Original Article

Role of Fine Needle Aspiration Cytology as a Diagnostic Tool in Orbital and Adnexal Lesions

Lubna Khan[1], MS; Kamal Malukani[2], MD; Siddharth Malaiya[1], MS; Prashant Yeshwante[2], MD; Saba Ishrat[1], MS
Shirish S. Nandedkar[2], MD

[1]Department of Ophthalmology, Sri Aurobindo Institute of Medical Sciences, Indore, Madhya Pradesh, India
[2]Department of Pathology, Sri Aurobindo Institute of Medical Sciences, Indore, Madhya Pradesh, India

Abstract

Purpose: To evaluate the role of fine needle aspiration (FNAC) as a diagnostic tool in cases of orbital and ocular adnexal masses. Cytological findings were correlated with histopathological diagnosis wherever possible.

Methods: FNAC was performed in 29 patients of different age groups presenting with orbital and ocular adnexal masses. Patients were evaluated clinically and investigated by non-invasive techniques before fine needle aspiration of the masses. Smears were analyzed by a cytologist in all cases. Further, results of cytology were compared with the histopathological diagnosis.

Results: The age of patients ranged from 1 to 68 years (mean: 29.79±19.29). There were 14 males and 15 females with a male to female ratio of 0.93:1. Out of 29 cases, 26 aspirates were cellular. Cellularity was insufficient in three (10.34%) aspirates. Out of 26 cellular aspirates, 11 were non-neoplastic while 15 were neoplastic on cytology. Subsequent histopathologic examination was done in 21/26 cases. Concordance rate of FNAC in orbital and ocular adnexal mass lesions with respect to the precise histologic diagnosis was 90%.

Conclusion: When properly used in well-indicated patients (in cases where a diagnosis cannot be made by clinical and imaging findings alone), FNAC of orbital and periorbital lesions is an invaluable and suitable adjunct diagnostic technique that necessitates close cooperation between the ophthalmologist and cytologist. However, nondiagnostic aspirates may sometimes be obtained, and an inconclusive FNAC should not always be ignored.

Keywords: Fine Needle Aspiration Cytology; Ocular Adnexal Lesions; Orbital Lesions

INTRODUCTION

The orbit is a common location for various disease processes presenting as mass lesions such as inflammatory and infectious diseases, cysts, various primary and secondary neoplasms.[1] Fine needle aspiration cytology (FNAC) is considered as a reliable and relatively safe preliminary diagnostic tool before attempting any invasive procedure. The concept of FNAC was proposed by Martin and Ellis (1930).[2] Schyberg first used fine-needle aspiration biopsy for diagnosis of orbital tumors in 1975.[3] Zajdela et al introduced a modified technique (cytopuncture/non-aspiration) in which cutting edge of the needle is used to dislodge material

Correspondence to:
Lubna Khan, MS. Department of Ophthalmology,
Sri Aurobindo Institute of Medical Sciences, ED-45, Scheme
No. 94 D, Near Khajrana Square, Indore - 452 016,
Madhya Pradesh, India.
E-mail: lubnakhan65@yahoo.co.in

Access this article online

Quick Response Code:

Website:
www.jovr.org

DOI:
10.4103/2008-322X.188397

How to cite this article: Khan L, Malukani K, Malaiya S, Yeshwante P, Ishrat S, Nandedkar SS. Role of fine needle aspiration cytology as a diagnostic tool in orbital and adnexal lesions. J Ophthalmic Vis Res 2016;11:287-95.
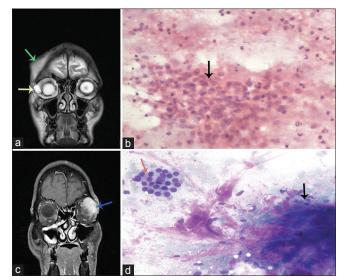
Figure 1. (a) MRI T2 Coronal image of tubercular lesion showing a large collection in the subgaleal region of right frontal bone (green arrow) extending inferiorly to the orbit (yellow arrow) with uniformly hyperintense signal in the center and hypointense rim. (b) Smear showing epithelioid granuloma (black arrow) in a case of orbital tuberculosis (Pap, ×400). (c) MRI T2 C+ Coronal image of pleomorphic adenoma showing well-defined oval shaped homogenously enhancing extraconal lesion along the superolateral aspect of left orbit (blue arrow). (d) Smear of pleomorphic adenoma showing clustered benign epithelial cells (orange arrow) and few spindle cells enmeshed in a fine fibrillary magenta colored ground substance (black arrow) (Giemsa, ×400).

