Case Report
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Navigating the Orbit: Endoscopic Transnasal Transorbital Approach to Orbital Cavernous Hemangiomas

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Abstract:

Introduction:

Orbital cavernous hemangiomas are common benign orbital tumors often presenting with slowly progressive proptosis, visual disturbances, or diplopia. Although histologically the lesion is benign in nature, its features, such as a progressive increase in tumor size, result in optic nerve compression necessitating surgical removal. Traditional external approaches such as lateral orbitotomy or transcranial surgery are the most commonly employed approaches, but they are associated with higher morbidity, significant tissue disruption and visible scarring. Evolution of Endoscopic Skull Base Surgical Techniques has helped surgeons in designing a cosmetically favourable minimally invasive route.

Case Report:

Here we report a case of a 69-year-old male diagnosed with a right orbital cavernous hemangioma who underwent endoscopic transnasal transorbital approach and excision of lesion under neuronavigation guidance.

Conclusion:

This case report highlights the growing role of endoscopic transnasal approaches in the management of orbital lesions by providing direct access to medial and infero-medial orbital compartments.

Keywords: Navigation, Endoscopic, Transnasal, Transorbital, Orbital lesions, Cavernous Hemangioma

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Introduction

Cavernous hemangioma which is also referred to as orbital cavernous malformation is one of the most common benign orbital lesions in adults, constituting 5 to 7% of all orbital lesions (1). These lesions usually present as unilateral well-circumscribed solitary round or oval masses. In most cases these lesions are seen occupying the intra-conal compartment medial to the optic nerve and lateral to the medial rectus muscle in the middle third of the orbit (2). The hallmark feature associated with this lesion is painless progressive proptosis which may or may not be accompanied by globe displacement (3).

Other characteristic features with which the patient presents include: diplopia, blurring of vision, gaze evoked amaurosis. However, lesions which are localised deep within the orbital apex may cause little to no proptosis instead, they are associated with progressive visual decline due to compression of the optic nerve.

One of the most crucial factors while determining the surgical approach to orbital cavernous hemangioma is the lesion's location (4). Conventionally entry into the orbital compartment is mainly achieved through open surgical procedures such as anterior orbitotomy, lateral orbitotomy or craniotomy. The choice of incision in these open approaches is tailored according to the localization of the lesion which may include pterional, frontoorbito-zygomatic approach or Kronlein orbitotomy (5-7).

In recent years, endoscopic approaches namely the endonasal endoscopic approach (EEA) and the endoscopic transorbital approach (ETA) have been increasingly acknowledged in surgical practice and in literature as well-recognised options for orbital surgery (7-9). The mainstay feature of these surgical approaches is that these minimally-invasive techniques are effective and safe alternative options for approaching orbital lesions (7).

In this journal, we report the case of a 69-year-old male diagnosed with an orbital lesion who underwent excision of lesion via endoscopic transnasal transorbital approach considering the location of the lesion and patient's cosmetic concerns thereby highlighting the increasing utility of this approach in managing orbital lesions. Our experience further reinforces the feasibility, safety, and cosmetic superiority of this approach, thereby underlining its importance in the modern era of minimally-invasive orbital and skull base surgery.

Case Report

A 69-year-old patient presented with complaints of blurring of vision in the right eye associated with intermittent episodes of diplopia. General examination of the patient revealed proptosis of right eye with no restriction of eye movements. Patient was subjected to radiological examination using MRI orbit which revealed a well-defined, ovoid-shaped right intra-orbital lesion measuring 1.4×1.1× 1.3 cm, situated in an intra-conal location, medial to the optic nerve. The lesion indents the optic nerve causing its lateral displacement (Figure 1).

