Dissertation on

A CLINICAL STUDY ON THIRTY CASES OF OCULAR TOXOCARIASIS

Submitted in partial fulfillment of requirements of

M.S. OPHTHALMOLOGY

BRANCH - III

REGIONAL INSTITUTE OF OPHTHALMOLOGY

MADRAS MEDICAL COLLEGE

CHENNAI- 600 003

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI

MAY 2018

CERTIFICATE

This is to certify that this dissertation entitled "A CLINICAL STUDY ON THIRTY CASES OF OCULAR TOXOCARIASIS" is a bonafide record of the research work done by Dr. S.SANGEETHA, post graduate in Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College and Government General Hospital, Chennai-03, in partial fulfillment of the regulations laid down by The Tamil Nadu Dr. M.G.R. Medical University for the award of M.S. Ophthalmology Branch III, under my guidance and supervision during the academic years 2015-2018.

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DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled "A CLINICAL STUDY ON 30 CASES 0F OCULAR TOXOCARIASIS" is a bonafide and genuine research work carried out by me under the guidance of Prof.Dr.Latha Hariharan M.S.,D.O.

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To
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Dear Dr.S.Sangeetha,

The Institutional Ethics Committee has considered your request and approved your study titled **"A CLINICAL STUDY ON 30 CASES OF OCULAR TOXOCARIASIS" - NO.13012017 (III).**

The following members of Ethics Committee were present in the meeting hold on **24.01.2017** conducted at Madras Medical College, Chennai 3

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CONTENTS

PART – I

INTRODUCTION

Uveitis is defined as the inflammation of the uveal tissue which includes iris, ciliary body and choroid. Uveitis is associated with involvement of other ocular structures like retina, choroid, blood vessels, cornea, sclera, optic nerve and vitreous. Most of the cases are idiopathic in nature. Some patients have systemic associations like systemic lupus erythematosus, rheumatoid arthritis, ankylosing spondylitis, Reiters syndrome, inflammatory bowel disease etc. A thorough history along with systemic and ocular examination is essential in diagnosing a case of uveitis as well as for managing the same. Laboratory investigations helps us to find out the etiology of the intraocular inflammation. By determining the etiology, specific therapy can be directed to the patients.

ANATOMY OF UVEA

Uveal tract consists of iris, ciliary body and choroid from anterior to posterior in order. It is a highly vascularised structure.

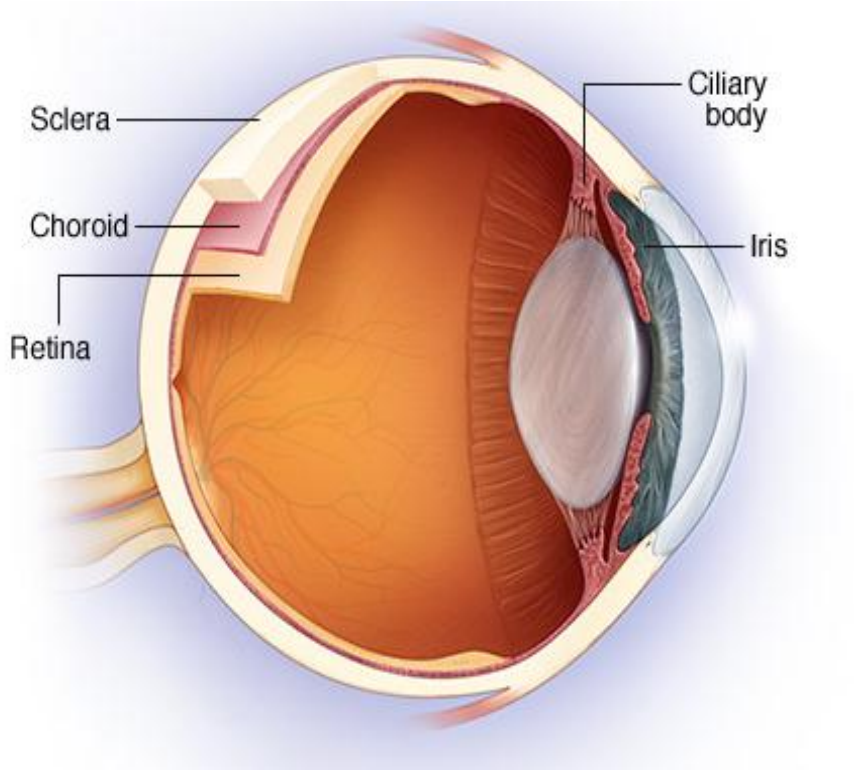

Fig 1: PICTURE SHOWING THE LAYERS OF EYEBALL

IRIS

It is a diaphragm like structure with a central aperture called pupil through which light rays pass to reach the retina. Root of the iris is attached to the ciliary body which is named as ciliary margin. Iris that covers the pupil is called the pupillary margin. Diameter of the iris is 12 mm and it is thickest 2mm from the pupillary margin. Pupil size varies from 1 to 8mm. The iris colour differs from one person to another. It may range from light blue to dark brown depending on the melanin pigmentation. Melanin

pigment is produced by melanocytes. The anterior surface is divided into a pupillary zone and ciliary zone. They are separated by collarette. Epithelium is absent along the anterior surface. The major arterial circle is situated near the root of the iris. Branches from this circle will anastomose at the collarette to form the minor arterial circle. The pigmented posterior epithelium of the iris is visible at the pupillary margin to give a crenated appearance and it is called the ruff. When it extends anteriorly beyond the pupillary margin it is called as ectropion uvae.

Iris is made up of two layers namely

- Stroma – derived from the mesenchyme and situated anteriorly.
- Pigmented posterior epithelium –consists of two layers derived from the neural ectoderm.

The stroma is made up of collagen fibres, fibroblasts, melanocytes, matrix, nerve fibres, sphincter pupillae and dilator pupillae muscle. The sphincter pupillae muscle is located in the pupillary zone and arranged in a ring like fashion. The pupil constricts when the muscle contracts. The nerve supply is from the parasympathetic postganglionic fibres in the short ciliary nerve which is derived from the oculomotor nerve. The dilator pupillae muscle occupies the ciliary zone and is arranged in a radial manner. Anterior layer of the epithelium of the iris gives rise to myoepithelial cells. The basal process of these cells form the muscle fibers while the apical process forms the pigment cells. It is supplied by the postganglionic fibers

from the superior cervical ganglion via the long ciliary nerve. The pupil dilates when the muscle contracts. Both the muscles of iris are derived from the external layer of the optic cup.

The posterior surface of the iris has two layers of epithelium. The anterior layer of epithelium is closely related to the stroma and dilator pupillae muscle. It contains few melanin pigments and is continuous with the pigmented layer of the ciliary epithelium. The posterior layer of epithelium is in contact with the aqueous humor. Numerous melanin granules are present in this layer. It continues as the nonpigmented layer of the ciliary epithelium. The two layers are derived from the neuroectoderm of the optic vesicle. The two layers are arranged in a such a way that their apex is in contact with each other. The iris is supplied by the major and minor arterial circle. The major arterial circle is contributed by the two long posterior ciliary artery and seven anterior ciliary artery. The venous blood drains into the vortex veins.

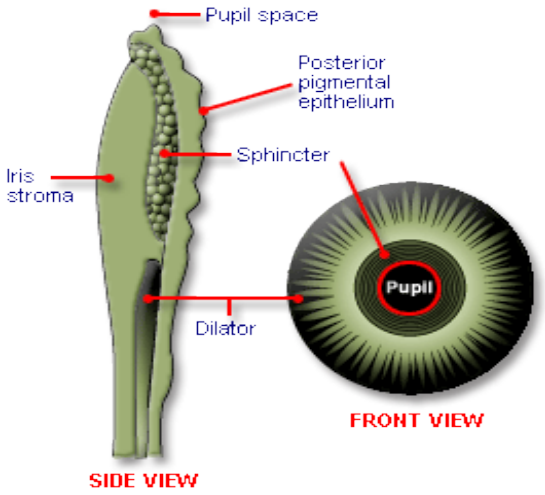

Fig 2: ANATOMY OF THE IRIS

CILIARY BODY

It is the middle portion of the uveal tract which extends anteriorly as iris and posteriorly as choroid. On cross section, it is triangular in shape with base towards the anterior chamber and apex continues as the choroid. The width of the ciliary body is 6mm.It is divided into two parts:

- Pars plicata:

  it is situated anteriorly and gives rise to ciliary processes. The surface gives a plicated appearance.

- Pars plana:

  It has a smooth surface and is situated posteriorly.

The suspensory ligaments connects the equator of the lens to the pars plicata region in between the ciliary process.

The ciliary body is made up of three parts:

- Ciliary epithelium
- Ciliary stroma
- Ciliary muscle

The ciliary epithelium has two layers, the inner nonpigmented layer and the outer pigmented layer. Their apex is in contact with each other and the space between them is called ciliary channels. The inner nonpigmented layer is continuous with the nervous part of the retina. The outer pigmented layer continues as the retinal pigmented epithelium. The basement

membrane of pigmented layer is continuous with the basement membrane of retinal pigmented epithelium and is in contact with the stroma. The basement membrane of nonpigmented cells extends as the internal limiting membrane and faces the posterior chamber. The main action of ciliary epithelium is production of aqueous humor.

The ciliary stroma is mainly made up of loose connective tissue with abundant blood vessels and melanocytes. The ciliary arteries, veins and capillary networks constitutes the blood vessels.

The ciliary muscle consists of smooth muscle fibres which are divided into three main groups:

- The longitudinal fibers: it is closest to the sclera and passes into the stroma of the choroid.
- The oblique or radial fibers: it radiates outward from the scleral spur.
- The circular fibers: it is the innermost fibers around the eyeball like a sphincter.

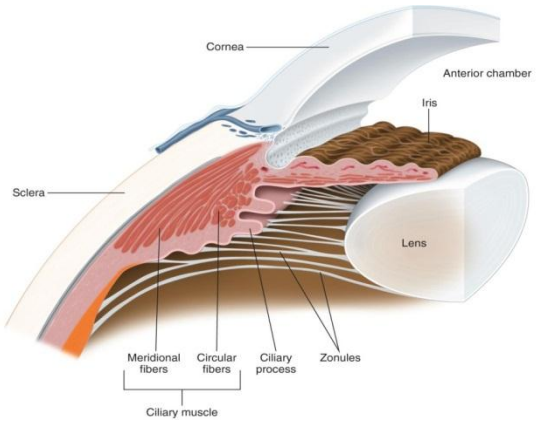

Fig 3: STRUCTURE OF THE CILIARY BODY

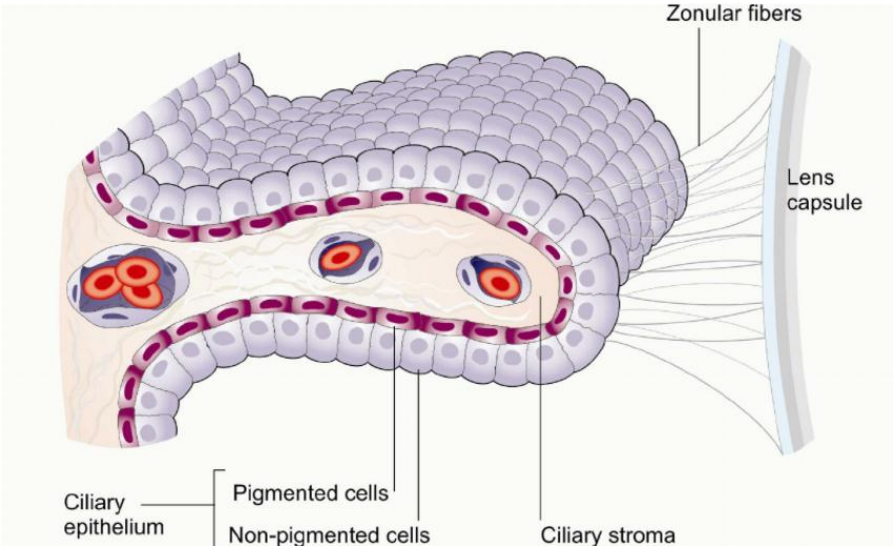

Fig 4: CILIARY EPITHELIUM

When the ciliary muscle contracts, the suspensory ligaments relaxes and curvature of the lens increases. This is the process of accommodation that takes place in our eye. The muscle is supplied by the postganglionic parasympathetic fibers of the oculomotor nerve through the short ciliary nerve. Functions of the ciliary body includes the process of accommodation and production of aqueous humor by the ciliary process.

CHOROID

Choroid is the middle layer of the eyeball located between the retina and sclera. It extends anteriorly up to the ciliary body and posteriorly till the optic nerve. It is highly vascularised layer which is thickest in the posterior pole. This layer becomes thinner as it extends anteriorly. It is strongly attached to the retinal pigmented epithelium internally. It is attached firmly to sclera at the optic disc and where the vessels and nerves pierce the

eyeball. The space between the choroid and sclera is called the perichoroidal space. This potential space is filled with connective tissue namely suprachoroidal lamina. The long and short posterior ciliary arteries and nerves run through this space.

The choroid is made up of three layers:

- The vessel layer: this is the outer most layer consist of connective tissue with numerous medium and large sized blood vessels in the sattler and hallers layer. The veins will join to form the vortex veins which are four in number and drains into the ophthalmic vein.
- The capillary layer: it forms the middle layer of choroid with numerous capillaries supported by connective tissue embedded with melanocytes. These capillaries are more in number in the macular region.
- Bruchs membrane: it is the innermost layer of 2-4 microns thickness. It consists of five layers.
    1. The basement membrane of the capillary endothelium.
    2. Outer collagen layer
    3. A layer of elastic fibres
    4. Inner collagen layer
    5. The basement membrane of the retinal pigmented epithelium

The choroid is supplied mainly by the long and short posterior ciliary arteries which is derived from the ophthalmic artery. The venous blood drains into the vortex veins. The nerve supply is mainly by the short and long ciliary nerve. The short ciliary nerve arises from the ciliary ganglion. The long ciliary nerve arises from the nasociliary nerve which is a branch of the ophthalmic division of the trigeminal nerve.

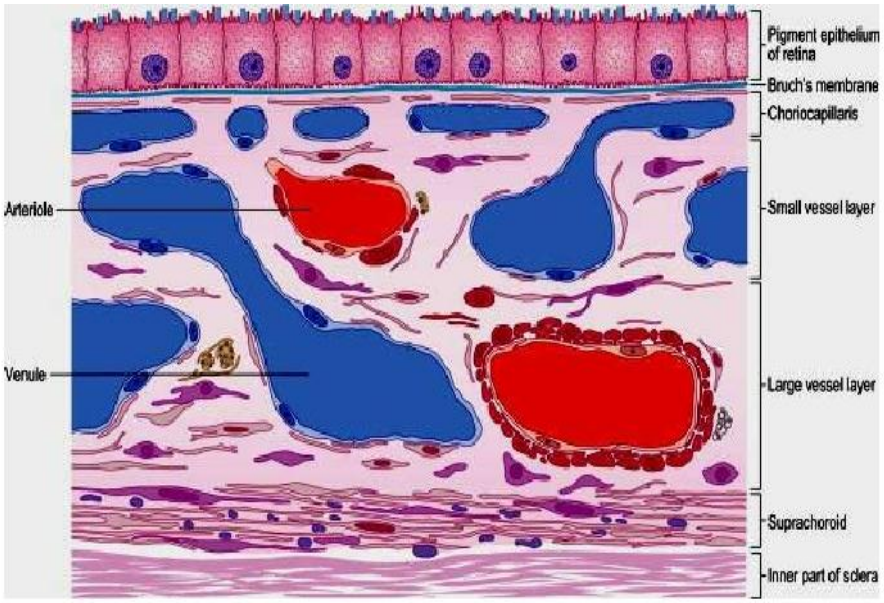

Fig 5: LAYERS OF CHOROID

CLASSIFICATION OF UVEITIS

There are several classifications for uveitis based on the anatomy, etiology, course of the disease, histology etc.

