CLINICAL PROFILE AND SHORT-TERM VISUAL OUTCOME OF OPTIC NEURITIS

INTRODUCTION

Optic neuritis is an inflammatory, demyelinating condition that causes acute, usually monocular, visual loss. It may develop as insidious progressive or nonprogressive visual dysfunction, and it may even be asymptomatic.

Optic neuritis usually is a primary demyelinating process. It almost always occurs as an isolated phenomenon or in patients who either have, or will develop, MS.Optic neuritis is also part of the demyelinating syndrome called ‘‘neuromyelitis optica’’ or ‘‘Devic’s disease,’’

EPIDEMIOLOGY

Incidence rate of optic neuritis 5.1 per 100,000 person-years and the prevalence rate 115 per 100,000. Most patients with acute optic neuritis are between the ages of 20 and 50 years, with a mean age of 30–35 years. Females are affected more commonly than males . It is more common in Caucasians. Asians and Africans are least susceptible.

ANATOMY

The optic nerve is a white matter tract of the central nervous system that transmits visual information from the eye to the brain. Theoptic nerveis composed of retinal ganglion cellaxonsand glial cells. Each optic nervecontains

1.1 to1.3 millionaxonsderived from the retinal ganglion cells. The axons in the optic nerve originate in the retina, acquire a myelin sheath as they leave the lamina cribrosa and finally terminate by synapsing in the lateral geniculate bodies or in the midbrain. The optic nerve is 5 to 6 cm long and can be divided into four parts:

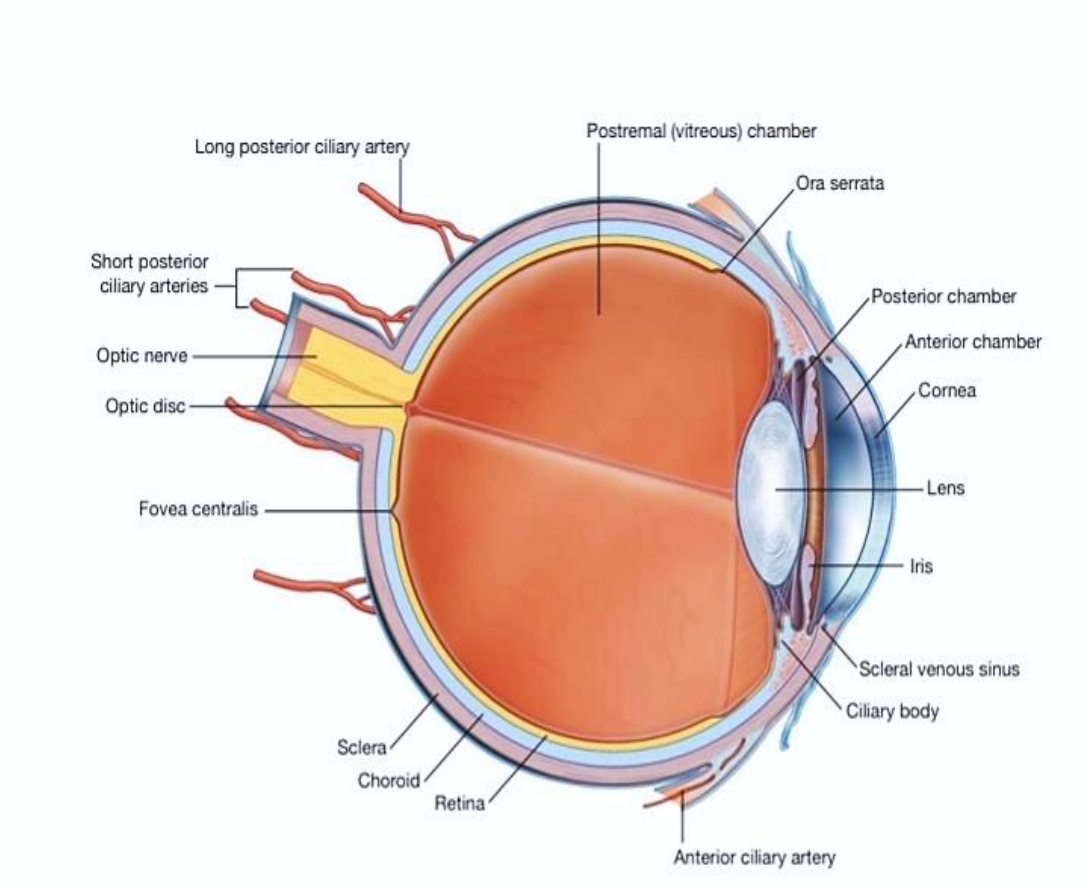


Fig :1 - Schematic diagram of the human eye, with the optical disc, or blind spot.

Parts of the optic nerve	*Extensions*	*Length*
Intraocular	Optic nerve head, up to lamina cribrosa	0.7 to 1mm
Intraorbital	From eyeball up to the optic canal	30 mm
Intracanalicular	Part of the optic nerve with in bony optic canal of sphenoid bone	6 to 10 mm
Intracranial	Up to optic chiasma	10 to 16 mm

The optic nerve consists of Retinal ganglion cell (RGC) axons + Supportive glial tissue+ Vascular tissue and is surrounded by three layers of meningeal tissue (pia, arachnoid, and dura)

INTRAOCULAR PART OF OPTIC NERVE

The intraocular portion of the optic nerve is the shortest portion of the nerve and is approximately 1 mm long. The intraocular portion further can be divided into prelaminar and laminar segments.

The term “optic disc” usually refers to the ophthalmoscopic view of the nerve head, while the term “papilla” is used to describe the appearance of optic nerve head seen in microscopic sections. The optic disc is oval-shaped and measures approximately 1.5 mm horizontally × 1.75 mm vertically in size. The

optic disc has a pale red or yellowish red color. The relative pallor of the disc is observed due to the reflection of light from the myelin sheaths of the optic nerve bundles behind LC as well as from the connective tissue & glial tissues which occupy and lie in front of the sclerochoroidal aperture. And the light reddish tint is due to the presence of a capillary plexus derived from the vessels of the circle of Zinn and central retinal artery. There is a short funnel-shaped depression in the center of the optic disc, from which the retinal vessels appear to emerge. This depression is known as the physiological cup of optic disc. In about 15% individuals, the optic disc does not show physiological cupping. About 15% of cases of the optic disc do not show physiological cupping.

Fibers are continuous with those of sclera and choroid bridge the sclerochoroidal aperture forming a sieve-like structure which is known as *lamina cribrosa*. The nonmyelinated axons of the retinal ganglion cells converge and make 90 degrees turn sharply at the optic disc and exit as optic nerve through *lamina cribrosa*. It must be noted that the complete absence of rod or cones in this area (optic nerve head) makes it insensitive to light and thus it is called the blind spot. It has been estimated that the optic nerve consists of approximately 1 million to 2.22 million such nerve fibers. The nerve fibers are arranged in bundles (800–1,200 fibers are arranged in a single bundle). There are two types of axons in the optic nerve:

A. Majority (approximately 90%) of the axons are less than 1 μm in diameter. These axons originate from the midget ganglion cells, associated with cones.

B. Larger axons are few in number and measure 2 µm to 10 µm in diameter. These axons originate from ganglion cells, associated with rods.

The axons in the optic nerve are arranged in a distinct pattern:

- The peripheral retinal nerve fibers or axons are located in the peripheral portion of the optic nerve,
- The central area of the nerve contains fibers from the posterior or central part of the retina.
- Macular fibers form the papillomacular bundle and enter the disc temporally; they remain temporal for a short distance behind the eye, but as they proceed further posteriorly these fibers become diffusely distributed.
- Nerve fibers arising in the nasal half of the retina cross in the chiasm; axons arising in the temporal half are uncrossed.

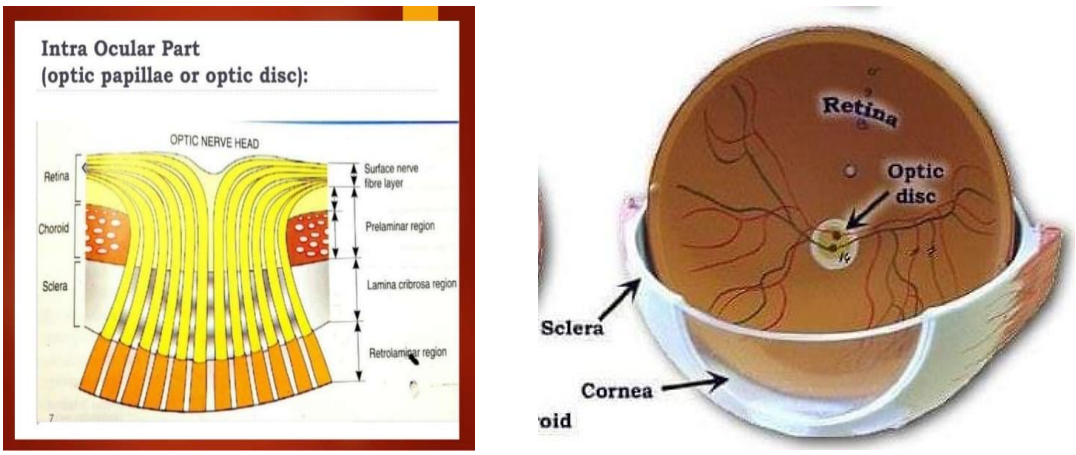


Fig 2: Anatomy of optic nerve head

Intraorbital Part of the Optic Nerve

- Immediately after crossing *lamina cribrosa*, the optic nerve fibers become myelinated. These myelin sheaths or coverings are secreted by oligodendrocytes. As a result of myelinations, the diameter of these fibers increases to 3 mm (from 1.5 mm of the intraocular part).

- *Lamina cribrosa* acts as a barrier for the oligodendrocytes and thus normally myelinations are not seen in the retina.

- Myelin sheaths in the optic nerve are secreted by oligodendrocytes because there are no Schwann cells in the central nervous system.

- The length of the intraorbital part of the optic nerve is 25-30 mm. This part of the nerve is comparatively longer than its normal distance from the eyeball to optic canal because of the sinuous or curvy course of the nerve in this part. Here the optic nerve is enclosed by the coverings of the meninges namely outer dura mater, middle arachnoid mater and innermost pia mater. These meningeal coverings extend up to eyeball and blend with sclera and periorbita. The subarachnoid space, between arachnoid and pia mater, around the optic nerve is continuous with intracranial subarachnoid space and contains cerebrospinal fluid (CSF). Among these three coverings, only pia mater continue with the intracranial part of the optic nerve. The orbital fat present in the intraorbital part provides support and act as a cushion for the optic nerve

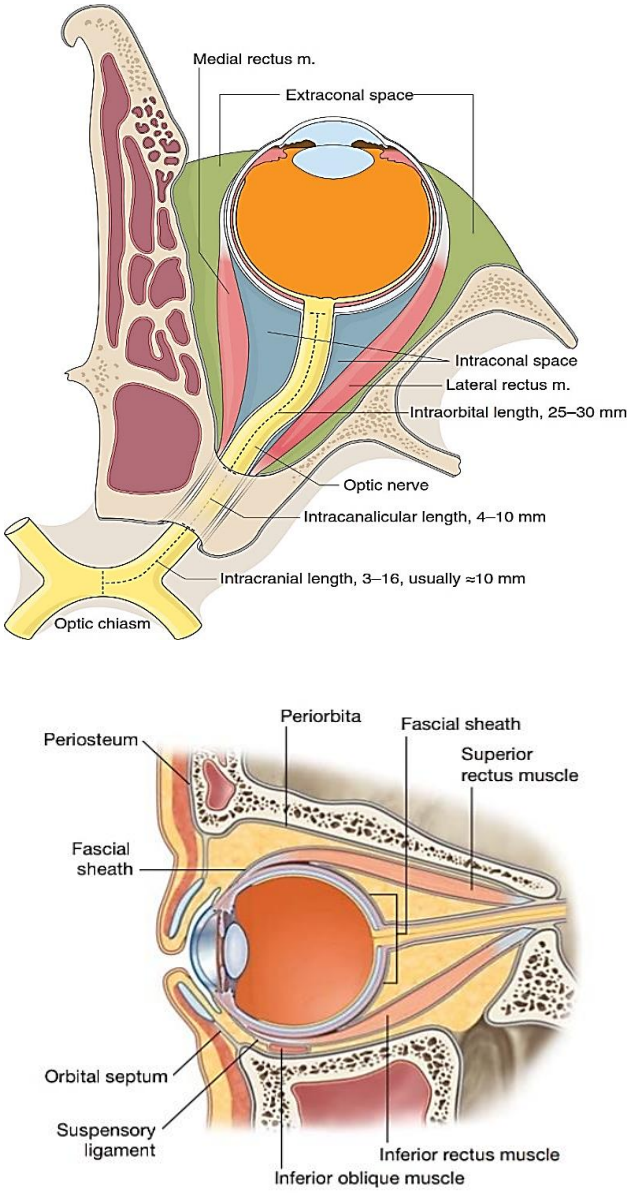


Fig 3: Intraorbital part of optic nerve

Intracanalicular Part of the Optic Nerve:

- The optic canal is situated in lesser wing of the sphenoid bone. The length of this bony canal is 5 mm. Along with the optic nerve, the ophthalmic artery, postganglionic sympathetic nerve pass through the canal. As mentioned earlier, intracanalicular part of the optic nerve

carries three coverings of meninges and dural sheath blends with periorbita lining the canal. This blending fixes the optic nerve. The subdural space (potential space between the dura mater and the arachnoid), does not communicate with subdural space of the brain. But the subarachnoid space (potential space between the arachnoid and the pia mater), is continuous with the corresponding intracranial space and transmits cerebrospinal fluid. Thus, it can provide a potential pathway for the spread of blood, infectious agents, and tumor cells between the eye and the brain.