Figure 2. (a) CT Orbit of a case of plasmacytoma showing well defined slightly hyperdense oval soft tissue lesion along the anterolateral temporal aspect of right orbit superiorly (green arrow). (b) MRI Orbit of the same patient when recurrence occurred. A mass located more medially (yellow arrow) than the previous one. (c) Smear showing plasma cells with binucleate (blue arrow) and trinucleate forms (black arrow) (Giemsa, ×400). (d) MRI T2 C+ Coronal Image of metastatic neuroblastoma showing heterogeneously enhancing subperiosteal soft tissue along the outer table of right frontal bone and superior orbital margin (blue arrow). (e) Smear of neuroblastoma showing small round blue cells arranged in rosette pattern (red arrow) (Giemsa, ×400).

which is collected by capillary action. This technique is particularly suitable for vascular lesions in which aspiration may draw significant quantity of blood and compromise cellular preservation and interpretation.[4]

With the modern day imaging techniques at hand, in the majority of cases, the clinicians are aware of the extent as well as nature of the lesion, yet, sometimes there is still a diagnostic dilemma regarding the nature of the mass. In such a situation, it is advisable to have an adjunct investigative tool, for which FNAC serves the optimal purpose. Once the patient is made aware of the nature of the lesion and diagnosis is disclosed, management becomes easier. Ultrasound-guided fine needle aspiration (FNA) had also made the technique safer especially in cases where mass is posterior to the equator and in close relation to vital structures such as optic nerve and central retinal artery.[5]

The presence of a cytopathologist during the procedure, use of imaging techniques in localizing orbital lesions and repeated attempts if required, reduce the false negative results. Although inadequate aspiration rates are high with very fibrotic lesions or posteriorly located lesions, low-cost benefit ratio of FNAC offsets it.[6] Preoperative aspiration cytology also provides a great advantage to ophthalmic surgeons who routinely operate in an area of the body requiring great attention
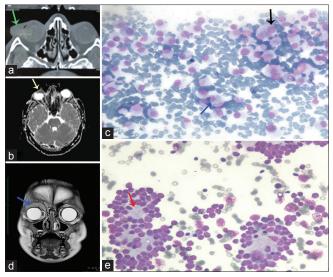
to cosmesis.[7] Extra material obtained by FNA can be used for immunocytochemistry and any molecular studies. Adjunct immunocytochemistry is documented to increase specificities and is essential for diagnosis and management in about 10% of cases.[8]

The present study is aimed to evaluate the role of FNAC as a diagnostic tool in cases of orbital and ocular adnexal masses. It is intended to correlate cytology-based diagnosis with histopathology. Also, an attempt is made to compare our findings with those of previous similar studies.

METHODS

The present study is a cross-sectional study, conducted on 29 patients who presented with orbital and ocular adnexal masses in outpatient Department of Ophthalmology, Sri Aurobindo Medical College and Post Graduate Institute, Indore (Central India) spanning over a period of 11 years (between May 2004 and August 2015). These patients underwent FNA as diagnostic workup, and a written consent was obtained from each patient explaining the procedure, its safety, and potential complications. The procedure was done under general anesthesia in all 5 patients of pediatric age with prior consent. Radiological findings (CT/MRI/USG) were available in 23 cases.
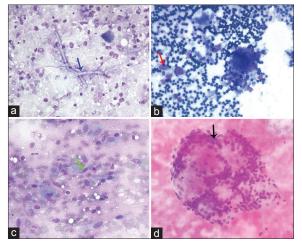
Figure 3. (a) Smear of aspergillosis showing septate fungal hyphae (blue arrow) with acute angled conidiophore (Giemsa, ×400). (b) Smear of malignant melanoma showing clustered and scattered melanoma cells (red arrow) (Giemsa, ×400). (c) Smear of schwannoma showing plump to spindle cells having a wavy nucleus (green arrow) and a moderate amount of cytoplasm embedded in a fibrillary matrix (Giemsa, ×400). (d) Smear of adenoid cystic carcinoma showing pink globule of basement membrane-like material with small cells arranged in a cribriform pattern (black arrow) (Giemsa, ×400).

Inclusion Criteria

1. All patients with palpable orbital mass lesions, either presenting for the first time or recurrent, where there was a diagnostic dilemma
2. In all cases of orbital mass lesions where nature of lesion was not known and surgery was indicated
3. In cases of venolymphatic malformations where sclerotherapy was indicated.

Exclusion Criteria

Exclusion criteria were thyroid-associated orbitopathy, orbital cellulitis, arteriovenous fistula and pulsatile proptosis.