The SUN Working Group Anatomical Classification of Uveitis

1. Anterior uveitis
    - Iritis
    - Iridocyclitis
    - Anterior cyclitis
2. Intermediate uveitis
    - Pars planitis
    - Posterior cyclitis
    - Hyalitis
3. Posterior uveitis
    - Focal, multifocal or diffuse choroiditis
    - Chorioretinitis
    - Retinochoroiditis
    - Retinitis
    - Neuroretinitis
4. Panuveitis

The SUN Working Group Descriptors in Uveitis

- Onset
    - Sudden
    - Insidious
- Duration
    - Limited: < 3 months duration
    - Persistent: > 3 months duration
- Course
    - Acute: sudden onset and limited duration.
    - Recurrent: repeated episodes separated by periods of inactivity without treatment for > 3 months duration.
    - Chronic: persistent uveitis with relapse occurring within 3 months of discontinuation of treatment.

ANTERIOR UVEITIS

The primary site of inflammation in anterior uveitis is anterior chamber. Iritis is defined as inflammation restricted to the anterior chamber alone. The term iridocyclitis is used if there are cells in the anterior vitreous phase. If iritis is present secondary to the corneal inflammation, it is termed as keratouveitis. Inflammation of the uveal tract and sclera is termed as sclerouveitis.

Causes:

- Idiopathic
- Reiters syndrome
- Ankylosing spondylitis
- Psoriatic arthritis
- Inflammatory bowel disease
- Behcets disease
- Fuchs heterochromic iridocyclitis
- Juvenile rheumatoid arthritis
- Syphilis
- Sarcoidosis
- Glaucomatocyclitic crisis
- Masquerade syndromes

INTERMEDIATE UVEITIS

The primary site of inflammation in intermediate uveitis is vitreous cavity. Patients mainly complaints of floaters and defective vision. Vision drop is due to either cystoid macular oedema or cataract formation.

Causes:

- Sarcoidosis
- Inflammatory bowel disease
- Lyme disease

- Pars planitis
- Multiple sclerosis

POSTERIOR UVEITIS

The primary site of inflammation is the choroid and / or retina. It can be associated with inflammation of the retinal vasculature and vitreous cavity. Macular oedema, neovascularisation of the choroid or retina, retinal detachment and peripheral vasculitis are few complications seen in posterior uveitis.

Causes:

- Focal choroiditis
    a. Tuberculosis
    b. Toxocariasis
    c. Nocardiasis
- Multifocal choroiditis
    a. Tuberculosis
    b. Sympathetic ophthalmia
    c. Vogt Koyanagi Harada syndrome
    d. Sarcoidosis
    e. Birdshot choroidopathy
    f. Serpiginous choroidopathy
    g. Masquerade syndromes

- Focal retinitis
    a. Toxoplasmosis
    b. Onchocerciasis
    c. Cysticercosis
    d. Masquerade syndromes
- Multifocal retinitis
    a. Herpes simplex virus
    b. Cytomegalovirus
    c. Syphilis
    d. Candidiasis
    e. Meningococcus
    f. Masquerade syndromes

PANUVEITIS

Panuveitis is defined as the inflammation of the whole uveal tract which includes the iris, ciliary body, and the choroid.

Causes:

- Sarcoidosis
- Behcets disease
- Sarcoidosis
- Vogt Koyanagi Harada syndrome
- Infectious endophthalmitis

RETINAL VASCULITIS

Inflammation of the retinal vasculature is seen in association with ocular inflammation. It is characterised by perivascular sheathing, cuffing, occlusion and leakage.

Primarily arteritis:

- Syphilis
- Herpes simplex virus
- Varicella zozter virus
- Systemic lupus erythematosus
- Polyarteritis nodosa
- IRVAN syndrome
- Churg strauss syndrome

Primarily phlebitis:

- Sarcoidosis
- Eales disease
- Behcets disease
- Multiple sclerosis
- Birdshot uveitis
- HIV paraviral syndrome

Arteritis and phlebitis

- Toxoplasmosis

- Frosted branch angitis
- Granulomatosis with polyangiitis
- Crohns disease
- Relapsing polychondritis

HISTOLOGIC CLASSIFICATION

- Non- granulomatous uveitis: it is characterised by lymphocytic and plasma cell infiltration.
- Granulomatous uveitis: it is characterised by epithelioid and giant cells.

  Causes of granulomatous inflammation:

  - Tuberculosis
  - Syphilis
  - Sarcoidosis
  - Sympathetic ophthalmia
  - Vogt Koyanagi Harada syndrome
  - Lens induced uveitis
  - Intraocular foreign body

CLINICAL FEATURES OF UVEITIS

SYMPTOMS OF UVEITIS

Pain

Redness

Photophobia

Defective vision

Floaters

Epiphora

Black spots

Photopsia

Metamorphopsia

SIGNS OF UVEITIS

1.Eyelid and skin

- Vitiligo
- Nodules
- Oedema

2.Conjunctiva

- Circumcorneal congestion
- Nodules

3.Corneal endothelium

- Keratic precipitates: these are aggregation of inflammatory cells on the back of the cornea. Fresh keratic precipitates are white in colour with smooth borders. Old keratic precipitates are dry, pigmented with shrunken and crenated appearance. Yellowish, greesy and large KPs called mutton fat keratic precipitates are seen in granulomatous inflammation.
- Fibrin
- Iris pigments

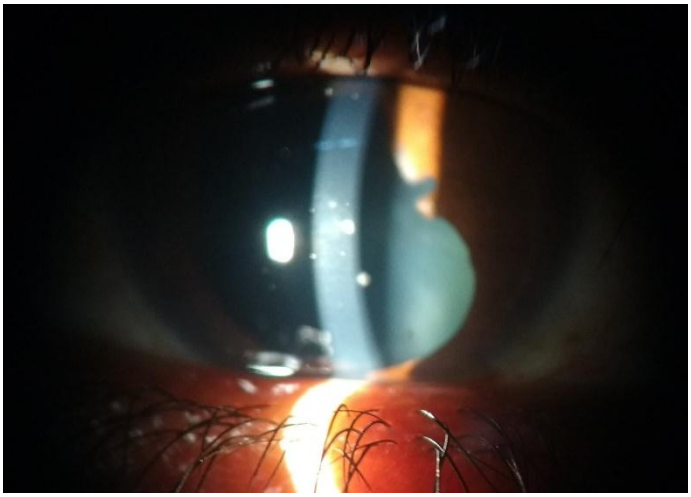

Fig 6: KERATIC PRECIPITATES

4.Anterior chamber reaction

- Serous
- Purulent
- Fibrinous
- Sanguinoid

Grading of cells and flare in the anterior chamber is done using the slit lamp at high intensity and magnification. 1×1 mm slit is used at an angle of 45 to 60 degree in a dark room.

Grading of anterior chamber cells

Grade	no of cells
0	<1
0.5+	1-5
1+	6-15
2+	16-25
3+	26-50
4+	>50

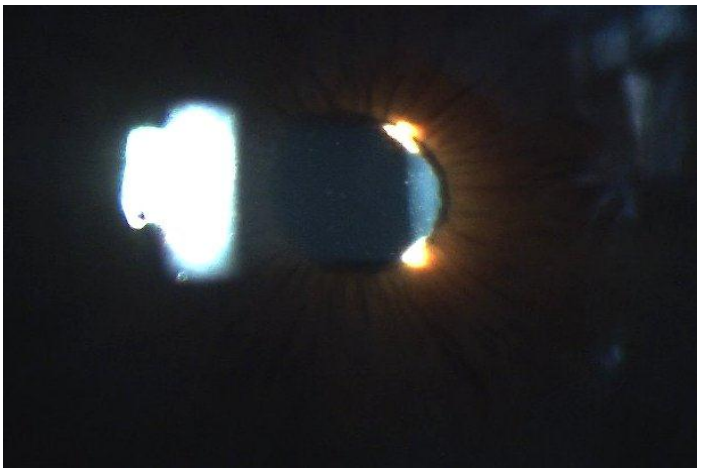

Fig 7: PICTURE SHOWING THE AQUEOUS CELLS BY SLIT LAMP EXAMINATION

Grading of anterior chamber flare

Grade	description
0	none
1+	faint
2+	moderate (iris &lens details clear)
3+	marked (iris &lens details hazy)
4+	intense (fibrin or plasmoid aqueous)

5.Iris

- nodules: they are generally seen in granulomatous inflammation
    - Busaca nodules are present in the stroma
    - Koeppes nodules are present in the pupillary margin
- posterior synechiae
- atrophy
- heterochromia
- occlusio pupillae
- seclusio pupillae

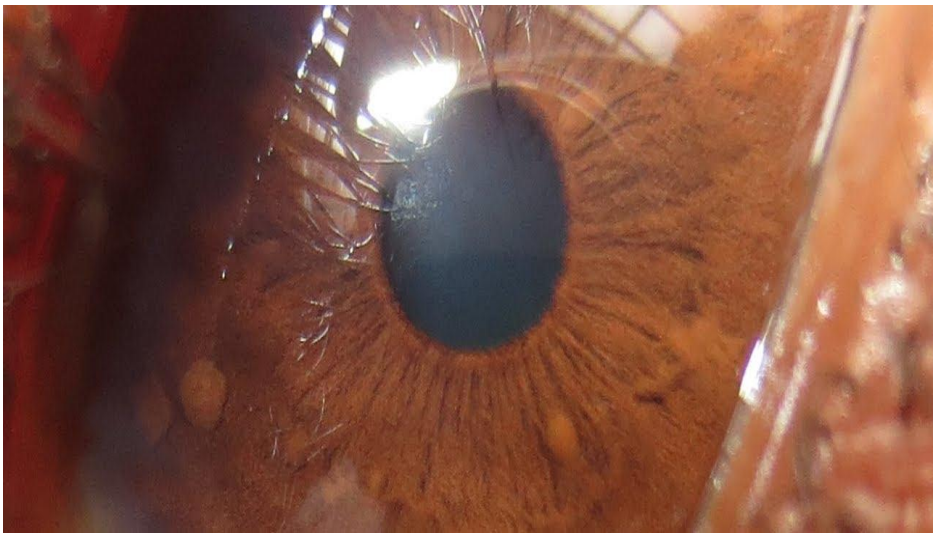

Fig 8: IRIS NODULES (BUSACCA NODULE)

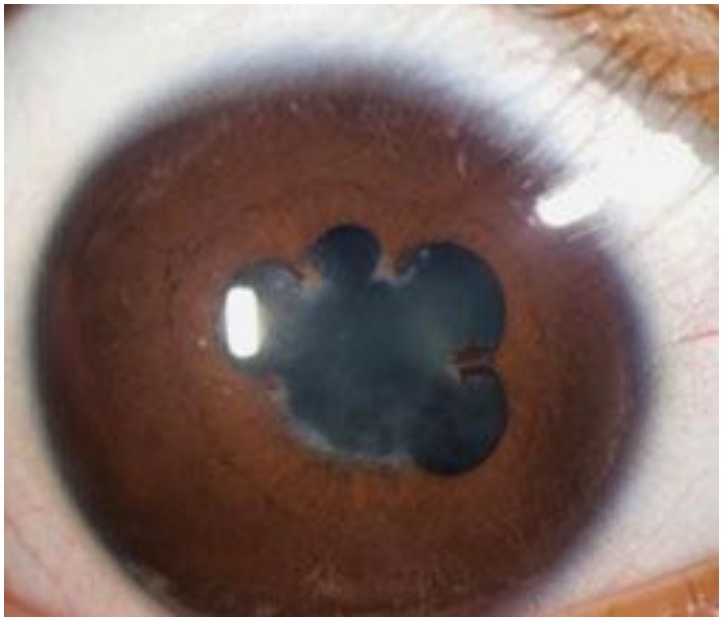

Fig 9: POSTERIOR SYNECHIAE- FESTOONED PUPIL

6.Angle

- peripheral anterior synechiae
- nodules
- neovascularisation
- keratic precipitates

7.Intraocular pressure

- hypotony
- secondary glaucoma

8.Lens

- complicated cataract

9.Vitreous

- inflammatory cells
- traction bands

Grading of vitreous cells

Grade	number of cells
0	0
0.5+	1-5
1+	6-10
2+	11-20
3+	21-50
4+	>50

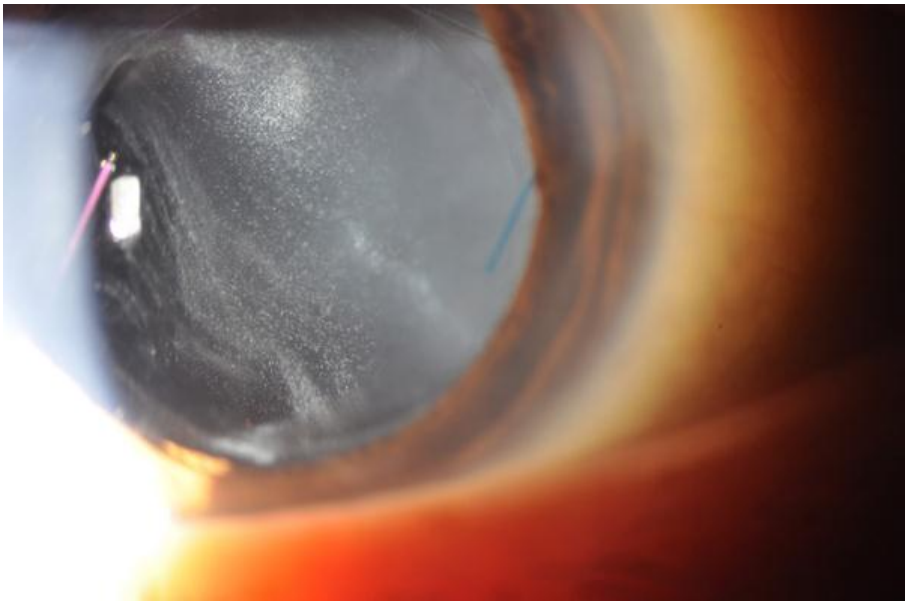

Fig 10: PICTURE SHOWING VITREOUS CELLS

Grading of vitreous haze

Grade	description
0	no flare
0.5+	trace
1+	clear optic disc & vessels, hazy nerve fiber layer
2+	hazy optic disc & vessels
3+	optic disc visible
4+	optic disc not visible

10.Pars plana

- snowbanking

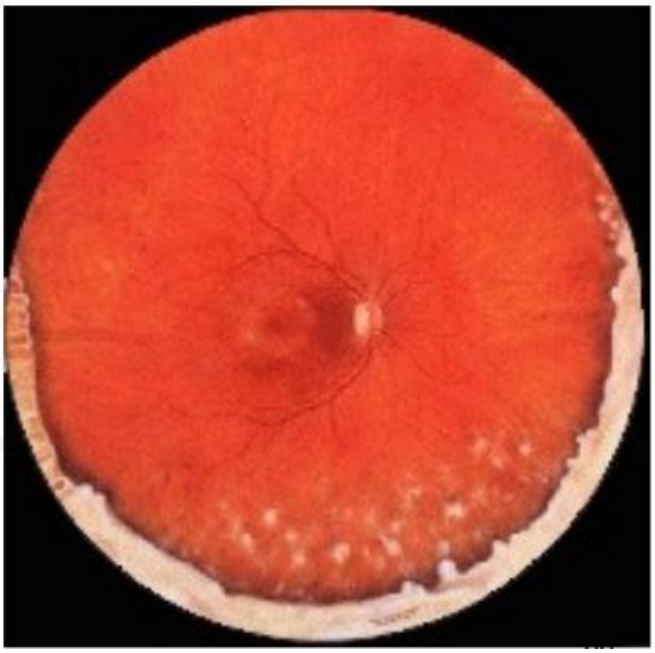

Fig 11: SNOWBANKING

11.Retina

- inflammatory cells
- inflammatory cuffing of blood vessels
- cystoid macular oedema
- retinal oedema
- epiretinal membrane
- retinal pigment epithelium: hypertrophy/loss

12.Choroid

- inflammatory infiltrate
- neovascularisation
- atrophy

13.Optic nerve

- oedema
- neovascularisation

SYSTEMIC SIGNS AND SYMPTOMS IN UVEITIS

1. headache: sarcoidosis, Vogt Koyanagi Harada syndrome
2. neurosensory deafness: Vogt Koyanagi Harada syndrome, sarcoidosis
3. vitiligo, poliosis: Vogt Koyanagi Harada syndrome
4. paresthesia, weakness: multiple sclerosis, Behcets disease
5. erythema nodosum: sarcoidosis, Behcets disease
6. psychosis: Vogt Koyanagi Harada syndrome, sarcoidosis, Behcets disease, systemic lupus erythematosus
7. skin nodules: sarcoidosis, onchocerciasis
8. alopecia: Vogt Koyanagi Harada syndrome
9. oral ulcers: Behcets disease, inflammatory bowel disease
10. genital ulcers: Behcets disease, Reiters syndrome
11. skin rash: herpes zoster, psoriatic arthritis, syphilis, sarcoidosis, Behcets disease
12. salivary or lacrimal gland swelling: sarcoidosis, lymphoma
13. lymphoid organ enlargement: sarcoidosis, AIDS
14. diarrhoea: inflammatory bowel disease
15. cough, breathlessness: sarcoidosis, tuberculosis

16. systemic vasculitis: Behcets disease, sarcoidosis
17. arthritis: Behcets disease, Reiters syndrome, juvenile rheumatoid arthritis, rheumatoid arthritis, systemic lupus erythematosus, inflammatory bowel disease, Wegeners granulomatosis, other connective tissue disorders
18. sacroiliitis: ankylosing spondylitis
19. sinusitis: Wegeners granulomatosis

INVESTIGATION

Proper history and clinical examination is required to arrive at a probable etiology. Once the underlying cause is suspected, laboratory and imaging investigations should be done to confirm the diagnosis. These are the list of various investigations done in a uveitis patient to clinch the etiology.