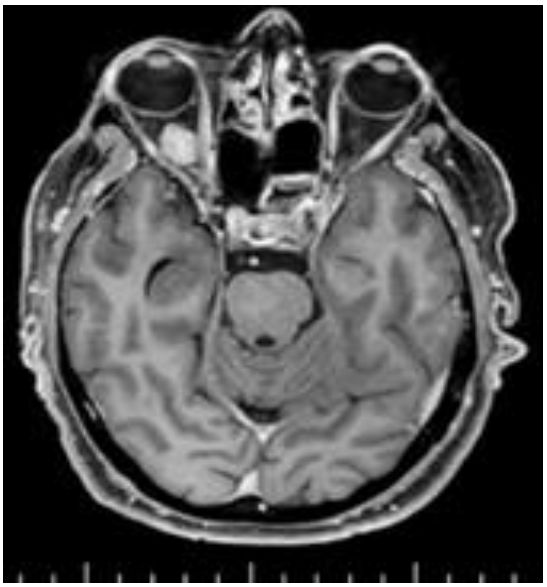

Fig 1: MRI of the patient showing well defined lesion in the intra-conal compartment lateral to and indenting on the optic nerve causing its lateral displacement

The lesion appears isointense on T1 and hyperintense on T2 compared to extraocular muscles.

Given the location of the lesion in the intra-conal medial compartment of the orbit and also considering the cosmetic concerns of the patient, decision was made to take the patient up for an endoscopic transnasal transorbital approach and excision of lesion under neuronavigation guidance. Surgical technique (Figure 2,3,4,5)

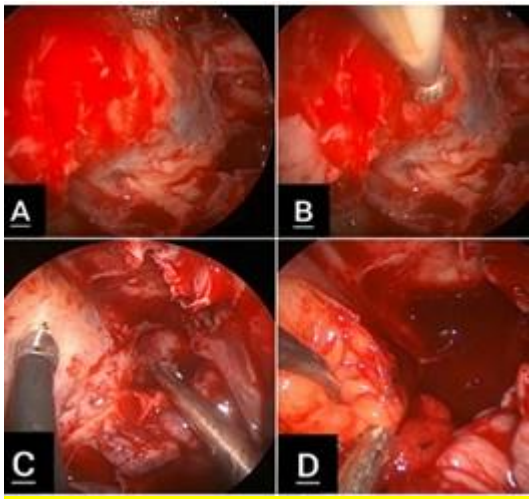

Fig 2: Surgical Technique (A) Exposure of Lamina papyracea (B) Removal of lamina papyracea by drilling (C) Coblator Assisted placement of incision (D) Exposure of Periorbital fat

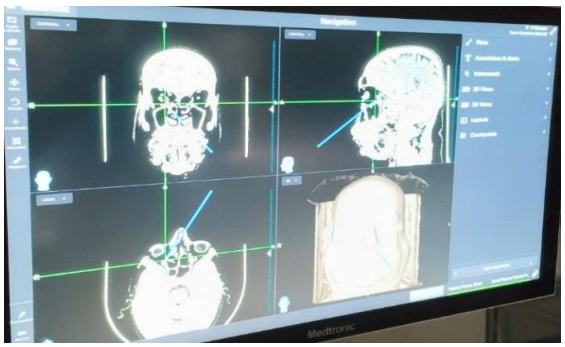

Fig 3: Neuronavigation Guidance

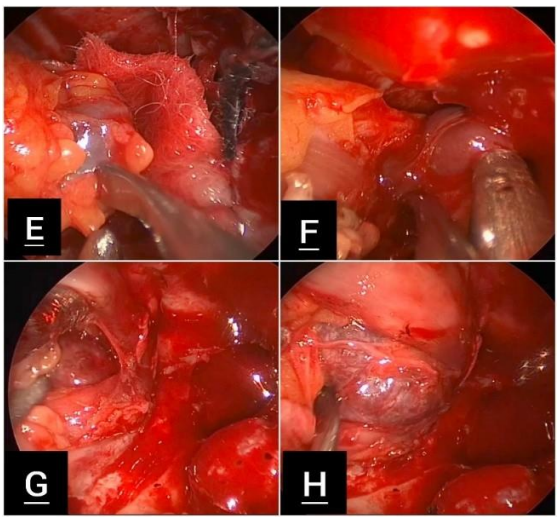

Fig 4: Surgical exposure (E) Dissection of periorbital fat revealing an extra-conal lesion (F) Dissection and removal of extra-conal lesion (G) Creation of infero-medial periorbital window (blue arrow indicates medial rectus muscle and white arrow indicates inferior oblique muscle) (H) Identification of intra-conal tumor