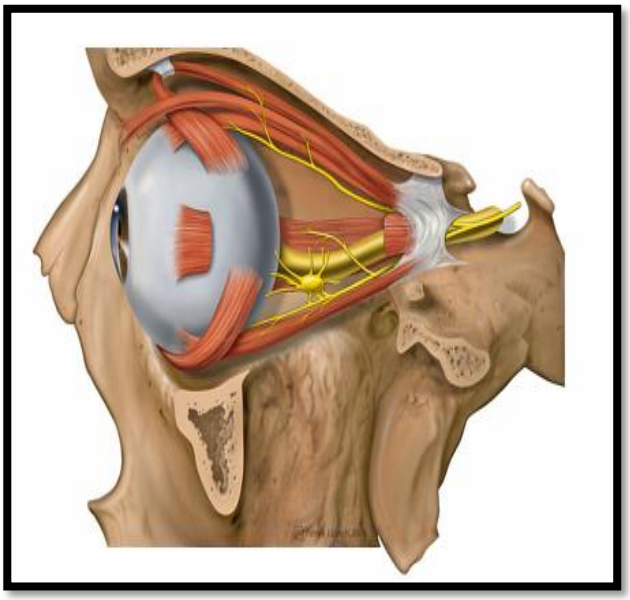


Fig 4:Intracanalicular part of optic nerve

Intracranial Part of the Optic Nerve:

- After leaving the bony canal, the optic nerve passes posteriorly and upwards to reach the optic chiasma, which is situated on the floor of the third ventricle.

- Optic chiasma is a flattened bundle of nerve fibers, roughly rectangular in shape with a dimension of 12 mm x 8 mm x 2 mm. Fibers from nasal hemiretinas of both eyes decussate here to the contralateral side while the fibers from the temporal hemiretinas remain ipsilateral as continue as an optic tract.

Glial tissue of optic nerve:

- The supportive tissue system of the central nervous system (CNS), known as neuroglia or glial tissue, is similar for the optic nerve also. These include astrocytes, oligodendrocytes, and microglia.

- Astrocytes: Astrocytes of the optic nerve can be compared with Mullers cells in the retina. They protect the axons structurally and maintains a stable biochemical environment,

- Oligodendrocytes: Oligodendrocytes are unique cells found only in optic nerve posterior to the Lamina cribrosa, (normally absent in retina and optic nerve head) which produces myelin sheaths that covers the optic nerve axons.

- Microglia: Microglias are the phagocytes of the central nervous system. These cells are found within bundles of axons.

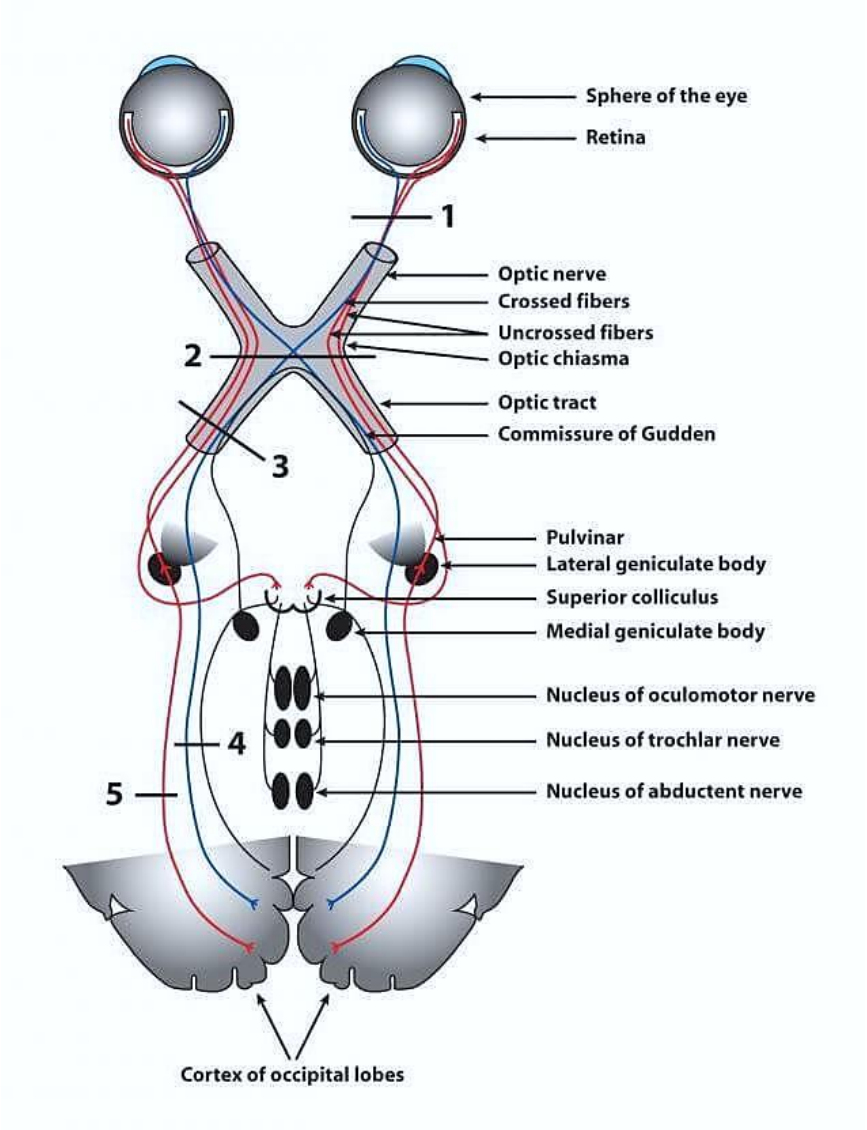


FIG 4 : INTRACRANIAL PART OF OPTIC NERVE

ETIOLOGY

1)Idiopathic

2)Multiple sclerosis

Optic neuritis occurs in about 50% of patients having MS and is the presenting feature in about 20% of patients[1-4.] Recurrent optic neuritis is more common with MS, which can involve the same eye or

the fellow eye [1-4]. The optic neuritis treatment trial shows that female gender, one or more lesions on MRI, history of non specific neurological symptoms (usually transient numbness), prior optic neuritis in fellow eye or retro bulbar optic neuritis are positive risk factors for the development of multiple sclerosis[5]. Negative risk factors includes male gender, no lesions on MRI,optic disc swelling, absence of pain and ophthalmoscopic findings of severe optic disc edema, peri papillary haemorrhages /retinal exudates[5].

ONTT shows that the 10 year risk of development of multiple sclerosis is 38% in patients with idiopathic optic neuritis. Patients who had 1 or more typical lesions on the baseline MRI had 56% risk; those with no lesions had a risk of 22% was also demonstrated that, higher number of lesions do not appreciably increased that risk.

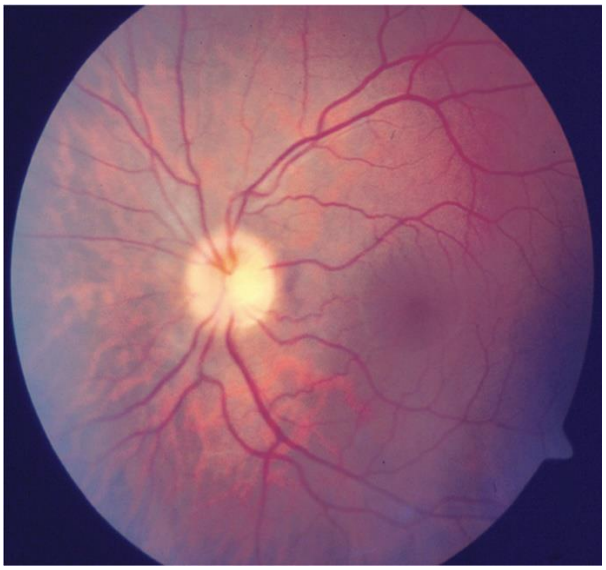


FIG 5: Mild Optic Disc Edema Associated With Multiple Sclerosis.

3.Neuro myelitis optica (Devic's disease)

An inflammatory demyelinating disease of the CNS. It is a variant of multiple sclerosis, characterised by bilateral optic neuritis and transverse myelitis, children and young adults are more susceptable. The optic nerves, the spinal cord and less commonly the cerebrum are affected by scattered lesions of demyelination,which principally affect the white matter, with widespread destruction of the myelin sheaths[6-9]

The primary features of neuro myelitis optica are visual loss caused by damage to the anterior visual sensory pathways and paraplegia caused by damage to the spinal cord. It is usually preceded by a prodrome of sore throat, fever and headache or rarely previous viral illness or of a recent viral vaccination. There is rapid, severe visual loss which is usually bilateral although one eye is affected first, while the second eye is affected within hours to days. This is in contrast to typical optic neuritis where visual loss is less severe and often unilateral. Eventhough few patients develop permanent, severe visual loss in both eyes, most of the patients show some visual recovery within a few weeks to months of the disease onset. Visual fields also shows gradual recovery.

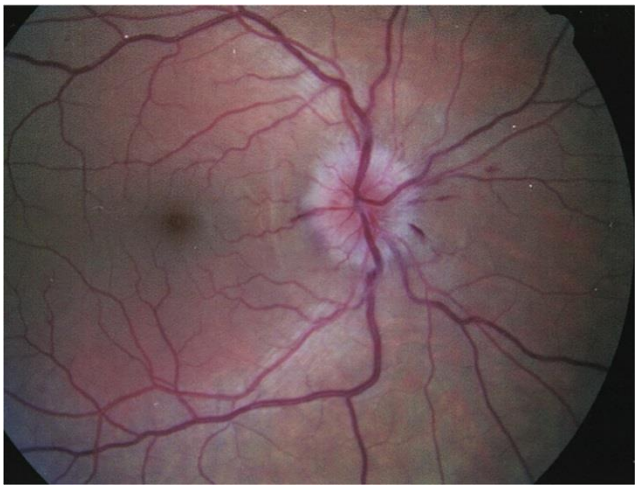


FIG 6: Optic disc edema and retinal inflammation in optic neuritis. Optic disc edema with nerve fiber layer (splinter) hemorrhages due to myelin oligodendrocyte glycoprotein (MOG)-IgG optic neuritis.

3) Viral and bacterial infections

Here optic neuritis is caused by direct infection of the optic nerve (viral or bacterial) or inflammation triggered by an auto immune reaction to a systemic or central nervous system infection .

Etiology includes viruses like adeno virus, CMV, coxsackie virus, hepatitis A virus, measles, mumps, rubella, EBV, HIV and varicella zoster viruses. Bacterial infections includes syphilis, Lyme's disease, cat scratch disease ,brucellosis, anthrax, β haemolytic strepto coccal infection, meningo coccal infection, TB, typhoid fever and Whipple's disease. Optic neuritis most frequently occurs within 1 to 3 weeks of the basic infection [10-12] .

4) Post vaccination optic neuritis

Optic neuritis can occur after vaccination against both bacterial and viral infections like BCG, hepatitis B virus, tetanus toxoid,rabies virus, MMR & DPT. Influenza virus is most frequently associated with such presentation. The onset is most likely within 1 to 3 weeks, usually bilateral and of the anterior variety. Visual recovery take place within few weeks to months [13-15].

5) Inflammatory optic neuritis

Granulomatous inflammation of the optic nerve occurs in certain diseases such as tuberculosis, sarcoidosis and leprosy where this manifestation could be the first clinical feature of the disease process, but usually occurs during the course of the disease. Characteristic appearance of optic disc in this is lumpy white. Inflammatory reaction may accompany optic neuritiss, in the vitreous or the anterior chamber. Unlike in cases with demyelination, classical response to therapy with cortico steroids is seen in an inflammatory etiology. Visual recovery is rapid, which may decline when dose is tapered or stopped. This feature is more typical of inflammatory pathology.[(16-19)]

1) Parasitic infestation- toxocara, toxoplasma, sandfly fever

2) Fungal infection- crypto coccosis,aspergillosis.

3) Contiguous inflammation from meninges, orbit and sinuses

4) Unusual retinal diseases- DUSN, APMPPE, MEWDS

5) Severe pyogenic and orbital infections

6) Diabetes mellitus

7) Takayasu arteritis

8) Carotid vascular insufficiency

9) Athero sclerosis

10) Collagen vascular diseases

Pathophysiology

Lesions of the optic nerve in idiopathic and multiple sclerosis- related optic neuritis are almost similar to the plaques seen in multiple sclerosis of the brain. In case ofacute optic neuritis, there is relative preservation of axons with sharply defined areas of myelin sheath loss. It contains large numbers of foamy macrophages, with cholesterol ester droplets , abundant lymphocytes and plasma cell accumulation.

In the later stages of the disease, the numbers of lymphocytes, plasma cells, and macrophages diminishes & astrocytic scar formation occurs. Little remyelination of the damaged axons in lesions is seen in chronic multiple sclerosis, but evidence exists of oligo dendrocyte precursor cells and remyelination attempts in case of early multiple sclerosis and acute lesions. This is suggesting that potential therapeutic interventions that promote myelin formation, can play a role in improved recovery. [20-23]

Various genetic & environmental factors are thought to predispose patients to demyelination as an auto immune response. The presence of alleles for human leucocyte antigen DW2 (HLA – DW2) or human leucocyte antigen DR2 (HLA – DR2) is a known risk factor in the development of optic neuritis and multiple sclerosis. Viral or bacterial infection, stress and systemic antigens and metabolites are possible initiating events, that result in auto reactive antibodies and T cells crossing the blood brain barrier, causing a delayed type IV hypersensitivity reaction and injuring myelin.[20-23]

The most common site of involvement of optic nerve in optic neuritis in decreasing order of frequency :[20-23]

1) Anterior (45%), abutting the optic disc
2) Mid- intra orbital (61%)
3) Intra canalicular (34%)
4) Intra cranial pre chiasmatic (5%) and
5) Chiasmatic segments (2%)

Classification

a) Ophthalmoscopically: Papillitis

   Retro bulbar neuritis Neuro retinitis

b) Etiologically: Demyelinating Para infectious Infectious

   Structurally: Peri neuritis or peripheral optic neuritis Axial neuritis

Clinical features

Optic neuritis can be symptomatic or asymptomatic. When symptomatic, it presents with the classical triad of loss of vision, dyschromatopsia and ipsilateral eye pain. Associated symptoms can be movement phosphenes, sound induced phosphenes, visual obscuration in bright light and Uhthoff's phenomenon. A relative afferent papillary defect is nearly always present in unilateral and bilateral asymmetric cases.

