Dissertation on

CLINICAL STUDY ON ENDOPHTHALMITIS

Submitted in partial fulfilment 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

APRIL 2015

CERTIFICATE

This is to certify that this dissertation entitled **"CLINICAL STUDY ON ENDOPHTHALMITIS"** is a bonafide record of the research work done by **Dr. DIVYA ALEX,** post graduate in Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College and Government General Hospital, Chennai-03, in partial fulfilment 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 2012 - 2015.

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PART – III

Part I

CHAPTER 1

INTRODUCTION

Endophthalmitis is an inflammation of the internal layers of the eye resulting from intraocular colonization of infectious agents manifesting with an exudation into the vitreous cavity. Endophthalmitis is otherwise called as vitreous abscess. Endophthalmitis is an entity that can rapidly destroy vision and is a true emergency.

Colonization of organisms inside the eye can happen either following breech in the ocular coats or by dissemination through the systemic blood stream. But, entry of an infectious agent into vitreous cavity is a pre requisite for endophthalmitis to occur. The commonest causes of major breach in the integrity of ocular coats are intraocular surgery and penetrating trauma. Although the incidence of endophthalmitis have sharply declined over the past decades, it is a surgeon's nightmare. Even today, in the era of all latest facilities and

technologies and despite the best available therapeutic efforts, the prognosis remains extremely variable.

Infectious endophthalmitis is the inflammation associated with infective process. It may be exogenous in origin following intraocular surgery or trauma. Or it may be endogenous when infectious organism reach the eye through haematogenous dissemination. Non-infectious endophthalmitis may follow inflammatory response to retained lens material, intraocular foreign body resulting in sterile endophthalmitis.

ANATOMY OF THE UVEAL TRACT

Uvea is the Latin word for grape. The term uveal tract means the vascular middle layer of the eye consisting of iris anteriorly ciliary body in the middle and the choroid posteriorly. Embryologically, uveal tract is derived from the neuroectoderm, neural crest cells and vascular channels.

Ciliary arteries which originate from the ophthalmic artery supply blood to the whole vascular tunic. Iris and ciliary body are supplied by the anterior and long posterior ciliary arteries via the major arterial

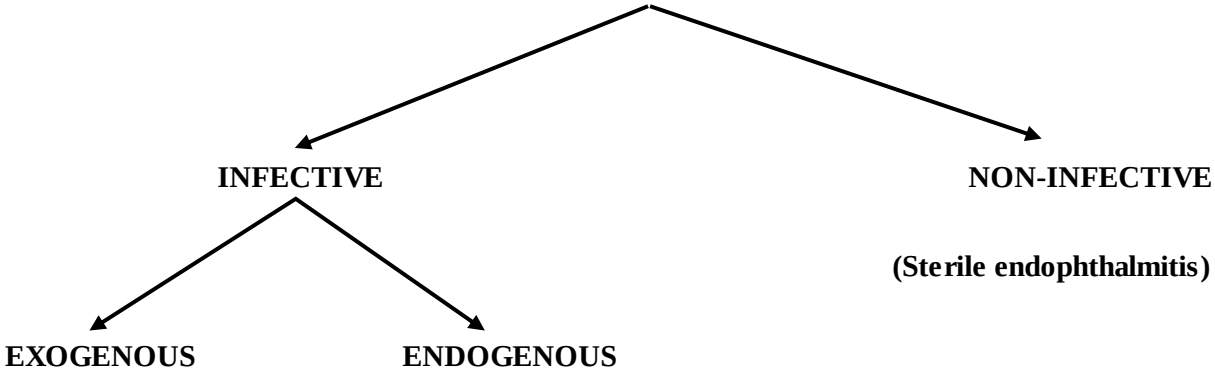
circle. Choroid is mainly supplied by the short posterior ciliary arteries. Venous drainage of the uvea is provided by the vortex veins and by the scleral and episcleral venous system.

The structures of the uveal tract share a common blood supply so together involved in the inflammatory processes. Because of its extreme vascularity, uveal tract is an ideal site for dissemination occurring in endogenous endophthalmitis.

VITREOUS HUMOUR

Vitreous humour is an inert, colourless, hydrophilic gel serves the optical functions and acts as a supporting structure for the eyeball. It's about 4cc and forms two thirds of the volume of the entire globe. It may be divided into 3 parts namely hyaloid membrane, cortical vitreous and medullary vitreous. Vitreous body is composed of water (99%) collagen, hyaluronic acid, sugars such as glucose, galactose, mannose, fructose and soluble proteins. Once the organism enters the vitreous cavity through a breach in the ocular coats, the vitreous serves as an excellent culture medium that the organisms can proliferate within.