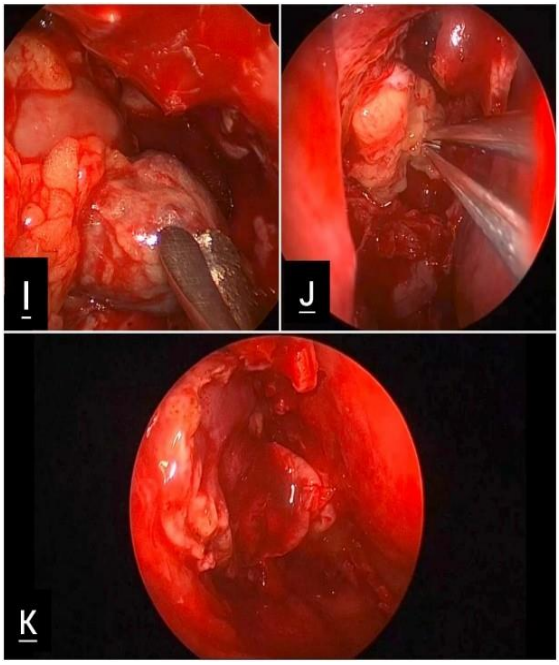

Fig 5: Tumor Exposure (I) Dissection of the intra-conal tumor (J) Reconstruction using fat (K) Placement of Nasoseptal flap

Surgery was conducted with the patient under general anesthesia. The procedure began with resection of the middle turbinate which was subsequently followed by identification and debridement of uncinate process.

Middle meatal antrostomy was done which was followed by debrider-assisted ethmoidectomy and widening of sphenoid ostium. Hadad flap was raised from right side and placed into the nasopharynx until the procedure was completed. Reverse Hadad flap was elevated from left side and was sutured in place after posterior septectomy.

Lamina papyracea was identified and completely exposed from maxillary line to optic canal. Neuronavigation was used for accuracy and lamina papyracea was drilled to completely expose the periorbita. Under neuronavigation guidance, an incision was placed over medial side of the periorbita in proximity of the lesion. Careful dissection of the orbital fat was performed with the assistance of saline- soaked neuropatties to expose an extra-conal hemangiomatous lesion. Gentle, sharp dissection was performed to excise this lesion and was sent for histopathology. As this lesion was not in accordance with the radiological evidence of an intra-conal lesion, neuronavigation was used for accuracy and a hemangiomatous lesion was identified lateral to

the medial rectus muscle in the intra-conal compartment medial to the optic nerve. Dissection was further continued to expose the medial rectus and inferior oblique muscles and an infero-medial periorbital window was created. Medial rectus muscle was carefully retracted upwards which resulted in visualisation of an intra-conal tumor located lateral to the medial rectus muscle and indenting on the optic nerve causing its lateral displacement.

Gentle exploration into the intra-conal compartment resulted in complete exposure of the lesion which was dissected out carefully with special attention paid to the protection of nearby vital structures, especially the optic nerve.

This lesion was completely excised (Figure 6) and sent for histopathological examination. Orbital fat and muscles were carefully pushed back into the orbit and were reinforced with fat harvested from thigh followed by the placement of right nasoseptal flap, gelfoam and nasastent.

Fig 6: Specimen

Merocel packs were inserted. Perioperative antibiotics were administered. Immediate post-operative period was uneventful and post-operative imaging studies confirmed total tumor excision.

Pack removal was done on post-operative day 3 and patient was discharged on post-operative day 5 and was called for follow up after 1 week – he reported no further episodes of blurring of vision or diplopia thereby indicating that there was complete resolution of his symptoms with excellent cosmetic outcome (Figure 7).

