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ORIGINAL RESEARCH

Unilateral Proptosis: A Spectrum of Underlying Etiopathologies

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ABSTRACT

Background: Unilateral proptosis is a clinical sign with a wide spectrum of etiologies ranging from benign inflammatory conditions to life-threatening malignancies. A timely and accurate diagnosis is crucial for optimal patient management and outcomes.

Objective: This study aims to analyze the underlying causes of unilateral proptosis in different age groups and assess the associated clinical presentation and outcomes.

Methods: A prospective observational study was conducted on 29 patients presenting with unilateral proptosis. The cases were categorized based on age, etiology, and clinical course. The pediatric group (<= 15 years) and adult group (>15 years) were analyzed separately to identify distinct patterns in etiology and prognosis.

Results: Proptosis was observed in all patients (100%). Associated symptoms included diplopia (31.5%), diminished vision (27.5%), eye pain (20.6%), and systemic symptoms such as headache and fever (13.7%). In the pediatric population, the most common causes included orbital cellulitis (27%), retinoblastoma (18%) and optic nerve glioma (18%). In adults, thyroid eye disease (16.6%), Pseudotumor of the orbit (11.1%), and orbital cellulitis (11.1%) were among the frequent etiologies. Malignant conditions were more prevalent in children, whereas inflammatory and vascular causes were more common in adults.

Conclusion: The etiology of unilateral proptosis varies significantly with age. While infectious and malignant causes predominate in children, inflammatory and vascular pathologies are more frequent in adults. A systemic approach to evaluation, including clinical examination and imaging, is essential for accurate diagnosis and appropriate management.

Key Words: Unilateral proptosis, orbital cellulitis, Retinoblastoma, Pseudotumor of the orbit, optic nerve glioma.

INTRODUCTION

Proptosis is an abnormal protrusion of one or both eyeballs relative to the skull.[1]Proptosis may be unilateral or bilateral. Unilateral proptosis is the forward displacement of one eye, often alarming. Unlike bilateral proptosis, which is commonly associated with systemic conditions like thyroid eye diseases, unilateral proptosis raises immediate concern for localized orbital disease, ranging from cysts to aggressive malignancy. The possible causes include neoplastic, infection, inflammation, vascular, and traumatic origin. As there is close anatomical proximity of the orbit to the nose, the sinuses, and the nasopharynx, the majority of ENT pathology presents with ocular manifestations.[2] The causes of unilateral proptosis include trauma followed by thyroid ophthalmopathy, orbital hemangioma, malignant lymphoma, pseudotumor, lacrimal gland epithelial tumors, meningioma, lymphangioma, glioma of the optic nerve, metastatic malignant tumor.[3] Any space-occupying lesion in the intraconal and extraconal orbital spaces can cause bulging or protrusion of the eyeball out of the orbit, called proptosis.[4] Orbital metastasis constitutes 2.3% and 7% of orbital tumors.[5] This study aims to explore the etiologies, clinical evaluation, imaging modalities, and management approaches for unilateral proptosis. There are a few studies about unilateral proptosis, so we planned this study.

MATERIAL AND METHODS

This prospective study was carried out on the patients attending OPD and IPD in the ophthalmology department at a tertiary care hospital in Bhubaneswar. 29 eyes of clinically diagnosed unilateral proptosis were studied from December 2023 to November 2024 for one year.

Inclusion Criteria

- All patients having unilateral proptosis of the age group 0 - 70 years of both genders.
- Patients should be systemically stable.

Exclusion Criteria

- Bilateral proptosis
- Pseudoproptosis
- Patients systemically unstable
- HIV positive patients

Informed consent was taken from all study participants. Detailed demographic data and ocular and systemic history were taken. Proptosis was measured with a Hertel exophthalmometer. A reading greater than 21 mm or a difference of more than 2 mm between both eyes was considered as having proptosis. All patients were evaluated for the displacement of the globe superiorly, inferiorly, medially, laterally, or axially. Clinical examination was done to asses any bruit, any changes in the color of the skin of the eyelids, and swelling of the eyelid were noted.