Technique of FNAC

Ophthalmologist and cytopathologist both were present during each procedure. A 23G 1½ inch disposable needle with attached 10 ml syringe was passed transcutaneously into the mass. The needle was then moved a little to and fro in different planes of the lesion. The dislodged cellular material was immediately transferred onto glass slides, half of which were air dried and half alcohol fixed for Giemsa stain and Papanicolau stain respectively. For deeply situated masses, B-scan ultrasound was used to guide the needle. Also, in cases of superficial masses, FNA was performed in the same setting wherein a planned B-scan ultrasound was done. In cases that a large amount of material was aspirated, negative pressure was maintained with the plunger until the aspirate was no

longer being drained. This also served as an evacuation procedure in the cystic lesions of orbit, helping in subsidence of proptosis. In two cases where a vascular malformation was suspected, FNA was done as a dual (therapeutic as well as diagnostic) procedure. A separate preloaded syringe containing the calculated amount of sclerosing agent (Bleomycin) was kept ready before the procedure. After aspiration of cellular material from the mass, the syringe was detached from hub of the needle, and another preloaded syringe containing sclerosing agent was attached to the same needle, and sclerotherapy was instituted. Intralesional Bleomycin injection was injected only when there was a sudden increase in the size of the vascular lesion. No complication was seen in any of the cases during or after the procedure.

Subsequent histopathologic examination was done in 21 cases. Immunohistochemical analysis was done in three cases for confirmation.

RESULTS

In the present study, out of 29 cases of orbital and ocular adnexal masses, 26 aspirates were cellular. Cellularity was insufficient in three aspirates. Out of 26 cellular aspirates, 11 were non-neoplastic while 15 were neoplastic on cytology. Subsequent histopathologic examination was done in 21/26 cases. Out of 11 cases diagnosed as non-neoplastic on FNAC, two were chronic infections (one Tuberculosis [Figure 1a and b] and one Aspergillosis [Figure 3a]), two were inflammatory pseudotumors, five were benign cystic lesions and two were veno-lymphatic malformations, while out of 15 neoplastic cases, malignant (11 cases) out-numbered the benign ones (4 cases) and constitute 37.9% of total orbital lesions.

Benign tumors reported in the present study were one each of shwannoma [Figure 3c], meningioma, Pleomorphic adenoma [Figure 1c and d] (non-recurrent primary tumor) and solitary fibrous tumor (SFT). Malignant tumors diagnosed on cytology included retinoblastoma (1), non-Hodgkin's lymphoma (1), plasmacytoma [Figure 2a-c] (1), metastatic neuroblastoma [Figure 2d and e] (2), malignant melanoma [Figure 3b] (1), squamous cell carcinoma (2), adenoid cystic carcinoma [Figure 3d] (1), sebaceous carcinoma (1) and nasopharyngeal carcinoma with direct extension to floor of orbit (1).

Out of three insufficient aspirates, one was inflammatory pseudotumor, and two were benign neoplasms (one optic nerve meningioma and one fibroangioma).

The age of the patients ranged from 1 year to 68 years. There were 14 males and 15 females with male to female ratio of 0.93:1. The clinical data, imaging findings along with a cytological and histological diagnosis of each patient is shown in Table 1.

Case number	Age (years)/ gender	Clinical features	Imaging findings	Clinical diagnosis	Cytological findings	Histopathological findings
			Table 1. Clinicopathological details of orbital lesions			
1	1/male	Down and inward proptosis Retroorbital cystic swelling	MRI: Developmental orbital cyst	Dermoid/ epidermoid cyst	Epidermoid cyst	Epidermoid cyst
2	26/male	Swelling over the right orbital region for 1 month Montaux test was strongly positive	MRI: Large collection in the right frontal and temporal region, extending inferiorly into the right orbit	Cold abscess	Epitheloid granulomatous lesion - tubercular abscess	Not done
3	43/male	Complete ptosis of the right upper eyelid with restriction of ocular movements in upgaze	MRI: Mass lesion anterior to orbital septum with fluid-fluid levels, suggestive of veno lymphatic malformation	Vascular malformation	Vascular malformation	Veno-lymphatic malformation
4	2/female	Acute massive proptosis in the left eye with respiratory tract infection	CT: Venolymphatic malformation CT angiography brain: Intracranial venous malformation	Vascular malformation	Vascular malformation	Not done
5	40/female	Proptosis of left eye for 1 year, progressive and painless	CT: Cystic lesion (extraconal) in the supero-temporal region with irregular calcification; possibility of neoplasia of lacrymal gland	Pleomorphic adenoma	Epidermal cyst	Epidermal inclusion cyst
6	24/female	Painless ill-defined cystic mass in superonasal part of anterior orbit with bluish discoloration of the overlying skin	B-scan ultrasound - Cystic lesion in superonasal orbit anterior to orbital septum	Possibility of benign cyst or hemangioma	Epidermal inclusion cyst	Epidermal inclusion cyst
7	46/female	Protruding mass from left orbit History of enucleation 5 months back	CT: heterogeneously enhancing soft tissue mass occupying the right retroorbital region, suggestive of malignancy	Suspicious of malignancy with recurrence	Squamous cell carcinoma, recurrence	Squamous cell carcinoma
8	20/female	Left eye proptosis gradually increasing in size for 1 year	CT: A soft tissue mass (extraconal) in the superomedial orbit	Suspicious of meningioma	Meningioma	Pssamomatous meningioma - extracranial
9	17/female	Complaints of discomfort in the left eye with globe dystopia and ptosis	MRI: Soft tissue (extraconal) lesion occupying superomedial margin of orbit		Adenoid cystic carcinoma of lacrimal gland	Adenoid cystic carcinoma of the lacrimal gland
10	68/female	Acute proptosis of left eyeball with the sudden loss of vision. History of uncontrolled diabetes	MRI: Inflammatory mass in left maxillary antrum with orbital extension	Inflammatory mass	Aspergillosis	Not done