Loss of vision

Occurs as an isolated symptom in 55% of cases.Rate of failing vision varies- within hours(29%), within 1 to 2 days(20%), within 3 to 7 days(23%) or within one to two weeks(7%).The drop is initially unstable, then stabilises and then improves. The severity variesfrom mild to severe (perception or no perception of light).

Pain

It may either accompany or precede the visual loss[24]. It can be generalised headache or headache in involved eye region.

The pain is dull aching in nature.The maximal severity occurs in 24-36 hour spontaneously abates in 48-72 hours. Pain may be due to traction of the origin medial and superior recti on the optic nerve sheath at the orbital apex, especially in retro bulbar neuritis (Whitnall's hypothesis)[25].

Dyschromatopsia

Impaired colour vision is always present in optic neuritis. Patient observes a reduced vividness of saturated colours. In absence of macular lesion, colour desaturation is highly sensitive indicator of optic nerve dysfunction.

Movement phosphenes

It can occur before an attack of optic neuritis or may accompany visual loss during the attack, or may occur 6 months after full recovery.These occur especially in horizontal movements in dimly lit room- lasting only for 1 or 2 seconds, occurring unilaterally and in ipsilateral affected eye, even when it is maintained in lateral gaze. In optic neuritis,demyelination and demyelinated nerve fibres may discharge spontaneously when subjected to minimal mechanical stress.

Sound induced phosphenes

They can be precipitated by sudden noise and can occur in diseases of eye or optic nerve including optic neuritis and compressive optic neuropathy.

Visual obscuration in bright light

It may be due to fluctuating interference in the transmission of visual signals- the site may be at the level of demyelinated visual pathway.

Uhthoff's symptom

It is an episodic obscuration of vision with exertion, hot baths and showers in 49.5% of patients with isolated optic neuritis and may be correlated with a higher incidence and recurrence of optic neuritis[26].

Typically the patient has blurring of vision in the affected eye after 5 to 20 minutes of exposure to the provoking factor. Colour desaturation may also occur. After resting or moving away from heat, vision recovers to its previous level within 5 to 60 minutes.

It correlates significantly with multi focal white matter lesions on brain MRI.It can be detected by Fansworth Munsell 100 hue testing and Octopus perimetry, as well as by fluctuations in VEP amplitudes and contrast sensitivity.

Signs

1) **Reduced visual acuity:**

It can be variable from 6/9 to no perception of light . The severity can be assessed with Graded visual Impairment scale in optic neuritis.

FIG 7: An illustration of the visual disturbance in a patient with optic neuritis

2) Pupillary reaction

Relative afferent papillary defect (Marcus Gunn pupil) is a highly sensitive sign of optic nerve lesion. The unilateral RAPD can be roughly quantified by use of graded density filters. The filter density is placed in front of the normal eye and is used to balance the defect in the other eye. This can be used to measure the disease progression[27].

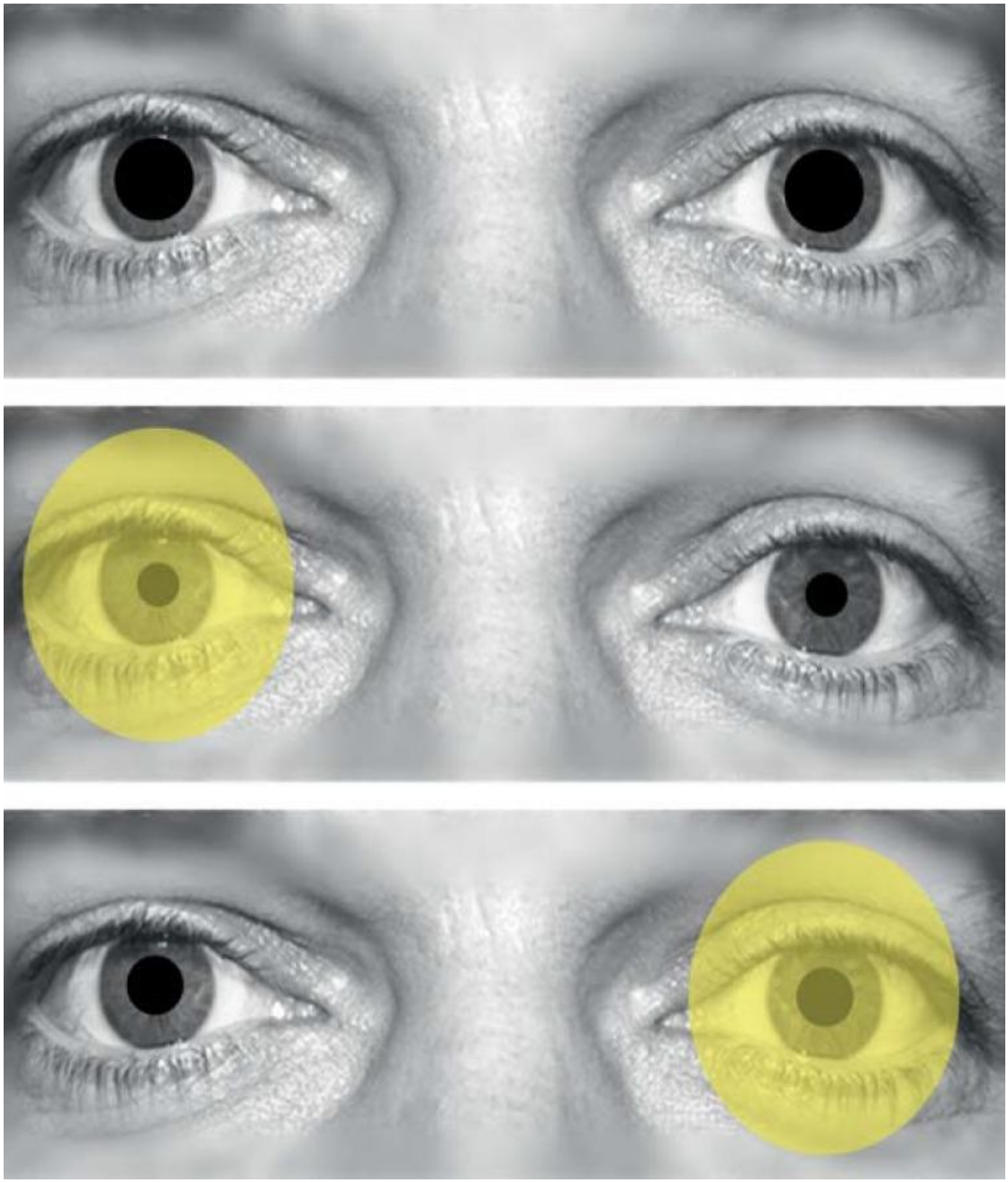


FIG FIG 8 : Swinging flashlight test in a patient with left optic neuritis (schematic figure). The pupils react more rapidly, and to a greater extent, with illumination of the healthy right eye, compared to the affected left eye

3)**Dyschromatopsia**

Impaired colour vision is always present in optic neuritis. In the absence of a macular lesion, colour desaturation is a highly sensitive indicator of optic nerve disease. Colour vision – a parvo cellular – ganglion cell function, is abnormal in patients with acute and recovered optic neuritis.

Colour vision defects are highly sensitive indicators of a previous attack of optic neuritis. Typically, the patient observes a reduced vividness of saturated colours. Saturation refers to the purity of colour, while desaturation is the degree to which a colour is mixed with white. Red desaturation is commonly seen in optic neuritis.

Colour vision tested by Fansworth Munsell 100 Hue test(FM 100) or Ishihara / Hardy Rand Ritter pseudo isochromatic plates is always impaired and was supposed to be essentially red green deficiency. But it has been found that there is no evidence of a wavelength specific defect in FM polar diagrams, but significant bipolar abnormality in the tritan(blue-yellow) axis present at presentation, but not on subsequent visits[(28)].

Recent studies show, blue-yellow defects tend to be slightly more common in the acute phase of the disease, with slightly more red-green defects at 6 months. Persons may shift defect type over time. Colour defect type cannot be used for differential diagnosis of optic neuritis[(29)].

4) Visual fields

The field defect in optic neuritis is highly variable with respect to size of circumscribed plaques and where the area of complete and incomplete demyelination is present. In the optic neuritis treatment trial, diffuse field loss was present in 48.2% of eyes, central or centro caecal scotomas was present in 8.3% of eyes, altitudinal or other nerve fibre bundle type defects were found in 20.1% of eyes and a variety of other defects were found in 23.4% of eyes. Bitemporal field defect, contra lateral homonymous hemi anopia due to chiasmal or retro chiasmal neuritis has been observed in 2.9% of patients.

When acuity is severely impaired, perimetric field charting is unreliable and confrontation testing is recommended.As vision improves, multi isopter kinetic Goldmann perimetry or computer assisted automated static perimetry using a Humphrey analyser or Octopus perimeter are sensitive techniques for serial testing.A finding of generalised depression, para central scotomas or scattered nerve fibre bundle – related defects between 5° and 20° from fixation, may indicate sequelae of prior demyelinating optic neuropathy

5)Optic disc findings

In acute cases, it may be normal(64%), swollen(23%), blurred or hyperaemic(18%) and blurred with peri papillary haemorrhages around the disc(2%). Temporal pallor(10%) may be present suggesting previous attack in the same eye.

In recovered optic neuritis, 6 months after the first attack, a normal disc can be present in 42% of eyes, temporal pallor in 28% and total disc pallor in 18% of eyes .In MS in remission, total disc pallor may be present is 38% of cases[30].

6)Retina

Two signs that may be seen in optic neuritis and ms are:

i) Retinal venous sheathing, resulting from peri phlebitis retinae. It is accompanied by vitreous cells.

ii) Defects in retinal nerve fibre layer.

Nerve fibre layer defect appears as a slit in associated nerve fibre bundles, seen with the use of mono chromic red free ophthalmoscopy through dilated pupil. Based on fundus finding, optic neuritis is classified into

i) Retro bulbar neuritis – with normal fundus.

ii) Papillitis – with disc swelling.

Special tests

a)Contrast sensitivity

Detected by Pelli Robson chart or Regan letter chart as cycles per degree – more sensitive indicator than Snellen's acuity.

b)Stereo acuity

The Titmus Polaroid 3D vectograph stereograph test is recommended for both children and adult with optic neuritis.

The Pulfrich effect in which patients experience a stereo illusion by having the patient gaze at a pendulum swinging at right angles to the line of sight and determining if the pendulum appears to the patient to be swinging in an elliptical path is a sensitive indicator of optic nerve disease.

c)Visual evoked potential

It is used to confirm weak evidence of optic neuritis and to differentiate organic from functional cause of defective vision. It tests central and perifoveal visual field and there is prolongation of P100 latency[31], and decrease in amplitude which is a permanent change[32].

Inter ocular difference in P100 latency is also an indicator of optic nerve dysfunction; in pattern shift VEP; this has been used to prove optic nerve pathology in optic neuritis[33].

It is a sensitive test, but the specificity is not high, as other conditions like glaucoma and compression can also cause increase in latency.

d)Pattern electro retinogram(PERG)

PERG monitors integrity of central retinal ganglion cell layer. It is of value in improving interpretation of abnormal VEP pattern when both are recorded simultaneously, to rule out if delay in pattern VEP P100 latency in a patient with suspected optic nerve demyelination is not caused by more anterior lesions.

e**)OCT-RNFL**

Thinning of the peripapillary retinal nerve fiber layer is correlating with other parameters for assessing the course of multiple sclerosis . OCT thus reflects the severity of damage in optic neuritis and in related conditions such as neuromyelitis optica . It is easy to perform and yields objectively measured values;

f) Pupillary light reflex latency(PLRL)

Prolonged latency of pupillary light reflex which is measured using infrared reflection.

g)Foveal critical flicker frequency

Subjective brightness measured by Authorn Flicker test in relation to flicker frequency is abnormal.

Features of atypical optic neuritis

1) Painless
2) Bilateral
3) Relatively older patients are affected
4) Disc haemorrhage & cotton wool spots can occur
5) Progression of visual loss beyond 2 weeks
6) Patients fail to improve with treatment

Table 3. Clinical Characteristics of Typical and Atypical ON

Typical	Atypical
• Acute or subacute attack	• Progressive disease
• Mostly young adults (age 20-55 y)	• Age group <12 and >50 y
• Unilateral visual acuity loss	• Bilateral visual loss
• Improvement with/without treatment	• No spontaneous visual improvement
• Continued improvement after corticosteroid withdrawn	• Deterioration after corticosteroids are discontinued
• Mild pain that worsens with eye movement	• Following loss of vision, painless to severe pain
• The optic disc appears normal or mildly swollen	• Severe swelling and hemorrhage in optic disc
• Variable visual field defects may occur	• Variable signs and symptoms, depending on etiology
• Altered perception of motion (the Pulfrich phenomenon)	
• Vision blurs when body temperature rises (Uhthoff's phenomenon)	
• Bright, fleeting flashes of light (phosphenes)	

ON: optic neuritis. Source: References 1, 7, 17, 19.

Investigations

OBLIGATORY BLOOD TEST	**ADDITIONAL BLOOD TEST**
CRP	RF
CBC	ACE
BLOOD CHEMISTRY	Antiphospholipid antibody
GLUCOSE	ENA
ANA	p/c ANCA
VITAMIN B12	Methymalonic acid
Serological testing for lyme borreliosis	Serological testing for syphilis,HIV
	Virology
	AQP-4 Ab
	Tuberculosis
	Genetic testing

CRP, C-reactive protein; CBC, complete blood count; ANA, antinuclear antibody; RF, rheumatoid factor; ACE, angiotensin converting enzyme; Anti-dsDNA Ab, anti-double-stranded DNA antibody; ENA, extractable nuclear antigens; ANCA, protoplasmic/cytoplasmic antineutrophil cytoplasmic antibody; AQP-4 Ab, antibodies against aquaporin 4; Ab, antibody.