CLASSIFICATION OF ENDOPHTHALMITIS



1. **Post-operative**

   (Cataract, Antiglaucoma,
   Bleb related, Keratoplasty,
   Secondary IOL implantation,
   Internal RD, PPV**,**
   External RD [infected buckle**])**

2. **Post traumatic**

POSTSURGICAL ENDOPHTHALMITIS

FULMINANT (<4days)	ACUTE (5-7 days)	CHRONIC (>4weeks)
Gram negative bacteria (Pseudomonas)	Staph. Epidermidis	Delayed entry (Bleb)
Streptococci	Coagulase negative cocci	Delayed onset (P.acnes, Fungi)
Staph. Aureus		

NONINFECTIOUS CAUSES OF CHRONIC POSTOPERATIVE INTRAOCULAR INFLAMMATION [6]

- Lens induced uveitis (phacoantigenic uveitis)

  Retained cortical material

  Retained intravitreal lens fragments

- Intraocular lens related uveitis

  Iris chafing/IOL malposition

  UGH (Uveitis-Glaucoma-Hyphema) syndrome

  IOL material related.

- Other causes

  Masquerade syndromes (intra ocular lymphoma)

  Sympathetic ophthalmia

  Uveitis of other causes unrelated to surgery

HISTORICAL REVIEW

Incidence of different types of endophthalmitis

POSTOPERATIVE ENDOPHTHALMITIS

Postoperative endophthalmitis is a catastrophic complication of intraocular surgery. Its reported incidence in the present era has considerably decreased because of the strict aseptic precautions used and use of broad spectrum antibiotics. Christy et al conducted the first study on postop endophthalmitis and the incidence was 0.5%. Now the incidence is about 0.1% to 0.3%.

Kattan et al conducted study in 30,002 cases and reported the incidence pattern of different forms of surgeries as

- ECCE -0.082%
- Secondary IOL implantation- 0.30%
- Penetrating keratoplasty-0.11%
- Filtering surgery for glaucoma-0.061%
- PPV-0.051%

The study reported an increased incidence of endophthalmitis in diabetics. 90-95% of culture from all postsurgical endophthalmitis revealed gram positive organisms.

PENETRATING KERATOPLASTY ENDOPHTHALMITIS

Endophthalmitis can present in the immediate postoperative period usually within 72 hours of surgery. Contaminated donor tissue or corneal storage media may be the source of the infection. Prolonged storage of corneal tissue for more than 5 days may also be a risk factor for endophthalmitis.

FILTERING BLEB ASSOSIATED ENDOPHTHALMITIS

The incidence reported was 0.2 to 1%. Wolner and group reported that incidence of endophthalmitis increased with usage of antimetabolites such as Mitomycin C and 5-Flurouracil.

POST TRAUMATIC ENDOPHTHALMITIS

The correct incidence was difficult to confirm as most of the cases were poorly reported. Barr and associates found out that the incidence was about 3.3%. The incidence increased up to 7% in case of retained intra ocular foreign body.

PHACOEMULSIFICATION

Use of phacoemulsification increases pressure within the eye forcing bacteria backwards into the vitreous, where early multiplication gives rise to the anterior vitritis characteristically seen behind the posterior capsule. The incidence of endophthalmitis with phacoemulsification and clear cornea incisions is between 0.3 to 0.5 and 0.015 per cent. (ESCRS)

DEFINITION OF TERMS

- Culture positive: Any organism that has grown in more than one culture media.
- Dry tap: in absence of aspiration of fluid from vitreous cavity using a 26 gauge needle.
- Good visual recovery: Any patient whose vision after treatment improved to more than 6/60.
- Satisfactory: visual recovery between 2/60 and 6/60
- Poor: visual recovery < 2/60

GRADING OF MEDIA BY INDIRECT OPHTHALMOSCOPY

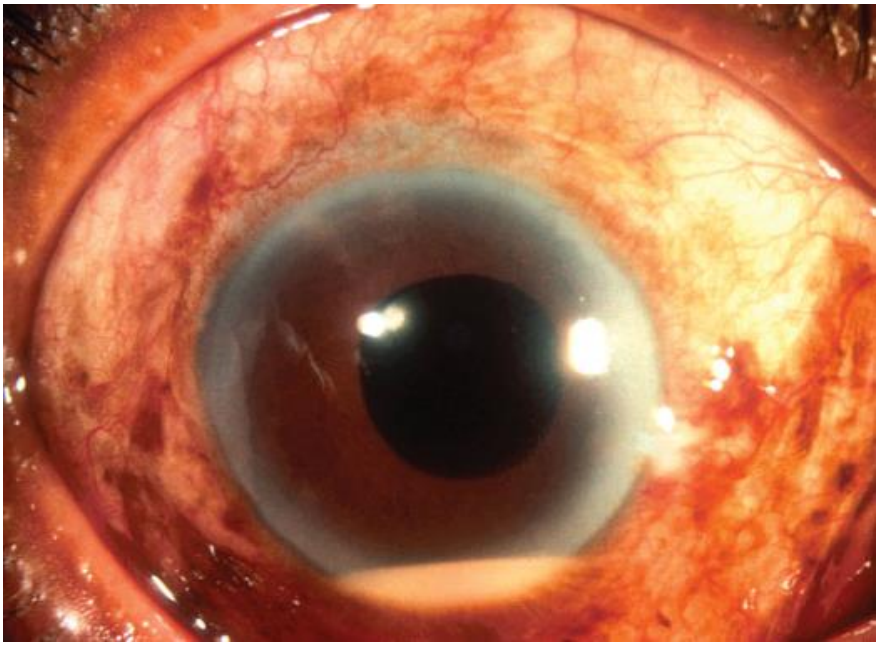
GRADE 1- Media clarity of 6/12 or more in viewing retina