Contd...

Case number	Age (years)/ gender	Clinical features	Imaging findings	Clinical diagnosis	Cytological findings	Histopathological findings
11	63/female	Painless nodular swelling at upper lid margin for 3 weeks Owing to non-compliance of the patient it enlarged to enormous dimension in a duration of 3 years	Not done	Suspicious of malignancy	Sebaceous carcinoma	Sebaceous (meibomian gland) carcinoma
12	56/female	A frontal headache for 6 months, down and out proptosis of the left eye	Not done	Frontoethmoidal mucocele	Infected mucocele	Infected mucocele
13	22/male	Mass at the junction of roof and lateral wall of orbit causing ptosis Recurrence with limitation in ocular movements	CT: Well-defined hyperdense soft tissue lesion, abutting the right lacrimal gland; possibility of a benign etiology MRI: Mass lesion located more medially than the previous one	Idiopathic orbital Inflammation	Inflammatory mass Plasma cell tumor	Plasmacytoma IHC: LCD, CD138, MuM-1 and lambda light chain were positive, consistent with plasmablastic plasmacytoma
14	4/male	Fungating orbital mass	CT: Irregular mass involving the whole orbit with calcific foci		Round cell tumor - retinoblastoma	Retinoblastoma
15	47/female	Pigmented fungating mass with proptosis	Not done	Malignant melanoma	Malignant melanoma	Malignant melanoma
16	16/male	Acute right proptosis with chemosis.	CT: Extraconal mass in superomedial orbit	Pseudotumor	Inflammatory pseudotumor	Not done
17	10/female	Acute left proptosis, mass palpable superiorly	Not done	Pseudotumor	Inflammatory pseudotumor	Not done
18	37/female	Painless mass in left inferior orbit for 3 years, gradually increasing in size	CT: Well-defined homogenous extraconal mass	Epidermoid/ dermoid cyst	Benign tumor of the nerve sheath	Schwannoma
19	16/male	Right proptosis with conjunctival chemosis for 3 months	CT: Hyperdense mass in superior orbit	Pseudotumor	Lymphoma	Non-Hodgkin's lymphoma
20	60/male	Proptosis of left eye for last 2 years	MRI: Well-defined extra-conal mass with focal bone erosion Solid neoplastic lesion suspicious of meningioma	Left orbital meningioma	Pleomorphic adenoma	Pleomorphic adenoma

Contd...