Hematologic tests:

- complete blood count
- erythrocyte sedimentation rate
- interferon gamma release assay
- T cell subsets

Serologic tests

- Liver and renal function test
- Serum angiotensin converting enzyme
- Serum calcium
- Antinuclear antibody
- Antiphospholipid antibody
- Rheumatoid factor, anticitrullinated protein antibody
- HLA typing
- ANCA testing
- VDRL and VCTC

- TORCH screening
- Toxocara serology

CSF studies

- Protein, glucose, gram stain, culture, VDRL cytology

Urinalysis

Radiographic studies

- Chest X ray
- Sacroiliac joint X ray
- CT chest
- CT/ MRI brain

Intraocular fluid analysis

- Aqueous tap: it is a simple diagnostic procedure. Under aseptic precautions, topical anaesthetic drop is applied and a 30-gauge needle with a tuberculin syringe is entered into the anterior chamber through the temporal limbus. 0.1 to 0.2 ml of aqueous is aspirated and it is used for various tests. It is mainly used for gram staining, culture, cytology and to measure the local antibody production. Polymerase chain reaction can be done to find out specific infection like tuberculosis, herpes simplex, varicella zoster, toxoplamosis, toxocariasis etc. Complications of this procedure is hyphema, endophthalmitis, injury to the iris and lens.

- Vitreous tap: under aseptic precautions and topical anaesthesia, 26-gauge needle is introduced into the vitreous cavity through the pars plana region. 0.1 to 0.2 ml of vitreous sample is collected. Similarly, like the aqueous sample, battery of test is done to find out the specific infection.

Chorioretinal biopsy

It is a very challenging procedure and is done as a last resort. Indications for biopsy includes chronic recalcitrant uveitis, bilateral vision threatening disease, unknown etiology, not responding to treatment and when all the investigations fail to confirm the diagnosis. It is performed by experienced vitreoretinal surgeon as the rate of complication is high.

Ocular imaging

- Fundus fluorescein angiography: it is an invasive imaging technique. 5ml of 10% fluorescein dye is injected into the vein. Arm to retina circulation time is 10 to 12 seconds. Series of fundus photograph is taken using the fundus camera and the pathology is studied. This test is used for both the diagnosis as well as prognosis. Hyperfluorescence pattern is noted in the form of pooling, leakage and staining. Hypofluorescence is seen as blocked fluorescence.
- Fundus autoflourescence imaging
- Indocyanine green angiography

- B scan and ultrasound biomicroscopy
- Optical coherence tomography

MANAGEMENT

Management of uveitis includes both medical and surgical management. The main aim of our management is to restore the vision loss due to the pathology and to prevent the occurrence of complication like complicated cataract, secondary glaucoma, cystoid macular oedema and hypotony.

Medical management

1. Cycloplegics: it is the first line of management. The patient will be relieved of severe pain due to ciliary spasm. It prevents the synechiae formation and breaks the already formed synechiae. Drugs used are 1% atropine eyedrops, 2% homatropine eyedrops or 1% cyclopentolate eyedrops.
2. Corticosteroids: they are the mainstay of uveitis treatment. They can be given through the following routes based on the severity of the uveitis.
    - Topical administration: 1% prednisolone acetate and 0.05% difluprednate eyedrops are used for topical application. The dosing ranges from once daily to hourly. The main

complication of topical steroids is increase in intraocular pressure which has to be monitored frequently.

- Periocular administration: it is given mostly in the subconjunctival and posterior sub tenon space. The indications are intermediate uveitis, posterior uveitis and cystoid macular oedema as the drug is delivered close to the site of inflammation. Triamcinolone acetate (40 mg) and methyl prednisolone acetate (40 to 80 mg) are frequently used. They can be repeated after 4 weeks. Posterior sub tenon injection is given in the superotemporal or inferotemporal quadrant using the 26-gauge needle. They are avoided in necrotising scleritis and infectious uveitis.
- Intravitreal administration: it is given in the pars plana region using the 26-gauge needle in the superotemporal quadrant. 0.1 ml of triamcinolone containing 4mg is the dose recommended for intravitreal injection. The sustained release implants like fluocinolone (0.59mg) and dexamethasone (0.7mg) is approved by FDA and are in use now. Their action will last for 3 to 6 months. The complications of intravitreal steroids are increased intraocular pressure, cataract, endophthalmitis, vitreous haemorrhage and retinal detachment.

- Systemic administration: it can be administered through oral or intravenous route. High dose pulse methylprednisolone of dosage 1gm / day is given intravenously for 3 days followed by oral prednisolone which is tapered in 6 to 8 weeks. Patient can be started on oral prednisolone directly at a starting dose of 1 – 2mg per kg body weight when patient is not responding to topical or periocular steroids. Both ocular and systemic complications of steroids are noted in these patients.

3. Immunomodulatory medications: the use of immunomodulatory therapy is recommended in the following settings.

- Vision threatening bilateral disease
- Not responding to steroid therapy
- Corticosteroid dependence
- Unacceptable complications of steroid therapy
- When steroids are contraindicated

IMT is commonly used in certain uveitic conditions such as Behcets disease, Vogt Koyanagi Harada , sympathetic ophthalmia, serpiginous choroiditis and necrotising scleritis associated with systemic vasculitis. The complications are renal toxicity, hepatic toxicity, bone marrow suppression, secondary malignancy like leukemia, lymphoma and increased risk of infection. It is avoided in pregnancy due to the teratogenic effect.

- Azathioprine: it is a purine nucleoside analogue that inhibits DNA replication and RNA transcription. The dosage is 2mg / kg / day in adults.
- Methotrextrate: it is a folic acid analogue that inhibits the enzyme dihydrofolate reductase. The recommended dose is 10 – 15 mg / week. The maintenance dose is increased up to 15 – 25 mg / week in adults. It is supplemented with folate at a dose 1mg / day to overcome the adverse effects.
- Mycophenolate mofetil: it acts by inhibiting the enzyme inosine monophosphate dehydrogenase and DNA replication. It is given at a dose of 1 – 1.5 gm twice a day in adults.
- Cyclosporine: it is a T cell signalling inhibitor given in the dosage of 1-5 mg / kg /day. The most common side effect is nephrotoxicity and systemic hypertension.
- Tacrolimus: it inhibits T cell signalling and is given orally at a dose of 0.10 – 0.15 mg / kg /day in adults. It is less nephrotoxic compared to cyclosporine.
- Cyclophosphamide: it is an alkylating agent that causes impaired DNA replication and cell death. The recommended dosage of the drug is 2mg / kg / day given orally. The most common adverse effect is hemorrhagic cystitis.

- Etanercept: it is a TNF receptor blocker used in rheumatoid arthritis and juvenile idiopathic arthritis.
- Infliximab: it is a monoclonal antibody directed against TNF alpha.
- Adalimumab: it is a human monoclonal IgG1 antibody against TNF alpha.
- Rituximab: it is a monoclonal antibody directed against CD20 + cells.
- Anakinra: it is a recombinant IL-1 receptor antagonist.
- Interferon alpha 2a/2b: it has antiviral, antiangiogenic and immunomodulatory effects.

TOXOCARIASIS

Toxocariasis is a zoonotic disease caused by roundworms Toxocara canis which lives in dogs intestine and Toxocara cati which lives in the cats intestine respectively[3]. It exists as two categorisations, visceral larva migrans and ocular larva migrans.

HISTORY

1. 1937 - Dr Calhoun first visualised the nematode larva invading the eye.

2. 1950 – Dr Wilder first described the infection with toxocara species in human. He found the nematode larva within the retinal granuloma of a child.

3. 1952 – Dr Beaver described the clinical features of visceral larva migrans and classification of the larva into T. canis / T. cati.

4. Dr Ashton – Described the histopathologic and clinical findings in 4 cases of ocular toxocariasis in Britain. He also explained the need for histopathologic examination of granulomatous reaction in young patients especially with an eosinophilic component.

5. Dr Duguid – In his study he isolated T.canis larva in 2 eyes and its fragments in 4 eyes during histopathology examination of eyes with chronic endophthalmitis. He also described the clinical features of

chronic endophthalmitis and posterior retinal granuloma seen in ocular toxocariasis in 28 cases.

6. Dr Wilkinson & Welch – studied 40 patients with intraocular toxocara of which 1 patient had bilateral presentation and 17 cases presented with peripheral inflammatory mass.

7. Dr 0' Connor – studied 20 uveitic cases and found peripheral retinal mass attached to the disc by retinal folds in 9 patients.

INCIDENCE AND PREVALENCE

Ocular toxocariasis is an uncommon helminthic disease affecting mainly children and young adults causing profound visual loss. The average age of incidence is found to be 7.5 years[31], ranging from 2 to 31 years[25]. Men and women are equally affected. Its prevalence has been found to be 1%[5] among the uveitic population at Tertiary care centre in north California. The main concern is underreporting and misdiagnosis. They are commonly misdiagnosed as retinoblastoma. Unilateral presentation of ocular toxocariasis is more commonly seen than bilateral presentation which is quite rare.

ETIOLOGY

T.canis and T.cati have a similar morphology and biology. Three lips surrounding the mouth, intestinal tract, excretory columns and cervical alae are found in both male and female sex. They are used for identification and to differentiate from other parasites. Adult worms can live for 4 months in the small intestine of dogs and cats. Adult worms produce 2 lakh eggs per day. Eggs of toxocara are light brown in colour, spherical in shape and covered by rough, thick proteinaceous material with vitelline membrane. This coat helps the fertilised eggs to survive in the faeces for months, even years. Under favourable conditions of temperature, humidity 5 to 6 days are required for the development of second stage larva.

LIFECYCLE

Human infection is due to accidental ingestion of infective eggs and tissue invasion of second stage larvae.[4]

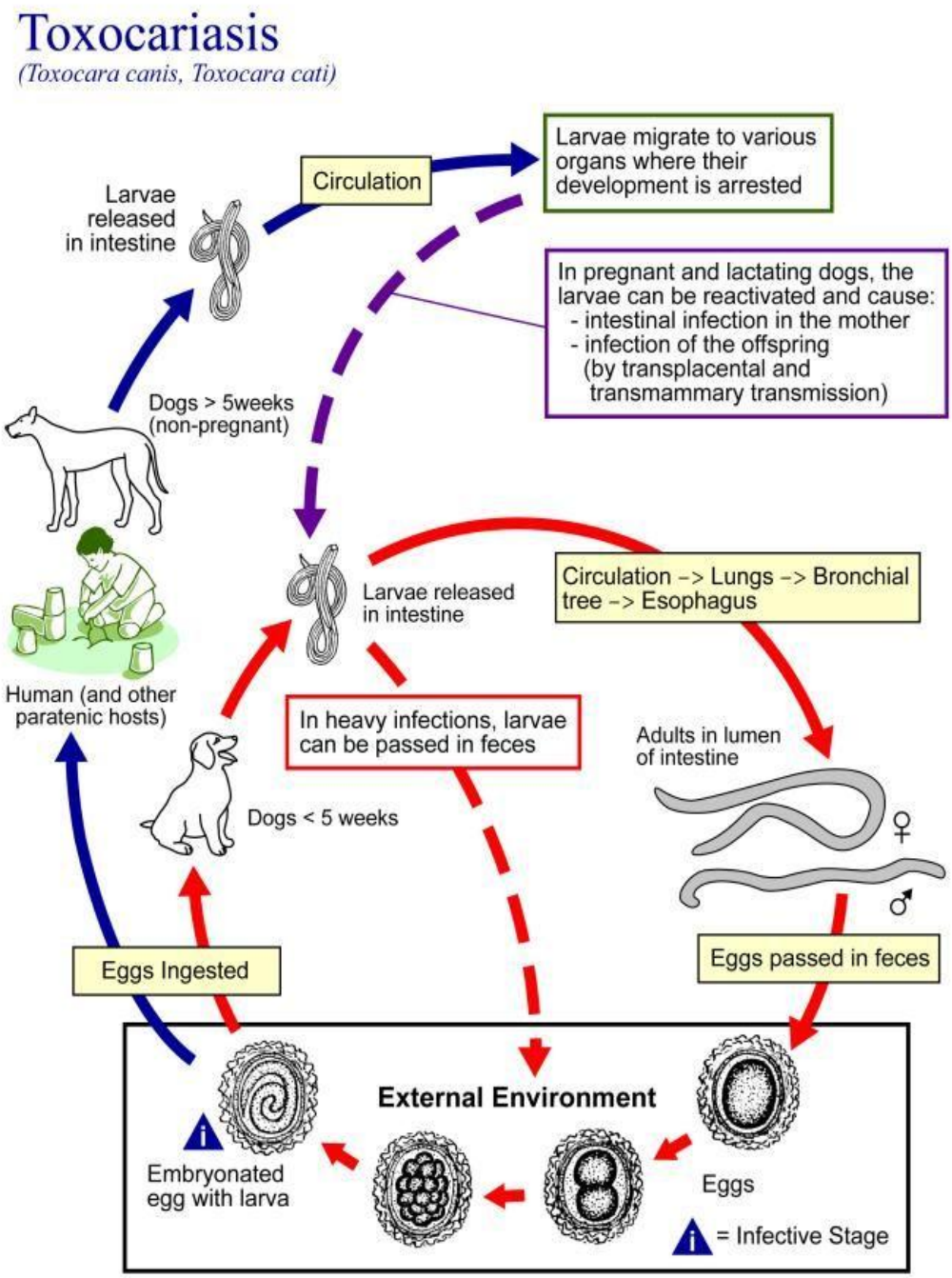

Fig 12: Lifecycle of Toxocara canis and cati

RISK FACTORS

- Geophagia – ingestion of soil contaminated with the eggs of toxocara species.
- Close contact with pets – mainly puppies and kittens are at particular risk. The prevalence of toxocariasis in puppies is high in age less than 6 months.
- Ingestion of meat contaminated with eggs of toxocara species.
- Poor personal hygiene.

PATHOPHYSIOLOGY

Human intestine harbours the second stage of larva which enters the bloodstream through the portal circulation and encyst in various organs of the body mainly the brain, lung, eye, liver etc. the larvae are not able to develop into adult worms to complete their life cycle in human. A focal granulomatous reaction from around the encysted larvae and they remain alive for years.

Toxocariasis can manifest in 3 different forms

1. Visceral larva migrans
2. Ocular toxocariasis
3. Covert toxocariasis

VISCERAL LARVA MIGRANS

VLM is seen in mainly young children (1 – 4 years). Mostly patients are asymptomatic or may have a subclinical course of disease. Symptomatic patients present with varied features depending upon the age, number of larvae and hosts response to the disease. Patients may present with fever, cough, wheeze, malaise, irritability, weight loss, pruritic eruption, nodules over the legs and hepatomegaly. Patient will reveal leucocytosis, eosinophilia, increased levels of serum IgG, IgM and IgE. In some children anti – A and anti – B titres are positive. Chest X ray shows pulmonary infiltrate. CNS involvement includes seizures, encephalitis and cerebral eosinophilic granulomata. Severe VLM can result in death but the incidence is rare, if present, it is due to CNS or myocardial involvement. Simultaneous incidence of VLM and ocular toxocariasis is quite rare.

COVERT TOXOCARIASIS

Irritable bowel syndrome is attributed to toxocariasis recently. Leucocyte count, eosinophil count and ELISA titres are used to diagnose covert toxocariasis.