Neuro imaging MRI

a) Enhancing optic nerve on T1 contrast fat saturated- best seen on coronal images. On axial images, may have tram-track enhancement pattern, simulating optic nerve sheath meningioma.

b) On T2 with fat saturation (or STIR images) – mildly enlarged hyper intense optic nerve.

Acute and chronic MS lesions appear bright in T2 images. Lesions are round or ovoid in peri ventricular white matter, internal capsule & corpus callosum (perpendicular to venterides, at callososeptal interface). They may also be linear with finger like appearance - Dawson's fingers. MRI shows the size, quantity and distribution of lesions larger than 2 mm, and together with supportive evidence, helps in the diagnosis of MS.[34-36]

MRI criteria for diagnosing MS

At least 3 lesions and two of the following should be present for the diagnosis to be present[(37)]:

1) Lesions abutting the lateral ventricles

2) Lesions with diameters greater than 5 mm

3) Lesions present in the posterior fossa (infra tentorial).

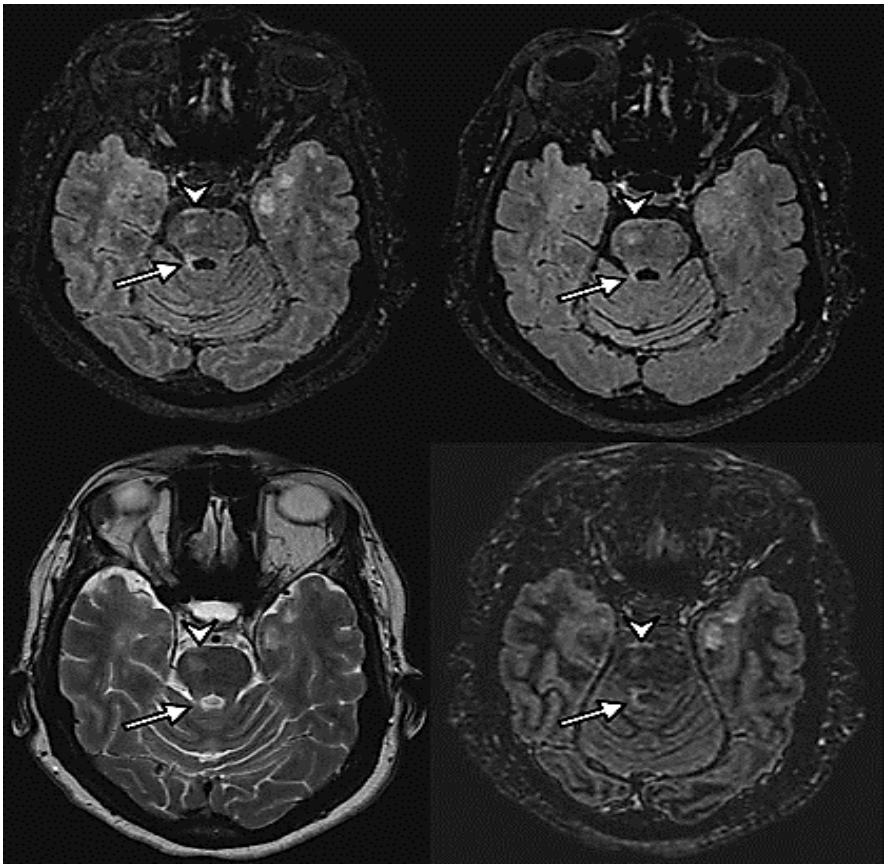


FIG 9: MRI BRAIN OF MULTIPLE SCLEROSIS

CSF analysis

ONTT concluded that no patients had their diagnosis or management altered as a result of CSF findings. Except for oligo clonal bands, few patients showed abnormalities on CSF tests, and no tests correlated with the 2-year development of clinically definitive multiple sclerosis(CDMS). Thus csf analysis may not be necessary in the routine evaluation of patients presenting with a typical clinical profile of acute optic neuritis[37].

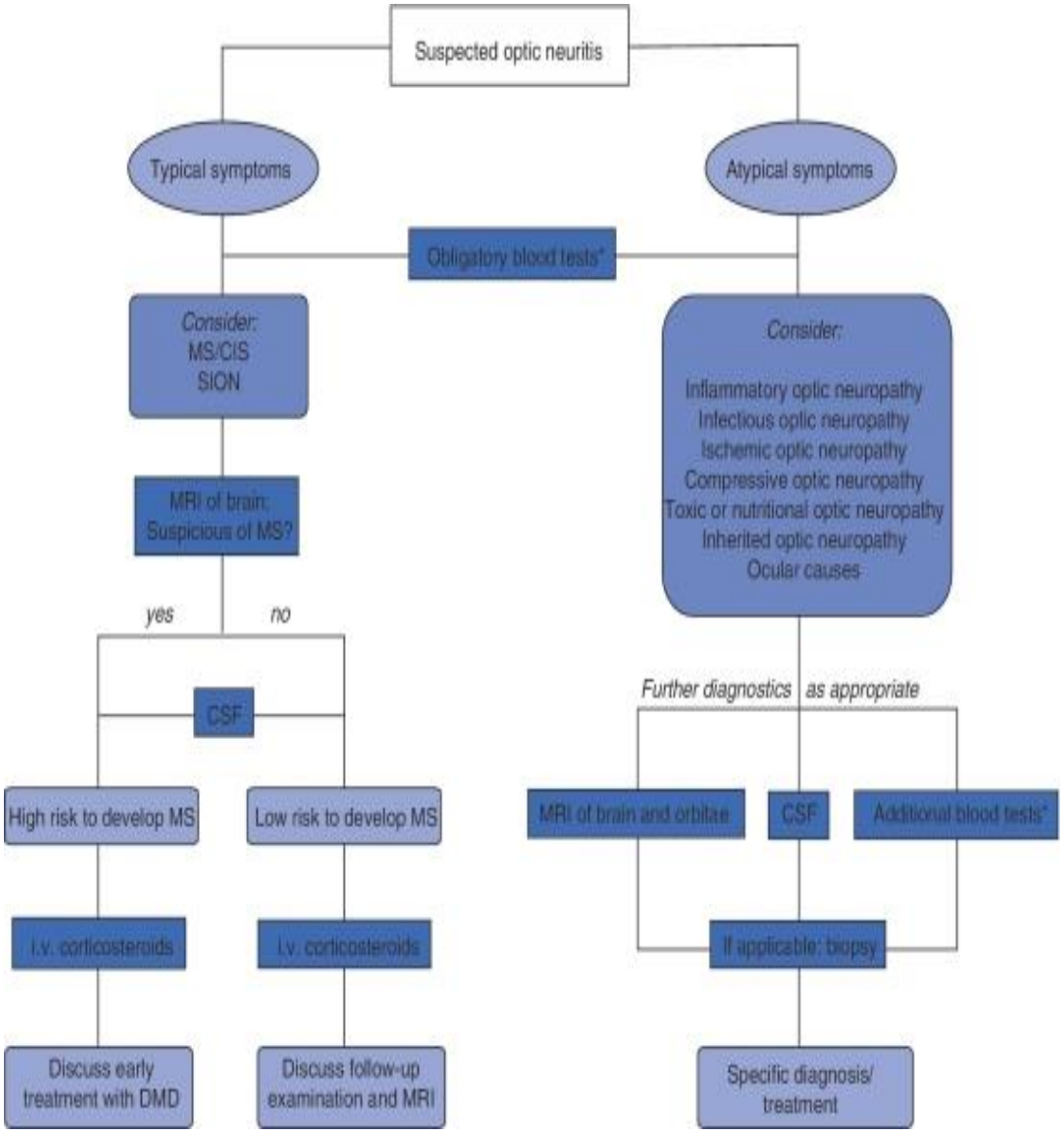


FIG 10: Clinical workflow for patients with diagnosis of suspected optic neuritis.

Treatment

ONTT: Optic Neuritis Treatment Trial

It was a carefully performed randomized clinical trial and yielded useful information. There was no difference in the ultimate visual outcome at the 5-year mark in the group treated with steroids when compared with the group kept under observation without steroid treatment[38-41].

Study objectives and methods

1. To evaluate the efficacy of corticosteroid treatment of acute optic neuritis.
2. To investigate the relationship between optic neuritis and multiple sclerosis. 457 patients were divided into 3 treatment groups.
3. Oral prednisolone(1mg/kg/day) for 14 days
4. Intra venous methyl prednisolone (1000mg/day) for 3 days, followed by oral prednisolone (1mg/kg/day) for 11 days
5. Oral placebo for 14 days

Conclusions

Fastest recovery was seen in the intra venous group, but at 1-year follow up and thereafter, there was no significant difference in the visual recovery among the 3 groups.

Intra venous methyl prednisolone followed by oral prednisolone speeds the recovery of visual loss due to optic neuritis and results in slightly better vision at 6 months.[38-41]

Oral prednisolone alone, as prescribed in this study, is an ineffective treatment in the standard doses and increases the risk of new episodes of optic neuritis. Intra venous steroids followed by oral steroids decrease the 2-year incidence of multiple sclerosis. [39]

Recurrences were more frequent in patients with multiple sclerosis and in those treated with oral prednisolone alone.[40]

Even 10 years after optic neuritis, the neurological impairment was mild, with 65% of patients having an Expanded Disability Status Scale score lower than 3.0 and the degree of disability appeared to be unrelated to whether the baseline MRI scan was lesion-free or showed lesions. [42]

Intra venous dexamethasone has been found to be a cheaper and effective alternative to methyl prednisolone with less side effects. [43,44]

At 1-year follow up, 91%-95% of patients in the 3 groups regained acuity of 20/40 or better. Visual prognosis for optic neuritis was generally good. At 15 year follow up:

20/25 or better: 89% 20/30

to 20/40: 4%

20/50 to 20/200: 5%

Worse than 20/200: 2%

Overall probability of developing clinically definite multiple sclerosis at 5 years = 30%

at 10 years = 38%

at 15 years = 50%

MRI findings are strongest predictors of developing clinically definite multiple sclerosis at 15 year follow up:

1) No MRI lesions: 25%
2) One or more lesions: 72%
3) Greater number of lesions on MRI increases the likelihood of developing multiple sclerosis.

At 15 year follow up, nerve fibre bundle defects (arcuate, para central) were the most common localised visual field abnormality Combination of the following substantially decreases the likelihood of developing multiple sclerosis(atypical for demyelinating optic neuritis):

1) Lack of peri ocular pain
2) Severe optic disc edema
3) No light perception

CHAMPS study (The Controlled High Risk Avonex Multiple Sclerosis Trial) [45,46] :

It was a prospective, randomized study of 383 patients with first acute demyelinating event (optic neuritis, myelitis, brainstem, cerebellum) and at least 2 MRI white matter signal abnormalities.

Study objective:

This study was undertaken with the objective as to whether Interferon beta 1a (Avonex) treatment would benefit patients, who had experienced a first acute demyelinating event involving the optic nerve, brain stem, cerebellum or spinal cord, and who displayed MRI brain abnormalities that have previously predicted a high likelihood of MS-like events. All patients in this study received intra venous methyl prednisolone 1g/day for 3 days within 14 days of the onset of their neurological symptoms. This was followed by an oral taper beginning with 1mg/kg for 11 days and ending with a 4 day oral taper.

Then patients were divided into 2 groups:

Group 1: received once weekly intra muscular injection of Interferon beta 1a(30 micro grams).

Group 2: received placebo injections.

Primary outcome measure was development of CDMS and change in demyelinating lesions on serial brain MRI scans.

RESULTS

1) At the end of 3 years, the probability of CDMS was 50% in the placebo treated group & 35% in the Interferon beta 1a treated group.

2) Reduction in the volume of brain lesions in Interferon beta 1a group.

3) Fewer new or enlarging lesions and fewer gadolinium enhancing lesions in Interferon beta 1a group.

4) Trial terminated because of clear benefit of therapy over placebo.

There was no difference in treatment among patients presenting with optic neuritis, brain stem cerebellar or spinal cord events. Treatment with avonex significantly reduced the 2-year likelihood of future neurological events & worsening of the brain MRI in patients with a first acute CNS demyelinating event.

CHAMPIONS study: Controlled High Risk Avonex Multiple Sclerosis Prevention Surveillance

Objective

This study compared the outcomes in those who had been given drug from the start of the CHAMPS study ("immediate treatment" or IT group) versus those who had switched from placebo after about 30 months ("delayed treatment" or DT group). [47]

It reported that early use of weekly Interferon beta 1a (compared to delayed treatment) reduced the likelihood of developing clinically definite multiple sclerosis(CDMS) after a 5-year follow up period in patients who had initially presented with clinically isolated syndromes (CIS) suggestive of MS.

Results

Immediate treatment group had significantly fewer relapses and fewer brain MRI lesions than the delayed treatment group and that significantly fewer of its members converted to definite MS.

Early Treatment of Multiple Sclerosis (ETOMS) Study Group

It was a prospective, randomized, multi-centre, double-blind study of 300 patients experiencing first episode of neurologic dysfunction suggesting multiple sclerosis within the previous 3 months and strongly suggestive brain MRI findings.

Treatment groups

1) Interferon beta-1a (Rebif) 22 micro grams subcutaneously once per week

2) Placebo injected subcutaneously once per week

Results

1) Fewer patients developed clinically definite multiple sclerosis (34%) versus the placebo group (45%; p=0.047)

2) For 30% of each group to convert to clinically definite multiple sclerosis required 569 days in treatment group versus 252 days in placebo group (p=0.034)

3) Annual relapse rate in treatment group was 0.33 versus 0.43 with placebo (p=0.045)

   Number and total volume of new T2 weighted MRI lesions was lower in treatment group.