Table 1. Contd...						
Case number	Age (years)/ gender	Clinical features	Imaging findings	Clinical diagnosis	Cytological findings	Histopathological findings
21	4/male	Abdominal lump with bilateral proptosis and cervical lymphadenopathy	MRI: Multiple irregular masses in both orbits, maxillae and mandible. Suspicious of metastasis		Neuroblastoma - metastatic	Not done
22	28/male	Right orbital swelling, involving bulbar conjunctiva	Not done	Squamous cell carcinoma	Squamous cell carcinoma	Squamous cell carcinoma
23	24/male	Oval swelling near the supraorbital margin of left eye	MRI: Developmental orbital cyst	Dermoid cyst	Dermoid cyst	Dermoid cyst
24	56/male	Left eye proptosis. History of surgical excision of nasal mass eight months back elsewhere	CT: Expansile mass lesion causing erosion of floor of the left orbit	Suspicious of malignant lesion	Nasopharyngeal carcinoma, recurrence; with extension into the floor of the orbit	Nasopharyngeal carcinoma
25	47/female	Left eye proptosis with vision loss and relative afferent pupillary defects	CECT: Homogenously enhancing left optic nerve sheath in tram track pattern; possibility of meningioma	Suspicious of optic nerve meningioma	Insufficient material aspirated	Not done
26	28/female	Large ulcero-proliferative soft tissue mass in the left orbital space Enucleation and excision of tumor done 12 years back	CT: Large lobulated soft tissue mass in the left orbital space, infiltration of the surrounding structures. Large areas of necrosis and erosion of orbital roof with intracranial extension, possibility of neoplastic etiology	Suspicious of neoplastic Malignant	Spindle cell tumor ? nature	Spindle cell tumor IHC: Vimentin+, CD34 +, CD99+, S100+and SMA+. EMA−, PR−. Ki67 proliferation index: 8% Solitary fibrous tumor
27	5/male	Right orbital swelling with mild proptosis	MRI: Heterogeneously enhancing, subperiosteal soft tissue along the outer table of both frontal bones, superior orbital margins, with bilateral intraorbital extension. Possibility of ? acute lymphoid leukemia ? metastasis	Suspicious of leukaemia Suspicious of metastasis	Round cell tumor neuroblastoma - metastatic	Metastatic neuroblastoma IHC synaptophysin and CD56 were positive LCA, CD99, and MPO were negative
28	30/female	Acute right eye proptosis with restriction of ocular movement and a palpable mass in inferolateral orbit	Not done	Pseudotumor	Inadequate material aspirated	Not done
29	24/male	Left eye proptosis for three months	CT: Well defined lobulated heterogenous mass displacing optic nerve medially and eyeball anteriorly	Benign neoplastic lesion	Inadequate material aspirated	Angiofibroma

CT, computed tomography; CECT, contrast enhanced computed tomography; FNA, fine needle aspiration; IHC, immunohistochemistry; MRI, magnetic resonance imaging

In the present series, histopathological reports of excised masses/biopsies were available in 21 cases. In 18 cases the histopathological diagnosis was in concordance with the cytological diagnosis. In one case (solitary fibrous tumor: Intermediate grade) we could not decide the nature of the mass based on morphological features. In another case (plasmablastic plasmacytoma), cellular morphology was not very characteristic for making a diagnosis of plasmacytoma. When the mass recurred, it was only then that a repeat FNAC was conclusive. In yet another patient, owing to insufficient aspirate, cytology was inconclusive but after surgical excision histopathology done reported it to be an angiofibroma. In 5 patients, histopathological evaluation was not done. So the concordance rate of FNAC in orbital and ocular adnexal mass lesions with respect to the precise histologic diagnosis was 90%.

Amongst the three cases (10.34%), where aspirates were insufficient, two masses were fibrous in nature (pseudotumor and orbital angiofibroma), and one was posterior to the equator (optic nerve meningioma).

No serious complication was noted following FNAC, except for mild discomfort and prolonged bleeding for 15-30 minutes despite applying pressure in four cases.

The results of the present study are shown in Table 1 and compared with other similar studies in Table 2.[1,9-14]

DISCUSSION

Fine needle aspiration cytology of orbital lesions is now increasingly popular, but very few series of orbital and intraocular lesions diagnosed by this technique have been published from India.[9-13,15,16] The main limitations of the procedure include varying sensitivity, nondiagnostic aspirates and possible complications such as retrobulbar haemorrhage, blindness, motility disturbances, ptosis and globe perforation with vitreous haemorrhage.[17] In orbital mass lesions, the diagnostic accuracy of FNAC varies from 23% to 100%, depending on the skill of the operator, size and site of the lesion, and the expertise of the cytopathologist in interpreting the smears.[18] The rate of non diagnostic aspirates reported in various studies ranges from 2.85% to 27.4%.[15]

Non-neoplastic Inflammatory Lesions

Sometimes infectious and lymphoproliferative lesions can clinically mimic malignancy. Non-neoplastic inflammatory lesions diagnosed on FNAC in the present series were one each of tubercular and fungal granulomatous inflammation and two cases of inflammatory pseudo-tumor. Epithelioid granulomatous inflammation of the orbit can be seen in tuberculosis, fungal infection, cat scratch disease and other diseases.[15] Orbital tuberculosis is not very uncommon in India as Agrawal et al have reported 14 cases of orbital tuberculosis during a 5-year period.[19] The presence of caseous necrosis favors the diagnosis of tuberculosis, which can be confirmed by Ziehl-Neelsen (Zn) staining or culture of bacteria using the aspirated material. Zn staining was positive for acid fast bacilli in our case. The patient responded to antitubercular agents.

