SINGLE INSTITUTIONAL EXPERIENCE IN SURGICAL MANAGEMENT OF ORBITAL TUMOURS- NEUROSURGICAL PERSPECTIVE IN SURGICAL APPROACH

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ABSTRACT

BACKGROUND

Orbital tumours are rare and complex lesions, which require a multidisciplinary approach for diagnosis and management. They pose a great challenge for the neurosurgeons and ophthalmologists.

MATERIALS AND METHODS

This is a retrospective study with analysis of data for 15 patients who underwent surgery for orbital tumours at our institution. Data available from 2007 to 2016 was collected and analysis was done. Clinical presentation, age, sex, imaging features, approaches planned, surgical records, histopathological findings and follow up records were extracted for statistical analysis.

RESULTS

Most common presentation was exophthalmos (80%), visual disturbances (46.6%), diplopia (40%), retro-orbital or periorbital pain (20%). The most used surgical approach was FTOZ (33.3%) followed by lateral orbitotomy (20%). Histopathological findings showed that most of the orbital tumours were haemangiomatous tumours (33.3%) followed by neurofibromas (20%). Malignant tumours accounted for (33.3%). Total resection was achieved in 53.3% of cases. Recurrence was seen in 33.3% cases.

CONCLUSION

Orbital tumours need a multidisciplinary approach. Early diagnosis, better imaging modalities correlated with good surgical skills provides good functional outcome. Surgical approach should be planned according to the location and extension of the tumour. Histopathology remains the mainstay of diagnosing the tumour and prognostication of the disease.

KEYWORDS

Proptosis, Orbital Tumours, Surgical Management, Histopathology.

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BACKGROUND

Orbital tumours are very rare tumours. Incidence of orbital tumours in neurosurgical practice is 3.5 to 4%.[1,2] The orbital tumours can be divided into extraconal, intraconal and intracanalicular tumours.[1] These tumours include tumours of lacrimal gland, adipose tissue, fibrous tissue, muscle tissue, bone and cartilage, tumours of blood vessels and lymphatics, tumours of peripheral nerves and cranial nerves, tumours of optic nerve, tumours of dural meninges, arachnoid and metastasis from adjacent or distant site.[1,2,3,4] Orbital tumours present with visual disturbances as decreased vision and double vision, proptosis, periorbital and retro-orbital pain, lacrimation, conjunctival oedema and inflammation.[3,4]

Many neoplastic conditions masquerade as or mimic other less aggressive inflammatory conditions and should be differentiated before definitive therapy is planned. Clinical examination and radiological investigations are not so helpful in preoperative diagnosis in all cases of orbital tumours. Until the histopathology is evident, the actual diagnosis is still not confirmed by these preoperative workup. All orbital lesions are subjected to histopathology for prognostication and for planning further management.

Many approaches are described for treating orbital tumours and in recent trend is towards endoscopic management of these tumours with less invasion and morbid technique compared to the open surgeries.[5,6]

Aims and Objectives

1. To study the morphological and clinicopathological correlation of orbital tumours.
2. To know the pattern of prevalence of orbital tumours in our institute.

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3. To help in formulating treatment strategy and surgical approaches.
4. To study the outcome of orbital tumours.

MATERIALS AND METHODS

We searched the database for all patients who underwent surgery for the treatment of orbital tumours at our institution between 2007 and 2016. Data from clinical notes, surgical reports and radiological findings were obtained for the analysis. Tumour location, size and relation to neighbouring anatomical structures were determined using preoperative Computed Tomography (CT) and Magnetic Resonance (MR) imaging. A cooperative team of neurosurgeons, an ophthalmologist and plastic surgeons participated in the treatment planning for each patient. The extent of the tumour resection was determined intraoperatively and confirmed by immediate postoperative period and images taken after 3-6 months. Morbidity, followup and outcome were analysed from entries in the clinical notes and phone calls to the patients regarding their absence if not turn up for followup.

RESULTS

Age and Sex- A total of 15 patients who underwent surgery for the treatment of orbital tumours were enrolled in the present study. There were 6 males and 9 females and their ages ranged from 6 to 75 years (mean age of 40 years).