Betaseron in Newly Emerging Multiple Sclerosis for Initial Treatment (BENEFIT) Trial

Prospective, randomized, multi-centre, double-blind study of 468 patients experiencing first clinical demyelinating event (mono focal or multifocal) & at least 2 brain MRI lesions.

Patients were divided into 2 treatment groups

1) Interferon β-1b (Betaseron) 250 micrograms subcutaneously every other day

2) Placebo injected subcutaneously every other day

Results: Diagnosis of CDMS established or follow up of 2 years

1) Reduction of development of CDMS over 2 years from 45%(placebo) to 28%(treatment)

2) Similar significant reduction at 2 years if McDonald criteria (combines

clinical & MRI findings) used: 51%(placebo) versus 28%(treatment)

3) At the 25th percentile, time to develop CDMS was delayed from 255 days(placebo) to 618 days(treatment)

PreCISe study (early glatiramer acetate treatment in delaying conversion to clinically definite multiple sclerosis subjects presenting with a clinically isolated syndrome)

It was a randomized double-blind trial involving 481 patients (80 sites in 16 countries) presenting with the following:

1) Clinically isolated syndrome

Two or more T2 brain lesions(≥6mm) Treatment protocol

1) Glatiramer acetate (Copaxone): 20mg subcutaneous injection per day

2) Placebo – subcutaneous injection

3) Endpoint: upto 36 months or conversion to CDMS

Results

1) Glatiramer acetate reduced the risk of developing CDMS by 45%

2) Time for 25% of patients to convert to CDMS prolonged from 336 days to 722 days, if treated with glatiramer acetate

3) At 5-year follow up, 41% reduced conversion rate to CDMS for treated

patients. Also, reduction in number of T2 white matter lesions and T2 lesion volume

Although the management of this disorder in adults is well described, there is a paucity of evidence-based, prospective clinical data on its management & treatment in pediatric population. The current treatment of pediatric optic neuritis consists of 3 to 5 days of intra venous methyl prednisolone (4-30 mg/kg/day), followed by a prolonged oral corticosteroid taper. A prolonged course of oral steroid (2 to 4 weeks) is recommended to avoid recurrence, which is common in this age group. Some controversy persists concerning the exposure of children to high dose parenteral corticosteroids to treat an entity that is usually self- limited, but given the severity of vision loss in one or both eyes in this population, this intervention is standard in neuro-ophthalmologic practice. [48]

Differential diagnosis

a) Optic Nerve Compression

Due to intra cranial masses (eg-pituitary tumours) or orbital masses (eg- optic nerve sheath meningioma), papilloedema (bilateral, gradual vision loss and disc swelling more than 2 diopters and neurological signs)

b) Anterior ischemic optic neuropathy

Visual loss is due to vascular insufficiency because of atherosclerotic or inflammatory involvement of posterior ciliary arteries Rare before 40 years of age No ocular pain on eye movements

Fundus – pale segmental disc edema, superficial flame shaped haemorrhages

Vision fails to improve in 2 weeks Field defects- altitudinal scotoma

The clinical features may be overlapping, making the diagnosis difficult[49]. Neural network analysis (an artificial intelligence technique) is a useful technique for classification of optic neuropathies, particularly where there is overlap of clinical findings[50] .

a) Toxic or nutritional deficiency amblyopia

This may be due to exogenous substance (alcohol, tobacco), drugs (ethambutol) or nutritional deficiency (pernicious anemia); it presents as moderate to marked visual loss, with colour vision deficiency and bilateral centro caecal scotoma.

These are differentiated by being

1) Painless

2) Bilateral

3) Symmetric changes in both eyes

b) Non organic visual loss

Hysteria, malingering – classical clinical features are

c) Leber's hereditary optic neuropathy.

It is a mitochondrial disease with subacute painless visual loss. It affects young maleusually becomes bilateral. Visual recovery is poor.

d) Other ocular conditions

1) Posterior uveitis
2) Central serous retinopathy
3) Disc drusen Glaucoma
4) Glaucoma
5) Posterior scleritis

Differentiated by clinical presentation and appearance

Prognosis

Though irreversible damage to optic nerve occurs in 85% of optic neuritis patients[51], most (60%-80%) regain Snellen's visual acuity of 6/9 or better, 45% recover rapidly in first 4 months, 35% recover normal or near normal in a year & 20% fail to make any significant improvement. Recurrences were more frequent in patients with MS[52].

Dyschromatopsias, defective stereo acuity, RAPD, delayed latencies on VER, defect in contrast sensitivity, Pulfrich & Uhthoff phenomenon and persistent field defect may remain as residual defects after an attack of optic neuritis.

Nettleship E. On cases of retro-ocular neuritis. Trans Ophthal Soc UK 1884;4: 186-226. 3.

By the 1880's, in the pre –ophthalmoscopic era, von Graefe and Nettleship, had given description of many of the classical features of idiopathic optic neuritis.

Nettleship described optic neuritis to be characterized by decreased sight usually limited to one eye, may present along with neuralgic pain around the temple and orbit and pain in eye movements; though eventual recovery usually occurs, permanent damage or even total blindness can occur; at times there is no ophthalmoscopic change, but usually the disc n becomes atrophic over a few weeks, and now and then there are few retinal changes.

In the study conducted by Dutton and colleges, they described that visual acuity loss may range from mild to severe; eye pain is infrequent and the fundus examination often reveals mild edema. Relapsing isolated optic neuritis is used to describe patients with spontaneous and isolated attacks of non-progressive, unilateral or bilateral optic neuritis. Patients with relapsing isolated optic neuritis are predominantly females with moderate levels of vision loss(average 20/80)[52].

Jin Choi, Seong-Joon Kin, Ji Woong Chang, Jeong Hum Kim, Young Suk Yu conducted a retrospective study on nine eyes in 8 patients. The

mean age of patients at presentation was 60.5 years (range, 53 to 71 years). Six patients were female, and two were male. There was one patient with bilateral ON. The mean BCVA at presentation was 20 / 400 (no light perception-20 / 70). Eight eyes (89%) complained of pain with eye movement. Six eyes (66%) had disc edema. Central scotoma was the most common field defect. All eyes had color abnormalities. Five eyes in four patients showed abnormalities of the involved optic nerves on MRI. The patients were followed for a mean of 11.3 months (range, 2 to 34 months). All of the patients recovered to a BCVA of 20 / 40 or better within 2 months. On the last follow-up, the mean BCVA was 20 / 20 (20 / 40 to 20 / 16). Although ON is uncommon in elderly patients, it can develop in patients >50 years of age, and clinical features of optic neuritis in elderly patients are similar to those of younger patients [53,54].

Kavin Vanikieti and et all conducted a retrospective observational study on 171 patients (78.4% [n=134] female; mean age 45 years [standard deviation 15.4 years]; 32.2% [n=55] bilateral involvement). The most common type of acute ON was idiopathic (51.5%), followed by neuromyelitis optica spectrum disorder (NMOSD, 30.9%), other autoimmune disorders (9.9%), myelin oligodendrocyte glycoprotein antibody-associated disorder (MOGAD, 5.3%), multiple sclerosis (MS, 1.8%), and postinfection (0.6%). In the other autoimmune disorders group, 2 patients developed systemic lupus erythematosus (1.2%), 2 Sjogren's syndrome (1.2%), 1 RA (0.6%), 1 anti-NMDAR (0.6%), 3 anti-Jo1 (1.8%), 2 c-ANCA (1.2%), 1 anti-centromere (0.6%), and 5 nonspecific autoimmune disorders (2.9%). In the idiopathic group,

38.6% developed single isolated ON, 1.8% relapsing isolated ON and 11.1% chronic relapsing inflammatory optic neuropathy. The most common form of acute ON in this study, similar to other Asian countries, was idiopathic. Idiopathic-ON shared some phenotypes with NMOSD and MOGAD [55] .

Study conducted by Devin. D.Mackey showed that. High-dose IVCS are effective in hastening visual recovery in acute typical optic neuritis, but do not affect the final visual outcome. In optic neuritis patients, IVCS may delay progression to clinically definite multiple sclerosis (CDMS) at 2 years, but not at 5 or 10 years. It is reasonable to recommend high-dose IVCS for acute optic neuritis patients with significant vision loss, severe pain and/or white matter lesions on brain MRI in whom the potential for benefit outweighs the risks [56,57]

PART II

AIM

To study the clinical profile and evaluate the short-term visual recovery of patients presenting with Optic

Neuritis in RIO-GOH.

OBJECTIVES:

Primary objective :

To assess the type of presentation, treatment given and visual outcome of patients presenting with optic neuritis.

Secondary objective :

To assess the factors which are responsible for the visual prognosis in cases of optic neuritis .

MATERIALS AND METHODS

Design of study :

Prospective observational study

Study Population : 30 cases

Subject selection :

All patients with idiopathic optic neuritis attending RIOGOH services are taken up for study after consent from the patients.

Inclusion criteria :

1) 1.Sudden unilateral or bilateral loss of vision of less than 4 weeks duration.
2) 2.Presence of RAPD.
3) 3.Dyschromatopsia.
4) 4.Normal or swollen optic disc on fundus examination.

Exclusion criteria :

1. Other optic neuropathies such as ischaemic, infective, traumatic, toxic, hereditary and compressive.
2. Other ocular disease such as amblyopia, high myopia, uveitis or glaucoma
3. Patients underthe age of 15.

METHODOLOGY

SOURCE OF DATA

All patients presenting with optic neuritis attending RIOGOH services are taken up for study after consent.

PERIOD OF STUDY

Period of study was from March 2020 to August 2021. Patients were recruited for the period of 1 year and subsequently each case was followed up for 6 months.

- A detailed history was obtained from each patient which included
    - Ocular complaints
    - Systemic symptoms
- A complete ocular examination was performed at each visit which included
    - Best corrected visual acuity using Snellens' chart
    - Pupil
    - Colour vision, fields.
    - Fundus examination with 90 D lens

- A data form was prepared which collected information on

    - Demographic data including age at presentation, gender
    - Extra ocular neurological symptoms

- Ophthalmic data recorded which included

    - Age at onset
    - Laterality
    - Visual acuity
    - Ocular findings
    - Investigation (if needed)

Imaging – MRI brain with contrast

- The treatment advised for each patient was documented.
- The patient was examined on each follow up visit (1 month, 3 months,6 months) Collected data was statistically analysed

STATISTICAL TESTS USED

1. Proportion
2. Mean
3. Chi-square test

p value less than 0.05 was considered as statistically significant.

DATA ENTRY AND ANALYSIS

Microsoft excel and STATA 11 (TEXAS USA) were used.

ETHICAL CONSIDERATION

The protocol designed for the present study was submitted to the Ethical committee, Madras Medical College, Chennai . After getting clearance from the Research Committee, Ethical clearance certificate was issued by the institution. Consent was also taken and Confidentiality of the data was maintained.

RESULTS

This study included a total of 30 adult patients and was conducted at the Regional Institute of Ophthalmology Government Ophthalmic Hospital, Chennai in the period of March 2020 to August 2021.

DEMOGRAPHIC PATTERN IN ADULT OPTIC NEURITIS PATIENTS

AGE AT PRESENTATION

The mean age at presentation in the present study was 33.3 years. The youngest patient was 15 years old and the oldest patient was 89 years old.

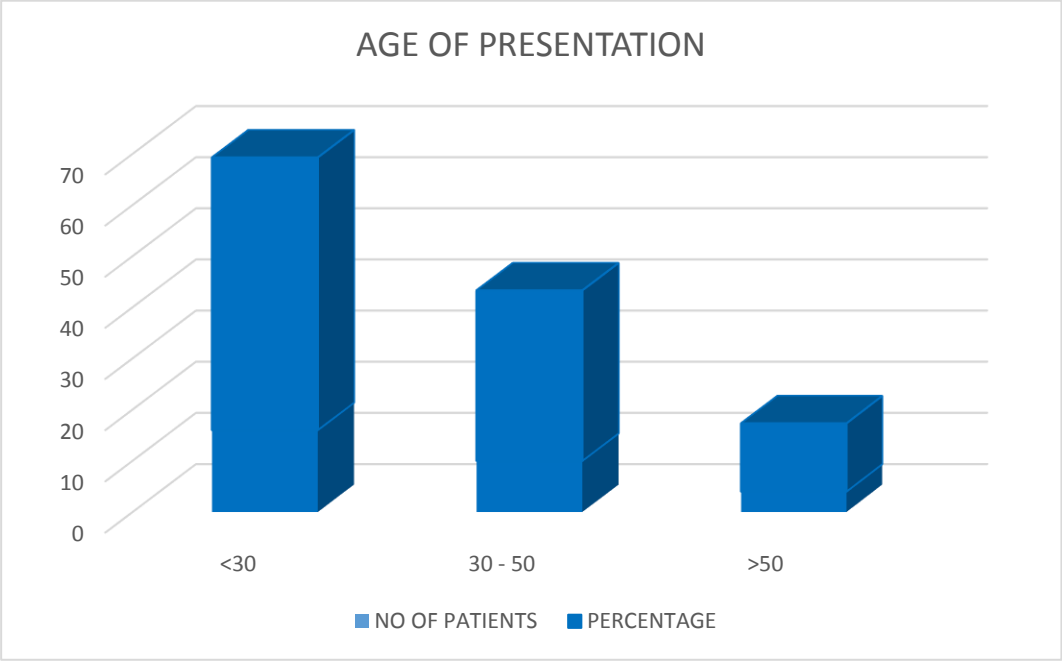
AGE BASED DISTRIBUTION OF CASES

Of the 30 patients, 16(53.3%) patients were less than 30 years of age & 10 (33.3%) patients were 30-50 years of age & 4(13.3) patients were above 50 years of age.

