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ORBITAL TUMORS – AN INDIAN ARMED FORCES TERTIARY CARE CENTRE EXPERIENCE

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ABSTRACT The neurosurgeon has a great deal to offer in the therapy of orbital tumors. Dr. Dandy's supposition that all orbital tumors could be approached by the intracranial route is certainly correct, but technical advances have made the medial and lateral approaches to the orbit more useful for most tumors and cause less morbidity which are confined to the orbit. For those which involve the posterior orbit and canal and have intracranial extensions, the intracranial approach is excellent.

The location of the pathology within the orbit, relative to the optic nerve, should dictate the choice of approach. This is the key guiding principle for orbital approaches.

In our institution for the period of three years from 2015 – 2018 various approaches were used in which the orbit was divided into four quadrants and orbital apex. The zones were allocated depending on the location of the tumor.

KEYWORDS : Orbit, orbital tumors

INTRODUCTION

The neurosurgeon has a great deal to offer in the therapy of orbital tumors. Dr. Dandy's supposition that all orbital tumors could be approached by the intracranial route is certainly correct, but technical advances have made the medial and lateral approaches to the orbit more useful for most tumors and cause less morbidity which are confined to the orbit. For those which involve the posterior orbit and canal and have intracranial extensions, the intracranial approach is excellent.[1]

Most orbital tumors like optic nerve glioma, nerve sheath meningioma are benign, so if a tumor is small and does not cause symptoms, it may be observed without treatment. If, however, the tumor causes disfiguring exophthalmos or causes visual symptoms, surgical removal is the best treatment option. For benign tumors, surgery usually will provide a cure. For rare malignant tumors with proven histopathology diagnosis, surgery may be followed by radiation and chemotherapy.

The orbit is a cone-shaped cavity with a quadrangular base and an apex formed by the optic canal and the superior orbital fissure. The optic canal contains the optic nerve and ophthalmic artery; the superior orbital fissure is the gateway for the Oculomotor nerve, Ophthalmic nerve, superior ophthalmic vein, and the sympathetic fibres from the cavernous sinus.

Pathologies within the orbit can be classified as intraconal or extraconal based on their relationship with the extraocular muscle cone. Intraconal lesions tend to present with early vision loss, impairment of ocular motility, and axial proptosis. In contrast, extraconal lesions tend to cause proptosis as an early manifestation and vision loss as a late one. Intracanalicular tumors (within the optic canal) are a subgroup of intraconal lesions that cause early vision loss.[2] Excision of orbital lesions can often be challenging, requiring the combined expertise of more than one speciality including ophthalmologists, neurosurgeons, and otolaryngologists.

MATERIAL & METHODS :

This retrospective study was carried out at a tertiary care apex armed forces hospital in India. An analysis of 15 cases of Orbital tumors, operated upon at the neurosurgical department of Army Hospital (Research & Referral) over 3 years, from 2015 to 2018, was performed. Preoperative imaging was carried out in each case, to plan for the various approach corridors, optimal for each case. The rationale for choosing an approach was analysed & discussed in each case.

OBSERVATION & RESULTS

The 15 patients who underwent treatment of orbital pathologies at our institution over a period of 3 years from Oct 2015 to Oct 2018 were reviewed. Patients symptoms and signs at presentation, and histologic diagnosis were recorded. The location of the lesion was defined as intraconal (within the extraocular muscle cone), extraconal, or intracanalicular (within the optic canal). The type of approach was classified as frontotemporal craniotomy/orbitotomy with or without zygomatic osteotomy, lateral orbitotomy, anterior medial micro-orbitotomy. The majority of the tumors were removed from the medial and lateral orbital approach. The medial transconjunctival approach provides access to the anterior orbit from 1 to 6 o'clock. The lateral micro-orbitotomy gives access to the orbit from 8 to 10 o'clock. The frontotemporal craniotomy with orbital osteotomy accesses the orbit from 9 to 1 o'clock; addition of a zygomatic osteotomy to this extends the access from 6 to 8 o'clock.The clinical outcome was recorded (Table 1)

Table 1

S No	Age	Symptoms	Location	Procedure	Diagnosis	Clinical outcome
1	M/41	Blurring of vision	Intraconal Zn-05	FT Craniotomy+ Orbitomy	Cavernous Hemangioma	Vision improved
2	M/42	Pain/ Proptosis	Intraconal Zn-03	Medial micro orbitotomy	Foreign body -Metallic Splinter	Foreign body removed. Pain resolved , no Sequelae
3	F/37	Blurring vision	Intraconal Zn-04	Medial micro orbitotomy	Angioleiomyoma	Vision Improved
4	F/58	Pain photophobia	Intraconal Zn-04	Medial micro orbitotomy	Pleomorphic adenoma – Lacrimal gland	Pain resolved. Photophobia remains