Aspergillosis is the most common orbital fungal infection as described in a large study by Gupta et al[9] The single case of orbital fungal infection in our series was that of Aspergillosis showing chronic inflammatory cells, multinucleated foreign body giant cells and few septate hyphae branching at an acute angle on cytology. PAS stain confirmed the fungal infection. However, culture was not done in this case. The patient responded to antifungal treatment.

In two cases, smears showed non-specific inflammatory cells including lymphocytes, germinal center cells,

Table 2. Comparison of the present study with other previous similar studies								
	Solo et al[1]	Gupta et al[9]	Nair and Sankar[10]	Rastogi and Jain[11]	Singhal et al[12]	Nag et al[13]	Amoli et al[14]	Present study
Total number of cases	12	389 (301+88)	41	17	7	41	62	29
Insufficient aspirates (%)	1 (8.3)	77 (19.8)	2 (4.88)	3 (17.6)	0	3 (7.32)	17 (27.4)	3 (10.34)
Concordance with histology (%)	100	-	87.8	5/5 (100)	4/5 (80)	23/27 (85.18)	33/45 (73.33)	18/20 (90)
Infective and lymphoproliferative lesions	2	A – 70 P – 16	10	3	3	3	16	4
Benign cystic lesions	0	A – 38 P – 07	7	0	0	1	2	5
Benign tumors	3	A – 29 P – 08	4	2	0	20	1	4
Malignant tumors	6	A – 106 P – 38	16	8	4	14	18	11
Others	0	0	1 (LCH) 1 (AN)	1 (HX)	0		2 (LCH) 6 (AL)	2 (AL)
Serious complication	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

A, adult population; AN, adnexal neoplasm; AL, angiomatous lesion; HX, histiocytosis history; LCH, langerhans cell histiocytosis; P, pediatric population

plasma cells, and histiocytes. These were managed as inflammatory pseudotumors (IPT) with regression in size of the lesion following treatment. It is important to differentiate IPT from lymphoma as these patients respond well to corticosteroids.

In a case of clinically diagnosed IPT, FNA aspirates were insufficient, but patient responded to corticosteroids with no recurrence. FNAC has a limited role to play in the evaluation of IPT where there is a predominantly fibrous matrix.

Benign Cystic Lesions

There is a little clinical significance of differentiating cystic orbital lesions on FNAC as all of them are benign and need to be excised. Benign cystic lesions observed in our study were epidermal inclusion cysts (three cases), dermoid cyst (one case) and mucocele (one case) accounting for 17.24% of total orbital lesions. All were histologically confirmed. The incidence of cystic lesions ranges in different previous studies from 6% to 30%.[9] Dermoid cyst may be misdiagnosed as epidermal inclusion cyst on cytology as reported in one out of five cystic lesions in the study of Solo et al[1] Aspirate of a dermoid cyst is generally thick and greasy. Anucleated and nucleated squames are seen in dermoid, epidermoid and pilar cysts, so it is difficult to differentiate these three on FNAC. Smears of infected mucocele in our study showed mucoid material with neutrophils and mucinophages.

Sometimes clinically suspected benign cystic lesions may be mistaken as malignant on cytology. One example of such benign cystic lesion described in few studies is apocrine hidrocystoma[1,20] which is characterized by the presence of thick pavement-like proteinaceous background resembling colloid along with few atypical pseudopapillary structures. These structures were mistaken for malignant metastatic deposit by Pérez-Guillermo and Solano.[20]

Intralesional Bleomycin injection can be given in the same sitting while doing FNA in cases of haemangiomas and congenital vascular malformations.[21,22]

Benign Tumors

Benign tumors were seen in 4/29 cases in our study and included one each of schwannoma, meningioma, pleomorphic adenoma and solitary fibrous tumor (SFT).

Neurogenic tumors including meningiomas, neurofibroma and schwannoma account for about 5% of all ophthalmic tumors.[23] The smears of meningioma show multiple whorls of spindly meningothelial cells sometimes with intranuclear inclusions and psammomatous calcification.[24] The smears of neurofibroma and schwannoma show spindle cells having a wavy nucleus and a moderate amount of eosinophilic cytoplasm embedded in a fibrillary matrix.

Pleomorphic adenoma is the commonest tumor of the lacrimal gland of the eye. The cytological features of pleomorphic adenoma are characteristic. The smears show clustered and discrete benign epithelial cells enmeshed in a fine fibrillary magenta colored ground substance with May-Grunwald Giemsa stain and grayish substance with Papanicolaou stain. A few spindle cells can also be seen in the intercellular substance. Sometimes it is difficult to differentiate pleomorphic adenoma with adenoid cystic carcinoma (ACC) as the myxoid acellular material may occur in both. Also, the globules of basement membrane-like material characteristic of ACC may also be seen in pleomorphic adenoma. Typical pink globules are usually absent in the solid variant of ACC. However, the magenta colored acellular material in pleomorphic adenoma is fibrillar, whereas it is homogenous in ACC. Also, cells of pleomorphic adenoma show much more cytoplasm than cells of ACC.