GRADE 2- Media clarity <6/12 .Second order retinal vessels visible

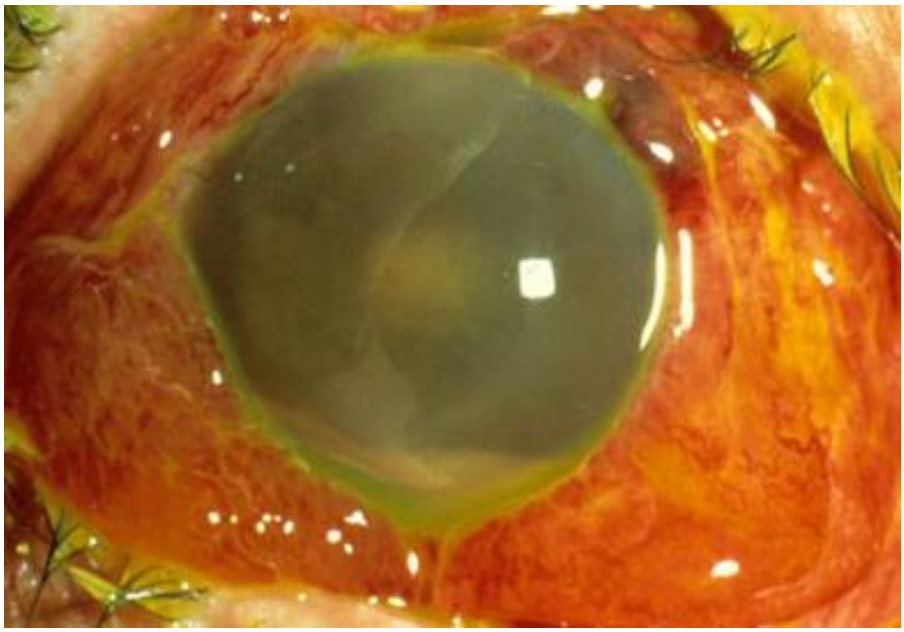
GRADE 3- First order main retinal vessels seen

GRADE 4- Vessels not seen. Red reflex present.