5	M/58	Blurring of vision	Intraconal Zn-03	Medial micro orbitotomy	Angioleiomyoma	Vision improved
6	F/23	Proptosis	Extraconal Zn-02	Lateral micro orbitotomy	Cavernous hemangioma (Fig 1)	Proptosis improved
7	F/31	Progressive vision loss	Intraconal Zn-05	FT Craniotomy + orbitotomy	Optic nerve meningioma	No further deterioration of the vision
8	M/42	Pain , photophobia	Intraconal Zn-03	Medial micro orbitotomy	Cavernous Hemangioma	Pain resolved. Photophobia remains
9	F/43	Diplopia	Extraconal Zn-01	Lateral micro orbitotomy	Angioleiomyoma	Diplopia resolved
10	M/15	Proptosis /Diplopia	Intraconal Zn-03	Medial micro orbitotomy	Cavernous Hemangioma	Proptosis improved. Diplopia resolved
11	F/57	Optic neuropathy / increase lacrimation /pseudoptosis	Extraconal Zn-01	Lateral micro orbitotomy	Pleomorphic adenoma – Lacrimal gland	Improvement in Optic neuropathy
12	M/53	Proptosis	Intraconal Zn-03	Medial micro orbitotomy	Foreign body	Proptosis improved, FB removed
13	M/23	Proptosis/progressive vision loss	IntraconalZn-05	Left osteomyoplastic craniotomy – orbital roof approach	Optic nerve sheath meningioma	Proptosis improved No further detioration in the vision
14	F/06	Proptosis	Intraconal Zn-03	Medial orbitotomy	Dermoid (Fig2)	Proptosis improved
15	M/54	Proptosis	Extraconal Zn-01	Lateral orbitotomy	Lacrimal gland tumor (Fig3)	Proptosis improved

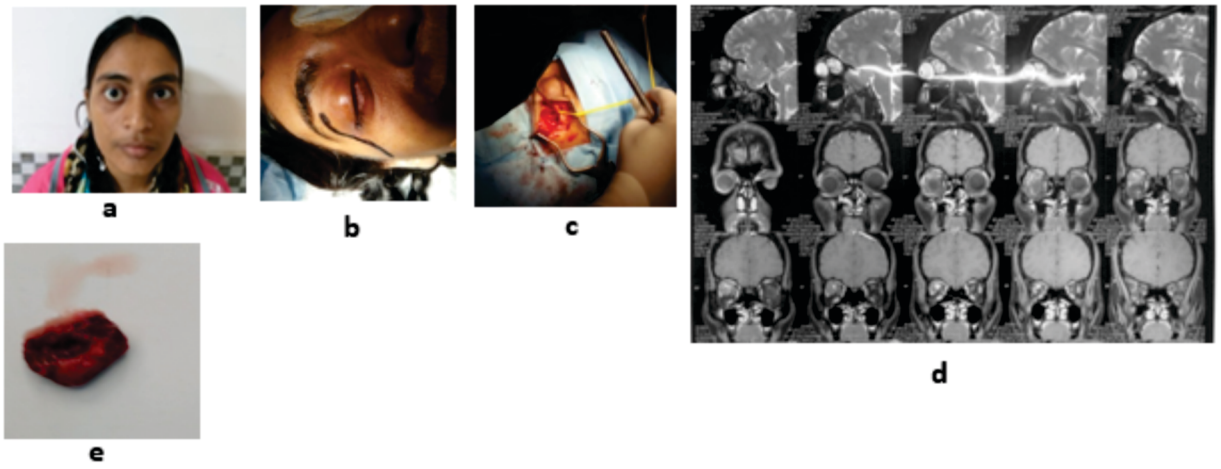


Fig 1 - Intra conal Cavernoma excised through lateral Orbitotomy. (a) Preop picture of patient with proptosis, (b) Intraop picture of the marking of skin incision, (c) intra op picture of the exposure, (d) preop MRI, (e) picture of the specimen after total excision.

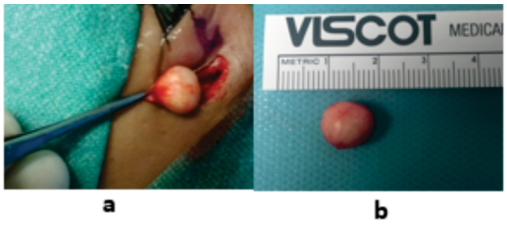


Fig 2- Intra conalDermoid excised through lateral Orbitotomy. (a) intra op picture of the exposure and the specimen (b) picture of the specimen after total excision

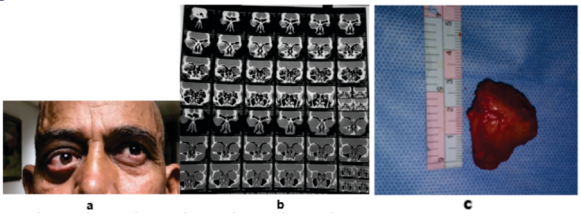


Fig 3 - Adenocarcinoma Lacrimal Gland excised through lateral Orbitotomy. (a) Pre-op picture of patient with proptosis, (b) pre-op MRI, (c) picture of the specimen after total excision

DISCUSSION

Tumors that involve the orbit can be classified into two major groups: primary tumors of the orbit and tumors with other sites of origin that extend into the orbit. The most frequent primary orbital tumors in adults include lymphoid tumors, cavernous hemangiomas, and meningiomas, whereas dermoid cysts, capillary hemangiomas, and rhabdomyosarcoma predominate in children. The most frequent initial symptom of an orbital mass is proptosis, which occurs in 44% of patients[3]. Change in visual acuity is often a late finding or indicates a tumor that is close to the orbital apex or infiltration of the optic nerve.