Age in Years	Number	Percentage
0-9	2	13.33
10-19	3	20
20-29	1	6.66
30-39	2	13.33
40-49	1	6.66
50-59	2	13.33
60 and above	3	20

Table 1. Age Wise Distribution of Orbital Tumours

Presentation

Right side predominant than left side (Rt:Lt = 2:1). Exophthalmos present in 12 patients, visual disturbances in 7, diplopia in 6 and periorbital and retro-orbital pain in 3 patients. These were major symptomatic presentations.

Symptoms	No. of Patients	Frequency (%)
Exophthalmos	12	80
Visual disturbances	7	46.6
Diplopia	6	40
Pain	3	20
Lacrimation	3	20
Conjunctival oedema	2	13.33
Inflammation	2	13.33

Table 2. Common Symptoms of Orbital Tumours

Site of Involvement of Orbital Tumours

Most of the tumours are primary intraorbital tumours. No tumour is extending into orbit from adjacent structures except for tuberculum sella meningiomas extending into optic canal and extending into orbit in 2 cases (Fig. 1a and Fig. 1b). One patient had medial and inferior orbital haemangioma extending into lesser orbital foramen into pterygo maxillary fissure into cheek (figure (2a and 2b). Most of the tumours are placed in middle and posterior third of orbit. Sites of involvement of orbit by the tumour included lateral orbit in 6, near orbital apex in 5, superior orbital in 3 and medial orbital in 1 patient. Majority of the tumours located in the posterior and middle third of the orbital space requiring extra-orbital or transcranial approaches for surgery.

Primary Tumour Involvement	Number	(%)
Lateral orbit	6	40
Medial orbit	1	6.6
Superior orbit	3	20
Near orbital apex	5	33.33

Table 3. Site of Involvement of Tumour in Orbit

Surgical Approach

The surgical approaches used were transcranial/extra-orbital approaches in 15 patients. FTOZ is the most common approach (6 cases) followed by lateral orbitotomy in 4 cases, frontal orbitotomy in 3 cases and fronto-temporo-orbitotomy in 2 cases.

Surgical Approach	No.	(%)	Site of Lesion
FTOZ	6	40	Tumour near orbital apex- 6
Lateral orbitotomy	4	26.66	Lateral orbital tumour- 4
Fronto-orbital	3	20	Superior orbital tumours- 2 Medial orbital tumour- 1
Fronto-temporo-orbital	2	13.33	Tumour near orbital apex- 1 Superior orbital tumour- 1

Table 4. Surgical Approaches Correlated with Site of Involvement

Amount of Resection of Tumour

Near total, subtotal resection and biopsy were achieved in 8, 5 and 2 patients, respectively. One patients with meningioma (FTOZ approach) experienced visual deterioration postoperatively. It was caused by the manipulation of optic nerve while drilling the optic canal roof. None of the patients died as a result of the surgical procedure.

Amount of Resection	No. of Cases	%
Near total	8	53.33
Subtotal	5	33.33
Biopsy	2	13.33

Table 5. Amount of Resection

Histopathology of Orbital Tumours

The underlying pathologies included cavernous haemangiomas in 3 patients, capillary haemangiomas in 2 patients, neurofibromas in 3 patients, meningiomas in 2 patients, sarcoma in 2 patients, metastasis in 1 patient, optic nerve glioma in 1 patient and lymphoma in 1 patient.

Tumour Type	Number	Percentage
Cavernous haemangioma	3	20
Capillary haemangioma	2	13.33
Neurofibroma	3	20
Meningioma	2	13.33
Sarcoma	2	13.33
Lymphoma	1	6.66
Metastasis	1	6.66

Table 6. Histological Results

Outcome

Patients with malignancy and subtotal resection for benign lesions were subjected to radiotherapy postoperatively. Follow up scans taken at 6 months postoperative period showed recurrence of tumour (metastasis from unknown origin) in one patient. One patient died at 6 months postop and did not turn up for follow up (sarcoma).