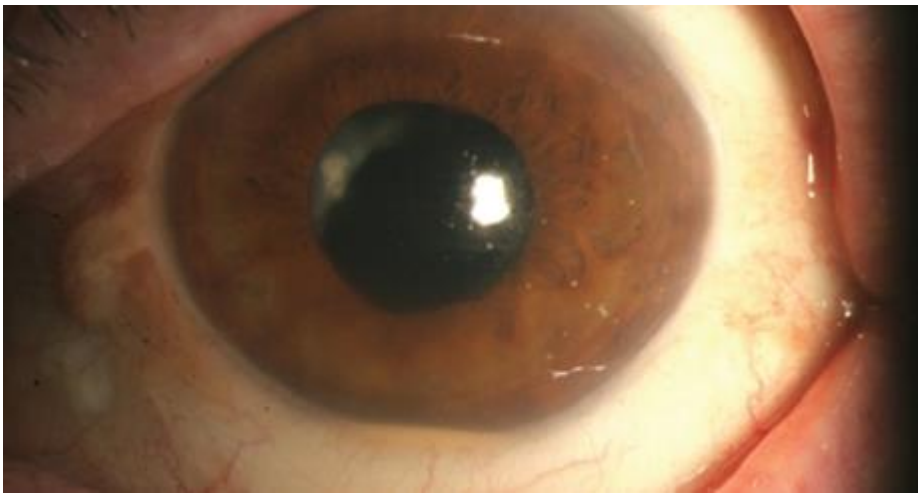
GRADE5- Absence of red reflex



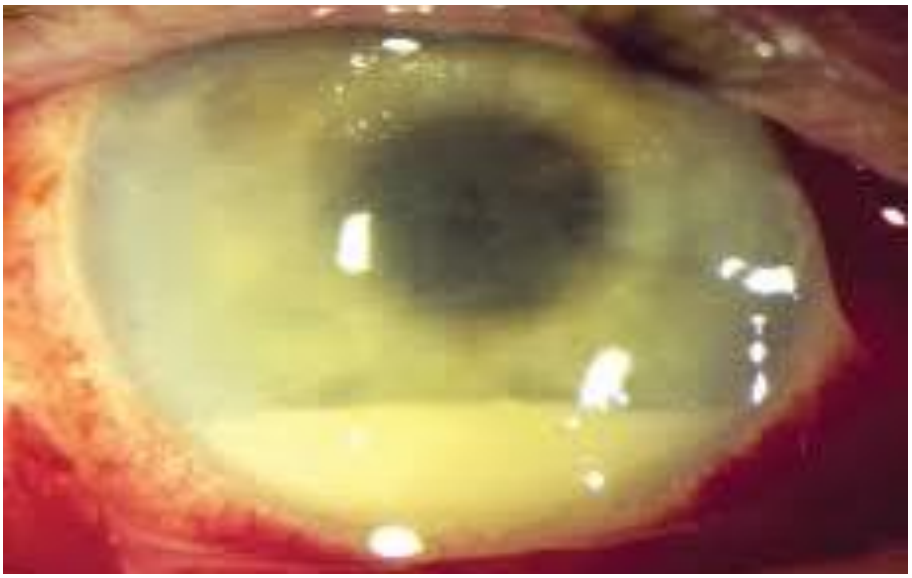
ACUTE ONSET POST OPERATIVE ENDOPHTHALMITIS



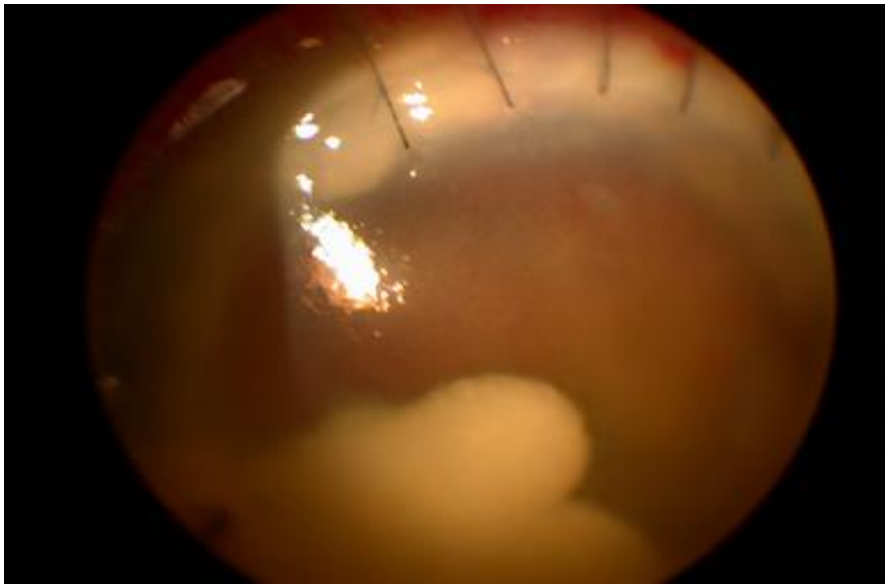
POST TRAUMATIC ENDOPHTHALMITIS



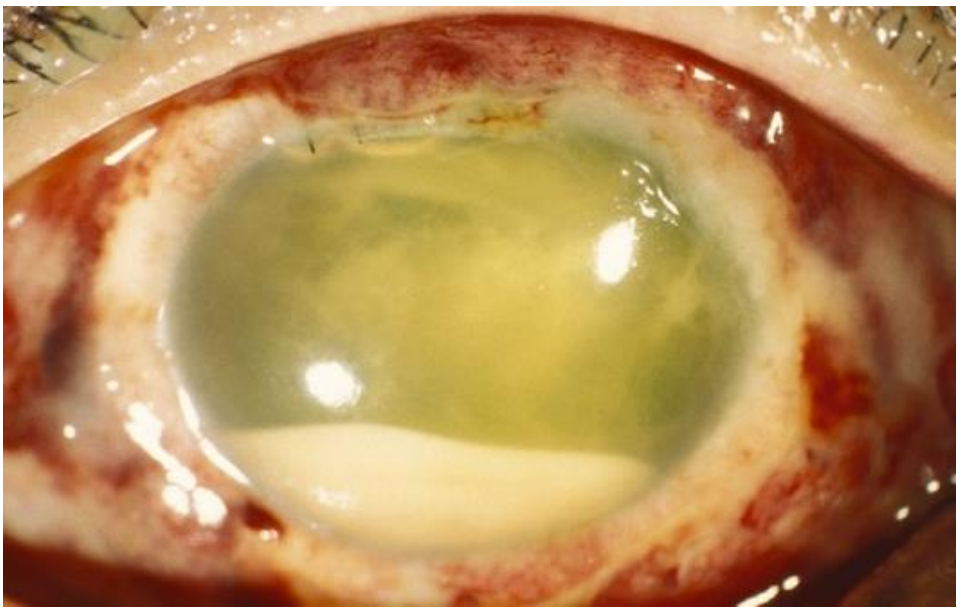
DELAYED ONSET P.ACNES ENDOPHTHALMITIS (WHITE PLAQUES SEEN)



