

Unilateral Optic Disc Swelling Demographic Study, Ocular and Systemic Association

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ABSTRACT

Objectives: this study aimed to investigate the most common causes of unilateral optic disc swelling and also to identify the ocular and systemic factors associated with each case.

Study design: this was a prospective study in El-Hussein University Hospital and National eye Center (Rod El-Farag). **Population:** 50 eyes of 50 patients who were suffered from unilateral optic disc swelling were included in this study. **Method:** personal, medical, family, systemic illness history, smoking, drug and alcohol intake, visual acuity assessment, clinical assessment of the optic nerve function, anterior segment examination, fundus examination, visual field testing, magnetic resonance imaging (MRI) of the orbit and brain and laboratory investigation including fasting blood glucose and 2 hours postprandial, lipid profile, complete blood picture, C reactive protein and ESR were included. **Results:** non arteritic anterior ischemic optic neuropathy (NAION) was the most common cause of unilateral disc swelling reported in this study (72%) followed by traumatic optic neuropathy, optic neuritis, disc swelling associated with orbital mass, disc swelling associated with brain mass in the same percentage (6%) followed by disc swelling associated with thyroid ophthalmopathy, disc swelling associated with cilio retinal artery occlusion in the same percentage (2%) with different ocular and systemic associations in each group. **Conclusion:** the most common cause of unilateral disc swelling in the present study is (NAION), it caused mainly by systemic vascular disorders (DM, HTN and hyperlipidemia).

Keywords: non arteritic anterior ischemic optic neuropathy, optic disc, disc swelling, funduscopy, visual field.

INTRODUCTION

Unilateral optic disc swelling is a general term used to describe the optic nerve head affection by a variety of local and systemic causes, accumulation of axoplasmic flow especially slow anterograde flow component at the lamina cribrosa produces disc swelling and retinal nerve fiber opacification⁽¹⁾.

Generally, there are multiple causes related to unilateral disc swelling such as anterior ischemic optic neuropathy, which was the most common cause of acute optic neuropathy in older age groups. It can be non arteritic optic neuropathy or arteritic, the latter being associated with giant cell arteritis and severe visual loss, anterior ischemic optic neuropathy was characterized by visual loss associated with optic disc swelling and pallor, Visual loss is usually sudden or develops over a few days at most and is commonly unilateral, although second eye involvement may occur later, Altitudinal field loss is common⁽²⁾.

Optic neuritis is inflammation of the optic nerve which leads to subacute visual loss and commonly affects young white females, Symptoms included monocular visual loss developing over days to weeks, periorbital pain with eye movement is a key symptom, clinically central field defects and

decreased color vision were common, inflammation of the optic nerve head or papillitis was presented with hyperemic and edematous disc⁽³⁾. Cavernous hemangiomas were the most common intraorbital tumors found in adults. These benign, vascular lesions were slow growing. Most of these tumefactions were exceedingly unilateral. Dilated funduscopic examination may elucidate choroidal folds secondary to compression of the globe by the mass, If the tumefaction is in close proximity to the optic nerve, visible changes may include edema, elevation, pallor and even atrophy in severe cases⁽⁴⁾.

Traumatic optic neuropathy is an uncommon cause of visual loss following blunt or penetrating head trauma.

Although the majority of patients were young adult males, about 20% of cases occur during childhood. Traumatic optic neuropathy refers to any insult to the optic nerve secondary to trauma⁽⁵⁾.

Optic nerve sheath meningioma usually arises from the intraorbital part of the optic nerve sheath and accounts for approximately 2% of all orbital tumor, optic disc abnormalities are nearly always visible at the time of presentation (98%), chronic disc swelling occurs when the tumor surrounds or compresses the intraorbital part of the optic nerve⁽⁶⁾.

PATIENTS AND METHODS

This study aimed to investigate the most common causes of unilateral optic disc swelling and also to identify the ocular and systemic factors associated with each case by complete examination of fifty eyes of fifty cases of patients who were suffered from unilateral disc swelling. **The study was approved by the Ethics Board of Al-Azhar University.**

All patients were submitted to: full personal, medical, family, and social history was obtained including systemic illness, smoking, drug intake and alcohol intake.

