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INTRACRANIAL LESIONS LEADING TO IMPAIRED VISION AND BLINDNESS IN ABA, SOUTH-EAST NIGERIA
Otuka Olufunmi Adebimpe Ijeoma, MBBS, FWACS, FICS, Ophthalmology Unit, Department of Surgery, Abia State University Teaching Hospital, P.M.B 7004 Abia 459272, Nigeria, Lisa Ifeyinwa Eweputanna, MBBS, FWACS, Department of Radiology, Abia State University Teaching Hospital, P.M.B 7004 Aba 450272, Nigeria, Eweputanna, Christian Chukwuemeka Eweputanna, MBBCh, Dip Medical Imaging, Dip Fam Med, NPGMCN, Todac Specialist Hospital, P.O. Box 6217 Aba 450272 Nigeria.

Corresponding author: Otuka Olufunmi Adebimpe Ijeoma, MBBS, FWACS, FICS Ophthalmology Unit, Department of Surgery, Abia State University Teaching Hospital, P.M.B 7004 Aba 450272, Nigeria. Email: aoi.otuka@abiastateuniversity.edu.ng

# INTRACRANIAL LESIONS LEADING TO IMPAIRED VISION AND BLINDNESS IN ABA, SOUTH-EAST NIGERIA

O. O. A. Ijeoma, L. I. Eweputanna and C. C. Eweputanna

## ABSTRACT

*Objective:* **To enhance the knowledge of visual symptoms in patients with intracranial space occupying lesions.**
*Design:* **A case series study.**
*Setting:* **Abia State University Teaching Hospital, Aba, South- East Nigeria.**
*Subjects:* **Patients who presented for the first time to the ophthalmic unit of the hospital with features suggestive of intracranial space occupying lesions from June 2017 to May 2018. Ophthalmic assessment and cross-sectional radiological investigations were carried out.**
*Results:* **A total of 14 patients with clinical suspicion of intracranial space occupying lesions were seen in the study period. Only 8 were selected for the study as others could not meet up with the required investigations due to financial constraints. The patients' age ranged from 10 to 54 years. Varied radiological diagnosis were made: bilateral chronic subdural hematoma, pituitary macroadenoma, lipoma of the corpus callosum, cerebral and cerebellar ischemic infarction, craniopharyngioma, cerebral glioma, middle cerebral artery aneurysm and neurodegenerative disease.**
*Conclusion:* **Various intracranial lesions present with eye features. There is need for high index of suspicion so that these are promptly diagnosed.**

## INTRODUCTION

Visual impairment could be debilitating and often presents initially to the ophthalmologist. It has a variety of causes. Neuro-ophthalmic causes are daunting in diagnosis. Highlighting neuro-ophthalmic symptoms and signs will help in timely diagnosis and intervention. The eyes are formed from the hindbrain in the 4th week of embryonic life (1). The eyeball is an offshoot of the brain. It is basically an evagination from the brain (2). It is a window through which the brain lesions can be assessed (3) because ophthalmological manifestation of intracranial space occupying lesions correlates with the site of the brain lesion (4).

The visual pathway which starts from the retina to the occipital visual cortex, traverses different parts of the brain and during the course, it could be affected by different pathologies. Any interruption along its course can affect the visual outcome (5). The expansive nature of the visual pathway together with the fact that of the 12 cranial nerves, 6 are associated with the eye make it vulnerable to lesions that occur anywhere along its path (4).

Though cataract is the commonest cause of blindness worldwide (6), intracranial space occupying lesions cause significant amount of visual impairment/blindness (4). Generally, the frequency of intracranial space occupying lesions increases with increasing age. They occur in both genders. Eye symptoms and signs that have been identified in patients with intracranial space occupying lesions include pupillary abnormalities, papilledema, cranial nerve palsies, optic nerve atrophy, visual field defects, restriction of eye movements, squints, vitreous hemorrhage, sub hyaloid retinal and macular hemorrhages (4,7,8,9,10). A variety of intracranial lesions lead to the aforementioned visual signs. These intracranial lesions may be neoplastic or non-neoplastic. Neoplastic lesions may be benign or malignant, primary or metastatic. Non-neoplastic lesions include brain abscess, cysts, inflammatory or parasitic lesions (7).