TABLE SHOWING AGE DISTRIBUTION

AGE OF PATIENTS	NO OF PATIENTS	PERCENTAGE
< 30	16	53.3
30-50	10	33.3
>50	4	13.3
TOTAL	30	100

CHART SHOWING AGE DISTRIBUTION



The mean age of presentation was 33.03 ±17.327(SD).

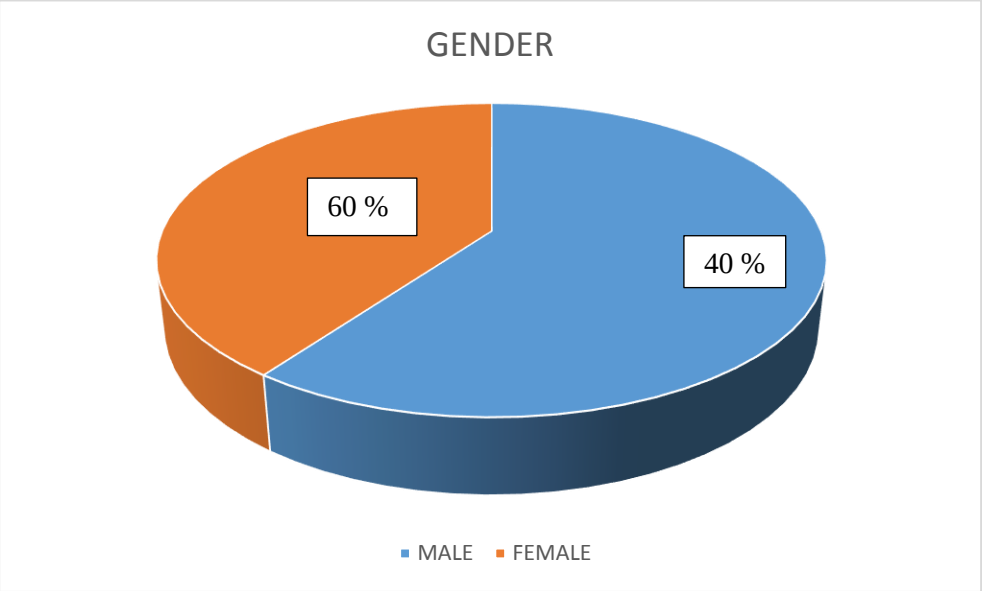
GENDER

Of the 30 patients, 18(60 %) were males and 12(40%) were females.

TABLE SHOWING GENDER DISTRIBUTION

GENDER	n %
MALE	18(60)
FEMALE	12(40)
TOTAL	30(100)

CHART SHOWING GENDER DISTRIBUTION



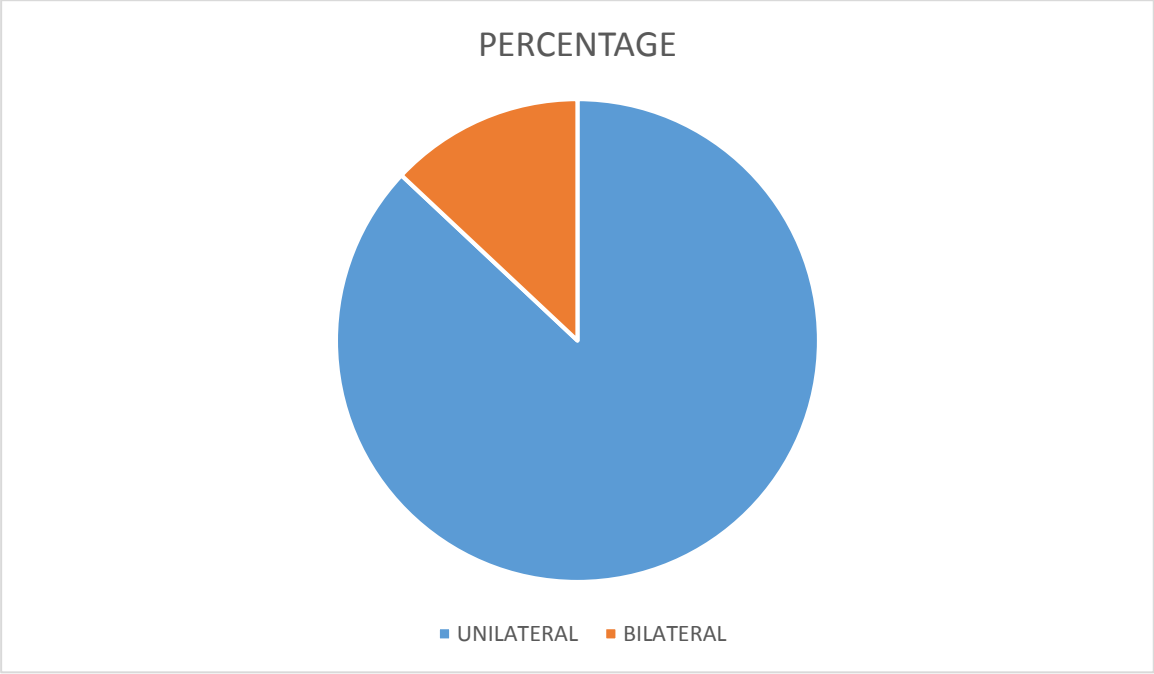
LATERALITY

Of the 30 patients, Optic neuritis was found to be unilateral in 26 patients (87%) and bilateral in 4 patients (13%).

TABLE SHOWING LATERALITY

LATERALITY	FREQUENCY	PERCENTAGE
UNILATERAL	26	87%
BILATERAL	4	13%

CHART SHOWING LATERALITY



COMPLAINTS

Defective vision was the main complaint in all patients.

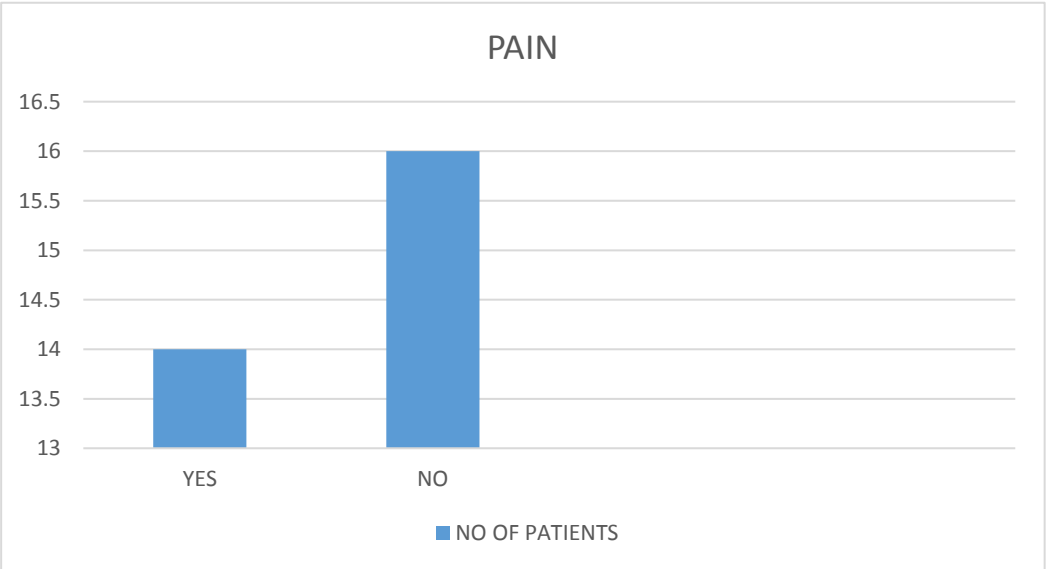
PAIN

Pain during eye movements was present in 14(46.7% %) of the patients.

TABLE SHOWING PRESENCE OF PAIN ON OCULAR MOVEMENTS

PAIN	NO OF PATIENTS	PERCENTAGE
PRESENT	14	46.7%
ABSENT	16	53.3%

CHART SHOWING PRESENCE OF PAIN ON OCULAR MOVEMENTS



DEFECTIVE VISION

At presentation, visual acuity was <3/60 in 27 (79.4%) eyes out of 34 eyes.

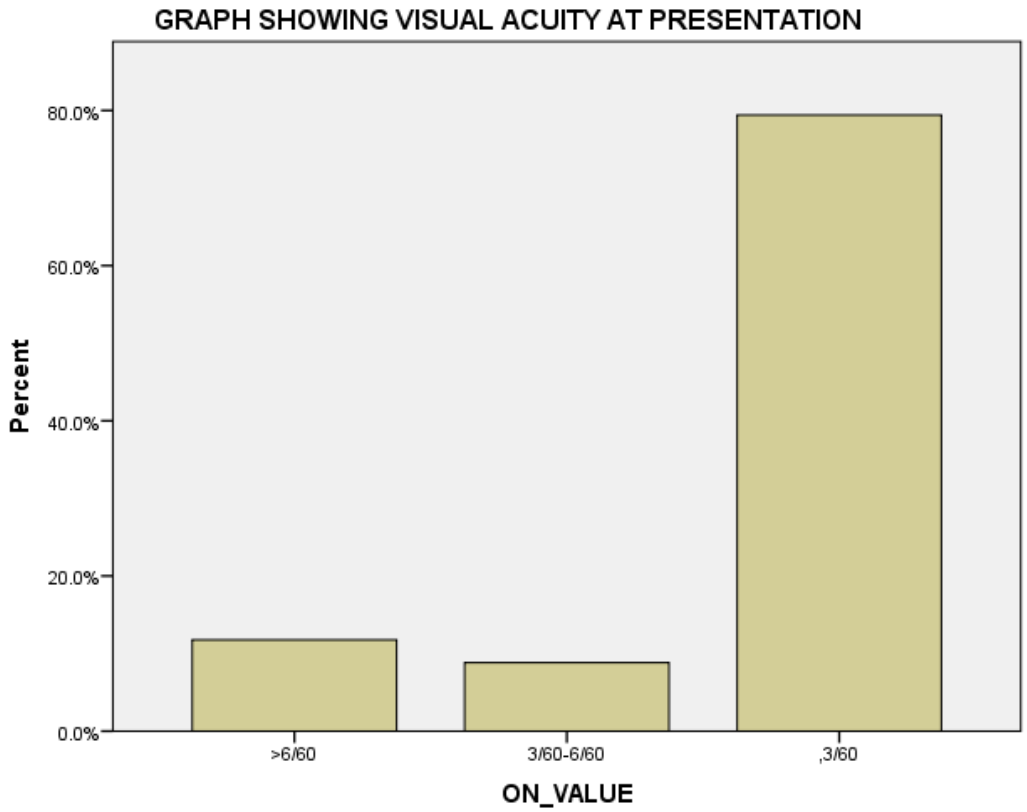


TABLE SHOWING DISTRIBUTION OF VISUAL ACUITY AT PRESENTATION

Visual acuity	Frequency	Percent	Valid Percent	Cumulative Percent
>6/60	4	11.8	11.8	11.8
3/60-6/60	3	8.8	8.8	20.6
<3/60	27	79.4	79.4	100.0
Total	34	100.0	100.0	

DYSCHROMATOPSIA

At presentation, colour vision was normal in 2(5.9%) eyes, defective in 5(14.7%) could not be assessed due to poor vision in 27(79.4%) cases.

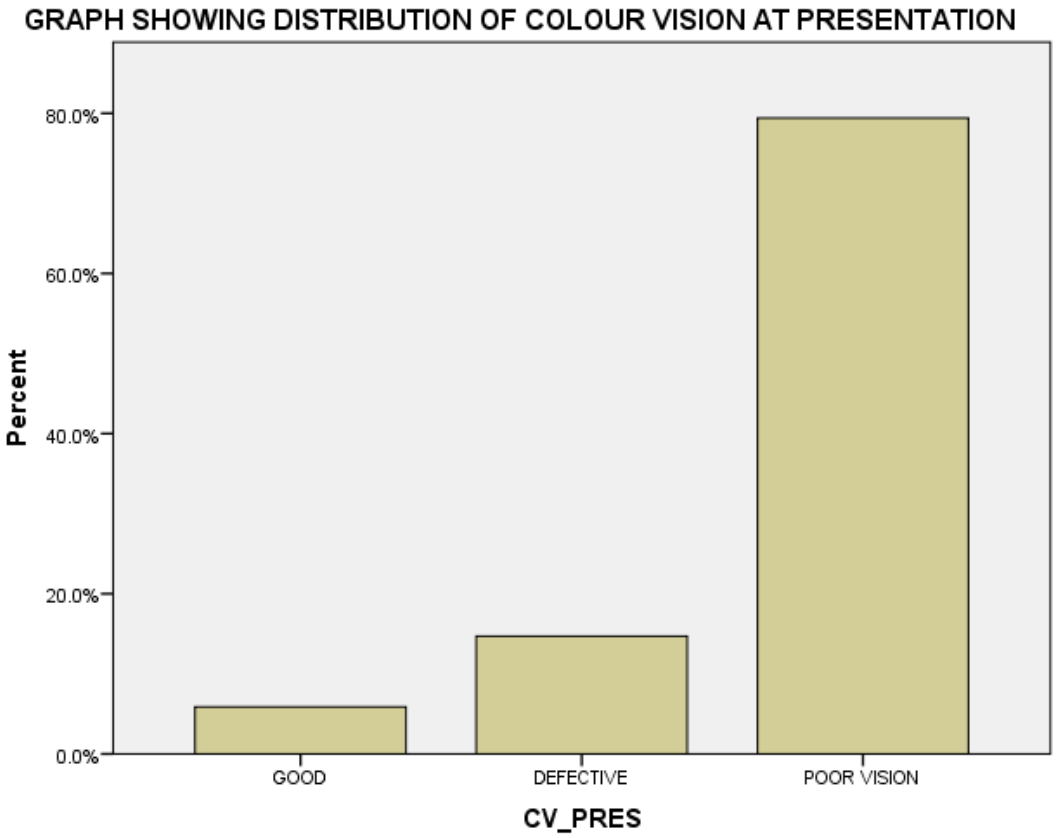


TABLE SHOWING PRESENCE OF COLOUR VISION

Colour Vision	Frequency	Percent	Valid Percent	Cumulative Percent
GOOD	2	5.9	5.9	5.9
DEFECTIVE	5	14.7	14.7	20.6
POOR VISION	27	79.4	79.4	100.0
Total	34	100.0	100.0	

FIELD DEFECTS

Out of 34 eyes, 2 (5.9%) eyes has normal visual fields,5(14.7%) eyes had defective fields,27(79.4%) fields could not be assessed due to poor vision.