Patients were asked to show the old photographs. The best corrected visual acuity was recorded. Color vision was evaluated using a color vision chart. Extraocular movement was noted. The anterior segment was examined with a slitlamp biomicroscope. Fundus examination was done with an indirect ophthalmoscope. Routine blood investigations were done, such as CBC, PT/PTT, and thyroid profile. Radiological investigations of the orbit (PA and lateral view), ultrasonography of the involved eye, CT scan, and MRI were done. FNAC and excisional biopsy were done in relevant cases. Statistical analysis was done with SPSS 16

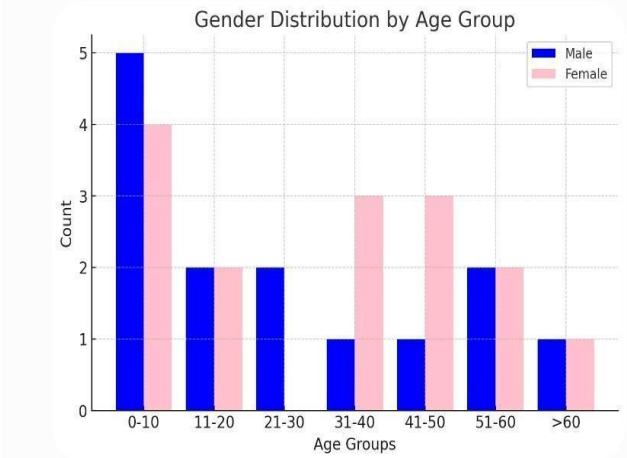
RESULTS

In our study, 29 patients diagnosed with unilateral proptosis who fulfilled inclusion and exclusion criteria were taken as the study population.

Gender	N = 29 (No of Cases of Unilateral Proptosis)	%
Male	14	48.2 %
Female	15	51.7 %
Number of Patients < =15 years old	11	37.9 %
Number of patients > 15 years old	18	62.0 %
Axial unilateral proptosis	25	86.2 %
Eccentric unilateral proptosis	4	13.7 %

Table 1: Demographic Data

The ages of the patients were between one year and 74 years. 48.2% were male and 51.7% were female. 62% of the study population were more than 15 years old. 86.2% of the study population had axial proptosis and 13.7% had eccentric proptosis.



Graph 1:

Clinical Presentations	N= 29	%
Proptosis	29	100
Eye pain	6	20.6

Diminished vision	8	27.5
Diplopia	9	31.5
Chemosis	4	13.7
Headache	3	10.3
Fever	4	13.7

Table 2: Clinical presentations

Orbital cellulitis	3	27 %
Retinoblastoma	2	18 %
Cavernous sinus thrombosis	1	9 %
Optic nerve glioma	2	18 %
Metastatic AML	2	18 %
Metastatic Neuroblastoma	1	9 %

Table 3: Etiology of childhood unilateral proptosis (age group <=15 years) (n = 11)

The etiology of Unilateral proptosis among the age group under 15 years was orbital cellulitis, 27%. All cases were secondary to sinusitis. The age of onset varies from 2 years to 6 years. All cases were treated with broad-spectrum antibiotics. All cases improved proptosis. The second most common causes were retinoblastoma and optic nerve glioma. 2 (18%) cases of proptosis were due to metastatic AML, and 1 case (9%) was due to metastatic neuroblastoma. This case of neuroblastoma died after 15 days of diagnosis of proptosis.

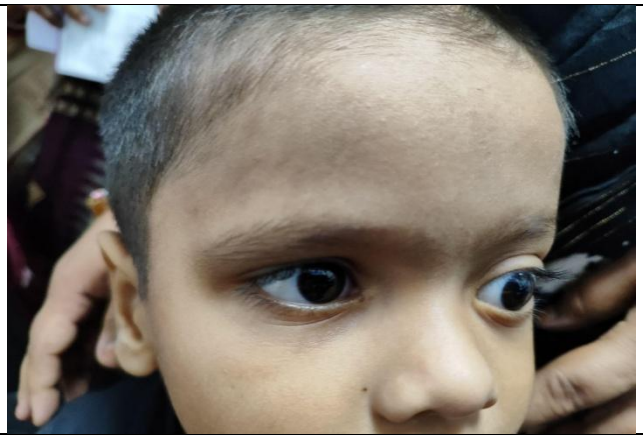


Figure 1 — A 2-year-old boy diagnosed with optic nerve glioma (left side).

Thyroid eye disease	**3**	**16.6%**
Pseudotumor of orbit	2	11.1%
Acute dacryoadenitis	1	5.5%
Trauma	1	5.5%
Orbital cellulitis	2	11.1%
Optic nerve meningioma	2	11.1%
Benign tumor of lacrimal gland	1	11.1%
Adenocarcinoma of lacrimal gland	1	5.5%
Ethmoidal sinus mucocele	1	5.5%
Sinonasal squamous cell carcinoma	1	5.5%
Metastasis from thyroid carcinoma, Breast carcinoma, Hodgkin's lymphoma	3 (one from each carcinoma)	16.6%

Table 4: Etiology of unilateral proptosis (age group > 15 years) (n = 18)

The most common etiology of unilateral proptosis among the age group of more than 15 years was thyroid eye diseases, metastasis from the primary thyroid carcinoma, breast carcinoma, and Hodgkin's lymphoma. 11% of cases had a pseudotumor of the orbit.