This study aims to enhance the knowledge of visual symptoms in patients with intracranial space occupying lesions and no similar study has been carried out in this environment.

## MATERIALS AND METHODS

*Study setting:* Abia State University Teaching Hospital, Aba is a state-owned tertiary health facility that provides secondary and tertiary medical care, and it is also involved in training of high and middle level manpower for the health industry. It is a 300-bed hospital and serves as a referral center for Aba and its environs.

This is a retrospective, descriptive study spanning from June 2017 to May 2018. Case files of patients managed in the Ophthalmology unit of Abia State University Teaching Hospital for neuro-ophthalmic disorders were retrieved.

All patients (adults and children) with visual complaints in which there was clinical suspicion of intracranial space occupying lesions that did radiological cross-sectional imaging of the brain were included in the study.

Patients without radiological investigation reports were excluded from the study. The biodata, clinical presentation, eye examination findings, radiology reports and management of these cases were retrieved. In each case clinical examination was done after obtaining a detailed history. Ophthalmological assessment included routine ocular examinations with special reference to visual

acuity, ocular movement, pupillary abnormalities and fundoscopy which was done on dilatation. Intraocular pressure (IOP) was measured using applanation tonometer. Central visual fields (CVF) were assessed with Bjerrum screen.

All patients were included except those with incomplete information.

## REPORT OF CASES

*CASE 1:* A 54-year-old housewife presented with a 2-month history of double vision, dizziness, severe eye and headache, insomnia and right hemiparesis following a fall. She was a known hypertensive on treatment. Blood pressure (BP) was 120/100 mmHg at presentation and was managed with lisinopril, chlorpromazine, cinnarizine, pyritinol and low dose aspirin. The visual acuity (VA) at presentation was 6/6 in both eyes. The anterior segment was normal, with normal pupillary reaction. Fundoscopy revealed bilateral splinter hemorrhages on the discs at 11 O'clock positions and mild disc oedema. The intraocular pressure (IOP) was 10mmHg and 8mmHg on the right and left eyes respectively. Central visual field (CVF) was normal.

Brain computerized tomography (CT) revealed bilateral crescentric shaped hypodense collection in the subdural space with effacement of the ventricles and sulci (Figure 1). A diagnosis of chronic bilateral subdural hematoma was made.

Burr hole drainage was done, and patient recovered after that.