OCULAR TOXOCARIASIS

It is usually common in children with a history of contact with pets and geophagia. It typically presents with unilateral involvement and asymptomatic course of the disease. Child mainly presents with defective

vision, pain, strabismus, floaters, photophobia and leukocoria in the late stage.[4] The larva affects the retina commonly

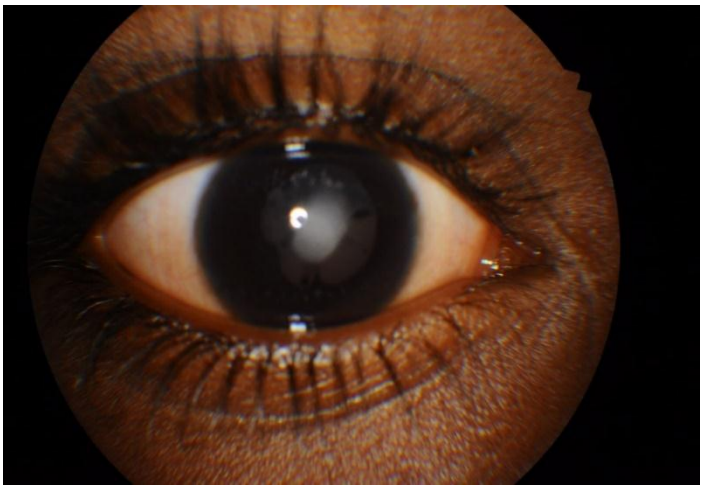

Fig 13: LEUKOCORIA (WHITE REFLEX)

Ocular manifestations are

- Posterior pole granuloma
- Peripheral granuloma
- Chronic endophthalmitis
- Papillitis
- Vitritis
- Scleritis
- Anterior segment – Keratitis, conjunctivitis, iridocyclitis, focal iris nodules and cataract.[9,10]
- Atypical presentations- neuroretinitis, motile subretinal larvae,[6,7] and diffuse chorioretinitis[8], branched retinal vein occlusion and vitreous haemorrhage.

POSTERIOR POLE GRANULOMA

It is seen as greyish white elevated round lesion which is 1 – 2-disc diameter in size. The granulomatous lesion may be located anywhere in the posterior pole. Sometimes the larva may be seen in the lesion as a crescent shaped dark area.

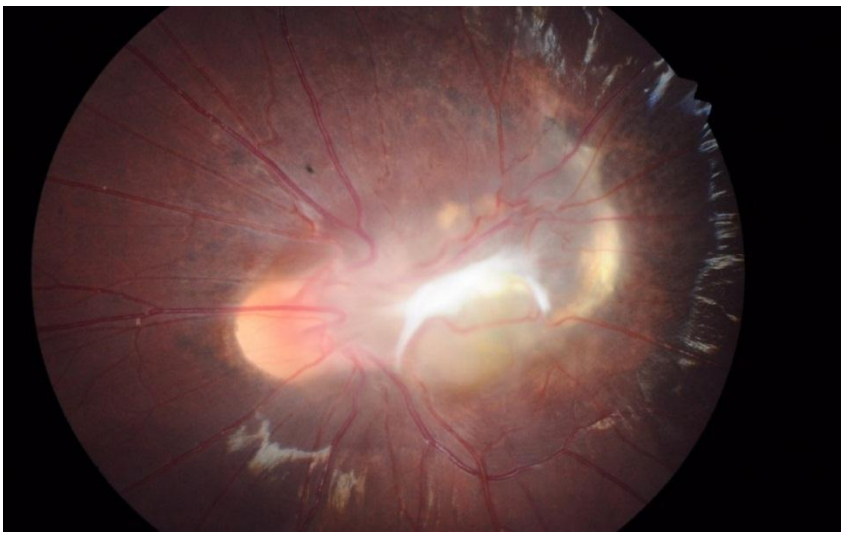

Fig 14: POSTERIOR POLE GRANULOMA INVOLVING THE DISC AND MACULA

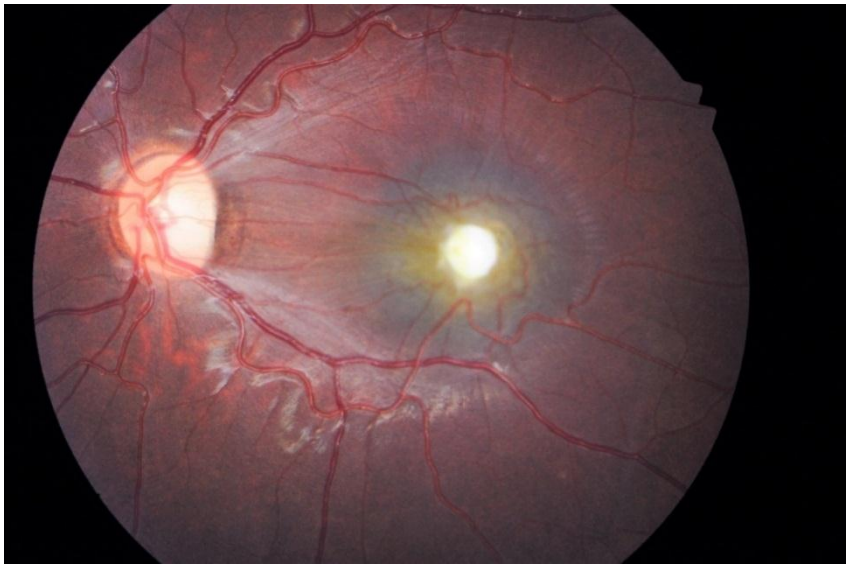

Fig 15: MACULAR GRANULOMA

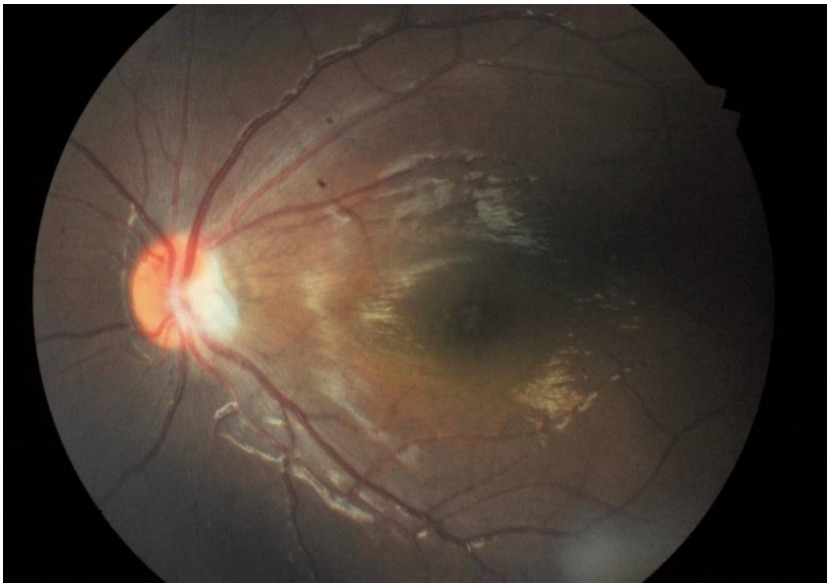

Fig 16: **GRANULOMA AT THE OPTIC DISC**

PERIPHERAL GRANULOMA

The lesion appears to be hazy white, elevated and seen in the periphery of the retina associated with retinal folds that extends between the lesion and optic disc.

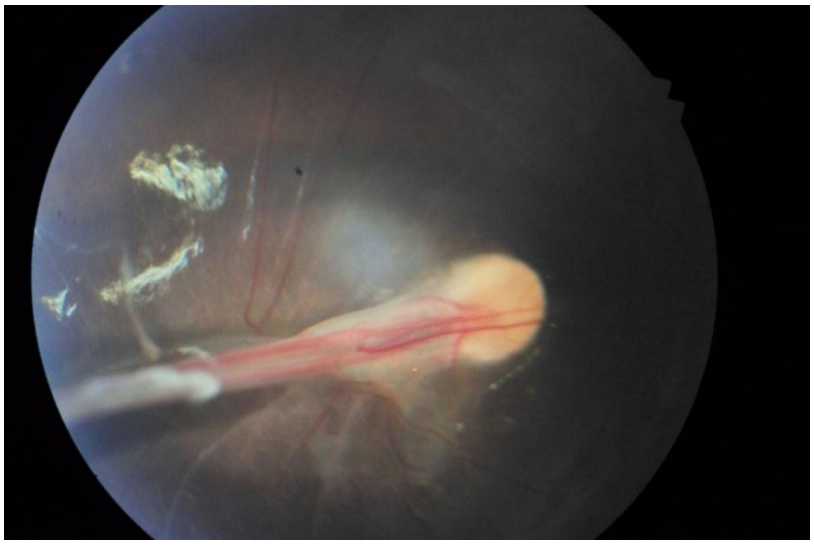

Fig 17: TRACTIONAL BAND EXTENDING FROM THE PERIPHERAL GRANULOMA TO THE DISC

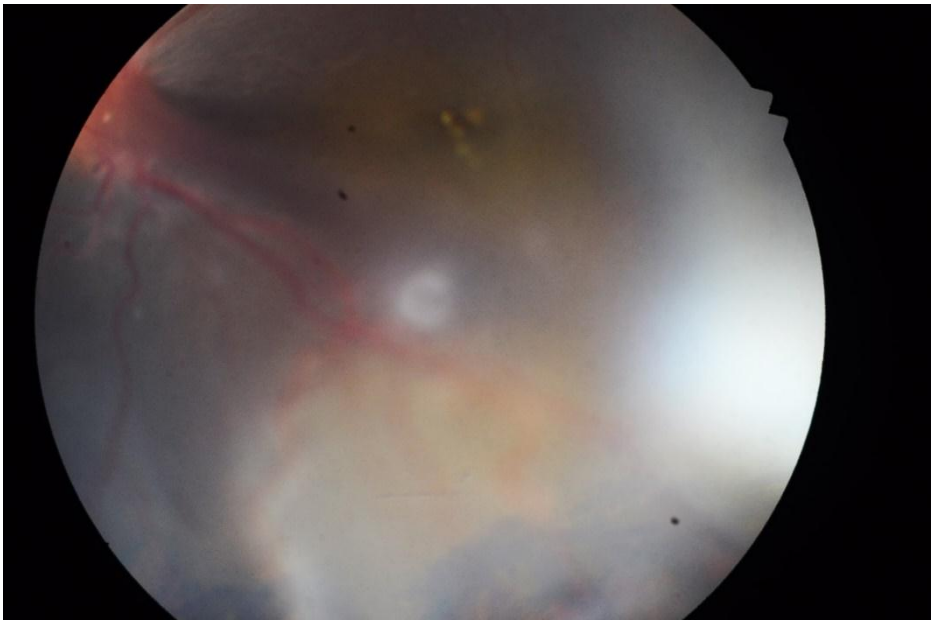

Fig 18: PERIPHERAL GRANULOMA IN THE INFEROTEMPORAL QUADRANT

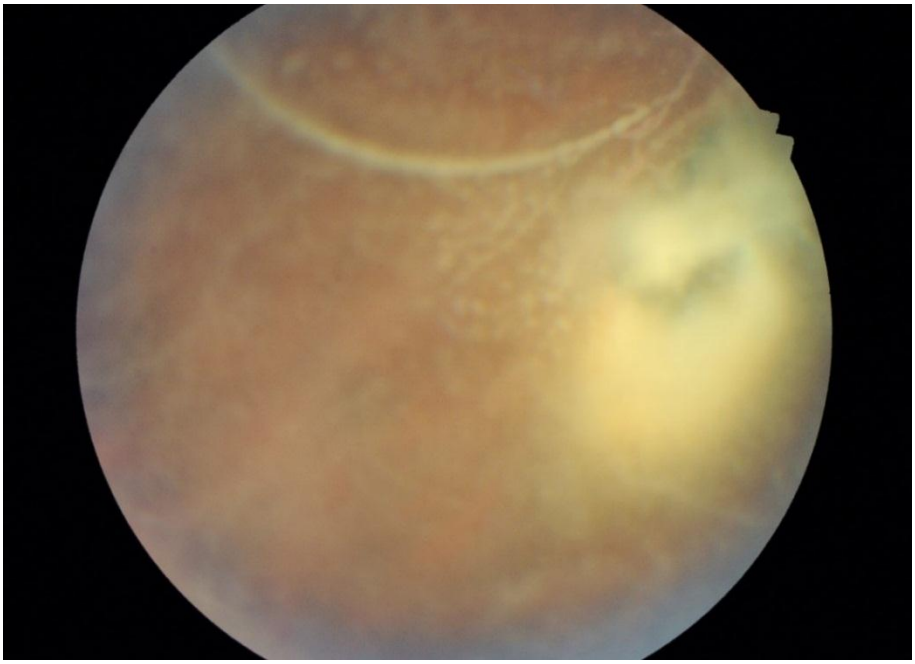

FIG 19: FUNDUS PICTURE SHOWING PERIPHERAL GRANULOMA

CHRONIC ENDOPHTHALMITIS

It is one of the common manifestation of ocular toxocariasis. It is associated with various findings such as retinal detachment, anterior uveitis, cyclitic membrane, papillitis, macular oedema and vitreous exudates. Hypopyon is seen in severe cases.

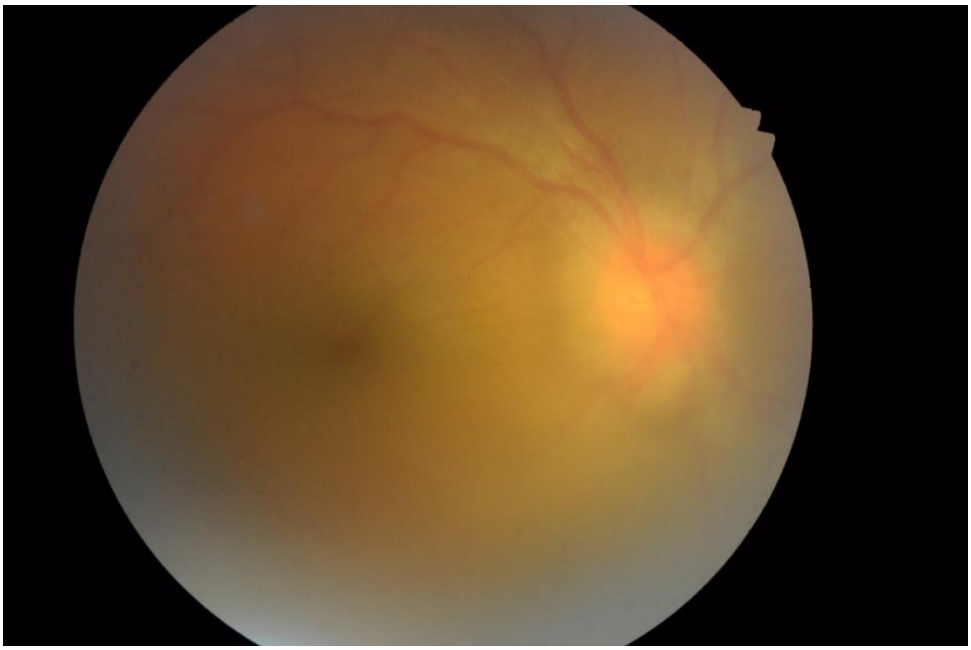

FIG 20: FUNDUS PICTURE OF CHRONIC ENDOPHTHALMITIS

COMPLICATIONS

Major complication is severely decreased visual acuity due to various causes. It includes retinal detachment, pars planitis, papillitis, vitreous tractional bands, macular lesion, ciliary body and choroidal detachment resulting in hypotony of the eye due to retraction of the cyclitic membrane.

DIAGNOSIS

1) Detection of anti toxocara antibodies by ELI+SA

Antibodies can be detected in both serum and aqueous sample using ELISA. In 1977 ELISA was introduced by Cypress and colleagues. It is the most accurate serologic test available now. Sensitivity of the test is 90% and specificity is approximately 90%. Cross reactivity with other helminthic parasites is unlikely. If 100 patients are positive for toxocara by ELISA, then 90 patients will have the disease and the rest 10 patients do not have ocular toxocariasis. Optimal cut off titre is more than 1:8. In severe cases even if the titre is low, ocular toxocariasis cannot be ruled out. This is possible because during follow up, the titre value decreases. Antibody titre from the aqueous has a major role when the serum titre is inconclusive or when the clinical diagnosis is not clear.