Orbital SFTs are relatively common, largely benign tumors, behave in a nonaggressive fashion similar to SFT of other sites in the head and neck region. Bernardini et al[25] have reported 8 recurrences and only one malignant transformation of the 42 cases. The diagnosis of orbital SFT cannot be made with certainty on clinical, radiological and cytological evaluation and requires histologic studies with immunohistochemical confirmation for which CD 34 is the most specific diagnostic test.[26]

Malignant Tumors

Malignant tumors diagnosed on cytology in our study included retinoblastoma (1), non-Hodgkin's lymphoma (1), plasmacytoma (1), metastatic neuroblastoma (2), malignant melanoma (1), squamous cell carcinoma (2), adenoid cystic carcinoma (1), sebaceous carcinoma (1) and nasopharyngeal carcinoma with direct extension to the floor of the orbit (1).

The early diagnosis of sebaceous carcinoma is critical as it is associated with high mortality, ranging from 22% to 41%.[27] FNAC is a useful tool in diagnosing and differentiating sebaceous carcinoma from other common malignant tumors of the eyelids such as squamous cell carcinoma and basal cell carcinoma. The FNAC smears usually show clusters of cells having moderate nuclear pleomorphism, prominent nucleoli, coarse chromatin and moderate to the abundant vacuolated cytoplasm.

FNAC of the retinoblastoma is indicated only if the diagnosis is not made by clinical presentation and indirect ophthalmoscopy. FNAC smears show small round cells singly and in clusters, having hyperchromatic nuclei and fine chromatin. Cellular cohesion and nuclear molding are the distinct cytologic features. Rosettes are rarely reported on cytology. Retinoblastoma needs to be differentiated from other small round cell tumors,

such as metastatic neuroblastoma and lymphoma/leukemia. In lymphomas, cells are mostly dissociated, and lymphoglandular bodies are present. Metastatic neuroblastoma needs to be ruled out by a careful exclusion of a primary site. Immunocytochemistry and electron microscopy on FNAC samples can be valuable in the differential diagnosis of small round blue cell tumor.[28]

Primary orbital lymphomas vary in their frequency from 1% to 18% of all orbital tumors according to different reports in the medical literature.[9] A monomorphic, cytologically atypical lymphoid cell population, in the absence of inflammatory cells, is seen in lymphoma. An increase in mast cells possibly favors a diagnosis of lymphoma rather than a reactive lymphoid lesion. Immunocytochemistry is of great diagnostic value in difficult cases.

In conclusion, if done with adequate safety precautions and in experienced hands, the accuracy of FNAC in diagnosing orbital mass lesions is high and complications are rare and minor. It is helpful to differentiate between inflammatory and neoplastic lesions, between benign and malignant neoplasms and epithelial and mesenchymal lesions. FNAC provides useful information to the clinician in instituting appropriate medical treatment without any surgical procedure. It is also useful in diagnosing an unresectable malignant neoplasm, eliminating the need for further surgical interventions. However nondiagnostic aspirates may sometimes be obtained, and a negative FNAC should not always be ignored.

Financial Support and Sponsorship

Conflicts of Interest

There are no conflicts of interest.

REFERENCES

1. Solo S, Siddaraju N, Srinivasan R. Use of fine needle cytology in the diagnosis of orbital and eyelid mass lesions. *Acta Cytol* 2009;53:41-52.

2. Martin HE, Ellis EB. Biopsy by needle puncture and aspiration. *Ann Surg* 1930;92:169-81.

3. Schyberg E. Fine needle biopsy of orbital tumours [proceedings]. *Acta Ophthalmol Suppl* 1975;125:11-12.

4. Zajdela A, Vielh P, Schlienger P, Haye C. Fine-needle cytology of 292 palpable orbital and eyelid tumors. *Am J Clin Pathol* 1990;93:100-104.

5. Spoor TC, Kennerdell JS, Dekker A, Johnson BL, Rehkopf P. Orbital fine needle aspiration biopsy with B-scan guidance. *Am J Ophthalmol* 1980;89:274-277.

6. Zeppa P, Tranfa F, Errico ME, Troncone G, Fulciniti F, Vetrani A, et al. Fine needle aspiration (FNA) biopsy of orbital masses: A critical review of 51 cases. *Cytopathology* 1997;8:366-372.

