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OCULAR DOPPLER IN BRAIN STROKE PATIENTS TO AID IN EARLY DIAGNOSIS OF EYE STROKE

Ophthalmology

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ABSTRACT

Ischemic stroke presents an exceptionally large medical burden given that it is one of the leading causes of morbidity and mortality and is associated with high healthcare expenditures. A 51 years old female, case of right MCA territory infarct was referred from Medicine department to ophthalmic OPD with transient loss of vision in right eye since 2 days after the episode of stroke. She was hypertensive since 4 years. On slit lamp evaluation, anterior segment revealed immature senile cataract in both the eyes. Grade II RAPD was seen in right eye. Right eye fundus examination revealed a inferior hemiretinal artery occlusion and grade III hypertensive retinopathic changes. Left eye fundus examination showed grade III hypertensive retinopathic changes.

Two dimensional echocardiographic study of cardiac valves and aorta and carotid doppler assist in locating embolic sources of retinal occlusions along with ocular doppler. Therefore, it is necessary to screen all patients who present in the emergency room with stroke or history of stroke to provide early diagnosis and improve visual prognosis.

We would also like to emphasise that there is a need to spread awareness among all physicians for the need of routine ophthalmic consult for all hypertensive patients. In stroke patients, an ophthalmic consult should be done on the day of stroke for better visual care and prognosis. If ocular doppler along with carotid doppler is introduced as primary investigation in emergency room, it might help in early diagnosis, early intervention and aid in prevention of visual loss.

KEYWORDS

INTRODUCTION

Ischemic stroke presents an exceptionally large medical burden given that it is one of the leading causes of morbidity and mortality and is associated with high healthcare expenditures.[1] Through rigorous studies, many independent risk factors for stroke have been identified, including age, smoking, diabetes mellitus, hypertension, and others. One of the less-studied risk factors is monocular visual loss, when occurring secondary to retinal arterial occlusion. Permanent monocular blindness or vision loss may be seen secondary to central retinal artery occlusion (CRAO) and branch retinal artery occlusion (BRAO), caused by arterial embolic events to the retina, or ocular ischemic syndrome (OIS), which is associated with severe ipsilateral carotid stenosis. [2]

Colour doppler imaging of the orbit allows evaluation of blood flow velocity in the ophthalmic artery (oa), central retinal artery (cra), and posterior ciliary artery (pca) and therefore, may provide information regarding haemodynamic changes in patients with carotid stenosis or occlusive disorders. Orbital circulation changes with varying degrees of carotid stenosis.[3] The maximum accuracy for detection of carotid disease via the ophthalmic artery is limited by the inherent anatomic limitations of the ophthalmic artery to reflect disease in the internal and common carotid arteries. Therefore, for patients with less clear symptoms or bruit of unknown hemodynamic significance, a noninvasive ophthalmic test; ocular doppler provides a safe, simple, rapid diagnosis with acceptable accuracy.

Retinal artery occlusion is a common vascular occlusive disorder which leads to visual impairment. It may be Central retinal artery occulsion or Branch retinal artery occlusion as a result of pathological changes in extracranial cardiovascular system. Patients present with an acute onset of painless monocular visual loss or visual field loss and is common in elderly patients.

Primary prevention is aimed at chronic management of underlying systemic conditions. Fluorescein angiography, Spectral domain optical coherence tomography (OCT) and OCT angiography helps in identifying retinal perfusion occlusion and retinal edema or atrophy.

Carotid evaluation is important in elderly. Two dimesional echocardiographic study of cardiac valves and aorta and carotid doppler assist in locating embolic sources of retinal occlusions[4]along with ocular doppler. Therefore, it is necessary for all these patients to be examined by an ophthalmologist who present in the emergency room with stroke or history of stroke to provide early diagnosis and improve visual prognosis.

CASE REPORT

A 51 years old female, case of right MCA territory infarct was referred from department of Medicine to ophthalmology out patient department for a detailed fundus examination. Patient had a history of hypertension since 4 years and was not on regular medications for the same. On detailed questioning, patient also gave history of transient loss of vision since two days which was accompanied with the tingling sensation in left upper and lower limb. On complete ophthalmic evaluation, visual acuity for distance was FC at 1m in right eye and FC at 3m in left eye (not completely reliable as the patient was drowsy due to the episode of stroke). On slit lamp evaluation, anterior segment examination revealed immature senile cataract in both the eyes and Grade II RAPD in right eye. Rest was unremarkable. On dilated fundus examination, Right eye showed an inferior hemiretinal artery occlusion and grade III hypertensive retinopathic changes (Figure 1) (grading according to Keith Wagener Barker grades) and Left eye showed grade III hypertensive retinopathic changes (Figure 2). Rest fundus examination was unremarkable. OCT along with OCT angiography and fundus fluorescein angiography was planned but could not be done as the patient was drowsy and did not consent for the same. Paracentesis with 26G needle under slit lamp was done. Globe massage with gonio lens was tried in an attempt to relieve the occlusion. All of this, was not fruitful due to delayed presentation of the patient after the episode. Laboratory investigations showed Serum homocysteine: 48 mcmol/L, lipid profile: Total cholesterol: 132, HDL: 36, LDL: 79.6, Triglycerides-82 and serum creatinine: 0.46. Carotid doppler ultrasound results were reported to be normal.