2) Leucocytosis
3) Eosinophilia
4) Increased serum Ig E levels
5) B scan

Three common findings seen in B scan are

- Highly reflective solid peripheral mass
- Vitreous membrane extending between the mass and posterior pole

- Tractional retinal detachment

6) CT scan

It is mainly used to detect any intraocular calcification which differentiates retinoblastoma from ocular toxocariasis.

7) Cytology of aqueous / vitreous

Presence of eosinophils supports the diagnosis of parasitic infestations, most likely ocular toxocariasis.

DIFFERENTIAL DIAGNOSIS

❖ RETINOBLASTOMA

With the advent of newer techniques like ELISA, CT scan, B scan, it has become easy to differentiate between retinoblastoma and ocular toxocariasis. Both conditions are common in children but the age of incidence is earlier in RB, that is less than 1 year. The most common presentation is leukocoria in both the conditions. RB is not associated with signs of inflammation and vitreoretinal traction. It usually increases in size. The level of LDH and phosphoglucose isomerase in aqueous is high but absence of eosinophils is noted.

❖ TOXOPLASMOSIS

It is difficult to differentiate between toxoplasmosis and toxocariasis due to severe vitritis. Toxoplasmosis can be confirmed by anti-toxoplasma antibody titre using ELISA.

- INFECTIOUS ENDOPHTHALMITIS

A thorough history of trauma, ocular surgery, immunodeficiency disorders is needed to rule out toxocariasis. Staining and culture techniques using aqueous or vitreous samples are used for definite diagnosis of infectious endophthalmitis.

- RETINOPATHY OF PREMATURITY

It is a bilateral condition affecting infants with a history of low birth weight and premature delivery. Inflammatory signs are absent. It is characterised by proliferative changes with membrane formation.

- FAMILIAL EXUDATIVE VITREORETINOPATHY

It presents bilaterally with an autosomal dominant pattern of inheritance. Characterised by vascular abnormalities and membrane formation.

- PERSISTENT HYPERPLASTIC PRIMARY VITREOUS

It is a unilateral congenital condition characterised by fibrovascular stalk extending from the disc to the lens surface causing ciliary body traction.

- COATS DISEASE

It is a unilateral condition commonly seen in young boys.

MANAGEMENT

Management of this disease focuses on 3 main points:

- Minimising inflammation
- Eliminating the offending organism
- Addressing the vitreal and retinal complications secondary to infection

Medical treatment

❖ Antihelminthics

- Thiabendazole – 25 mg /kg twice a day for 5 days
- Albendazole – 800 mg twice a day for 5 days
- Mebendazole – 100 to 200 mg twice a day for 5 days

❖ Steroids

Routes of administration – local, periocular, systemic steroids

Dose – 1 mg /kg/day

Surgical treatment

❖ Pars plana vitrectomy

❖ Cryopexy

❖ Photocoagulation – decreases the oedema thereby improving vision.

PARS PLANA VITRECTOMY

PPV decreases the incidence of complication of ocular toxocariasis. It is indicated when there is poor response to medical treatment and presence of vitreoretinal traction involving the macula.

PROGNOSIS

Factors affecting prognosis are

1. Age

2. Duration of disease

3. Degree of inflammation

4. Macular involvement

Better prognosis can be achieved when the age of onset of disease occurs in older children and early diagnosis of disease.

PART – II

AIM AND OBJECTIVES

Aim: To analyse the clinical presentation and response to medical treatment in ocular toxocariasis.

Primary objective: To study the incidence of age, sex and clinical presentation in 30 cases of ocular toxocariasis.

Secondary objective: To determine the visual outcome and fundus changes following medical treatment.

MATERIALS AND METHODS

Subject selection:

30 patients with OCULAR TOXOCARIASIS attending Uvea and Retina services of Tertiary Ophthalmic Eye Care Centre were included in the study.

Inclusion criteria:

1. Anti - Toxocara IgG positive cases
2. Anti – Toxocara IgM positive cases
3. Age less than 18 years.

Exclusion criteria:

1. Age more than 18 years.
2. Patients positive for TORCH screening
3. Patients with active signs of tuberculosis.
4. Patients with significant ocular trauma.

METHODS:

All the patients attending the Uvea and Retina clinic were registered, evaluated and followed up during the study period. They were subjected to detailed history, anterior segment examination, best corrected visual acuity, intraocular pressure recording, B scan, detailed fundus examination using direct ophthalmoscopy, slit lamp biomicroscopy with 90D lens and indirect ophthalmoscopy. Complete investigation like blood count, ESR, Mantoux test, chest X- ray, rheumatoid factor, X- ray spine, HLA B27, TORCH screening, serum ACE level, ELISA for toxocara was done before clinching onto the diagnosis. All the patients had ELISA (either IgM or IgG) positive for toxocara. The study population was treated with oral Albendazole 15mg/kg body weight twice daily for 14 days along with oral Prednisolone 1mg/kg body weight.

Follow up

Patients were followed up at 2^{nd}, 4^{th} week, 3^{rd} and 6^{th} month. At each visit patients best corrected visual acuity, intraocular pressure and fundus changes with response to treatment were documented to check for progression / regression.

RESULTS

1.Age Distribution

- Total number of patients in our study were 30. Majority of the patients belonged to the age group of 7-9 years of age which constitutes 53.3% of the study population. The youngest patient was 4 years old and the oldest patient was 14 years**.**

Age	Frequency	Percentage
1-3	0	0.0
4-6	7	23.3
7-9	16	53.3
10-12	6	20.0
13-15	1	3.3
16-18	0	0.0

Table 1: showing the age distribution

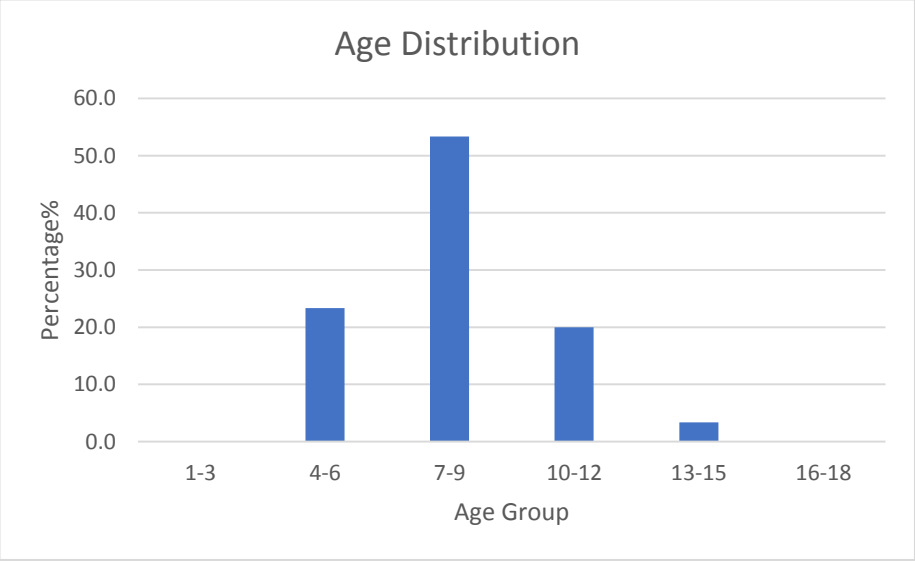

Chart 1: bar diagram showing the age distribution in percentage

2. Sex Distribution

In this study, there was a slight male preponderance, males accounting for 56.7% of patients. Majority of them were in 7-9 years age group.

Gender	Frequency	Percentage
Male	17	56.7
Female	13	43.3

Table 2: sex distribution

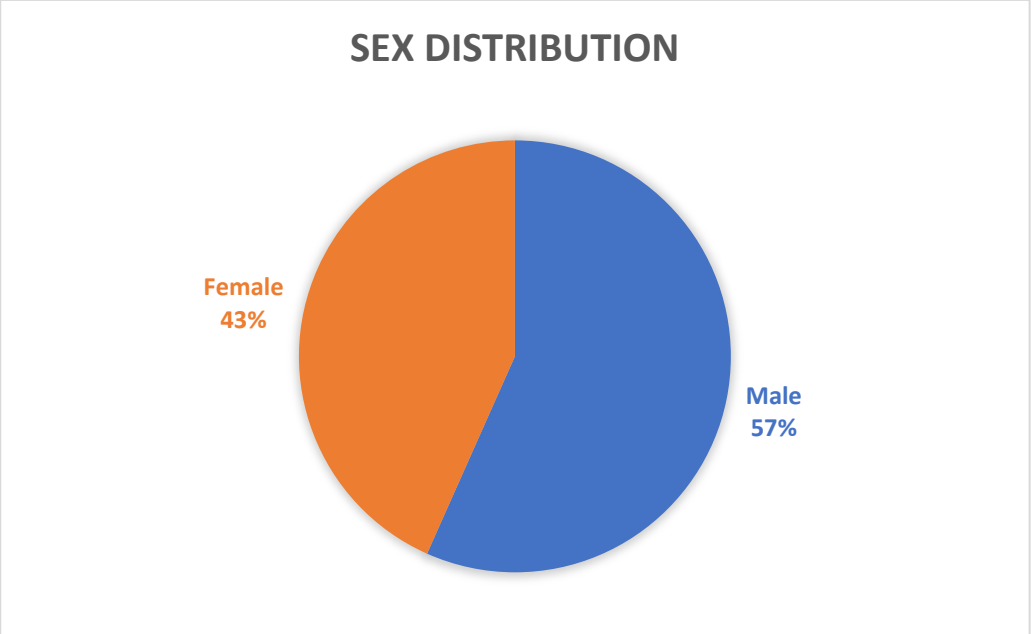

Chart 2: pie chart showing the sex distribution

3. Laterality

In this study left eye was affected more common than the right eye which constitutes 57%.

Laterality	Frequency	Percentage
Right eye	13	43.3
Left eye	17	56.7

Table 3: laterality of affected eye

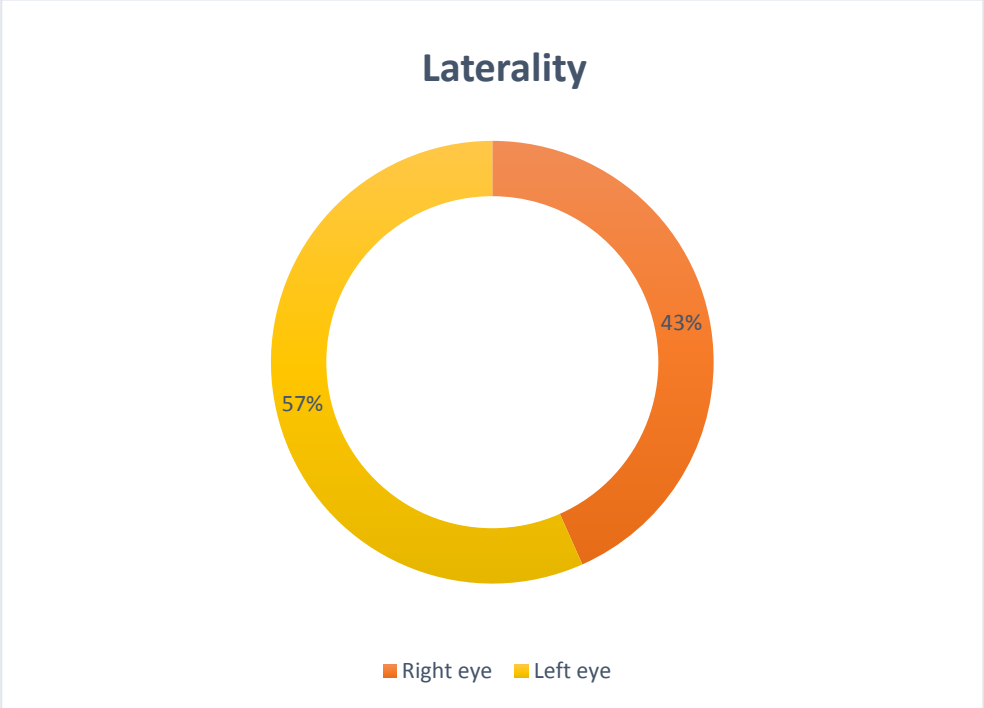

Chart 3: doughnut chart showing the laterality of affected eye

4. Presenting Symptoms

In our study 60 % of the patients presented with complaints of defective vision. 40 % patients presented with redness, 26.7% with pain, 16.7% with floaters, deviation of eyeball and floaters each.

Symptoms	Frequency	percentage
Defective vision	18	60.0
Deviation of eye	5	16.7
Floaters	5	16.7
Pain	8	26.7
Redness	12	40.0
Leukocoria	5	16.7

Table 4: various presenting symptoms in patients

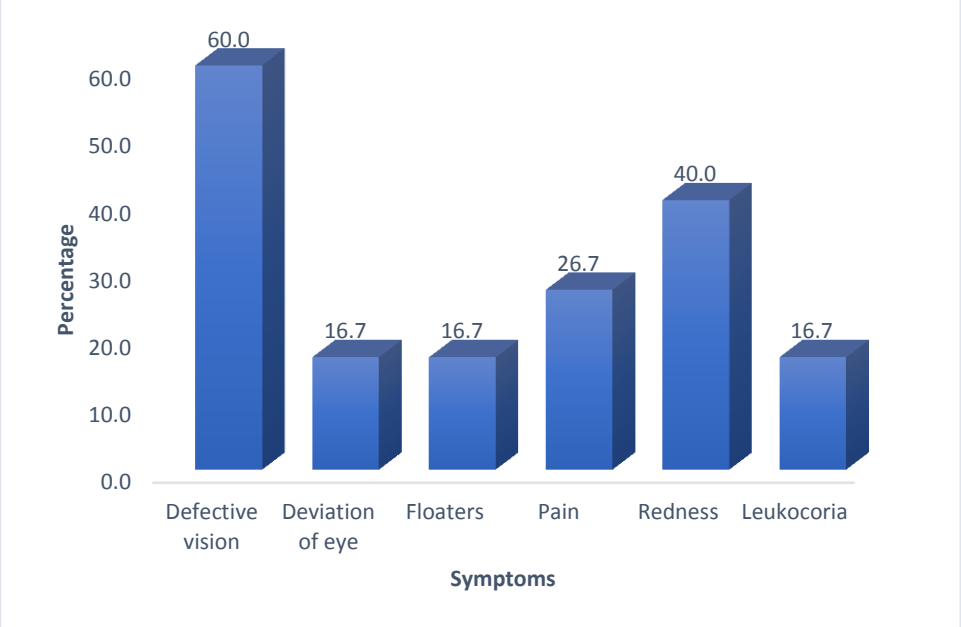

Chart 4: bar diagram showing various presenting symptoms

5. Risk Factors

- **History of Geophagia**

  40% of the total study population acquired the infection due to Geophagia. Majority of them were female patients.

Geophagia	Frequency	Percentage
Negative History	18	60
H/O Geophagia in males	4	13.3
H/O Geophagia in females	8	26.7

Table 5: history of geophagia in patients

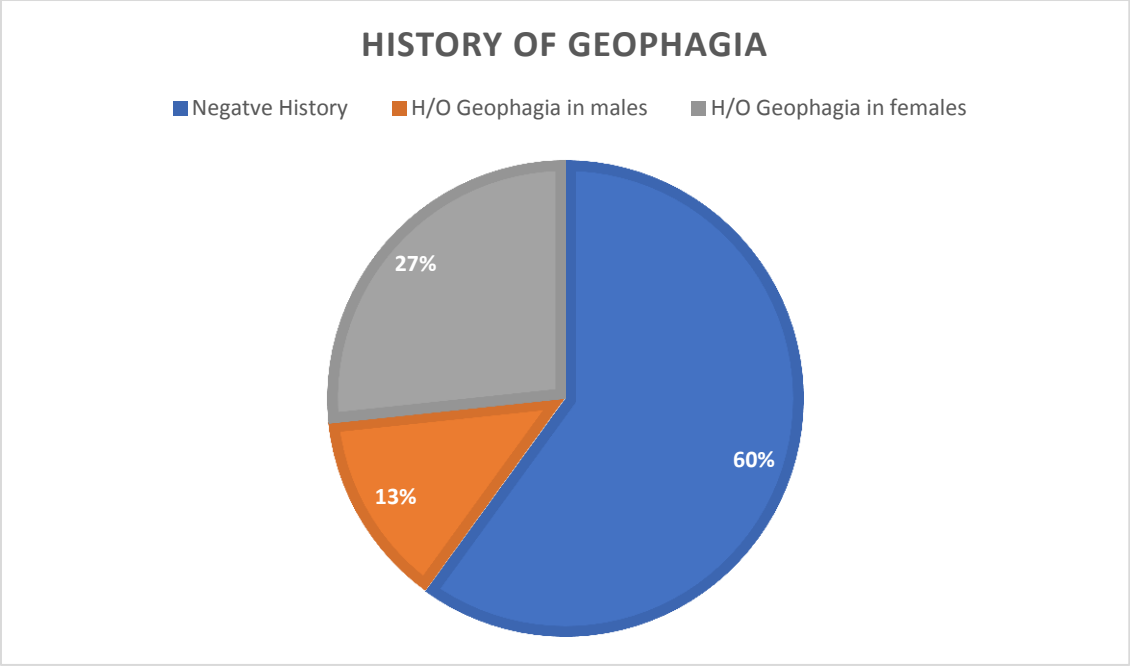

Chart 5: pie chart showing the history of geophagia in patients

- **History of contact with pets**

  About 66.7% of the study population had a history of contact with pets. Most of them were male patients.