CHRONIC POST OP ENDOPHTHALMITIS



CANDIDA ENDOPHTHALMITIS (FLUFFY YELLOW BALLS)



ENDOPHTHALMITIS SECONDARY TO IOFB

Review of Literature

CHAPTER 2

RISK FACTORS FOR ENDOPHTHALMITIS

POSTOPERATIVE ENDOPHTHALMITIS

Acute endophthalmitis is one of the most devastating complications of cataract surgery. Several risk factors are associated with postop endophthalmitis but the level of evidence and the strength of association is varied. Typically, postoperative endophthalmitis is caused by the perioperative introduction of microbial organisms into the eye either from the patient's normal conjunctival and skin flora or from contaminated instruments. Once organisms gain access to the vitreous cavity, overwhelming inflammation is likely to occur. Most of the cases occur within 6 weeks of postoperative period.

RISK FACTORS

Pre-operative

Presence of any active infection

- Blepharitis
- Meibomianitis
- Dacryocystitis
- Conjunctivitis
- Peripheral ulcerative keratitis.
- Secondary to dry eyes.

Intra operative

- Improper theatre sterilization.
- Improper surgical scrubbing of the doctor.
- Inadequate draping with povidone iodine
- Posterior capsule rupture
- Vitreous loss
- Prolonged procedure time
- Combined procedure (with vitrectomy)

- Clear corneal sutureless incision
- Temporal incision
- Sutureless sclerotomies
- Retained lens matter
- Usage of contaminated instruments or irrigating fluids

Post-operative

- Wound leak or dehiscence
- Delaying postoperative topical antibiotics the day after surgery
- Vitreous incarceration in the wound
- Suture removal

ENDOGENOUS ENDOPHTHALMITIS

- Uncontrolled diabetes mellitus
- Immunosuppressive conditions
- Indwelling catheters
- Hemodialysis
- Immunosuppression for autoimmune disease and transplant
- Bone marrow suppression

- Hepatic disease
- Postpartum
- Underlying systemic autoimmune disease

POST TRAUMATIC ENDOPHTHALMITIS

- Retained IOFB.
- Larger full thickness penetrating wound.
- Absence of use of prophylactic antibiotics in the post traumatic period.
- Lens disruption in penetrating injuries.
- Wound dehiscence.
- Protruded sutures.
- Delayed primary repair of open globe injuries.

BASELINE RISK FACTORS FOR DECREASED VISUAL ACUITY OUTCOME

- Older age group
- Corneal infiltrate
- Corneal ring ulcer
- Posterior capsule not intact
- Intraocular pressure <5mm Hg or > 25mm Hg
- Afferent pupillary defect
- Rubeosis iridis
- Absent red reflex
- Visual acuity of light perception is the most important risk factor with 2 fold increased risk of poor visual outcome compared with those with better visual acuity at the time of presentation.

MICROBIAL SPECTRUM IN ENDOPHTHALMITIS

Gram positive organisms are responsible for almost 80-90% of all post-surgical endophthalmitis. Gram negative infections are up to 7% but are highly virulent and may need early vitrectomy. Most of the cases are caused by the organisms that normally inhabit the conjunctival sac. Staph. Epidermidis has been isolated from conjunctival sac in 69%.

Post-operative endophthalmitis:

Coagulase-negative staphylococci (Staph. Epidermidis) is the most common. (50-70%) Staphylococcus aureus (15%), Streptococcus pneumoniae, alpha-haemolytic streptococci including S. mitis and S. salivarius(10%), Gram-negative bacteria including Ps. aeruginosa (occurs rarely) Fungi (Candida, Aspergillus, Fusarium) (8%) are the other causative organisms in post-operative endophthalmitis.

Delayed post-operative saccular or capsule bag endophthalmitis:

Propionibacterium acnes, corynebacteria including C. macginleyi and fungi.

Bleb related endophthalmitis:

Coagulase negative staphylococci (67%)

Post traumatic endophthalmitis:

Coagulase negative Staph. Epidermidis

Bacillus

Streptococci

Fungi

Corynebacterium.