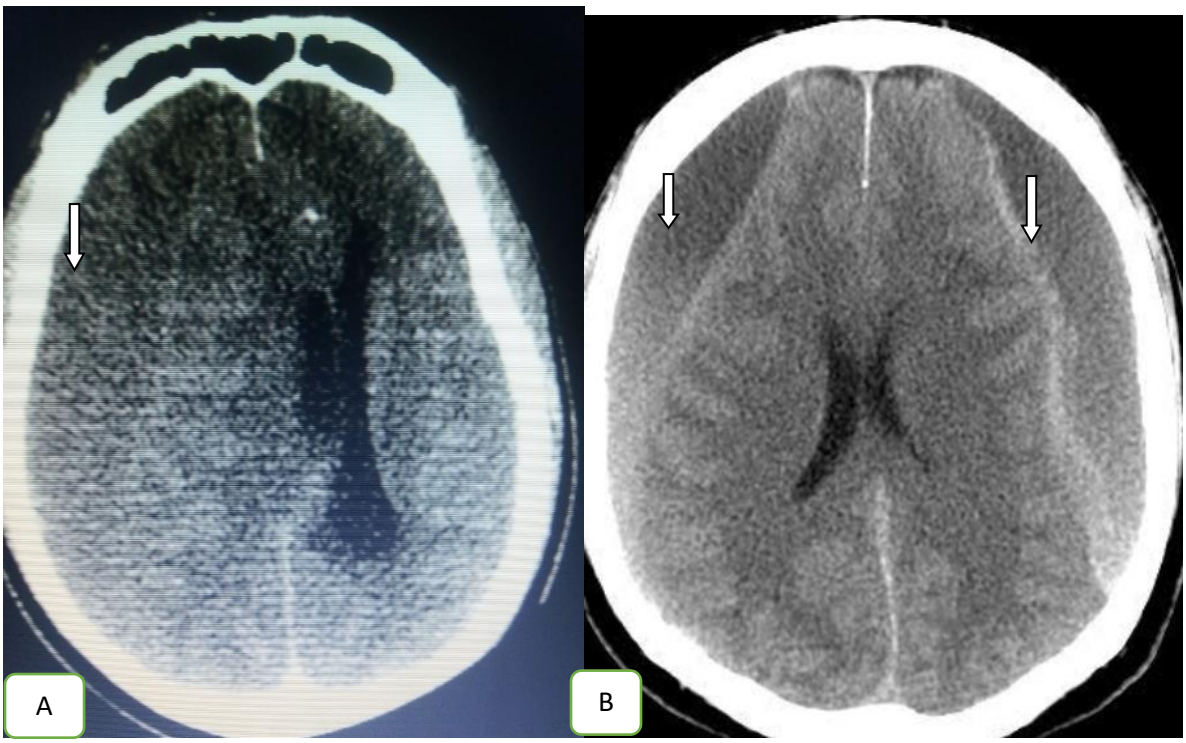


***Figure 1: Axial CT scan of the brain at the level of the lateral ventricles showing bilateral crescentic hypodense collection (arrow) due to chronic subdural hematoma.***

*CASE 2:* A 39-year-old male civil servant presented with one-year history of blurred vision, double vision and photophobia. The visual acuity was 6/18 and 6/36 in the right and left eyes respectively. There was no improvement of vision on refraction. The pupillary reactions were normal. The anterior segments were also normal. Ophthalmoscopy on dilatation showed normal fundus on the right, while on the left, the disc was pale, not cupped. Impending bilateral macular holes were seen. Intraocular pressure was 24mmHg and 18mmHg on the right and left eye respectively. Central visual field assessment (CVF) showed right incongruous homonymous hemianopia (Figure 2).

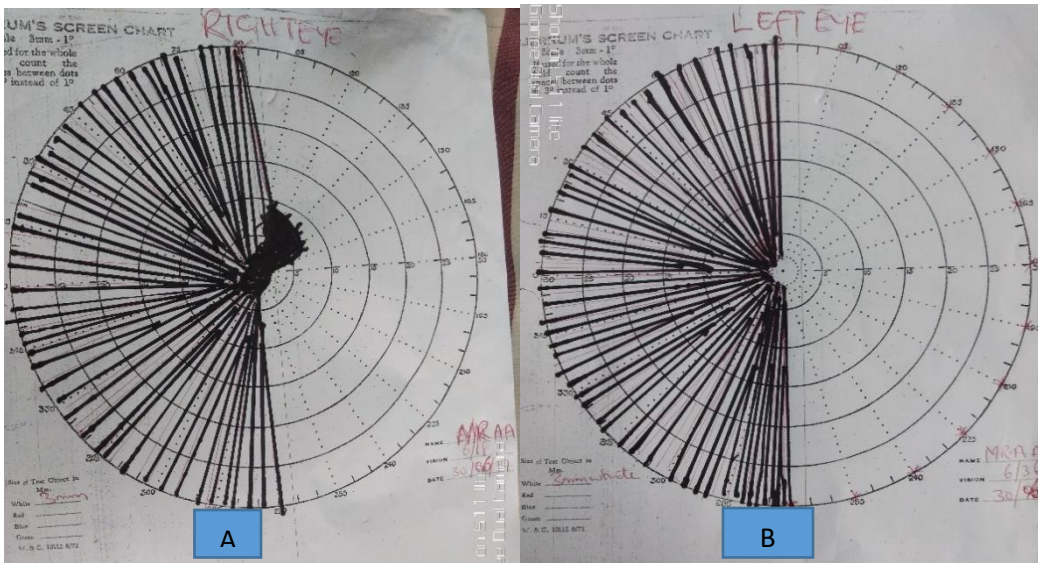


***Figure 2: Bjerrum screen chart showing bilateral right hemianopia (A &B) with central and superior field scotoma in the right eye(A).***

CT scan showed a solid figure-8 shaped enhancing isodense mass measuring 22mm in its widest diameter in the pituitary fossa. (Figure 3) A diagnosis of pituitary macroadenoma was made. He was managed via endoscopic trans-sphenoidal pituitary tumor excision. All visual signs and symptoms improved after the tumour excision. The visual acuity (VA) improved to 6/9 in both eyes. The left eye neuro retinal rim was pink as against the palor noted earlier and there was no macular hole seen.