Contact with pets	Frequency	Percentage
Negative history	10	33.3
H/o Contact in males	11	36.7
H/o contact in females	9	30

Table 6: history of contact with pets in patients

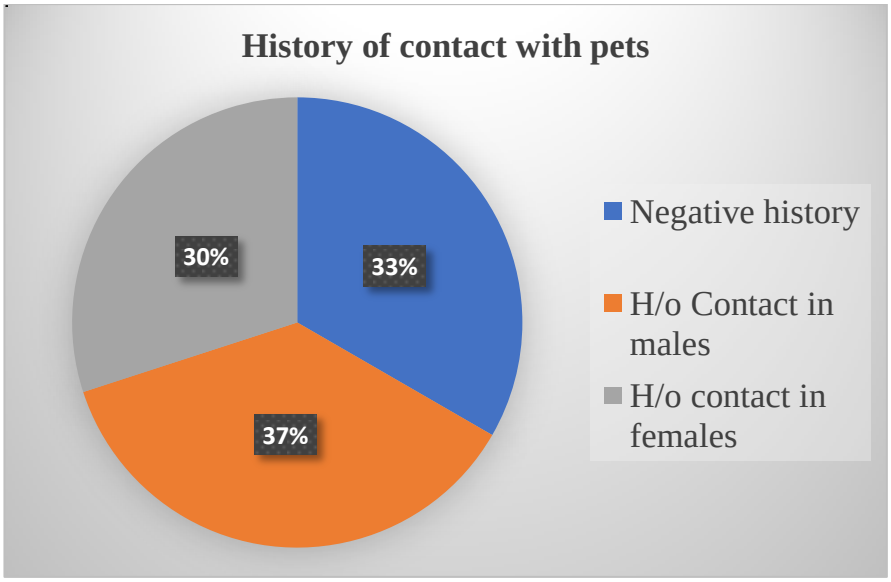

Chart 6: pie chart showing the history of contact with pets in patients

6. Presenting best corrected visual acuity

In our study, it was found that most of the patients presented with defective vision of the affected eye. All of them had a unilateral presentation. For the purpose of statistical analysis, vision by Snellen's chart was converted to log MAR units. 22.73% of the study population had visual acuity in the range 2-1.3 by log MAR chart, 18.8% had vision between 1.2 to 1 and 59.09% had vision ranging between 0.8 to 0.6.

Presenting vision in log MAR	Percentage
2 - 1.3	22.73
1.2 – 1	18.18
0.8 - 0.6	59.09

Table 7: best corrected visual acuity during presentation

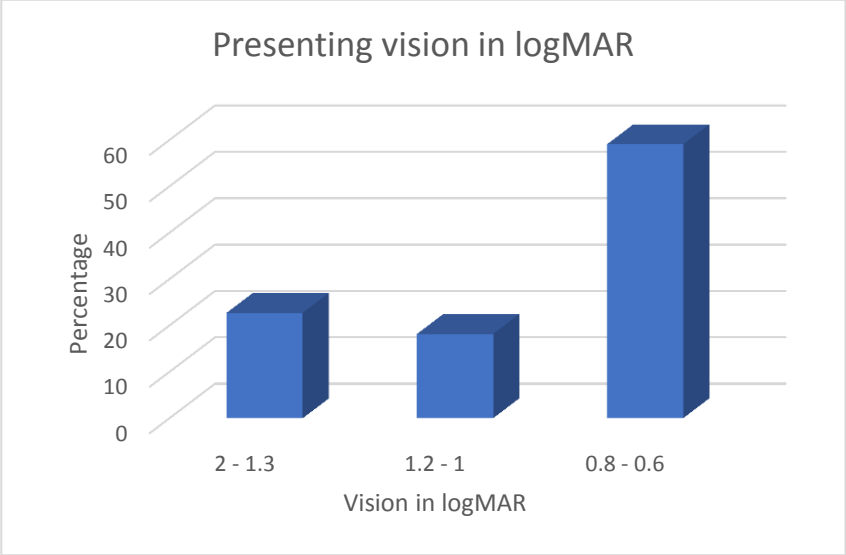

Chart 7: showing the visual acuity at presentation in log MAR

7. Intraocular pressure

17% of the study population showed an increase in the intraocular pressure in the affected eye ranging from 21-24 mmHg. They were treated with 0.5% timolol eye drops.

Intraocular pressure	Frequency	Percentage
≤ 20 mmHg	25	83.3
21-24 mmHg	5	16.7

Table 8: intraocular pressure of the affected eye

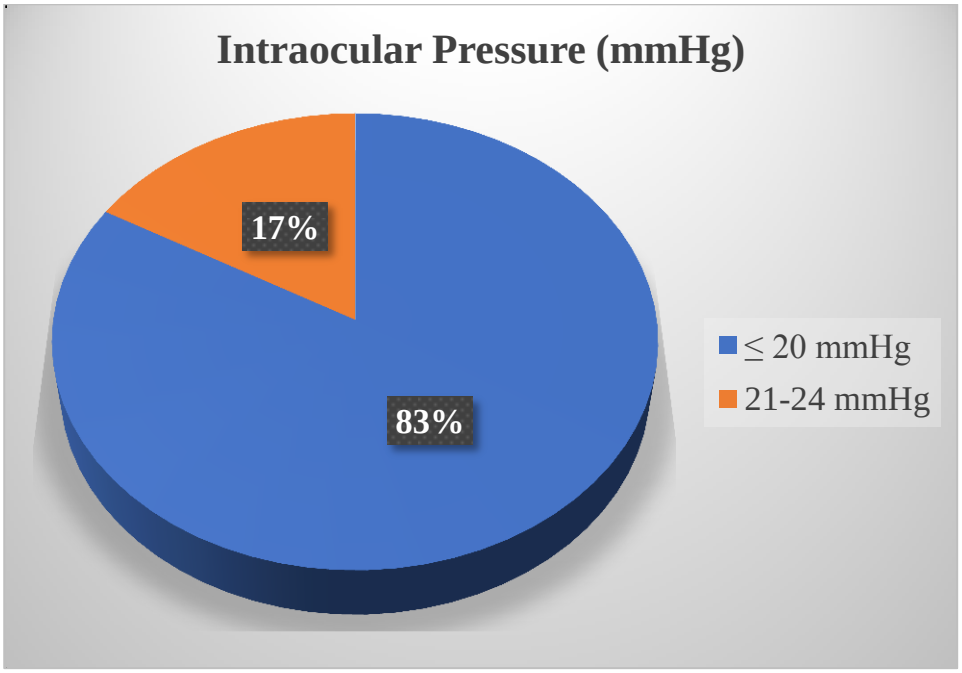

Chart 8: pie chart showing the intraocular pressure of the affected eye

8. Serology-ELISA for Toxocara antibodies

All the patients were positive for IgG. 17% of the total study population showed an active infection.

Serology	Frequency	Percentage
Ig G	30	100
Ig M	5	16.67

Table 9: results of serology ELISA for toxocara antibodies

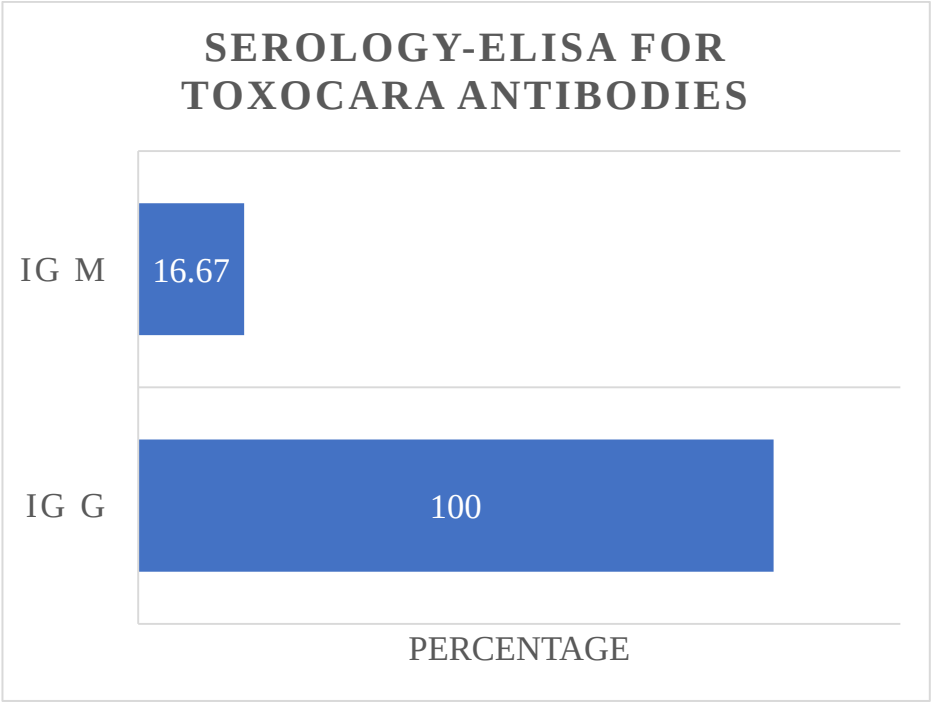

Chart 9: showing the results of serology ELISA for toxocara antibodies

9. Eosinophilia

In our study 13.3% of the patients had eosinophilia.

Eosinophilia	Frequency	Percentage
Present	4	13.3
Absent	26	86.7

Table 10: eosinophilia in ocular toxocariasis

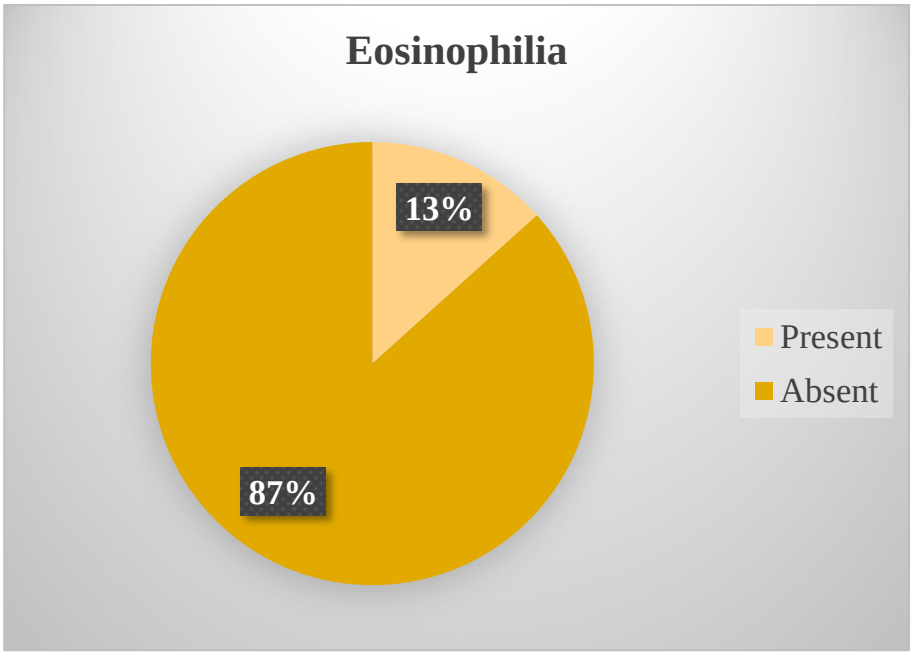

Chart 10: pie chart showing the presence of eosinophilia in patients

10. Anterior Uveitis

About 23.3% of the total study population presented with features of anterior uveitis which includes fine fresh keratic precipitates on the back of cornea, with posterior synechiae, festooned pupil and hypopyon.

Anterior Uveitis	Frequency	Percentage
Present	7	23.3
Absent	23	76.7

Table 11: presence of anterior uveitis

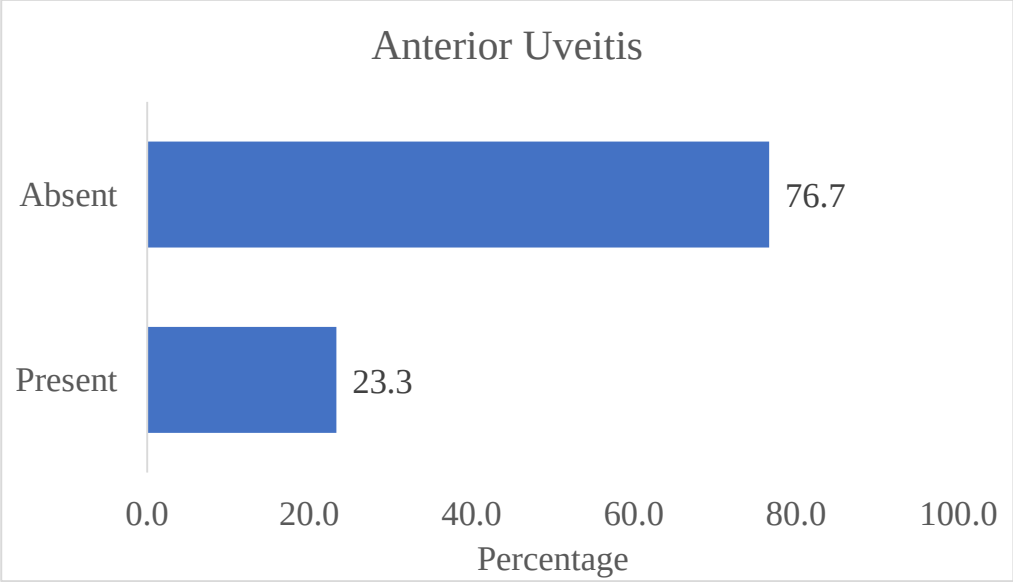

Chart 11: showing the presence of anterior uveitis in patients

11. Vitritis

In this study, 56.7% of the study population presented with vitritis. Among them 30% of the patients had Grade 1+ vitritis, 20% had Grade 2+ vitritis, 3.3% had Grade 3+ and Grade 4+ vitritis.

Vitritis grading	Frequency	Percentage
1+	9	30.0
2+	6	20.0
3+	1	3.3
4+	1	3.3
Total	17	56.7

Table 12: grading of vitritis

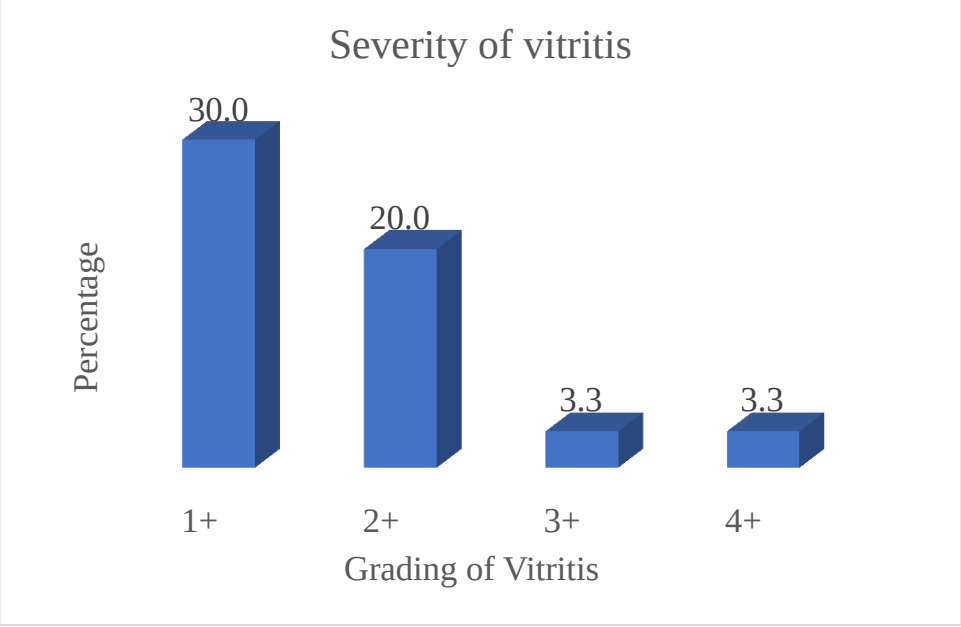

Chart 12: showing the severity of vitritis during presentation

12. Distribution of Clinical manifestation

Most of the patients presented with peripheral granuloma which constitutes 66.7% of the study population. 26.7% of the patients showed posterior pole granuloma and 6.6% of the patients presented with chronic endophthalmitis which was the least common clinical presentation of the fundus.