Endogenous endophthalmitis:

Staph. Aureus

Gram positive streptococci (endocarditis)

Bacillus, E.coli, Klebsiella

Neisseria meningitides

Fungi (Candida, Fusarium, Aspergillus)

HOST DEFENCE MECHANISMS &IMMUNE PRIVILEGE OF EYE

There are several defence mechanisms which protect the ocular surfaces.

EYELIDS AND LASHES: acts as a mechanical barrier protecting the ocular surface from pathogens and allergens.

TEAR FILM: The outermost lipid layer act as a surfactant enhancing the microbial trap. The middle aqueous layer undergoes continuous turn over with the pumping action of the blink help in flushing out the microbes. The innermost mucous blanket prevents the pathogen adherence to the surface.

1. Lactoferrin-iron binding protein enhances NKcell activity and compliment activation.
2. Lysozyme -cleaves the polysaccharide backbone of the bacterial cell wall and chitin in the fungal cell wall.
3. Beta lysin- attacks bacterial membranes.

4. Immunoglobulins- have a role in opsonisation of pathogens, blocks pathogen binding to ocular surface and neutralization of toxins. IgA from plasma cells of lacrimal gland prevent microbial adherence especially pseudomonas and acanthoemoeba.
5. Complement- promotes cell lysis.
6. Fibronectin- enhances phagocytosis.
7. Defensins and Phospholipase A2 also prevent pathogens.

OCULAR MUCOSAL IMMUNITY - provided by the MALT (Mucosa associated Lymphoid Tissue of conjunctiva prevents microbial invasion.

EPITHELIUM - the apical epithelial cells with the tight junctions made by desmosomes and macula occludentes prevents microbial penetrance.

BLOOD OCULAR BARRIER - the inner blood retinal barrier is composed of tight junctions of retinal capillary endothelial cells. The outer barrier consists of tight junctions between RPE cells. The blood aqueous barrier is formed by the tight junctions between the cells of inner non pigmented epithelium of ciliary body and non-fenestrated

endothelium of iris capillaries. These prevent the penetration of large molecules especially bacterial proteins.

ANTERIOR OR POSTERIOR CHAMBER-ASSOCIATED IMMUNE DEVIATION (ACAID OR POCAID) - Inoculation of antigens into the anterior chamber or vitreous elicits a deviant systemic immune response. There will be transient depression of cell-mediated immunity, particularly delayed-type hypersensitivity while the humoral response mediated by B cells that produce complement fixing antibodies is preserved. Delayed hypersensitivity is an effective means of killing pathogens, but potentially destructive to surrounding tissues because of the intense lymphokine-induced inflammation. Suppression of this by ACAID may preserve vision while permitting some degree of local immunity. This phenomenon is known as anterior chamber-associated immune deviation which is a dangerous compromise between the eye and the immune system. This is an immune privilege for the eye which can be compromised in PC rent with vitreous loss can lead on to endophthalmitis.

CLINICAL FEATURES

ACUTE POST OP ENDOPHTHALMITIS

Commences between the first post-operative day and approximately two weeks after the operation.

SYMPTOMS

Decreased visual acuity (90%)

Increasing ocular pain (85%)

Red eye (60%)

Ocular discharge

Lid oedema

SIGNS

Conjunctival chemosis

Corneal edema or infiltration

Hypopyon

Pupillary membrane

Absent or poor red glow

Retrolenticular cells

Corneal abscess

Air bubble in eye

Retinal periphlebitis

Fibrin in AC

CHRONIC LATE ENDOPHTHALMITIS

Commences usually after two weeks but may take many months to appear. It is usually caused by Propionibacterium acnes, Staph. Epidermidis and fungi. In P.acnes endophthalmitis, whitish plaques are found in the capsular sac (60-80%). There may be associated features like granulomatous KPs, vitritis and retained lens material sequestrated within the capsular bag.

P.acne endophthalmitis may usually follow a YAG capsulotomy. Hypopyon in (67%) and keratitis (26%) are found in fungal endophthalmitis. Pyramid-shaped hypopyon is typical of a mycotic cause.

DEFENITIONS OF DIFFERENT CATEGORIES OF POSTOP ENDOPHTHALMITIS[7]

Acute postop endophthalmitis is defined as intraocular inflammation secondary to an infectious cause characterised by an explosive onset and occurring in the immediate postoperative period following ocular surgery (<7days).

Delayed onset endophthalmitis is defined as an intraocular inflammation secondary to an infectious cause characterised by an explosive onset, but occurring upto 4 weeks after an ocular surgery.

Chronic postop endophthalmitis is defined as intraocular inflammation secondary to infectious cause characterised by indolent inflammation occurring any time following an ocular surgery.