Complete ophthalmic examination in the form of:

- Measurement of visual acuity (VA) and best corrected visual acuity (BCVA).
- Examination of the anterior segment of the eye by slit lamp.
- Measurement of Intra ocular pressure (IOP).
- Fundus examination using +78D lens (biomicroscopy) and +20D lens (fundoscopy) after pupillary diltation.
- Clinical examination of the optic nerve function included:
 - * Color vision assessment using ischahara chart.
 - * Pupillary reflexes assessment using swinging flashlight test.
 - * Contrast sensitivity assessment using Pelli Robson chart.
- Visual field testing was performed using Humphrey automated field analyzer using central 24-2 test strategy.
- Fluorescein angiography (FA) was obtained in 10 patients.
- Visual evoked potential (VEP) was obtained in 6 patients.
- Computerized tomography (CT) of the para- nasal sinuses was obtained in one case.
- Magnetic resonance imaging (MRI) of the orbit and brain in all patients.
- Laboratory investigation included:
 - * Fasting and 2 hours postprandial blood glucose level.
 - * Complete blood picture.
 - * Lipid profile.
 - * Erythrocyte Sedimentation Rate.
 - * C-reactive protein.
- Full medical evaluation was done in all cases and other systemic investigations were requested according to the probable etiology.

RESULTS

Fifty cases were diagnosed as unilateral disc swelling in this study, twenty eight patients (56%) were men and twenty two (44%) were women, their age ranged from 3 to 72 years with a mean age 48 years old.

1. Non Arteritic Anterior Ischemic Optic Neuropathy (NAION):

In this study non arteritic anterior ischemic optic neuropathy (NAION) was the most common cause of unilateral disc swelling, it was reported in 36 cases (72%). The age of presentation ranged between 35 to 72 years, the sixth decade was the most included decade, the patients showed the typical presentation of unilateral visual loss, fundus picture showed (ONH) swelling with disc pallor and nerve fiber layer hemorrhages.

The systemic associations in cases of (NAION) were diabetes mellitus (31%) followed by hyperlipidemia (22%) followed by systemic hypertension (17%), also combination of (DM) and hyperlipidemia (17%) and combination of (DM) and hypertension (11%) were presented, systemic hypotension presented only in one case, the coronaries and brain vessels as well as the optic nerve head vessels were also affected in some of these cases, the most common ocular associations were diabetic retinopathy (28%) and intra ocular lens implantation after cataract extraction with bad diabetic control (5%).

2. Optic neuritis:

Three cases (6%) were diagnosed as optic neuritis. One case was 37 years old aged male, (MRI) brain study was suggestive for white matter demyelinating disease, his (MRI) study for both orbits revealed maxillary sinusitis that is suggestive for infectious optic neuritis, other case was 23 years old aged female, (MRI) brain study revealed para-ventricular ischemic white matter demyelination that is impressive of demyelinating disease (MS), the last case had no associations.

3. Traumatic Optic Neuropathy:

Three cases (6%) were diagnosed as traumatic optic neuropathy, they were males 6,8,13 years. Patients presented with sudden drop of vision after blunt trauma, visual evoked potential (VEP) showed affection in all cases with delayed retino-cortical transmission and increase latency and decrease amplitude, only one case was associated with posterior sub-capsular cataract.

4. Unilateral disc swelling associated with orbital mass:

Three cases (6%) were diagnosed as unilateral disc swelling due to orbital mass.

Two cases were diagnosed as cavernous hemangioma of the orbit according to (MRI) brain and orbit and histopathological result, they were two female patients 36, 65 years, they were associated with conjunctival chemosis, external ophthalmoplegia and proptosis, one case was diagnosed as dermoid cyst of the orbit according to (MRI) brain and orbit and histopathological result, he was young child 3 years male patient, his mother noticed that her son cannot follow upward by his right eye.

5. Unilateral disc swelling associated with brain mass:

Three cases (6%) were diagnosed as unilateral disc swelling due to brain mass; one case was middle aged female (34 years) diagnosed as microadenoma of the pituitary gland, she was associated with systemic symptoms due to hormonal changes, other case was old aged male (50 year) diagnosed as suprasellar mass of the brain that is suggestive of giant aneurysm of the circle of willis that need brain (CT) angiography, last case was young child (5 years) diagnosed as fibrillary astrocytoma of the fourth ventricle according to MRI brain and orbit finding and histopathological result.

6. UniLateral Disc Swelling associated with Thyroid Ophthalmopathy:

The case was female patient (46 years), she was referred to the clinic for examination that showed bilateral proptosis and limitation of the lateral gaze movement and high Intra-ocular pressure was 35/38 respectively.

7. Unilateral disc swelling associated with Cilio-retinal artery occlusion:

The case was old age male (60 years) presented with sudden drop of vision (Perception of Light). This old male patient was cardiac, he did several interventions in the heart, also he was diabetic and hyperlipidemic.