7. Sturgis CD, Silverman JF, Kennerdell JS, Raab SS. Fine-needle aspiration for the diagnosis of primary epithelial tumors of the lacrimal gland and ocular adnexa. *Diagn Cytopathol* 2001;24:86-89.

8. Eide N, Walaas L. Fine-needle aspiration biopsy and other biopsies in suspected intraocular malignant disease: A review. *Acta Ophthalmol* 2009;87:588-601.

9. Gupta N, Kaur J, Rajwanshi A, Nijhawan R, Srinivasan R, Dey P, et al. Spectrum of orbital and ocular adnexal lesions: An analysis of 389 cases diagnosed by fine needle aspiration cytology. *Diagn Cytopathol* 2012;40:582-585.

10. Nair LK, Sankar S. Role of fine needle aspiration cytology in the diagnosis of orbital masses: A study of 41 cases. *J Cytol* 2014;31:87-90.

11. Rastogi A, Jain S. Fine needle aspiration biopsy in orbital lesions. *Orbit* 2001;20:11-23.

12. Singhal N, Mundi IK, Handa U, Punia RP, Mohan H. FNA in diagnosis of orbital lesions causing proptosis in adults. *Diagn Cytopathol* 2012;40:861-864.

13. Nag D, Bandyopadhyay R, Mondal SK, Nandi A, Bhaduri G, Sinha SK. The role of fine needle aspiration cytology in the diagnosis of orbital lesions. *Clin Cancer Investig J* 2014;3:21-25.

14. Amoli FA, Tarri AS, Doost KH, Kamalian N, Tabriz HM. Comparison of the results of fine needle aspiration biopsy specimens and permanent histopathologic preparation in orbital mass lesions. *Iran J Pathol* 2011;6:124-132.

15. Agrawal P, Dey P, Lal A. Fine-needle aspiration cytology of orbital and eyelid lesions. *Diagn Cytopathol* 2013;41:1000-1011.

16. Dey P, Radhika S, Rajwanshi A, Ray R, Nijhawan R, Das A. Fine needle aspiration biopsy of orbital and eyelid lesions. *Acta Cytol* 1993;37:903-907.

17. Liu D. Complications of fine needle aspiration biopsy of the orbit. *Ophthalmology* 1985;92:1768-1771.

18. Glasgow BJ, Goldbert RA, Gordon LK. Fine needle aspiration of orbital masses. *Ophthalmol Clin North Am* 1995;8:73-81.

19. Agrawal PK, Nath J, Jain BS. Orbital involvement in tuberculosis. *Indian J Ophthalmol* 1977;25:12-16.

20. Pérez-Guillermo M, Solano JG. Fine-needle aspiration of apocrine hidrocystoma – A potential mimic of papillary neoplasms metastasizing to the skin. *Diagn Cytopathol* 2004;30:275-279.

21. Muir T, Kirsten M, Fourie P, Dippenaar N, Ionescu GO. Intralesional bleomycin injection (IBI) treatment for haemangiomas and congenital vascular malformations. *Pediatr Surg Int* 2004;19:766-773.

22. Smit DP, Meyer D. Intralesional bleomycin for the treatment of periocular capillary hemangiomas. *Indian J Ophthalmol* 2012;60:326-328.

23. Shields JA, Shields CL, Scartozzi R. Survey of 1264 patients with orbital tumors and simulating lesions: The 2002 Montgomery lecture, part 1. *Ophthalmology* 2004;111:997-1008.

24. Agrawal P, Dey P, Saikia UN, Gupta N, Radhika S, Nijhawan R, et al. Fine-needle aspiration cytology of orbital meningiomas. *Diagn Cytopathol* 2012;40:967-969.

25. Bernardini FP, de Conciliis C, Schneider S, Kersten RC, Kulwin DR. Solitary fibrous tumor of the orbit: Is it rare? Report of a case series and review of the literature. *Ophthalmology* 2003;110:1442-1448.

26. Cerdá-Nicolás M, Löpez-Gines C, Gil-Benso R, Benito R, Pellin A, Ruiz-Saurí A, et al. Solitary fibrous tumor of the orbit: Morphological, cytogenetic and molecular features. *Neuropathology* 2006;26:557-563.

27. Lober CW, Fenske NA. Basal cell, squamous cell, and sebaceous gland carcinomas of the periorbital region. *J Am Acad Dermatol* 1991;25:685-690.

28. Akhtar M, Iqbal MA, Mourad W, Ali MA. Fine-needle aspiration biopsy diagnosis of small round cell tumors of childhood: A comprehensive approach. *Diagn Cytopathol* 1999;21:81-91.