POST TRAUMATIC ENDOPHTHALMITIS

Post traumatic endophthalmitis should be suspected when a patient presents with increasing pain, proptosis, chemosis, corneal infiltrates, hypopyon after a penetrating injury. Larger the wound, retained foreign bodies, injury with contaminated objects, injury with vegetable matter increases the risk.

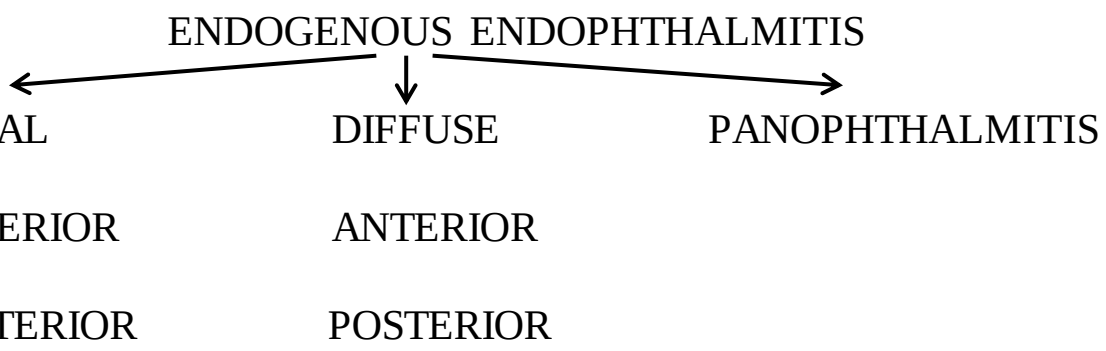
ENDOGENOUS ENDOPHTHALMITIS

Endogenous endophthalmitis presents with sudden onset pain, decreased vision, red eye or hypopyon in an immunocompromised

patients. May be associated white fluffy inner choroidal lesions breaking into the vitreous with budding (Candida). There is increased vitritis and perivascular inflammatory deposits.

Endogenous endophthalmitis occur as a result of haematogenous spread of infectious organisms to the eye which crosses the blood retinal barrier. It is otherwise called as metastatic endophthalmitis. Causative organism can be bacterial or fungal. Fungal endogenous endophthalmitis is most common. Most common fungal organisms responsible for this entity are Candida and Aspergillus. Rarely Histoplasma, Coccidiomycosis, Fusarium, Sporothrix, Mucormycosis have been isolated. Bacterial causative organisms may be Streptococci (32%) E.coli (18%) Klebsiella, Bacillus and Serratia.[26]

Greenwald proposed a classification for endogenous endophthalmitis as the clinical presentation can be extremely variable.



Focal endophthalmitis: may be associated with inflammatory nodules on iris, retina and choroid. There will be mild inflammation of the anterior chamber with moderate vitreous haze. These cases usually have good prognosis.

Diffuse anterior endophthalmitis: associated with severe anterior chamber inflammation with conjunctival chemosis, fibrin clots in anterior chamber and significant hypopyon. IOP is elevated. Prognosis is excellent with early and vigorous treatment.

Diffuse posterior endophthalmitis: associated with dense vitritis. Progressive necrosis of the retina is characteristic. Poor visual prognosis can be explained by retinal ischemia primary by inflammatory necrosis or secondary due to septic emboli causing central retinal artery occlusion.

Endogenous endophthalmitis usually occurs in immunocompromised individuals. The possibility of endogenous endophthalmitis should be considered in any patient who manifests a pronounced anterior reaction that is refractory to steroid treatment.

PROGNOSIS

Prognosis of endophthalmitis is extremely variable. Mainly depends upon

- Depends on the virulence and the number of the invading organisms. Highly virulent organisms and high bacterial load are associated with worse prognosis.
- Time duration between the onset and initiation of therapy. Earlier the intervention, better will be the prognosis.
- Complications such as retinal detachment choroidal detachment are associated with worse prognosis.
- Presence of intra ocular foreign body is associated with bad prognosis.
- Denser the amount of vitreous inflammation, worser the prognosis.
- Postoperative endophthalmitis has a better prognosis than post traumatic endophthalmitis.[11]
- Older age group have bad prognosis.
- Association of systemic diseases such as Diabetes have bad prognosis.[2]

- Presence of Relative Afferent Pupillary Defect have bad prognosis.[2]
- Presence of corneal infiltrate or ring ulcer is associated with bad prognosis.

  The axiom “if it isn’t worse, its better” may apply in the case of endophthalmitis as the media clarity and visual acuity may not improve initially.