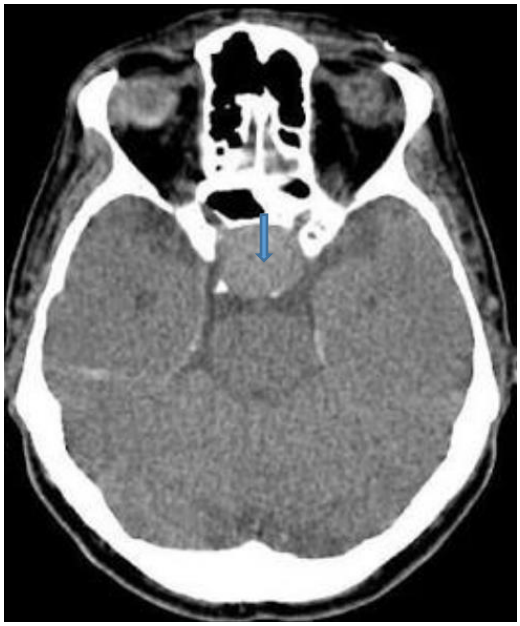

***Figure 3: Contrast enhanced brain CT at the level of the sella showing an enhancing mass (arrow) in the pituitary due to pituitary macroadenoma.***

*CASE 3:* A 10-year old female pupil presented with a 2-month history of double vision on distant gaze, inward deviation of the left eye, eye pain, tearing and headache. Eye evaluation showed normal visual acuity (6/6 in both eyes) and left convergent squint. The pupillary reaction and anterior segments were normal in both eyes. Fundal examination showed a right normal disc, while in the left eye, there was temporal disc pallor with a cup-to-disc ratio of 0.6.

Intraocular pressure was 25mmHg in both eyes. On refraction right eye was plano, the left eye was +0.50DS; the squint was not corrected with the refraction, the extraocular muscle movements were normal in all directions of gaze. A diagnosis of ocular hypertension with anisometropia to rule out intracranial space occupying lesion was made.

Magnetic resonance imaging (MRI) revealed a non- enhancing amorphous T1W & T2W hyperintense and STIR hypointense lesion in the splenium of the corpus callosum. It measured 5.2 x 2.7 x 7.5mm and extends from the midline to the right side. A diagnosis of corpus callosum lipoma was made. Other incidental findings were ethmoido-maxillary sinusitis with antral polyps.

Patient was managed conservatively.

*CASE 4:* A 44-year-old male trader presented with one-week history of double vision on distant gaze, noise in the right ear, inability to walk, dizziness and nausea. A history of syncope and vomiting was also elicited. On examination, the visual acuity was 6/18 and 6/24 on the right and left eye respectively. There was no improvement in visual acuity on refraction. The pupillary reactions and anterior segments were normal. The intraocular pressures were 20mmHg and 14mmHg on the right and left eyes respectively. Fundoscopy revealed normal discs. A diagnosis of Meniere's disease to rule out space occupying lesion was made and patient was referred for brain CT scan.

In craniocerebral CT, a non-enhancing uniformly hypodense area was noted in the

left cerebellar hemisphere and the ipsilateral occipital lobe. A diagnosis of left cerebral and cerebellar ischemic infarction was made.
Patient was placed on 150mg aspirin daily for 2 weeks and was referred to the neurosurgeon for further management.