DISCUSSION

Retinal artery occlusion is a common, visually disabling, ocular vascular occlusive disorder. It consists of multiple distinct entitles differing in their etiology, pathogenesis, clinical features and management.[5]

Central Retinal Artery Occlusion(CRAO) consists of four categories[5]:

1. Non-arteritic CRAO
2. Transient Non-arteritic CRAO
3. Non-arteritic CRAO with cilioretinal artery sparing
4. Arteritic CRAO with giant cell arteritis

Branch retinal artery occlusion (BRAO) is a common vascular occlusive disorder.[6] It is most likely to occur at bifurcation of an artery because of narrow lumen at those sites. 90% cases involve temporal retinal vessels.

Types of BRAO are mainly three:

A) Permenant BRAO
B) Transient BRAO
C) Three types of Cilioretinal Artery Occlusion(CLRAO):
i) Non-artertic CLRAO alone
ii) Arteritic CLRAO with Giant cell arteritis
iii) CLRAO associated with CRVO.

In response to ischemia, prolonged BRAO causes apoptotic cell death of inner retinal layers. T-cell antigen 1 mRNA levels decrease gradually and heme oxygenase-1 peaks at 12 or 24 hours after damage to retinal cells.[6]

Hemi-CRAO is a rare condtion and it may be a manifestation of a preexisting systemic condition or a harbinger of a hitherto undiagnosed systemic condition.[7]

Michael B. Avery et al conducted a retrospective study in Canada and found that BRAO, CRAO and OIS result in increased stroke rate, suggesting that these patients warrant urgent stroke assessment and risk factor modification. [8]

Dunlap et al. in 130 consecutive patients with a diagnosis of Hollenhorst plaques, CRAO or BRAO, found that they are associated with a low prevalence of extracranial cerebrovascular disease to require intervention.[9]

Andreas Widjaya et al conducted a pilot study on hypertensive patients to correlate hypertension with ocular doppler sonography. They found an increase in maximum systolic blood flow velocities in all ocular vessels of hypertensive compared to normal subjects. Ocular doppler sonography was suggested to detect atherosclerotic process as a potential risk factor for stroke.[10]

In our case, the patient presented with sudden onset of weakness of left upper limb and lower limb associated with tingling sensation, etiology being cerebrovascular accident. She had a history of hypertension since four years but never underwent an ophthalmic evaluation for the same previously. The patient was referred by the physician after two days to our OPD for fundus examination to rule out hypertensive retinopathy. On detailed evaluation and further questioning, the patient gave the history of transient loss of vision since 2 days and the above fundus findings were noticed. Probably, since the etiology affected the vision monocularly, patient failed to notice the loss of vision as it did not hamper her daily activity. Therefore, this explains the necessity to create awareness among hypertensive patients to monitor vision regularly so that such episodes can be catered to early and may help in better visual outcome. Due to delayed presentation of the patient to us, there were very limited options with us to improve the visual outcome. If the patient had presented on the day of stroke, we could have done an Ocular Doppler along with Carotid Doppler to prevent an eye stroke. Ocular Doppler may be considered useful to detect retinal emboli to prevent visual loss even if Carotid Doppler do not show positive findings. As we noted in our case, Carotid Doppler was normal but fundus showed occlusion.

Ocular Doppler helps in rapid diagnosis, early intervention, and optimize visual care. Thus, we emphasise on the importance of Ocular Doppler and ophthalmology consult on the day of stroke for early diagnosis, better visual care and prognosis.

Hypertension causes alteration in ocular blood vessels due to atherosclerosis. Hence, regular ophthalmic consult is advised to all hypertensives for better visual care, even if hypertension is under control.

Hence,we urge that there is a need to create awareness among all general practitioners and physicians for the need of routine ophthalmic consult for all hypertensive and stroke patients.

If ocular doppler along with carotid doppler is introduced as primary investigation in emergency room, it might help in early diagnosis, early intervention and aid in prevention of visual loss. Delay in management can lead to permanent loss of vision which is devastating physically as well as mentally. Therefore, early and regular referral of hypertensive and stroke patients can aid in optimum visual care.

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