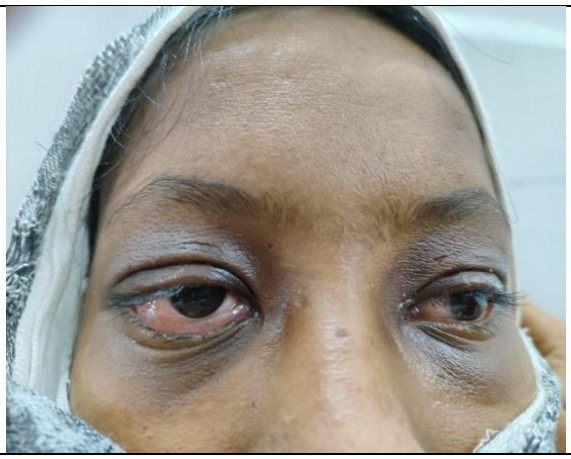


Figure 2— Women diagnosed with Pseudotumor of the orbit (right side)

DISCUSSION

This prospective study was done to identify the etiology of unilateral proptosis. The study period was from December 2023 to November 2024. .29 cases were selected as the study population with an age group of 0 to 70 years of both genders. Our study shows the incidence of unilateral proptosis is higher among the age group of 0 to 10 years, followed by 30 to 40 years. A study by Susan et al shows the incidence of unilateral proptosis is more among the age group 30 - 50 years.[6] A study by Dr Sanjiv et al. shows eccentric proptosis incidence is higher in the age group 31- 40 years.[7]

In our study, 25 (86.2%) cases had axial proptosis, and 4 (13.7%) had eccentric proptosis. A study by Susan et al. shows that 15 cases had axial unilateral proptosis, and 10 cases had eccentric proptosis.[6]

Orbital pathology usually presents as proptosis, symptoms reflect the orbital volume increases, and the direction indicates the site of the lesion.[8]A complete history is essential in the evaluation of unilateral proptosis. The outset, progress, and the presence of associated signs and symptoms such as fever, pain, visual loss, and diplopia should be established. A history of allergies, sinus infection, epistaxis, nasal discharge, and airway obstruction, suggests a sinonasal origin.[9] Among our study population, 20.6% had eye pain, and 27.5% had diminished vision. Four (13.7%) of our study population had a fever and were shown to have orbital cellulitis, cavernous sinus thrombosis, and AML.

Infection, inflammatory diseases, and tumors invading the orbit from the adjacent area have rapidly evolving symptoms and pain. Chemosis and injection suggest an inflammatory lesion when combined with proptosis.[9] The study by Susan et al. shows that the most common symptoms were eye pain followed by headache and chemosis.[6]

Computerized tomography of the brain, orbit, and sinuses was obtained in all cases. In our study, the etiology of unilateral proptosis among age group <= 15 years was orbital cellulitis 3 (27%) cases, retinoblastoma 2 (18%) cases, optic nerve glioma 2 (18%) cases, metastatic AML 1(9%), cavernous sinus thrombosis 1(9%), and 1(9%) cases of metastatic neuroblastoma. A study of the etiology of childhood proptosis by dr Martinet et al shows 38.6% had infectious orbital cellulitis, 14.1% had thyroid eye diseases, 14.1% had optic nerve glioma, 12.3% had rhabdomyosarcoma, 7% had metastatic neuroblastoma, 5.2% had orbital neurofibroma, 3.5% had metastatic Ewing's sarcoma, 1.7% had orbital dermoid cyst.[10] A study by Julie et al shows that 30% of orbital metastasis was neuroblastoma among patients <= 15 years of age.[11]

In our study, we found that the most common primary carcinoma metastasis to the orbit was AML followed by neuroblastoma among the age group of>=15 years. In our study period, we did not find orbital rhabdomyosarcoma or an orbital dermoid cyst. No case of thyroid eye disease was found among our study population of age <= 15 years. Neuroblastoma metastasizing to the orbit may present with proptosis and periorbital ecchymosis. A small proportion of neuroblastoma (2.8%-3.2%) present with orbital metastasis.[12,13]