*CASE 5:* A 16-year-old girl presented with bilateral loss of vision of 2-months duration. Prior to presentation, she was in and out of the hospital for severe headache, vomiting and vertigo and was managed for cerebral malaria, enteric fever and meningitis in the preceding 2 years. Eighteen months into the illness, she developed urinary incontinence and enuresis. Clinical eye examination revealed no light perception in both eyes, the pupils were mid-dilated and non-reactive to light, the anterior segments were normal. Fundoscopic examination showed bilateral severe disc atrophy. The intraocular pressure was 15mmHg in both eyes. A diagnosis of intracranial space occupying lesion was made and brain CT scan was requested.
CT scan showed a huge heterogeneous mass having cystic, solid and calcific foci in the sella turcica and parasella regions. Secondary obstructive hydrocephalous was noted. Post intravenous (IV) contrast studies showed heterogenous enhancement. CT diagnosis of craniopharyngioma was made. She was operated upon but died 2 weeks post-operation.

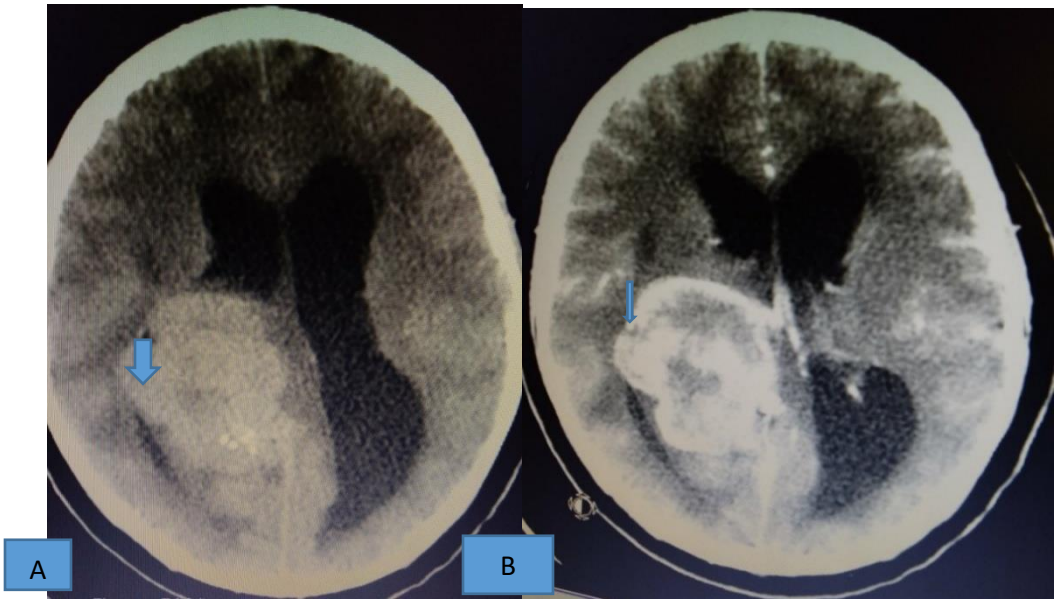


***Figure 4: Pre (A) and post IV contrast (B) CT scan of the brain showing a heterogeneous mass (arrow) with solid, cystic and calcific foci due to craniopharyngioma.***

*CASE 6:* A 37-year-old female interior decorator presented with a 2-year history of reduced vision, headache and pain in both eyes. Ocular examination revealed a visual acuity of 3/60 in the right eye and no light perception in the left eye. There was normal extraocular muscle movement. The pupillary reaction was very sluggish on the right and non-reactive on the left. There was bilateral lenticular opacity as well as posterior

subluxation of the right lens. There was also bilateral disc atrophy. The intraocular pressure was 28mmHg and 14mmHg on the right and left eyes respectively. Diagnoses of bilateral cataract, right ocular hypertension and intracranial space occupying lesion were made.

Brain MRI showed a large heterogeneous mass with heterogeneous enhancement on contrast study measuring 7.8cm in its widest diameter, arising from the left temporal lobe and extending to the left parietal lobe and parasella region. There was also significant mass effect with a midline shift of 2cm to the contralateral side. A diagnosis of cerebral glioma was made. Patient was scheduled for surgery but it has not been done due to financial constraints.