DISCUSSION

Unilateral optic disc swelling was caused by numerous systemic, orbital and ocular causes.

1. Non Arteritic Anterior Ischemic Optic Neuropathy (NAION):

a. Systemic associations in (NAION): **Taylor *et al.*** in a large study that included 977 of (NAION) patients, about the ocular and systemic associations

with NAION reported that a considerable higher risk of (NAION) among persons with uncomplicated as well as complicated hypertension, Systemic hypertension is an important risk factor for ischemic cerebrovascular accidents and this may be due to a decrease in endothelium dependent, flow-mediated vasodilation, Diabetes Mellitus would not found to be a risk factor for NAION, also there was a strong positive association between hypercoagulable state and (NAION). This result raised the intriguing possibility that oral antiplatelet therapy or other anticoagulants might reduce the risk of NAION, also a positive association found between macular degeneration and NAION and perhaps this association has a genetic basis ⁽⁷⁾.

Salomon *et al.* in a study that included 61 of (NAION) patients about NAION and systemic associations, reported that diabetes then ischemic heart disease then hypercholesterolemia were associated factors ⁽⁸⁾. **Hayreh *et al.*** in their study that included 406 of (NAION) patients about (NAION) and associated systemic diseases, reported that Hypertension then Diabetes then Cerebro-vascular disease then Ischemic heart disease were associated factors in (NAION) incidence, also thyroid diseases and chronic obstructive pulmonary disease were another association ⁽⁹⁾. In the present study, the cases of (NAION) were associated systemically with (DM) in (30.5%), hyperlipidemia in (22.2%), systemic hypertension in 16.6% , also combination of DM and hyperlipidemia was presented in 16.6% and combination of DM and HTN was presented in 11.1%, 2.7% was due to systemic hypotension and also vascular changes in the cerebro-vascular tree and neck arteries were presented in 17% of cases.

b. Ocular associations of (NAION):

The association post cataract extraction anterior optic neuropathy was supported by a study done by **McCulley *et al.*** who calculated the rate of incidence of NAION in cataract extraction cases per year that included 5787 cases over 5 years, It was 52/100000 ⁽¹⁰⁾. Another study done by **lam *et al.*** they found a strong association between cataract extraction and incidence of (NAION); they also calculated the rate of incidence of attack of NAION after cataract extraction in the same operated eye and the fellow eye in 325 of NAION patients ⁽¹¹⁾. In this present study, 8.3% of (NAION) cases were associated with incidence of attack of (NAION) after cataract extraction and Posterior Chamber (IOL)

implantation in the diabetic patients. A study done by **Reddy *et al.*** who examined 153 eyes of 109 patients to estimate the incidence of diabetic retinopathy in NAION patients, reported that diabetic retinopathy presented in 46 eyes (30.1%) of cases of NAION, duration of diabetes was an important risk factor for both presence and severity of diabetic retinopathy in subjects with NAION⁽¹²⁾.

Also in the present study 27.7% of NAION cases were associated with incidence of diabetic retinopathy.

2. Cavernous Hemangioma of the Orbit (CVM):

Shields *et al.* in a survey of 1264 orbital lesions based on adult patients referred to an ocular oncology center, reported that cavernous hemangioma of the orbit represented the third most common diagnosis after lymphoid tumors and orbital inflammatory syndrome⁽¹³⁾.

In the present survey about unilateral disc swelling, 50 cases were included the most common orbital mass that causes disc swelling was the cavernous hemangioma of the orbit and it was also the most common benign orbital mass founded although this study did not include such this large number of cases.

3-Traumatic Optic Neuropathy (TON):

Lee *et al.* estimated the incidence of (ITON) in the general population, it was approximately 1/million person, they also reported that, only 20% of cases presented in childhood period and the majority of cases suffered relatively minor head injuries with neither orbital nor skull fracture⁽¹⁴⁾. In the present study, all cases of traumatic optic neuropathy reported in childhood period, also they were not injured by severe trauma but by mild to moderate blunt trauma and no other eye segment are injured except one case by posterior sub-capsular cataract, this makes examination of posterior segment is too important even in mild trauma.

CONCLUSION AND RECOMMENDATION

The most common cause of unilateral disc swelling in the present study was NAION, it caused mainly by systemic vascular disorders (DM - HTN - Hyperlipidemia), It is recommended for all these patient to do regular fundus examination and regular follow up, controlling of these systemic disorders by

regular control of blood glucose and blood lipid levels, regular blood pressure control and referral to the specialist.

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