Thrombosis of the cavernous sinus may be due to the extension of retrograde thrombosis from various sources. Because of the communication of the cavernous sinus with other venous channels, infection may occur via the orbital vein as in a septic lesion of the face, mouth, pharynx, ear, nose, and paranasal sinuses or as a metastatic infectious disease or septic condition.[14] Ophthalmological signs initially arise from venous congestion within the orbital veins secondary to impaired drainage to a thrombosed cavernous sinus. In 95% of cavernous sinus thrombosis (CST) cases, develop visible signs of chemosis, periorbital edema, and proptosis.[15] Among our study group, one male child of 11 years had CST. CST has been reported to be more common in children and neonates than adults.[16]

In our study, 2 cases of optic nerve glioma were found among the age group <= 15 years. Optic nerve glioma usually occurs in children during the first decade of life.[17]

Among the age group of more than 15 years in our study, the most common etiology was thyroid eye disease (16.6%). Unilateral proptosis as a result of Graves's disease cannot be rejected as a diagnosis even 20 or 30 years after the onset of thyroid eye disease.[18]

Orbital inflammation, pseudotumor (OIP) also known as idiopathic orbital inflammation (IOI) and idiopathic orbital inflammation syndrome (IOIS) is a benign, noninfectious, nonspecific orbital inflammation.[19] In our study, 11.1% of cases more than 15 years of age had orbital pseudotumor. We treated with IV methylprednisolone 1 gram for 3 days, followed by oral prednisolone 1 mg/kg body weight for 11 days in tapering dosages. Visual acuity improved significantly after 3 weeks. In our study, two pseudotumor patients were female in the age group 20 to 30 years. No pseudotumor case was found in our study among the <= 15 years age group. A case report by Julia et al shows 2 cases of pseudotumor of the orbit in children <18 months old.[20] Radiation, cytotoxic agents, immunosuppressants, IV immunoglobulin, biological therapy, TNF alpha inhibitors, monoclonal antibodies, and mycophenolate mofetil are useful in the management of refractory orbital pseudotumor.[21]

Traumatic proptosis may include orbital hemorrhage and orbital emphysema.[22] Among our study population, one case had acute proptosis following blunt trauma. The MRI report of that case was retrobulbar emphysema.

In our study, 13.7% of cases had eccentric unilateral proptosis. Among them, the etiology was a lacrimal gland benign tumor, and adenocarcinoma of the lacrimal gland.

The majority of the nose, sinuses, nasopharynx, and thyroid pathology can present proptosis as one of the clinical manifestations.[23] Nasal polyposes and chronic ethmoiditis can cause proptosis and be associated with aspergillous fungal rhinosusitis.[24] Seventy percent of patients with sinus and paranasal tumors had clinical, radiographic, or operative evidence of orbital involvement.[25] Malignant sinonasal tumors are frequently diagnosed at a locally advanced stage. The rate of orbital invasion ranges from 50% to 80%, because of the proximity of the sinonasal tract to the orbit.[26]Novshaba et al study shows the most common cause of proptosis was sinonasal squamous cell carcinoma followed by juvenile nasopharyngeal angiofibroma and allergic rhinosinusitis.[23] In our study group aged more than 15 years, one (5.5%) case had ethmoidal mucocele and one (5.5%) case had sinonasal squamous cell carcinoma.

A study by Paolo et al shows orbital metastasis in the adult population was 36.3% breast carcinoma, 10.1% melanoma, and 8.5% from prostate carcinoma. The most common primary carcinomas that metastasize to the orbit are breast, prostate, liver, and lungs.[27] In our study, the most common primary tumor metastasis to the orbit among the age group more than 15 years was from thyroid carcinoma, breast carcinoma, and Hodgkin's lymphoma.

CONCLUSION

The study highlights the varied etiologies of proptosis in both pediatric and adult populations. In children, infectious and malignant conditions such as orbital cellulitis, retinoblastoma, and metastatic leukemia are the most common causes. Early diagnosis and timely intervention are crucial to prevent vision loss and systemic complications. In adults, thyroid eye disease emerges as the leading cause, followed by pseudotumor orbit and orbital cellulitis. While inflammatory and infectious causes are prevalent, neoplastic conditions such as optic nerve meningioma and lacrimal gland tumors also contribute significantly. The findings emphasize the importance of clinical and radiological approaches for accurate diagnosis and management of proptosis. Early recognition of malignant cases is particularly vital to improve prognosis and treatment outcomes.