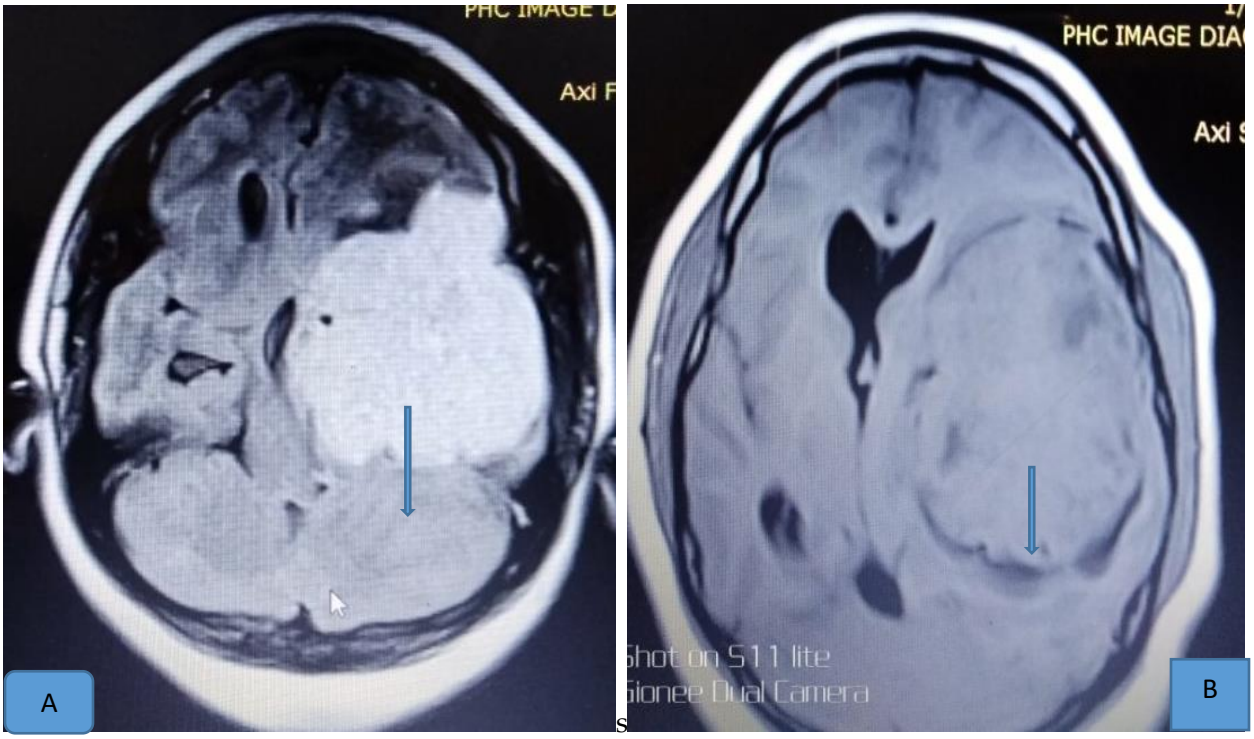


***Figure 5: T1W (A) and FLAIR (B) MRI images of the brain showing a large heterogeneous mass arising from the left temporal lobe due to cerebral glioma.***

*CASE 7:* Miss UC, a 19-year-old female student presented with double vision on distant gaze and inward deviation of the right eye of 2 weeks duration.

On examination, visual acuity was 6/6 in both eyes. She was noted to have right convergent squint on distant and near gaze; pupillary reactions and the anterior segments were normal. Fundoscopic examination revealed bilateral disc edema. The intraocular pressure (IOP) was 16mmHg and 14mmHg on the right and left sides respectively. Binocular diplopia test revealed double vision on central gaze with the second blurred image on the right. A clinical diagnosis of paresis of the right lateral rectus muscle was made.

An MRI was requested and showed a focal rounded T1W flow void & T2W hypointense bulge at the proximal part of the right middle cerebral artery due to aneurysm.

She declined surgical intervention and is being managed conservatively.

