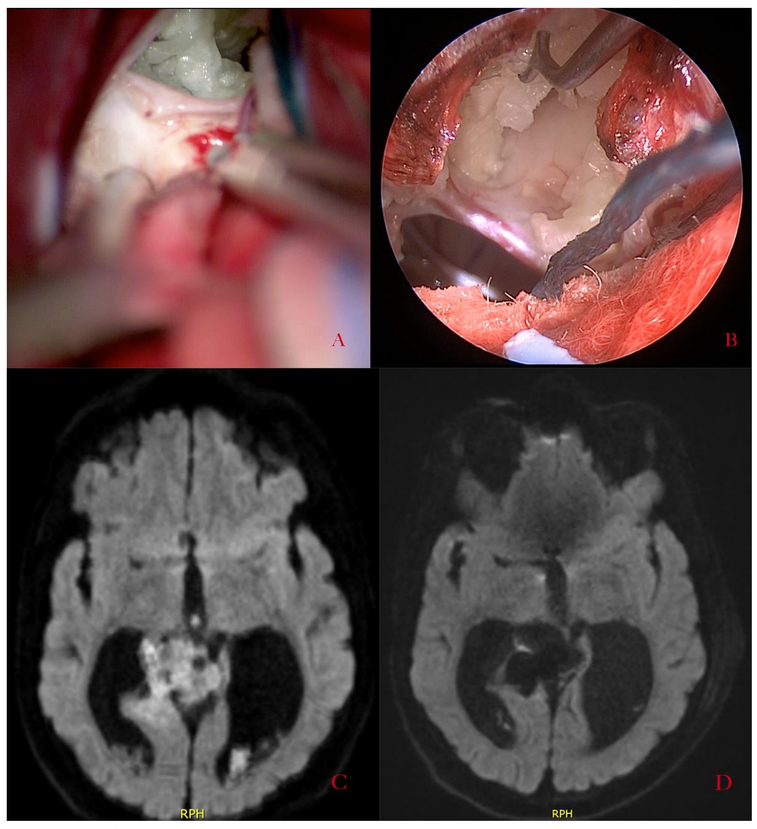

Figure 1. Quadrigeminal IEC. A. Microscope image, supracerebellar approach, demonstrating tentorium with supratentorial component of epidermoid in background. B. 45-degree angled endoscope image following ligation of tentorial edge, showing resection of supratentorial aspect of tumor. Ventricle visible in bottom left. C. Pre-operative axial DWI MRI. D. Post-operative axial DWI MRI.

Introduction

Intracranial epidermoid cysts (IEC) are rare benign tumors. Surgery remains the primary treatment modality but maximizing resection while maintaining function can be challenging due to their intimate relationship with neurovascular structures. The multicompartment nature of some IECs adds another layer of complexity to resection. Endoscopes have revolutionized neurosurgical management of complex tumors both with endoscopic endonasal and endoscopic-assisted transcranial approaches. Here, we review complex multicompartment IECs and discuss single-corridor surgical management strategies facilitated by use of the endoscope.

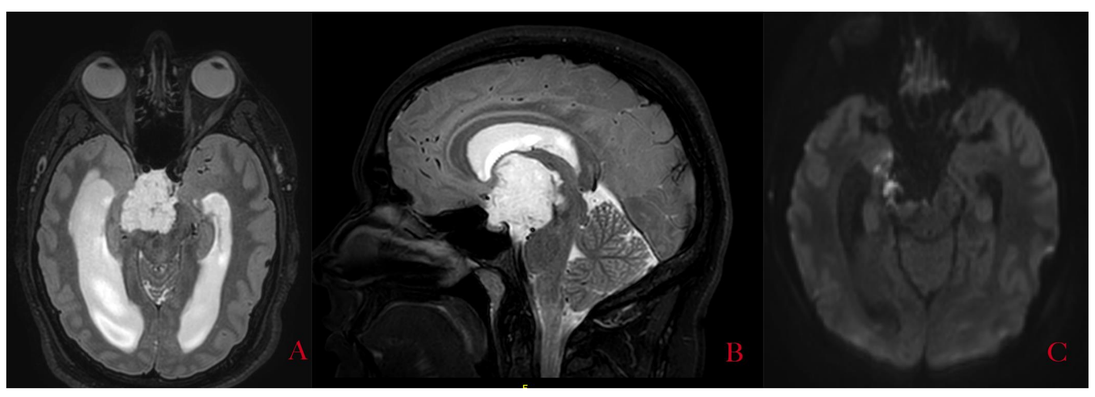

Figure 2. A. Axial T2 MRI demonstrating IEC. B. sagittal section showing mass extending posterior to dorsum sella. C. Post-operative axial DWI MRI with small residual component.

Methods and Materials

Cases performed in last eighteen months—since completion of fellowship of the senior author—were reviewed. A total of 4 cases of IEC with multicompartment extension were identified. Video recordings of surgery were obtained from the operative microscope (Zeiss Pentero), as well as Storz Image 1S 4U system 4K endoscope. Informed consent for publication of operative images was obtained in all cases.