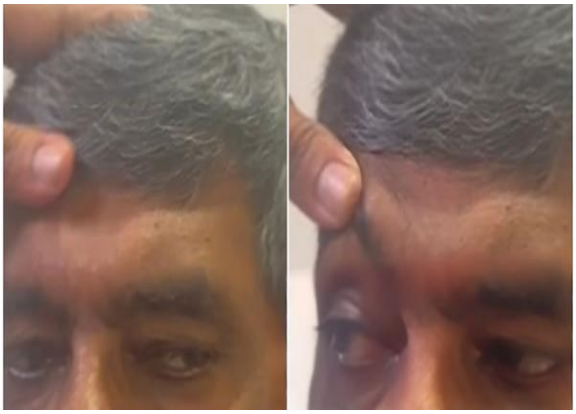

Fig 7: Post-operative follow-up period

Discussion

Most hemangiomas which are located in the intra-conal compartment are histopathologically benign in nature and are slow growing, and these patients are usually asymptomatic but in certain cases these patients may present with significant visual compromise due to their close anatomical relationship to the optic nerve. Progressive optic neuropathy and visual deficits can occur from compressive effects due to tumor growth thereby often necessitating surgical removal (10). Endoscopic transnasal orbital surgery has emerged as an effective alternative to traditional external approaches for benign lesions in the medial or infero-medial compartments of orbit without superolateral extension (11). The first successful use of this technique was demonstrated by Stamm and Nogueira, who reported complete recovery of visual symptoms following the removal of orbital apex cavernous hemangioma via endoscopic trans nasal approach (12).

Later, McKinney et al. reviewed the combined institutional experience across the University of North Carolina and the University of Pittsburgh regarding the endoscopic endonasal removal intra-conal tumors in six patients (11). Cavernous hemangiomas are ideal lesions that are favourable for endoscopic transnasal excision due to their encapsulated structure and firm consistency thereby enabling safe extracapsular dissection with very minimal risk of rupture (13). Surgical exposure requires careful delineation and removal of the medial orbital wall with adequate hemostasis. The

inferior and medial orbital walls should be carefully exposed until the entire orbit can be visualized from the maxillary line to the optic canal (13). While removing lamina papyracea to permit full exposure of the periorbita, it is important to dissect beneath the ethmoidal vessels so as to minimise the risk of retrobulbar hemorrhage (13). For intra-conal lesions, after the removal of lamina papyracea a window is created in the infero-medial periorbita which allows the identification of both inferior rectus and medial rectus muscles. Medial rectus muscle serves as an ideal anatomical landmark for medial orbit (13,14). In case of extra-conal lesions, the tumor can be visualised directly and can be safely excised (13).

Avoidance of crossing the optic nerve is the fundamental rule of endoscopic transnasal approach thereby indicating that orbital tumors with supero-lateral extension are absolute contraindications for this approach and in such cases traditional approaches such as lateral or superior orbitotomy are suitable for removal of such lesions (13). Excision of extra-conal tumors is more straightforward and easier as they can be exposed by placing an incision over the orbital fascia followed by the gentle displacement of orbital fat without much manipulation of intraocular muscles (15). This approach is well-suited for intra-conal or extra-conal tumors which are located medial to the optic nerve. Although in certain cases complete resection of tumor cannot be achieved easily but even in such cases this approach offers the benefit of vision preserving or vision improvement (15). One of the main challenges encountered during the dissection of tumor is manipulation of intraocular muscles and orbital fat (15).

In our case, saline soaked neuro-patties were used for adequate exposure of the tumor, for easier dissection of the lesion along with its capsule and to push back the medial rectus muscle and orbital fat into the orbit. This technique not only has the advantage of avoidance of medial rectus muscle damage but also helps in achieving excellent hemostasis throughout the procedure. Post-operative period in our case was uneventful and post-operative imaging confirmed complete removal of the lesion without any complications except for transiently restricted action of the medial rectus muscle; however, this restriction completely resolved within 1 week. However, this restriction of movement was completely resolved during his first post-operative visit after 1 week.

Endoscopic approaches, when performed by highly specialized and trained surgeons guarantees and enable precise surgery with reduced manipulation in addition to offering magnified visualization of the operative field, even though constrained by their inherent two-dimensional visualisation. However, integration of advanced technologies such as intra-operative imaging, neuronavigation, use of advanced instrumentation further contributes to the reduction of intra-operative morbidity by providing rapid and accurate identification of lesion, minimizing the invasiveness of this surgical approach, reducing manipulation of orbital anatomy (7).

Conclusion

This case highlights the growing role of endoscopic transnasal approaches in the management of orbital lesions thereby providing direct access to medial and infero-medial orbital compartments with excellent visualization while minimizing the surgical morbidity while avoiding external scars. This approach also acts as a gateway for gaining access to complex pathologies that are associated with intracranial extension or extension into the pterygopalatine fossa or infratemporal fossa (16). Our experience with this case throws light on the safety and feasibility of this approach while offering exceptional cosmetic results thereby showcasing its value in the modern era of minimally-invasive orbital and skull base surgery.

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