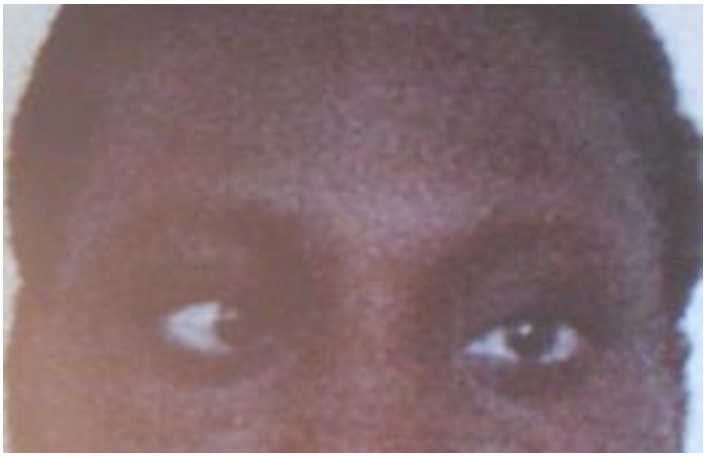

***Figure 6: Right convergent squint***

*CASE 8:* A 46-year-old male trader presented with a 4-month history of blurring of vision. It started in the right eye, progressed gradually and later involved the left eye. A history of head trauma following a fall 5 months prior to presentation was elicited. He was a known hypertensive but was inconsistent with his management. Blood pressure at presentation was 150/120mmHg. On ocular examination, the visual acuity of the right eye was light perception while on the left, it was hand movement. Both pupil were mid-dilated and sluggish to light. The anterior segments were normal. On fundoscopic evaluation, there was slightly hazy vitreous media and bilateral optic disc atrophy, worse on the right. The disc margins were distinct. The intraocular pressure was 16mmHg on both eyes. A working diagnosis of intracranial space occupying lesion was made.

B-mode ocular ultrasound showed freely mobile punctate and membranous echogenecities in the vitreous humor due to vitreous hemorrhage.

Magnetic resonance imaging (MRI) revealed multiple, small subcortical, bi-frontal, bi-parietal and periventricular T2W and FLAIR hyperintense lesions of varying sizes. An MRI diagnosis of neurodegenerative changes with a differential diagnosis of multiple lacunar infarcts was made. Other MRI findings were generalized cerebral/cerebellar atrophy and chronic maxillary/ethmoidal sinusitis.

In summary, the age of patients ranged from 10 – 54 years. There were three patients in the 2$^{nd}$ decade of life, 2 patients each in the 4$^{th}$ and 5$^{th}$ decades, while one was in the 6$^{th}$ decade of life. This study showed a predominance of female patients with a male: female ratio of 3:5.

Based on WHO International Classification of Diseases 11 - 2018 (11), 50% of eyes examined had normal visual acuity, 31% of the examined eyes were blind, 13% were moderately visually impaired and 6% were severely visually impaired. The right eye had higher percentage with normal vision and the left had more cases of blindness.

## DISCUSSION

Visual abnormalities, impairment and blindness may be the presenting features of an intracranial space occupying lesion. Though being atypical presentation, its recognition can aid the physician in timely detection and prompt application of

diagnostic and therapeutic modalities leading to reduction in morbidity and mortality.

In a study by Soomro et al(7), 13.5% of patients with intracranial space occupying lesions presented with loss of vision/ diplopia. This is in disparity with our study in which 63% of patients presented with diplopia. Disorders causing diplopia may arise due to lesions affecting any part of the third, fourth and sixth cranial nerves or due to diseases affecting the extra ocular muscles (12).

A patient in the study series presented with right convergent squint on distant gaze. This patient had an aneurysm in the proximal part of the right middle cerebral artery. Though squints are commonly caused by refractive errors, cataract, retinal, optic nerve or extra ocular muscular lesions like Brown's syndrome (13, 14), they have also been described in patients with giant aneurysms (15). The unilateral convergent squint could be related to the fact that the ophthalmic artery which originates from the internal carotid artery just proximal to middle cerebral artery around the circle of Willis close to the point of the aneurysm is compromised by pressure effect. Compromise to the middle cerebral artery which is the larger terminal branch of the internal carotid artery that supplies the extra cranial portion of the abducens nerve (16) may lead to paresis orparalysis of the lateral rectus muscle. Abducens nerve is the only innervation to the lateral rectus muscle, its paresis/ paralysis will lead to convergent squint as the medial rectus muscle function is unopposed by the weak/paralyzed lateral rectus muscles. It is a known fact that deprivation of blood supply to the nerves by different causes (in this case aneurysm) may produce paresis or paralysis of the muscle supplied (17).