DISCUSSION

Orbital tumours are rare in neurosurgical practice. The histopathological characteristics of these tumours are critical to their biologic behaviour, line of management, outcome and prognosis. Orbital tumours can be developed either from structures located in the orbit or from the structures surrounding the orbit. Adjacent structures producing metastatic tumours into orbit include paranasal sinuses, nasal cavity, skin of forehead, eyelid and from parotid.[2]

Operative approach for these tumours mainly depend on location, size, demarcation, extension, involved structures and histological type of the lesion. The least traumatic and easily accessible approach should be chosen. Procedures that can be performed will range from simple biopsy to near total or total resection depending on the histological variant.[3,4,5] Most appropriate surgical approach chosen for making complete excision possible. Approaches can be divided into transorbital and extra-orbital approaches. Most of the tumours present in anterior third of orbital space are approached through the transorbital approaches and mostly dealt by ophthalmologists. Tumours of middle third and posterior third orbital space are approached by extra-orbital or transcranial approaches. Medially placed tumours are best approached by endoscopic technique by entering orbital space through lamina papyracea.

Location of Lesion	Approach
Inferior and medial to optic nerve	Inferior orbital approach or posterior inferior orbitotomy through Caldwell-Luc incision and maxillary sinus
Transcranial	
Superior and medial (sometimes) to optic nerve	Fronto-orbitotomy
Tumours involving/extending superior orbital fissure and optic nerve	Fronto-temporo-orbitotomy
Tumours involving/extending optic nerve or superior orbital fissure and extending into middle fossa	FTOZ

Table 7. Appropriate Extra-Orbital Surgical Approach for Tumours Placed in Middle and Posterior Third of Orbit

Site of Lesion	Approach
Superior	Anterior orbitotomy (with or without removing orbital rim)
Lateral	Lateral orbitotomy
Medial and inferior	Medial orbitotomy
Lateral and medial	Combination of lateral and medial

Table 8. Transorbital Approaches for Tumours Placed in Anterior Third of Orbit

In addition to the use of microscope, other more recent modalities such as neuronavigation techniques, endoscopy and stereotactic radiosurgery have helped us in the surgical management of orbital tumours.

Our Study- A series of 15 orbital tumours in our study is based on clinical, radiological correlation and histopathological examination. Females are commonly affected than males. Median age group involved is 40 years, but less than 10 years and more than 60 years aged population are commonly involved than other groups. Right side eye is more involved than left side. In our study, most of the tumours are primary intraorbital tumours with one case with tuberculum sella meningioma with intracanalicular extension and one case of metastasis.

Most of the tumours are present in middle and posterior third of orbit. Hence, most surgical approaches are extra-orbital requiring main role by a neurosurgeon. Most of the tumours are located in lateral orbital space requiring lateral orbitotomy in most of the cases. Six tumours were approached through lateral orbitotomy. FTOZ is a good approach in which osteotomy can be done in single piece or two piece procedure. All FTOZs are single piece osteotomies and this approach was the second most common approach we performed in 4 cases in our study.

Most of the tumours are benign in which vascular tumours are more common than others followed by neurofibroma and meningiomas. Malignant lesion are seen in five patients in which fibrous histiocytoma and rhabdomyosarcoma (sarcoma) in two patients, lymphoma in one, optic nerve glioma in one and metastasis in one patient. All the patients with incomplete resection or malignant lesions are subjected to radiotherapy. Recurrence was seen in one patient and one patient with sarcoma died within 6 months. Others were not having any recurrence and 6 months follow up scans showed no recurrence of the lesions.

CONCLUSION

Orbit is an extremely difficult anatomical entity approached. Because of the technical advances in neurosurgery in the field of imaging, neuronavigation, endoscopy, microscope and stereotactic radiotherapy, management of orbital

tumours became very least morbid as compared to years ago. Tumours in all locations of orbit as medial, lateral, superior and inferior can be accessed with less invasive and less morbid approaches. Complete removal of orbital tumour is made possible with these new advances. Tumours in medial and less accessible with small size can be subjected to stereotactic radiotherapy with good results. Histopathology of the tumour is the mainstay in further management and prognostication of the disease. Multidisciplinary approach with histopathological and good surgical skill correlation results in good outcome of the patient.