REFERENCES

1. Wright JE. Proptosis. Ann R CollSurgEngl 1970;47(6):323-34.
2. Williamson-Noble FA. Diseases of the orbit and its contents, secondary to pathological conditions of the nose and paranasal sinuses. Ann R CollSurgEngl 1954;15(1):46-64.
3. Reese AB. Incidence and management of unilateral Proptosis. Ocular and Adnexal tumors, New and controversial aspects. Symposium sponsored by the Department of Ophthalmology, Baylor University College of Medicine, Waco 1964:389-94.
4. Krauss HR. Orbital Surgical Guidelines-Clinical Evaluation. J Neurol Surg B Skull Base 2021;82(1):129-41.
5. Silva D. Orbital tumors. Am J Ophthalmol 1968;65(3):318-39.
6. Dsouza S, Kandula P, Kamath G, Kamath M. Clinical profile of unilateral proptosis in a tertiary care center. Journal of Ophthalmology 2017;2017(1):8546458.
7. Baskey C, Sikka LM, Satpathy S. Etiopathogenesis of eccentric proptosis in people of southern Odisha. Int J Acad Med Pharm 2022;4(4):494-7.
8. Khan NH, Moin M, Khan MA, Hameed AZ. Unilateral proptosis: a local experience. Biomedica 2004;20(2):1114-6.
9. Osguthorpe JD. Sinus Neoplasia. Arch Otolaryngol Head Neck Surg 1994;120(1):19-25.
10. Sindhu K, Downie J, Ghabrial R, Martin F. Aetiology of childhood proptosis. J Paediatr Child Health 1998;34(4):374-6.
11. HarreldJH, Bratton EM, Federico SM, Li X, Grover W, Li Y, et al. Orbital metastasis is associated with decreased

survival in stage M neuroblastoma. Pediatr Blood Cancer 2016;63(4):627-33.
12. Youssefi B. Orbital tumors in children: a clinical study of 62 cases. Journal of Pediatric Ophthalmology & Strabismus 1969;6(4):177-81.
13. Albert DM, Rubenstein RA, Scheie HG. Tumor metastasis to the eye. II. Clinical study in infants and children. Am J Ophthalmol 1967;63(4):727-32.
14. BasseyOO, Elebute EA. Septic thrombosis of the cavernous sinus. West Afr Med J Niger Pract 1968;17(2):39-41.
15. Southwick FS, Richardoson EP, Swartz, MN. Septic thrombosis of the dural venous sinuses. Medicine 1986;65(2):82-106.
16. Plewa MC, Tadi P, Gupta M. Cavernous Sinus Thrombosis. 2023 Jul 3. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing 2025.
17. Fried I, Tabori U, Tihan T, Reginald A, Bouffet E. Optic pathway gliomas: a review. CNS Oncol 2013;2(2):143-59.
18. Kamminga N, Jansonius NM, PottJW, Links TP. Unilateral proptosis: the role of medical history. Br J Ophthalmol 2003;87(3):370-1.
19. Ding ZX, Lip G, Chong V. Idiopathic orbital pseudotumor. ClinRadiol 2011;66(9):886-92.
20. Stevens JL, RychwalskiPJ, Baker RS, Kielar RS. Pseudotumor of the orbit in early childhood. J AAPOS 1998;2(2):120-3.
21. Chaudhry IA, Shamsi FA, AratYO, Riley FC. Orbital pseudotumor: distinct diagnostic features and management. Middle East Afr J Ophthalmol 2008;15(1):17-27.
22. Stingl K, Schüttauf F, Besch D. Einseitigerexophthalmusmitorbitaeinblutung acute right proptosis due to spontaneous orbital hemorrhage. Ophthalmology 2012;109(3):286-8.
23. Nazeer N, IvaturiPB. Proptosis in otorhinolaryngology: an overview. Int Arch Otorhinolaryngol 2021;25(2):e267-72.
24. Restori M. Ultrasound in orbital diagnosis. Trans OphthalmolSoc U K (1962) 1979;99(2):223-5.
25. Johnson LN, Krohel GB, YeonEB, Parnes SM. Sinus tumors invade the orbit. Ophthalmology 1984;91(3):209-17.
26. Michel J, Fakhry N, Mancini J, Braunstein D, Moreddu E, Giovanni A, et al. Sinonasal squamous cell carcinomas: clinical outcomes and predictive factors. Int J Oral MaxillofacSurg 2014;43(1):1-6.
27. Palmisciano P, Ferini G, Ogasawara C, Wahood W, Bin Alamer O, Gupta AD, et al. Orbital metastases: a systematic review of clinical characteristics, management strategies, and treatment outcomes. Cancers (Basel) 2021;14(1):94.