TABLE SHOWING FIELD DEFECTS DISTRIBUTION

Field Defects	Frequency	Percent	Valid Percent	Cumulative Percent
GOOD	2	5.9	5.9	5.9
DEFECTIVE	5	14.7	14.7	20.6
POOR VISION	27	79.4	79.4	100.0
Total	34	100.0	100.0	

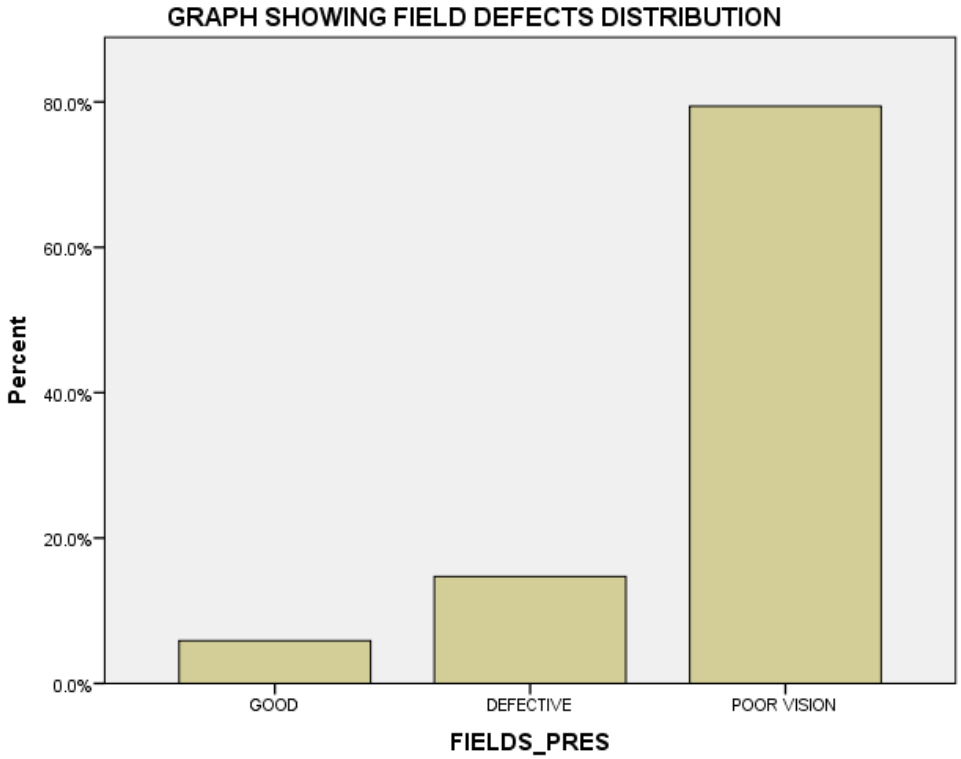
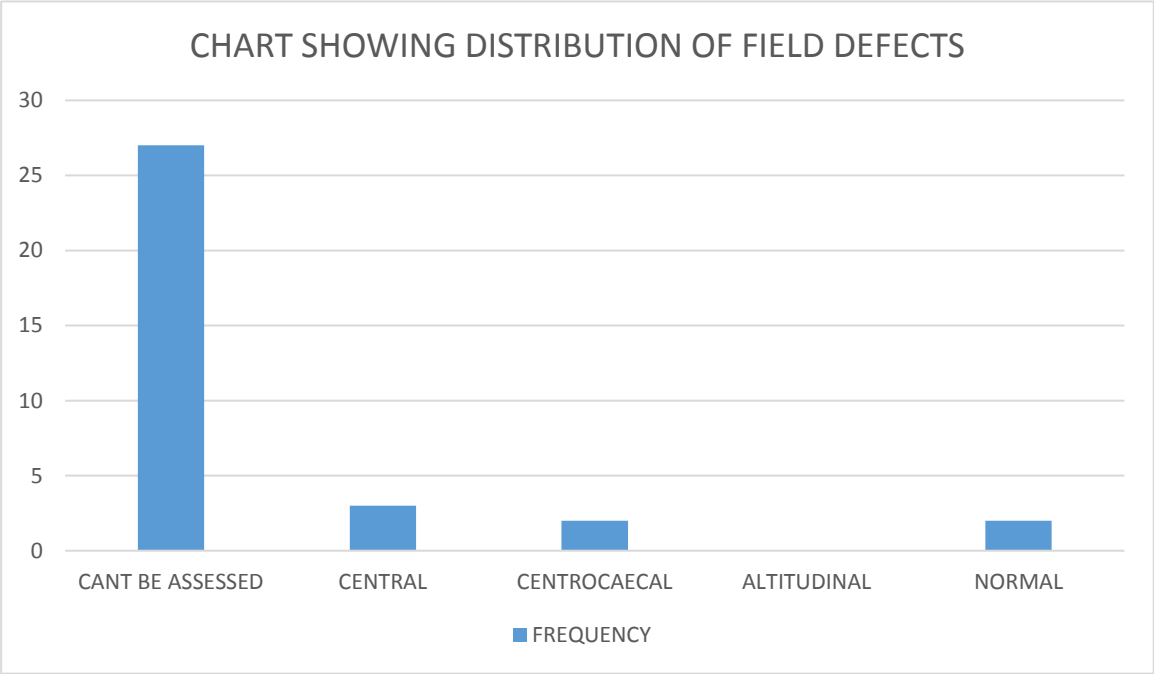


TABLE SHOWING DISTRIBUTION OF FIELD DEFECTS

FIELDS	FREQUENCY	PERCENTAGE
CANT BE ASSESSED	27	79.4
CENTRAL	3	8
CENTROCAECAL	2	5.8
ALTITUDINAL	0	0
NORMAL	2	5.8
TOTAL	34	100



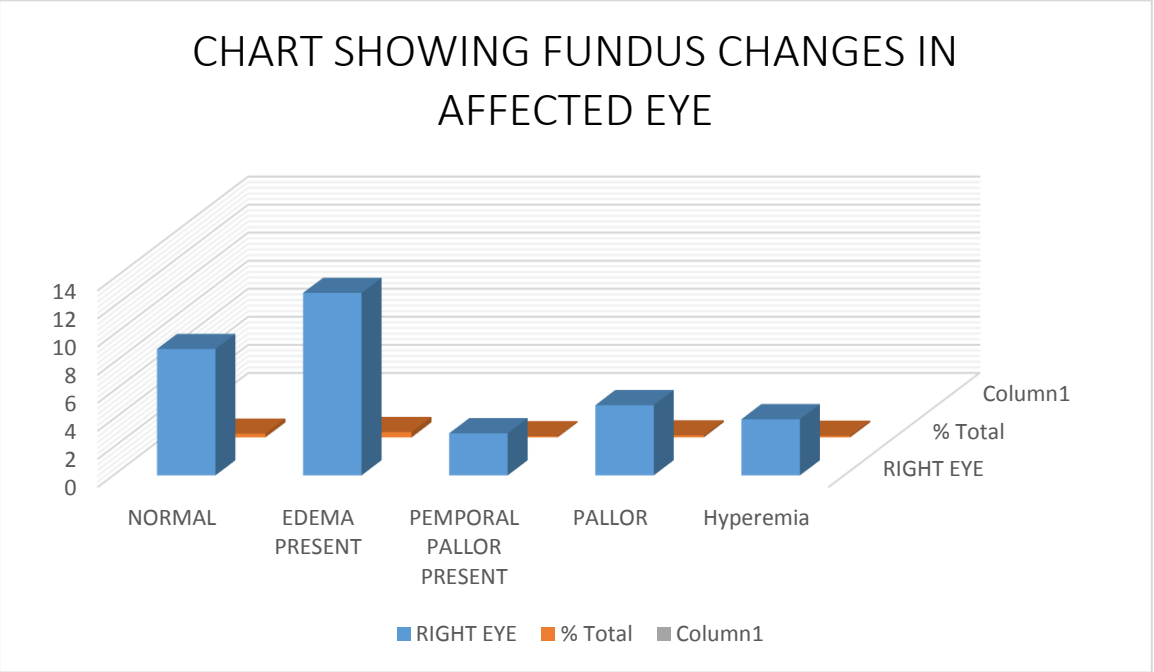
Central(8%) and paracentral (5.8%) field defect was found to be most common and normal(5.8%) and fields could not be assessed due to poor vision in 79.4 %.

FUNDUS

At presentation, affected eye revealed edema in 13(38%) eyes, temporal pallor 3(8%), pallor in 5 (5%) and hyperemia in 4(11%) eyes.

TABLE SHOWING FUNDUS CHANGES IN AFFECTED EYE

FUNDUS ABNORMALITIES	FREQUENCY	PERCENTAGE
NORMAL	9	26
Edema	13	38
Temporal pallor	3	8
Pallor	5	14
Hyperemia	4	11



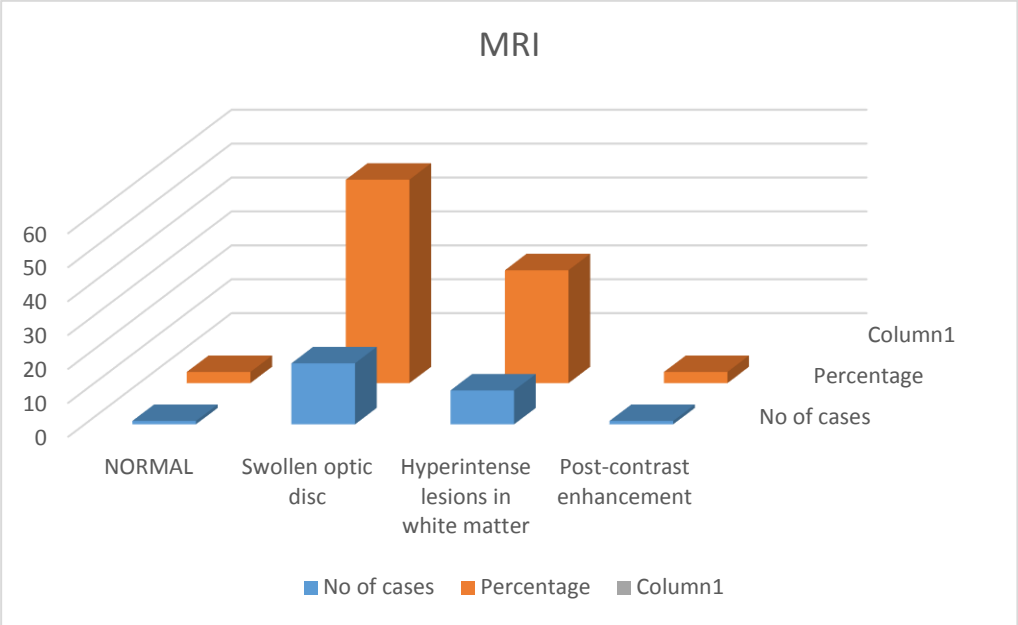
IMAGING

Swollen optic disc suggestive of idiopathic optic neuritis was present in 18(60%) cases. Hyperintense lesions in white matter, suggestive of multiple sclerosis was present in 10(33.3%) cases. 1(3.3%) patient had post contrast enhancement. Imaging was normal in 1(3.3%) case.

TABLE SHOWING MRI FINDINGS IN OPTIC NEURITIS

MRI	FREQUENCY	PERCENTAGE
NORMAL	1	3.3
Swollen optic disc	18	60
Hyperintense lesions in white matter	10	33.3
Post contrast enhancement	1	3.3

CHART SHOWING MRI FINDINGS IN OPTIC NEURITIS



TREATMENT

All patients with idiopathic optic neuritis or demyelinating lesions on imaging (suggestive of multiple sclerosis) were treated initially with intra venous methyl prednisolone (15 to 30 mg/kg/day) OD for 3 to 5 days. This was followed by a course of oral steroids – 1mg/kg/day for 11 days, followed by gradual taper.

FOLLOW- UP

1) VISUAL OUTCOME

At presentation 27(79.4%) eyes had vision<3/60,which had reduced to 10 eyes(29.4%) at 1 month,5 eyes(14.7%) at six months.