Vitreous hemorrhage was noted in a patient with hazy media on fundoscopy examination, in keeping with work by Eweputanna et al (18), there were punctate and membranous echogenicities in the vitreous humour.

Bilateral optic disc splinter hemorrhage was noted in a patient with bilateral chronic subdural hematoma. This is an uncommon finding as splinter hemorrhages are usually associated with systemic hypertension in patients with normal tension glaucoma (19). Though intraocular hemorrhage involving the subretinal, retinal and preretinal membranes as well as the subhyaloidal and vitreous humour in patients with intracranial hemorrhage and raised intracranial pressure (Terson syndrome) have been described extensively in literature (8, 9, 10); optic disc splinter hemorrhage has not been described in the same clinical setting. The optic disc splinter hemorrhage in this patient is likely due to the fact that the subdural space of the orbit (around the optic nerve within the optic canal and optic foramen) is continuous with the subdural space of the brain (20).

Headache is a common manifestation of intracranial space occupying lesions. Similar to findings in other studies (4, 21), fifty percent of patients in the study population had headache probably due to raised intracranial pressure.

Urine incontinence as a sign of intracranial space occupying lesion has been reported by Soomro et al (7). Cortical lesions like tumours, ischemia, aneurysms or hemorrhage can lead to inappropriate voiding secondary to depressed social awareness, decreased sensation and/or inappropriate urethral sphincter relaxation (22). In this study, urinary incontinence and enuresis was noted in a 16-year-old patient with a huge craniopharyngioma occupying the sella and parasella regions and extending to the optic chiasm and the right parietal lobe. While the extension to the optic chiasm led to the loss of

vision, craniopharyngioma led to diabetes insipidus hence urinary incontinence and enuresis (23).

Pericallosal lipomas are fat containing lesions occurring in the interhemispheric fissure closely related to the corpus callosum. They are congenital conditions, often asymptomatic, but may present with epilepsy, hemiplegia, dementia or headaches (24). Pericallosal lipomas are rare, accounting for less than 0.1% of intracranial tumours (25). Lipoma of the splenium of the corpus callosum was noted in a 10-year-old patient who presented with headache, double vision, left convergent squint, eye pain and tearing. These rare presentation of visual symptoms in patients with corpus callosum lipoma emphasizes the need to diagnose and differentiate visual disturbances. The pathophysiology of visual disturbances in corpus callosum lipoma is unclear and further studies need to be done.

Other presenting complaints noted in this study were sudden blackout, gradual reduction in vision, severe eye ache, photophobia, tearing dizziness, insomnia, tinnitus, hemiparesis, nausea and vomiting. These are similar to works by other researchers (4,21).

There was bilateral right hemianopsia with central and superior field scotoma in the right eye in the patient with pituitary macroadenoma in keeping with studies by Nawalade and Javadekar (21). These visual impairments are considered to be due to pressure effect by these masses on the visual pathway.

A total of 14 patients with a clinical suspicion of intracranial space occupying lesions were seen in the study period. Only 8 are however presented as others did not do the cross-sectional radiology imaging due to financial constraints.

## CONCLUSION

In conclusion there are varied presentations of intracranial space occupying lesions. There is need for high index of suspicion so that intracranial space occupying lesions are promptly diagnosed. Detailed history, clinical examination and ancillary investigations should be recommended for patients in which clinical suspicion of intracranial space occupying lesion is high.

## RECOMMENDATION

We recommend prompt referral to neuro-ophthalmologist and neurosurgeons for immediate intervention so as to preserve vision and life. There is need for availability of neuroimaging facilities at affordable prices to aid in the diagnosis of neuro-ophthalmic lesions.

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