Clinical manifestation	Frequency	Percentage
Chronic Endophthalmitis	2	6.6
Peripheral granuloma	20	66.7
Posterior pole granuloma	8	26.7

Table 13: distribution of clinical manifestation

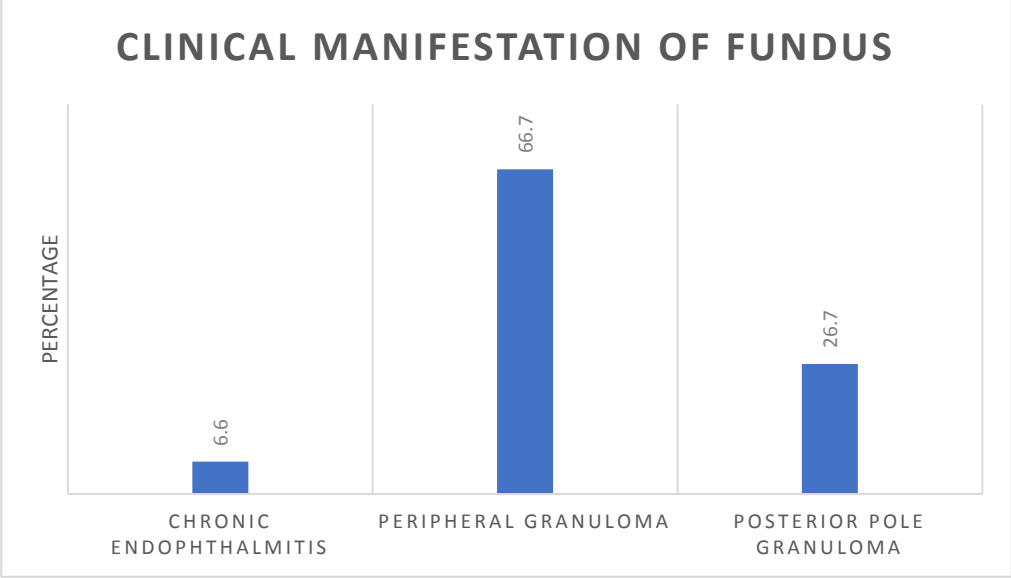

Chart 13: bar diagram showing the distribution of clinical manifestation

13. Comparison between presenting vision and vitritis

In our study as the grading of vitritis increases, best corrected visual acuity of the patients at the time of presentation in log MAR unit tends to increase which indicates significant visual loss.

Vitritis Grading	Mean presenting vision
0	0.95
1+	1.11
2+	1.30
3+	1.50
4+	2.00

Table 14: comparison between viritis grading and mean presenting vision

Pearson Correlation analysis	
Correlation Coefficient	P Value
0.7642	<0.01

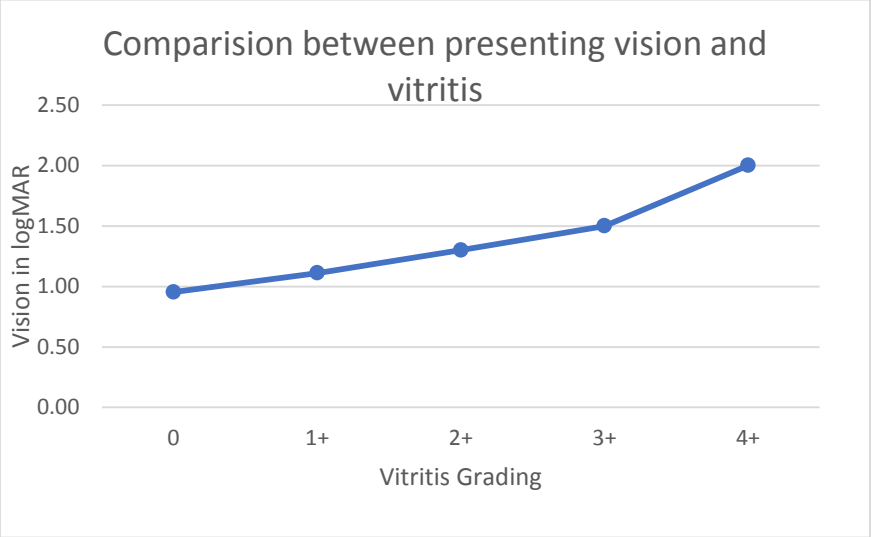

Chart 14: showing the correlation between severity of vitritis and visual loss at the time of presentation

14. Comparison of vision before and after treatment with clinical manifestation

All the patients in our study presented with one of the three clinical manifestations. Visual loss at the time of presentation was found to be maximum in patients presented with chronic endophthalmitis followed by posterior pole granuloma and peripheral granuloma. Patients in all the three groups showed improvement in vision following medical therapy, of which patients presented with chronic endophthalmitis showed significant improvement followed by peripheral granuloma. Patients presented with posterior pole granuloma showed minimum improvement in visual acuity due to the location of the granuloma involving the fovea.

Fundus	Pre- Treatment Mean Vision	Post Treatment Mean Vision	P value
Chronic endophthalmitis	1.75	0.30	<0.05
Peripheral granuloma	0.98	0.65	<0.01
Posterior pole granuloma	1.34	1.09	<0.01

Table 15: comparison of vision before and after treatment with clinical manifestation

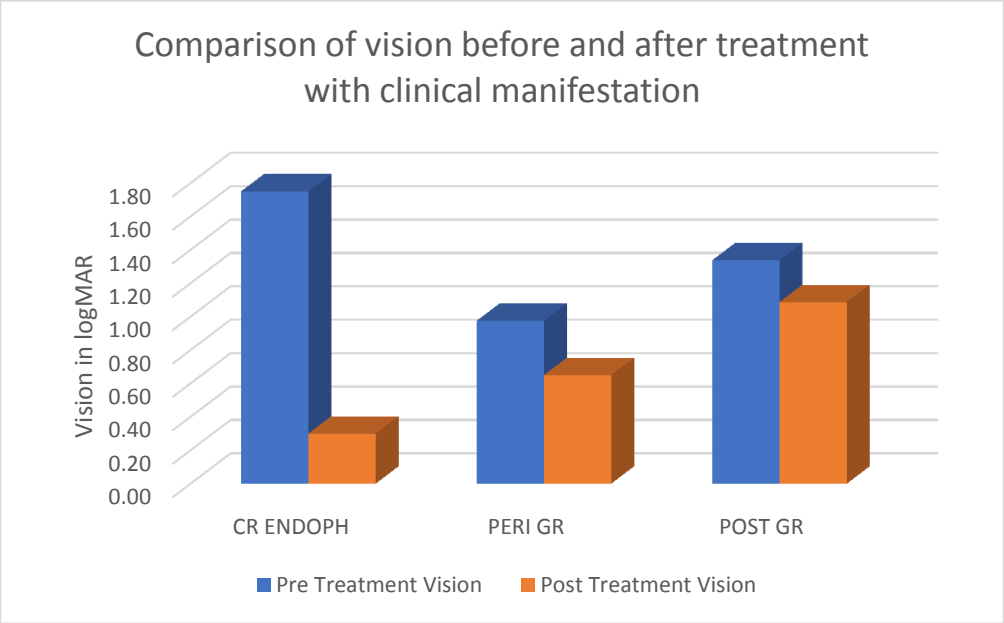

Chart 15: showing the comparison of vision with clinical manifestation following treatment

15. Comparison between pre-treatment and post-treatment vision

In our study, mean vision of patients before treatment was found to be 1.12 and after treatment was 0.74 in log MAR units with p value <0.01, which is statistically significant.

Vision	Mean vision
Pre- Treatment Vision	1.12
Post Treatment Vision	0.74
P Value < 0.01	

Table 16: mean vision before and after treatment

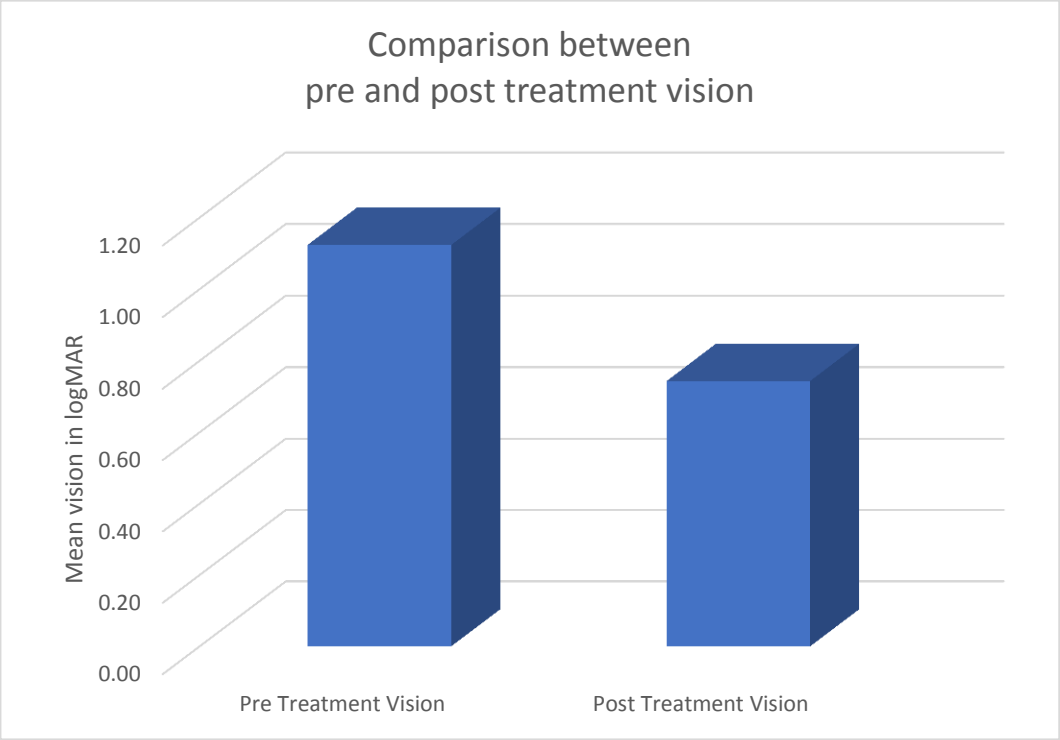

Chart 16: mean vision in log MAR before and following treatment

16. Improvement in mean vision following treatment

Improvement in mean vision following treatment in patients with chronic endophthalmitis is 1.45, in peripheral granuloma it is found to be 0.33 and 0.25 in posterior granuloma. Patients presented with chronic endophthalmitis had best prognosis followed by peripheral granuloma. Patients with posterior granuloma showed worst prognosis in our study**.**

Clinical manifestation	improvement in mean vision	Standard Deviation
Chronic endophthalmitis	1.45	0.35
Peripheral granuloma	0.33	0.23
Posterior pole granuloma	0.25	0.21

Table 17: improvement in mean vision following treatment

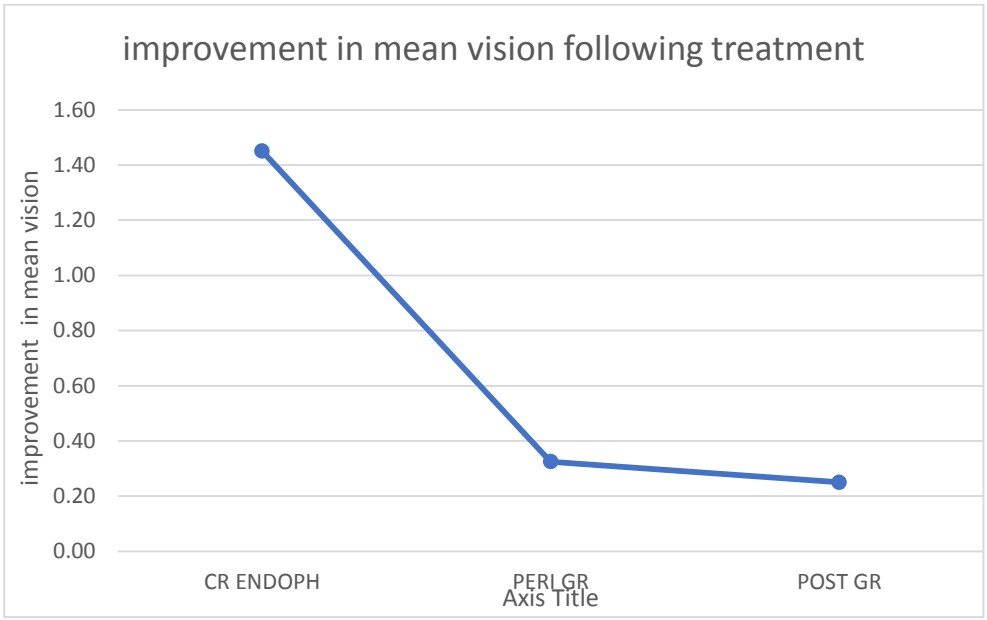

Chart 17: graph showing the improvement in mean vision following treatment

DISCUSSION

1. Age Distribution

In our study, maximum number of patients were found in the age group of 7-9 years. Caseiro (1996) observed 27.6 % of prevalence rates ranging from 7- 9 years old and 18.9 % in 10 -12 years old[15].

2. Sex Distribution

In our study, there was a slight male preponderance, males accounting for 56.7% of patients. Majority of them were in 7-9 years age group. Similar results were found in the study done by Ahn SJ et al[3]. Male predominance has been previously reported in Japanese[12] and Korean[13] population. Literature data have reported a predominance of Toxocara canis infection in males which may be explained by differences in the playing and social behaviour of boys, resulting in an increased exposure to Toxocara eggs. (Overgaauw 1997)[14]

3. Laterality

All the patients had unilateral involvement which is also seen in previous studies[3]. Based on our study left eye was affected more common than the right eye which constitutes 57%.

4. Presenting Symptoms

In our study 60 % of the patients presented with complaints of defective vision. 40 % patients presented with redness, 26.7% with pain, 16.7% with floaters, deviation of eyeball and floaters each. In a

study by Stewart JM et al[4]. majority of patients with ocular toxocariasis present with defective vision, pain, photophobia and floaters[4].

5. Risk Factors

- 40% of the total study population acquired the infection due to Geophagia, majority of them were female patients.
- About 66.7% of the study population had a history of contact with pets. Most of them includes male patients. In a study done by Woodhall D et al[11], 69 % of the study population owned a dog or cat. Previous other studies also proved contact with pets as a risk factor[4,16].

6. Presenting Vision

In our study, it was found that most of the patients presented with defective vision of the affected eye. All of them had a unilateral presentation. For the purpose of statistical analysis, vision by Snellen's chart was converted to log MAR units. 22.73% of the study population had vision in the range 2-1.3 by log MAR chart, 18.8% had vision between 1.2 to 1 and 59.09% had vision ranging between 0.8 to 0.6.

7. Intraocular pressure

17% of the study population showed an increase in the intraocular pressure in the affected eye ranging from 21-24 mmHg.

8. Serology-ELISA for Toxocara antibodies

All the patients were positive for IgG. 17% of the total study populations showed an active infection. The standard and current test for diagnosing toxocariasis is detection of serum anti toxocara IgG using an indirect ELISA based on the toxocara larva antigen[3].

9. Eosinophilia

In our study 13% of the patients had eosinophilia (> 500 eosinophils / micro-litre or ≥ 10 % total WBC count). In a study by Ahn SJ et al[3], 11.6 % of the patients showed eosinophilia.