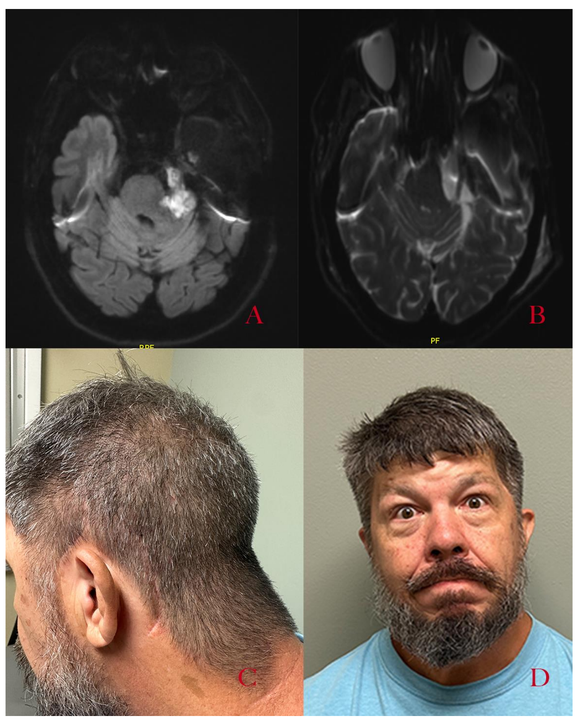

Figure 3. A. Preoperative axial DWI MRI demonstrating left CP angle IEC. B. Post-operative DWI MRI demonstrating resection of lesion. C. Post-operative photograph of retrosigmoid incision. D. Post-operative photograph of patient demonstrating appropriate functioning of facial nerve.

Results

Case 1 (Fig 1) involved a large quadrigeminal IEC with extension rostral and caudal to the tentorium and lateral ventricles in a 32yr old male. Patient presented with hydrocephalus and seizures. An EVD was placed. A supracerebellar transtentorial approach was performed to remove the infratentorial, posterior fossa portion of the tumor, followed by use of 0- and 45-degree endoscopes to resect the supratentorial component via a transtentorial approach (Fig 1, A and B). Initially the patient was weaned off the EVD, however he required a VPS in a delayed fashion. Gross total resection was achieved, and no neurological complications were noted.

Case 2 (Fig 2) presented with hydrocephalus and involved a large suprasellar IEC with extension into interpeduncular and prepontine cisterns in a 24yr old male. Pre-operative external ventricular drain (EVD) was placed. An endoscopic endonasal approach (EEA) was adopted to remove the suprasellar portion of the tumor. Further, a pituitary transposition was performed along with removal of posterior clinoids, dorsum sella and upper clivus to remove the retroclival portion of the tumor. A small residual adherent to the thalamus was left in place. A ventriculoperitoneal shunt (VPS) was required to address the hydrocephalus. Patient had blurred vision in the right eye which improved by 3 months post-op.

Case 3 involved a large IEC in cerebellopontine angle (CPA) which extension to middle cranial fossa (MCF) through the tentorial incisura in a 55-year-old male. A retrosigmoid approach (RSA) was performed to remove the cerebellopontine angle (CPA) component. Further, the tentorium was cut to perform a trans-tentorial approach (TTA). Using 0 and 45-degree endoscopes, supratentorial MCF portion of the tumor was removed. A small adherent tumor was left at the origin of lower cranial nerves. Patient was discharged home POD3 without any neurological deficits.

Case 4 (Figure 4) is a 32-year-old male who presented with gait imbalance, found to have large right cerebellopontine angle mass concerning for epidermoid (Fig 3A). Keyhole retrosigmoid craniotomy was performed, and tumor was found to be closely associated with lower cranial nerves (Fig 4B). Endoscope was brought in following procedure, demonstrated, CN V, VI, VII and VIII were identified, as well as small fragments of residual tumor, which were removed (Fig 4C). Finally, CN IX, X, and XI were identified as they passed into jugular foramen and were confirmed to be uninjured (Fig 4D). Gross total resection was achieved. Patient was discharged on POD1 with no deficits.

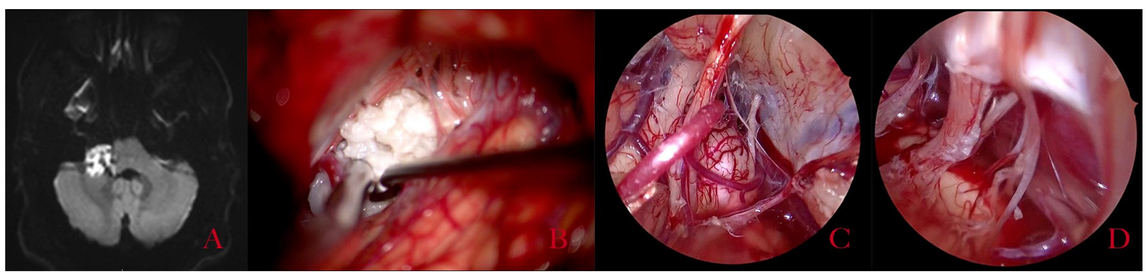

Figure 4. A. Pre-operative image demonstrating right CPA mass, concerning for epidermoid. B. Intra-op microscope image of retrosigmoid approach, demonstrating epidermoid and its association with lower cranial nerves adjacent. C. Intra-op endoscope image following resection of mass, demonstrating CN V, VI, VII and VIII. D. Endoscope image demonstrating IX, X, and XI passing into jugular foramen.

Figure 5. Photograph of patient from case 4 at post-operative follow-up, with right retrosigmoid incision.

Conclusions

We have demonstrated that complex multicompartment IECs can be successfully removed using a single surgical corridor, either through endonasal or endoscope-assisted transcranial approaches. The endoscope is a vital tool in accessing these deep-seated tumors, and it can allow for smaller surgical corridors and faster recovery. Familiarity with surgical anatomy and comfort using angled endoscopes is critical.

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