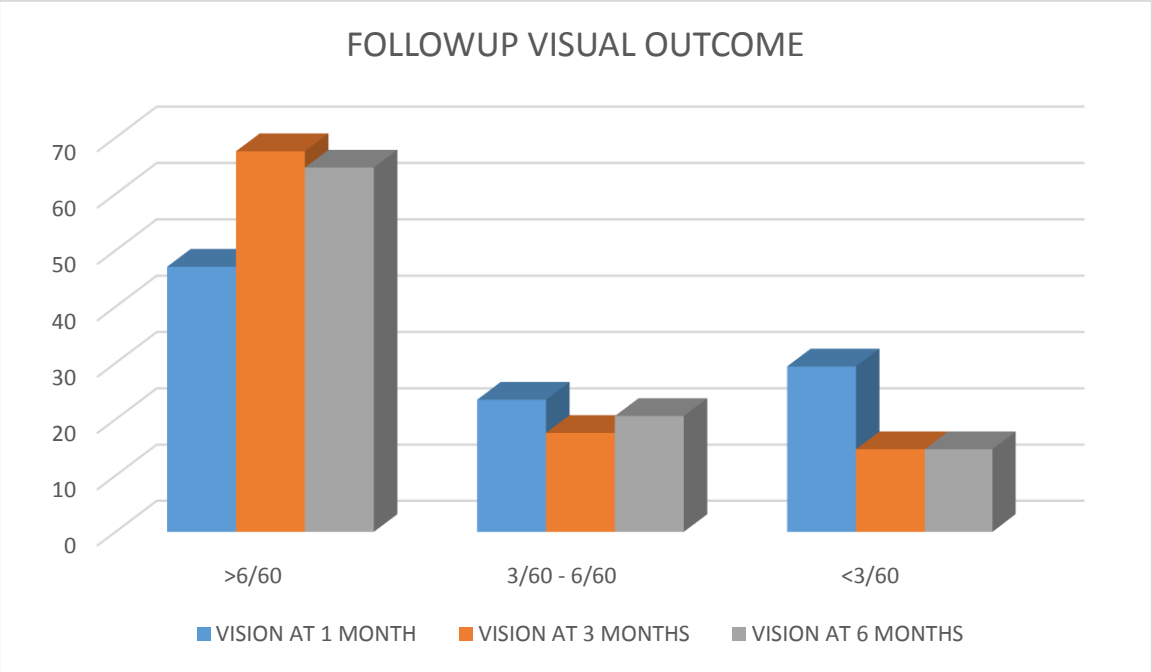
TABLE SHOWING VISUAL OUTCOME AT 1ST ,3RD AND 6TH MONTH

VISUAL ACUITY	FIRST MONTH		THIRD MONTH		SIXTH MONTH	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
>6/60	16	47.1	23	67.6	22	64.7
3/60 TO 6/60	8	23.5	6	17.6	7	20.6
<3/60	10	29.4	5	14.7	5	14.7
Total	34	100.0	34	100	34	100.0

TEST OF SIGNIFICANCE - ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
VN AT FIRST MONTH	Between Groups	.619	11	.056	19.424	.000
	Within Groups	.064	22	.003		
	Total	.683	33			
VN AT THIRD MONTH	Between Groups	1.739	11	.158	3.428	.007
	Within Groups	1.014	22	.046		
	Total	2.753	33			
VN AT 6TH MONTH	Between Groups	1.832	11	.167	3.747	.004
	Within Groups	.978	22	.044		
	Total	2.810	33			

CHART SHOWING FOLLOWUP VISUAL OUTCOME



There is a significant improvement of visual acuity at 1 month and 6 months following treatment, the significance being calculated using One way Anova, with p value 0.004 at 6 months.

2)COLOUR VISION

At presentation 6(17.6%) eyes had normal colour vision, which had increased to 27 eyes(79.4%) at 6 month. At presentation in 24 eyes (70.6%) colour vision could not be assessed due to poor vision which had decreased to 2(5.9) at 6 months.

TABLE COMPARING COLOUR VISION AT PRESENTATION AND AFTER TREATMENT AT 6 MONTHS

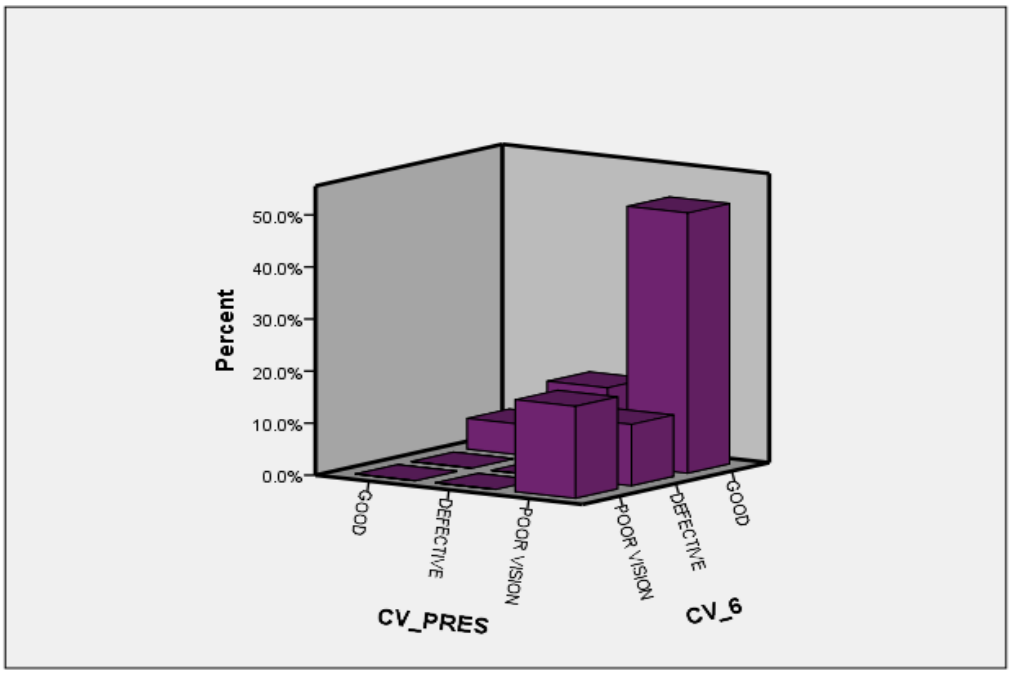
COLOUR VISION	CV AT PRESENTATION		CV AT 6TH MONTH	
	Frequency	Percent	Frequency	Percent
GOOD	6	17.6	27	79.4
DEFECTIVE	4	11.8	5	14.7
POOR VISION	24	70.6	2	5.9
Total	34	100.0	34	100.0

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
CV_6	Between Groups	8.413	11	.765	1.396	.243
	Within Groups	12.057	22	.548		
	Total	20.471	33			
CV_PRES	Between Groups	9.818	11	.893	24.544	.001
	Within Groups	.800	22	.036		
	Total	10.618	33			

There is a significant improvement of colour vision at 1 month and 6 months following treatment, the significance being calculated with One way Anova at 6 months.

3D BAR GRAPH SHOWING COLOUR VISION AT PRESENTATION AND AT 6TH MONTH



3)Fields

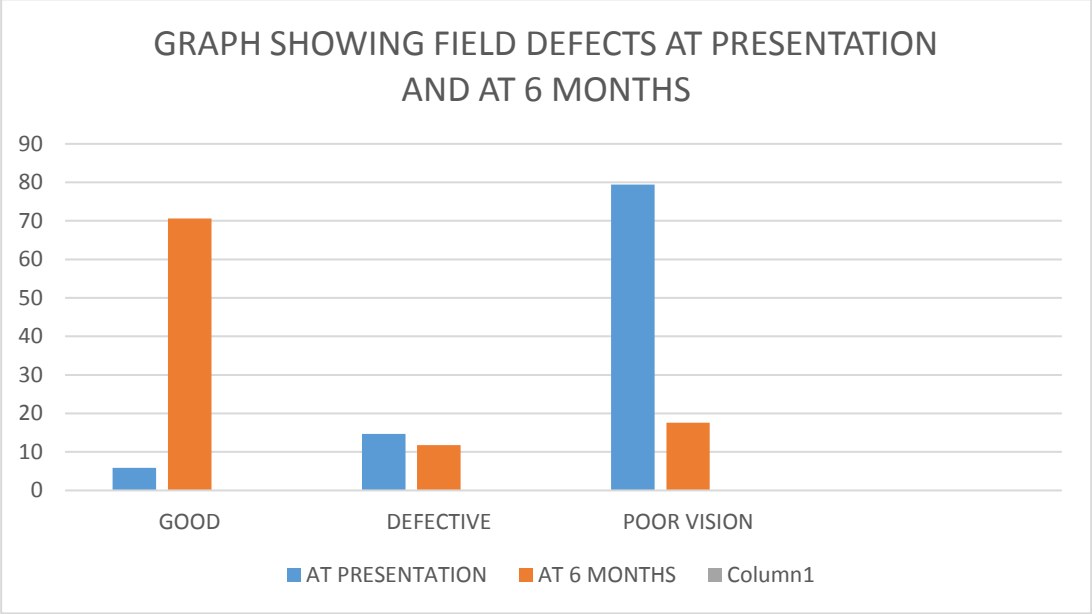
The field was defective in 14.7 percent of individuals at presentation which reduced to 11 percent after treatment with good significance. Number of patients who had normal field increased from 5.9 percent to 70 percent with good significance.

TABLE COMPARING FIELDS AT PRESENTATION AND AFTER TREATMENT AT 6 MONTHS

FIELDS	FIRST MONTH		SIXTH MONTH	
	Frequency	Percent	Frequency	Percent
GOOD	2	5.9	24	70.6
DEFECTIVE	5	14.7	4	11.8
POOR VISION	27	79.4	6	17.6
Total	34	100.0	34	100.0

TESTS OF SIGNIFICANCE - ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
FIELDS_PRES	Between Groups	9.818	11	.893	24.544	.001
	Within Groups	.800	22	.036		
	Total	10.618	33			
FIELDS_6	Between Groups	4.904	11	.446	1.970	.085
	Within Groups	4.979	22	.226		
	Total	9.882	33			

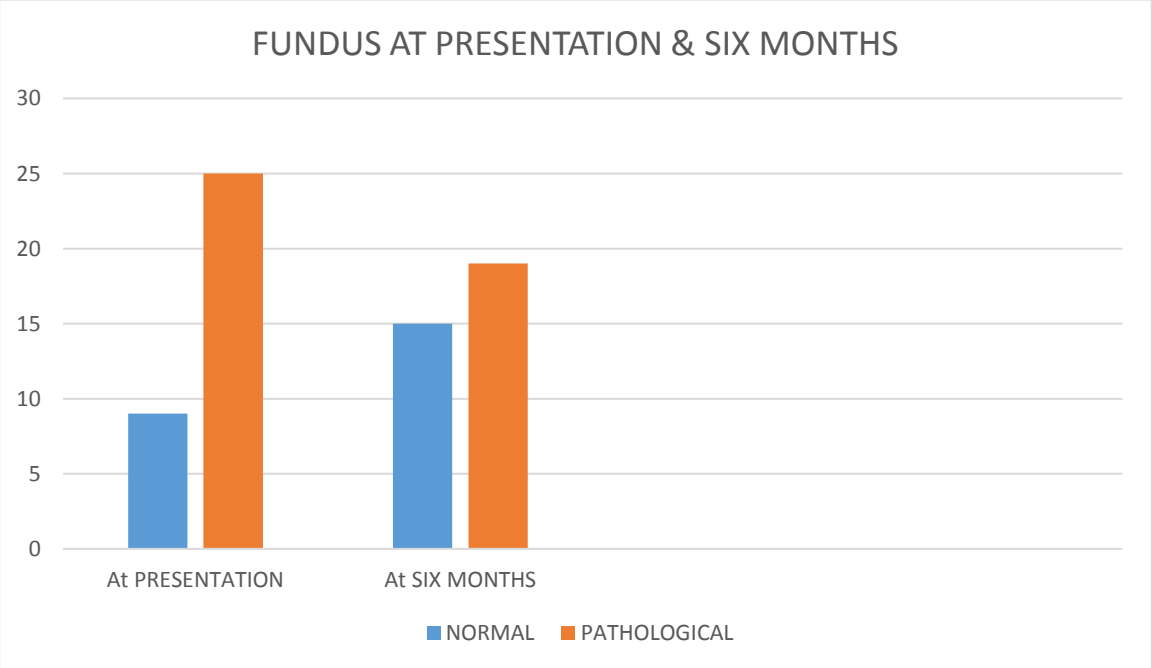


4) Fundus

Fundus of 25(55.9%) eyes were pathological at presentation, which reduced to 19(73.5%) at 6th months.

TABLE COMPARING FUNDUS CHANGES AT PRESENTATION AND AFTER TREATMENT AT 6 MONTHS

FUNDUS CHANGES	At Presentation		At Six months	
	Frequency	Percent	Frequency	Percent
NORMAL	9	44.1	15	26.5
PATHOLOGICAL	25	55.9	19	73.5
Total	34	100	34	100.0



ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
FUN_PRES	Between Groups	1.520	11	.138	.596	.008
	Within Groups	5.098	22	.232		
	Total	6.618	33			
FUN_SIX	Between Groups	2.285	11	.208	.749	.007
	Within Groups	6.098	22	.277		
	Total	8.382	33			

DISCUSSION

Jain et al made a report that in India the clinical profile of patients with Optic neuritis was not similar to that of Western population.

Our prospective study included 30 patients. Mean age was 33 years.

Unlike ***Optic neuritis treatment trial [ONTT]*** where 77% of patients affected were females, our study had 12 females (40 %) and 18 males (60 %).

The most common complaints in our study were defective vision (100%) and pain on eye movement (46.7%). This is similar to a study by ***Ismail Shatriah et al*** which reported defective vision in 77.3% and pain on eye movement in 31.7% of patients.

In the study conducted by ***Saxena et al***, papillitis (53.5%) is frequent in Indian population which was similar to our study, which showed papillitis in 55.9% of patients. Bilateral presentation was seen in 19.3% of cases where as in our study bilaterality was seen in 13% of cases.

At presentation, colour vision was defective in 14.7% and could not be assessed due to poor vision in 79.4% eyes.

This is similar to ***Optic Neuritis Study Group*** that reported 94% of patients with abnormal color vision in the acute phase of the disease.

The study conducted by ***Jin Choi et al*** showed that central scotoma is the most common field defect which was similar to our study in which central scotoma (8%) was most common followed by centrocaecal scotoma (5.8%).

ONTT showed that patients treated with Intravenous Methylprednisolone for 3 days followed by Tab.Prednisolone for 11 days recovered vision faster, which was similar to our study where vision of 64.7% eyes had improved to > 6/60.

CONCLUSION

Optic neuritis patients have profound loss of vision, defective colour vision and field defects at presentation. They have significant visual recovery following treatment, though residual visual disability does occur in few patients.

Treatment with Inj. Methyprednisolone followed by Oral Prednisolone has got a major role in visual prognosis of patients with optic neuritis. Thus patients presenting with optic neuritis should be evaluated and appropriate treatment should be intiated to prevent vision loss.