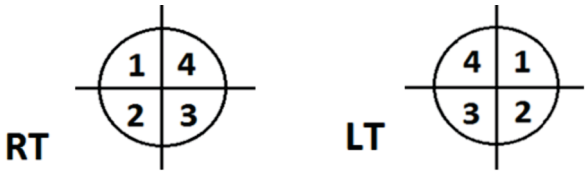
Orbital tumors can also be divided into three categories based on their location within the orbit: (1) intraconal (within the extraocular muscle cone), (2) extraconal, and (3) intracanalicular (within the optic canal), with differing features based on these locations. Intraconal tumors tend to cause early vision loss and impairment of ocular motility, as well as axial proptosis. These effects result from direct pressure on the optic nerve and impingement on extraocular muscles. Extraconal tumors cause proptosis as an early manifestation. Visual impairment occurs late as a result of tumor involvement of the optic nerve or the individual muscles and deformity of the globe itself. Finally, intracanalicular tumors cause early vision loss, papilledema, and the appearance of optociliary shunt vessels on the surface of the optic discs. These tumors cause minimal or no proptosis.[4]

Orbital tumors are a relatively rare and challenging group of tumors. The treatment options have expanded and evolved significantly. The degree of resection is guided by tumor type and the presence of pre-existing vision loss or cranial nerve compromise. Many tumors cannot be resected completely without undue morbidity, and consideration should be given both preoperatively and intraoperatively to radiotherapy and chemotherapy options, with the goal of preserving existing vision for as long as possible. The choice of approach is guided by determining the optimum trajectory and by surgeon comfort while respecting neurovascular boundaries to avoid unnecessary retraction.

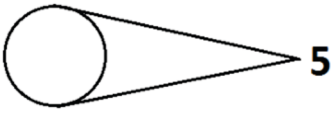
A lesser variant of this approach is the lateral micro-orbitotomy (as

previously described) that is reserved for lesions lateral to the optic nerve and apex. When it comes to pathologies situated very anterior in the orbit and medially, the anterior medial "orbitotomy," which uses a transconjunctival approach This approach, however, is limited to lesions located anterior to the posterior plane of the globe. When approaching lesions located in the proximity of the orbital apex, the exposure is often significantly limited by the intraorbital soft tissues. A helpful maneuver in these difficult cases involves detaching the medial rectus muscle and mobilizing the cone via a lateral orbitotomy. In spite of this, the surgical field often ends up being a deep cone-shaped area with suboptimal visibility in the depth at the tumor.[5,6]

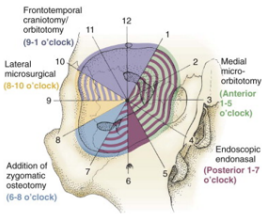
The location of the pathology within the orbit, relative to the optic nerve, should dictate the choice of approach. This is the key guiding principle for orbital approaches. When addressing lesions located superior and lateral to the optic nerve and orbit, traditional neurosurgical approaches like a frontotemporal craniotomy with or without orbitozygomatic osteotomy provide excellent exposure In our institution for the period of three years from 2015 – 2018 various approaches were used in which the orbit was divided into four quadrants and orbital apex. The zones were allocated depending on the location of the tumor.

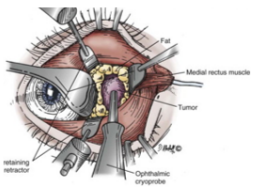


AHRR ZONE 1: SUPEROLATERAL
AHRR ZONE 2: INFEROLATERAL
AHRR ZONE 3: INFEROMEDIAL
AHRR ZONE 4: SUPEROMEDIAL
AHRR ZONE 5: ORBITAL APEX



ZONE 1&2: LATERAL ORBITOTOMY
ZONE 2&3 : MEDIAL ORBITOTOMY
ZONE 5: CRANIOTOMY





Tumor location rather than tumor type determines the type of approach selected as evidenced by the similarity among the pathologies resected via standard approaches. Selection of approaches is based on the meridian of the optic nerve (a vertical line drawn perpendicular to the optic nerve. Lesions that are located primarily lateral to the optic nerve are approached via a lateral orbitotomy (lateral microsurgical approach) with zygomatic osteotomy for inferolateral approach[7]. If the lesion has superior, lateral or intracranial extension, one of the transcranial approaches- orbital roof approach via Frontal craniotomy is used.[8,9]

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