10. Anterior Uveitis

About 23.3% of the total study population presented with features of anterior uveitis which includes fine fresh keratic precipitates on back of cornea, with posterior synechiae, festooned pupil and hypopyon

11. Vitritis

In this study, 56.7% of the study population presented with vitritis. Among them 30% of the patients had Grade 1+ vitritis, 20% had Grade 2+ vitritis, 3.3% had Grade 3+ and Grade 4+ vitritis. Previous study done by Stewart JM et al[4]. reported vitritis in 52.6 % of the study population.

12. Distribution of Clinical manifestation

Most of the patients presented with peripheral granuloma which constitutes 66.7% of the study population. 26.7% of the patients showed posterior pole granuloma and 6.6% of the patients presented with chronic endophthalmitis which was the least common clinical presentation of the fundus. Toxocara uveitis presented as a granuloma in the peripheral retina in 50 % of cases, macula in 25 % and chronic endophthalmitis in 25 % cases studied by Stewart et al[4].

13. Comparison between presenting vision and vitritis

In our study as the grading of vitritis increases, presenting vision of the patients in log MAR unit tends to increase which indicates significant visual loss. Pearson correlation analysis showed a correlation coefficient of 0.7642 and p value <0.01 which is statistically significant.

14. Comparison of vision before and after treatment with clinical manifestation

All the patients in the study presented with one of the three clinical manifestations. Visual loss at the time of presentation was found to be maximum in patients presented with chronic endophthalmitis followed by posterior pole granuloma and peripheral granuloma. Patients in all the three groups showed improvement in vision following medical therapy, of which patients presented with chronic endophthalmitis

showed significant improvement followed by peripheral granuloma. Patients presented with posterior pole granuloma showed minimum improvement in visual acuity due to the location of the granuloma involving the fovea.

15. Comparison between pre-treatment and post-treatment vision

In our study, mean vision of patients before treatment was found to be 1.12 and after treatment was 0.74 in log MAR units with p value <0.01, which is statistically significant.

16. Improvement in mean vision following treatment

Improvement in mean vision before and following treatment in patients with chronic endophthalmitis is 1.45, in peripheral granuloma it is found to be 0.33 and 0.25 in posterior granuloma. Patients presented with chronic endophthalmitis had best prognosis followed by peripheral granuloma. Patients with posterior granuloma showed worst prognosis in this study

CONCLUSION

Our study concludes that ocular toxocariasis mostly affects children in the age group 7 to 9 years old with a male predominance. All of them had a unilateral presentation with left eye affected more than the right eye. Most of the patients presented with defective vision (60%) as the main symptom. 40% of the study population showed a history of geophagia, majority of them includes females. 67% of the patients showed a history of contact with pets such as dogs and cats which included mainly male children. 22.73% of the study population had visual acuity in the range 2-1.3 by log MAR chart, 18.8% had vision between 1.2 to 1 and 59.09% had vision ranging between 0.8 to 0.6. 13% of the patients showed eosinophilia in our study. Rise in intraocular pressure in the range of 21-24 mmhg was noted in 17% of the study population. All the patients were positive for IgG antibody while 17% of the population were positive for IgM antibody for toxocara. In our study 23% of the patients presented with anterior uveitis and 57% presented with vitritis. Most of the patients presented with peripheral granuloma which constitutes 66.7% of the study population followed by posterior pole granuloma in 26.7% and chronic endophthalmitis in 6.6% of the patients. As the grading of vitritis increases, best corrected visual acuity of the patients at the time of presentation in log MAR unit tends to increase which indicates significant visual loss. Visual loss at the time of presentation was found to be maximum in patients

presented with chronic endophthalmitis followed by posterior pole granuloma and peripheral granuloma. In our study, mean vision of patients before treatment was found to be 1.12 and after treatment was 0.74 in log MAR units. Difference in mean vision following treatment in patients with chronic endophthalmitis is 1.45, in peripheral granuloma it is found to be 0.33 and 0.25 in posterior granuloma. Patients in all the three groups showed improvement in vision following treatment with antihelminthics and steroid combination, of which patients presented with chronic endophthalmitis showed significant improvement followed by peripheral granuloma. Patients presented with posterior pole granuloma showed minimum improvement in visual acuity due to the location of the granuloma involving the fovea. Patients presented with chronic endophthalmitis had best prognosis followed by peripheral granuloma. Patients with posterior pole granuloma showed worst prognosis in our study. Ocular toxocariasis is a great masquerade and needs to be considered in the differential diagnosis of leukocoria in children. Evaluation of proper history, constitutional symptoms of toxocara infection as well as laboratory workup including ELISA and complete blood count assist in diagnosis. Treatment with anti-helminthic agents and systemic steroids hasten recovery of ocular symptoms and fundoscopic findings, and prevents irreversible vision loss.

PART – III

BIBLIOGRAPHY

1. Bird AC, Smith JL, Curtin VT. Nematode optic neuritis. Am J Ophthalmol. 1970; 69:72-77.

2. Barisani-Asenbauer T, Maca SM, Hauff W, Kaminski SL, Domanovits H,Theyer I, Auer H. Treatment of ocular toxocariasis with albendazole. J OculPharmacolTher. 2001; 17:287-294.

3. Ahn SJ, Woo SJ, Jin Y,Chang YS, Kim TW, Ahn J, Heo JW, Yu HG, Chung H, Park KH, Hong ST. Clinical features and course of ocular toxocariasis in adults. PLoSNegl Trop Dis. 2014;8: e2938.

4. Stewart JM, Cubillan LD, Cunningham ET., Jr Prevalence, clinical features, and causes of vision loss among patients with ocular toxocariasis. Retina. 2005; 25:1005-1013.

5. Nichols RL. The etiology of visceral larva migrans. I. Diagnostic morphology of infective second stage Toxocara larvae. J Parasitol. 1965;42(4 section):349-362.

6. Wilkinson CP,Welch RB. Intraocular toxocara. Am J Ophthalmol. 1971; 71:921-930.

7. Sivaratnam D, Subrayan V, Ali NA. Transvitreal migration of a Toxocara larva resulting in a second chorioretinal granuloma. Jpn J Ophthalmol. 2008; 52:416-417.

8. Loukas A, Mullin NP, Tetteh KK, Moens L, Maizels RM. A novel c-type lectin secreted by a tissue dwelling parasitic nematode. Curr Biol. 1999; 9:825-828.

9. Shields JA. Ocular toxocariasis. A review. SurvOphthalmol. 1984; 28:361-381.

10. Kwon NH, Oh MJ, Lee SP, Lee BJ, Choi DC. The prevalence and diagnostic value of toxocariasis in unknown eosinophilia. Ann Hematol. 2006; 85:233-238.

11. Woodhall D, Starr MC, Montgomery SP, Jones JL, Lum F, et al. (2012) Ocular toxocariasis: epidemiologic, anatomic, and therapeutic variations based on a survey of ophthalmic subspecialists. Ophthalmology 119: 1211-1217.

12. Yoshida M, Shirao Y, Asai H, Nagase H, Nakamura H, et al. (1999) A retrospective study of ocular toxocariasis in japan: correlation with antibody prevalence and ophthalmological findings of patients with uveitis. J Helminthol 73: 357-361.

13. Park SP, Park I, Park HY, Lee SU, Huh S, et al. (2000) Five cases of ocular toxocariasis confirmed by serology. Korean J Parasitol 38: 267-273.

14. Overgaauw pa 1997. Aspects of Toxocara epidemiology: toxocariasis in dogs and cats. Crit Rev Microbiol 23: 233-251.

15. Caseiro MM 1996. Sindrome de Larva Migrans Visceral Causada por Larvas de Toxocara canis, no Municipio de Santos, MSc Thesis, Faculdade de Medicina, Universidade de Sao Paulo, Sao Paulo, 121 pp.

16. Schantz PM, Weis PE, Pollard ZF, et al. Risk factors for toxocaral ocular larva migrans: a case-control study. Am J Public Health 2980; 70(12):1269-72.

17. Glickman LT, Schantz PM. Epidemiology and pathogenesis of zoonotic toxocariasis. Epidemiol Rev 1981; 3:230-50.

18. Struchler D, Schubarth P, Gualzata M, et al. Thiabendazole vs.albendazole in treatment of toxocariasis: a clinical trial. Ann Trop Med Parasitol 1989;83(5):473-8.

19. Dernouchamps JP, Verougstraete C, Demolder E. Ocular toxocariasis: a presumed case of peripheral granuloma. Int Ophthalmol 1990; 14(5-6): 383-8.

20. Lampariello DA, Primo SA. Ocular toxocariasis: a rare presentation of a posterior pole granuloma with an associated choroidal neovascular membrane. J Am Optom Assoc 1999; 70(4): 245-52

21. Good B, Holland CV, Taylor MR, et al. Ocular toxocariasis in school children. Clin Infect Dis 2004; 39(3): 173-8

22. Maetz HM, Kleinstein RN, Federico D, et al. Estimated prevalence of ocular toxoplasmosis and toxocariasis in Alabama. J Infect Dis 1987; 156(2): 414.

23. Marmor M, Glickman L, Shofer F, et al. Toxocara canis infection of children: Epidemiologic and neuropsychologic findings. Am J Public Health 1987; 77(5):554-9.

24. Molk R. Ocular toxocariasis: a review of the literature. Ann Opthalmol 1983: 15: 216-231.

25. Brown DH. Ocular Toxocara canis II. Clinical review. J Pediatr Ophthalmol 1970; 7: 182-191.

26. Dinning WJ, Gillespie SH, Cooling RJ, et al. Toxocariasis: a practical approach to management of ocular disease. Eye 1988; 2: 580-582

27. Sakai R, Kawashima H, Shibui H, et al. Toxocara cati-induced ocular toxocariasis. Arch Ophthalmol 1998; 116: 1686-1687.

28. Albert DM, Marcus L. Ocular toxocariasis presenting as leukocoria in a patient with low ELISA titer to toxocara canis. Ophthalmology 1981; 88:1302-1306.

29. Kieler RA. Toxocara canis endophthalmitis with low ELISA titer ANN Ophthalmol 1983; 15: 447-449.

30. Upadhyay M, Rai NC. Toxocara granuloma of the retina. Jpn J Ophthalmol 1980; 24: 278-281.

31. Robert B, Nussenblatt, Scott.M, Whitcu, Alan-G, Palestine. Uveitis fundamentals and clinical practice. 4th edition:219-226.

PROFORMA

NAME:

AGE / SEX:

HOSPITAL NO:

ADDRESS:

INFORMANT: MOTHER/FATHER/GUARDIAN

PRESENT COMPLAINTS: Defective vision / pain / redness

Floaters

Strabismus

Leukocoria

PAST HISTORY: Previous episodes and treatment

-viral illness, joint pain, low backache, skin lesions, drug allergy, injury

PERSONNEL HISTORY: - H /o contact with tuberculosis

- H/o PICA

- H/o contact with pet animals

- Antenatal H/o exathematous fever / TORCH infection/ drug intake.

OCULAR EXAMINATION

	RIGHT EYE	LEFT EYE
Vision		
Lids		
Conjunctiva		
Cornea		
AC		
Pupils		
Iris		
Lens		
Anterior vitreous		
Extraocular movements		
Intraocular pressure		
Fundus		
B Scan		

INVESTIGATION

Blood - Hb %

TC

DC

ESR

TORCH screening

ELISA IgG and IgM for toxocara

Mantoux test

Chest X ray

Chest clinic opinion

DIAGNOSIS

TREATMENT - Medical treatment

FOLLOW UP

2^{nd}, 4^{th} week,3^{rd} and 6th month

KEY TO MASTER CHART

SEX

M - male

F – female

LATERALITY

RE – right eye

LE – left eye

SYMPTOMS

DV – defective vision

DE – deviation of eyeball

L - leukocoria

P - pain

R - redness

F - floaters

IOP – intraocular pressure

FUNDUS

PERI GR – peripheral granuloma

POST GR – posterior pole granuloma

CR ENDOPH – chronic endophthalmitis

S.NO	NAME	AGE	SEX	LATERALITY	SYMPTOMS	GEOPHAGIA	CONTACT WITH PETS	PRESENTING VSN RE	LE	IOP RE (mm hg)	IOP LE	Ig G TOXOCARA	Ig M TOXOCARA	EOSINOPHILIA	ANTERIOR UVEITIS	VITRITIS	FUNDUS	POST TREATMENT VSN
1	sundaresan	9	M	LE	DV	-	+	6/6	6/36	18	19	+	-	-	-	-	PERI GR	6/12
2	kalaiselvi	6	F	RE	P,R,DV	+	-	2/60	6/6	17	17	+	-	-	+	2+	POST GR	6/60
3	mohana	8	F	LE	DE	-	+	6/6	3/60	19	20	+	-	-	-	1+	POST GR	5/60
4	kathiresan	12	M	LE	F,R	-	+	6/6	6/60	18	19	+	-	-	-	1+	PERI GR	6/24
5	lakshmi priya	10	F	LE	DV,L	+	-	6/6	6/36	16	16	+	-	-	-	-	PERI GR	6/24
6	anandhi	7	F	RE	DE	+	-	5/60	6/6	15	15	+	-	-	-	1+	PERI GR	6/60
7	sanjay	4	M	RE	P,R	-	-	2/60	6/6	16	16	+	+	+	+	2+	POST GR	6/60
8	ilantamilan	7	M	LE	DV,DE	-	+	6/6	6/36	18	20	+	-	-	-	-	PERI GR	6/18
9	radha	6	F	RE	P,R	+	-	4/60	6/6	21	18	+	-	-	+	2+	PERI GR	6/24
10	anitha	9	F	RE	DV,L	-	+	6/60	6/6	19	17	+	-	-	-	-	PERI GR	6/36
11	ravindran	8	M	LE	P,R,DV	+	+	6/6	1/60	18	19	+	+	-	+	4+	CR ENDOPH	6/12
12	kavithendral	11	M	LE	F,R	-	+	6/6	6/60	16	19	+	-	-	-	1+	PERI GR	6/12
13	mohan raj	14	M	RE	P,R,F	+	-	4/60	6/6	22	19	+	-	-	+	1+	POST GR	6/36
14	mahesh	8	M	LE	DV	-	+	6/6	6/36	15	17	+	-	-	-	-	PERI GR	6/24
15	bharathy	5	M	LE	L,DE	-	+	6/6	3/60	17	23	+	-	-	-	-	POST GR	3/60
16	sivakumar	6	M	RE	DV	+	-	6/36	6/6	20	18	+	-	+	-	-	PERI GR	6/6
17	kavitha	12	F	LE	F,R	-	+	6/6	5/60	17	19	+	-	-	-	1+	PERI GR	6/18

18	preethi	9	F	RE	DV	+	+	5/60	6/6	19	17	+	+	-	-	-	POST GR	6/60
19	nithya	8	F	RE	DV	-	+	4/60	6/6	15	15	+	-	-	-	2+	PERI GR	6/60
20	rajkumar	7	M	LE	DV	-	-	6/6	6/36	17	18	+	-	-	-	-	PERI GR	6/24
21	dharan	6	M	LE	P,R	-	+	6/6	6/60	19	20	+	+	+	-	-	PERI GR	6/36
22	vinoth	7	M	RE	DV,L	-	+	2/60	6/6	15	14	+	-	-	-	1+	POST GR	4/60
23	praveen	9	M	LE	DV	+	-	6/6	5/60	14	16	+	-	-	-	-	PERI GR	6/60
24	vignesh	10	M	LE	DV	-	+	6/6	4/60	19	24	+	-	-	-	2+	PERI GR	6/24
25	harini	7	F	LE	R,P,DV	+	+	6/6	2/60	17	19	+	-	-	+	3+	CR ENDOPH	6/12
26	prashanth	11	M	LE	F,R	-	+	6/6	6/60	18	18	+	-	-	-	1+	PERI GR	6/36
27	senthilrajan	9	M	RE	DE,DV	-	-	6/36	6/6	20	18	+	+	-	-	-	PERI GR	6/36
28	kaviya	8	F	LE	DV,L	+	+	6/6	3/60	18	22	+	-	-	-	-	POST GR	3/60
29	ramya	7	F	RE	DV	+	+	6/36	6/6	18	17	+	-	-	-	1+	PERI GR	6/24
30	monisha	6	F	RE	P,R	-	+	4/60	6/6	19	19	+	-	+	+	2+	PERI GR	6/60