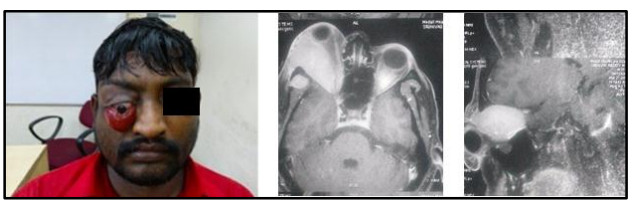

Figure 1a. Preop

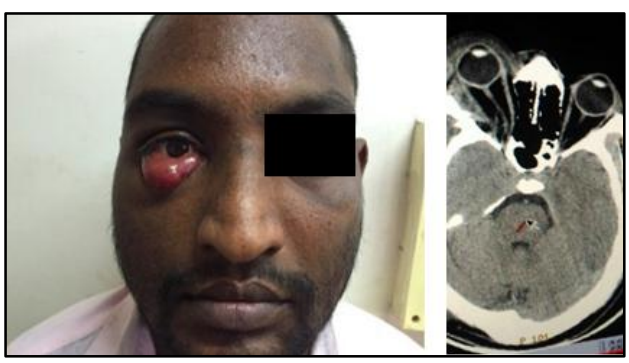

Figure 1b. Postop

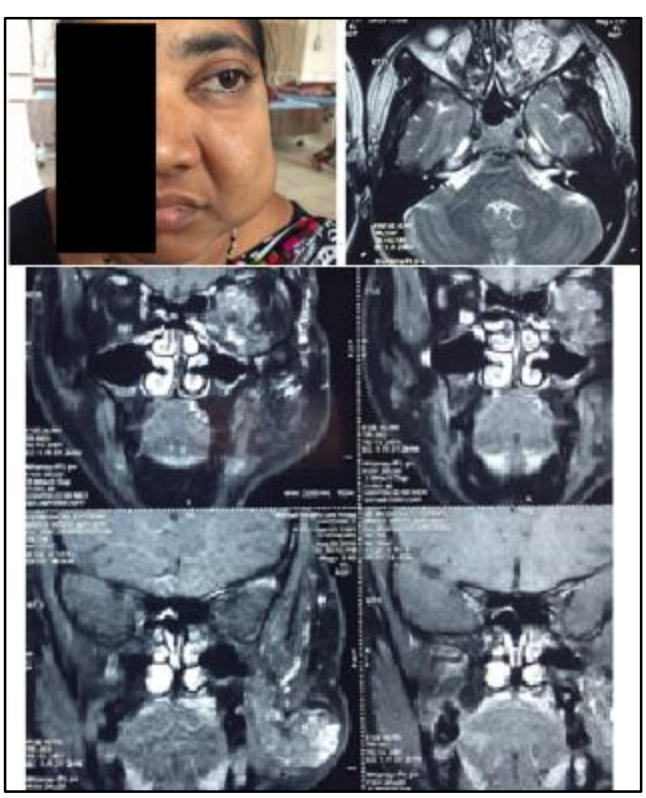

Figure 2a. Preop

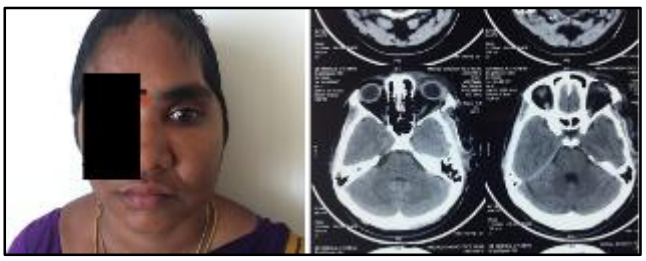

Figure 2b. Postop

Abbreviations- FTOZ- fronto-temporal-orbito-zygomatic osteotomy.

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