DIFFERENTIAL DIAGNOSIS OF INFECTIVE ENDOPHTHALMITIS [2, 8]

- Toxic anterior segment syndrome (TASS)
- Phacolytic glaucoma
- Severe sterile postoperative inflammation
- Lens induced inflammation
- Inadvertent toxic substance introduced into eye
- Drug induced

  Rifabutin (frequently associated with hypopyon)

  Metipranolol
- Neoplastic infiltration such as in leukaemia
- Masquerade syndromes
- Ruptured cysticercosis
- Viral retinitis as in the form of acute retinal necrosis, progressive outer retinal necrosis or CMV retinitis.

TOXIC ANTERIOR SEGMENT SYNDROME (TASS)

TASS refers to sterile postoperative inflammatory response to non-infectious agents entering the anterior chamber[8]. This entity manifests early within 48 hours. A variant of TASS is also described called as toxic endothelial cell destruction (TECD) syndrome. It is characterised by diffuse limbus to limbus corneal oedema and anterior segment inflammation. TASS occurs as a result of the inadvertent entry of toxic substances into the anterior chamber leading onto cellular necrosis. Corneal endothelium is the most damaged structure in TASS because of its inability to regenerate. Toxic agents induce the acute breakdown of endothelial junctions with loss of the blood aqueous barrier function

Causes:

Extra ocular substances entering AC such as topical antiseptic agents, talc from surgical gloves, topical anaesthetic agents, preservatives in the drug as Benzalkonium chloride, Mitomycin-C, Intraocular lenses specifically phakic intraocular lenses and

contaminated irrigating solutions such as balanced salt solution contaminated with bacterial endotoxin

Features	**TASS**	**Infectious Endophthalmitis**
Onset	Rapid onset ; 12- 24hours	2-7 days usually
Pain	Mild or no pain	Usually severe
Corneal edema	Diffuse Limbus to limbus	No specific pattern
Anterior chamber reaction	Moderate-to-severe anterior chamber reaction with increased white blood cells and fibrin. Hypopyon may be present.	Moderate-to-severe anterior chamber reaction. Hypopyon often present (75%)
Vitritis	Very rare	Always present
Visual acuity	Decreased	Decreased
Response to steroids	Dramatic improvement	No improvement only with steroids

LABORATORY DIAGNOSIS

A medical emergency exists as soon as the clinical diagnosis is made of acute bacterial endophthalmitis. It's important to identify the causative organism and treat accordingly.

COLLECTION OF SPECIMEN

The most important samples to culture are aspirates from the aqueous and vitreous cavity. The possibility of isolating an organism from vitreous sample is about 70% and aqueous sample is about 40%. The other specimens that can be used are explanted IOL, remnants of the lens and capsule and rarely eviscerated globe contents. Vitrectomy provides the maximum amount of material for diagnosis.

If an aspirate obtained can be reached immediately then the specimens are best sent to the laboratory with the original syringe with a cap on the needle. If processing is delayed the sample should be fixed with equal volume of 95%ethyl alcohol. Or preferably the smear can be made and inoculate the specimen into an appropriate culture media.

AQUEOUS TAP

- Under topical anaesthesia, 5% povidone iodine is instilled and washed.
- Speculum is inserted.
- Using a 27G tuberculin syringe (preferably) or 25G needle 0.1-0.2 ml fluid is aspirated via limbal paracentesis.
- The syringe is capped and labelled.

VITREOUS TAP

Pars plana aspiration:

- Under topical anaesthesia, 5% povidone iodine is instilled and washed.
- Speculum is inserted.
- Using a 26G needle the site of insertion is marked from the limbus.3mm(aphakic) 3.5mm (pseudophakic) 4mm (phakic)
- 0.2ml of fluid is aspirated. In case of fungal endophthalmitis usually dry tap is the result. Effort should be made to obtain the fluffy mass.
- The syringe is capped and labelled.

IN THE ABSENCE OF POSTERIOR CHAMBER IOL AND INTACT POSTERIOR LENS CAPSULE

- Widen the initial keratotomy from the anterior chamber tap.
- Insert a 22G needle attached to 3ml syringe, 3.5mm posterior to the limbus into the mid vitreous cavity
- Aspirate gently to yield 0.2 to 0.3 ml of liquid vitreous
- If the yield is poor consider vitrectomy.

Vitreous biopsy:

The safest method to obtain vitreous sample is vitreous biopsy using a vitreous cutter. Prevents the vitreous traction by cutting rather than pulling it. There are 2 methods to obtain the samples from the anterior vitreous phase. With or without an infusion line. If infusion line is used, specimen will be diluted and an additional sclerotomy is to be made. But the fluid can be suctioned by passing through a 0.45 micropore filter.

The ideal recommended stain and culture techniques

- The specimen is placed in a slide air dried and fixed in 95% methyl alcohol and is used for Gram staining, Giemsa staining ,

Gomori methanamine silver and Calcofluor white staining. Smear although provide rapid diagnosis, its less specific and sensitive.

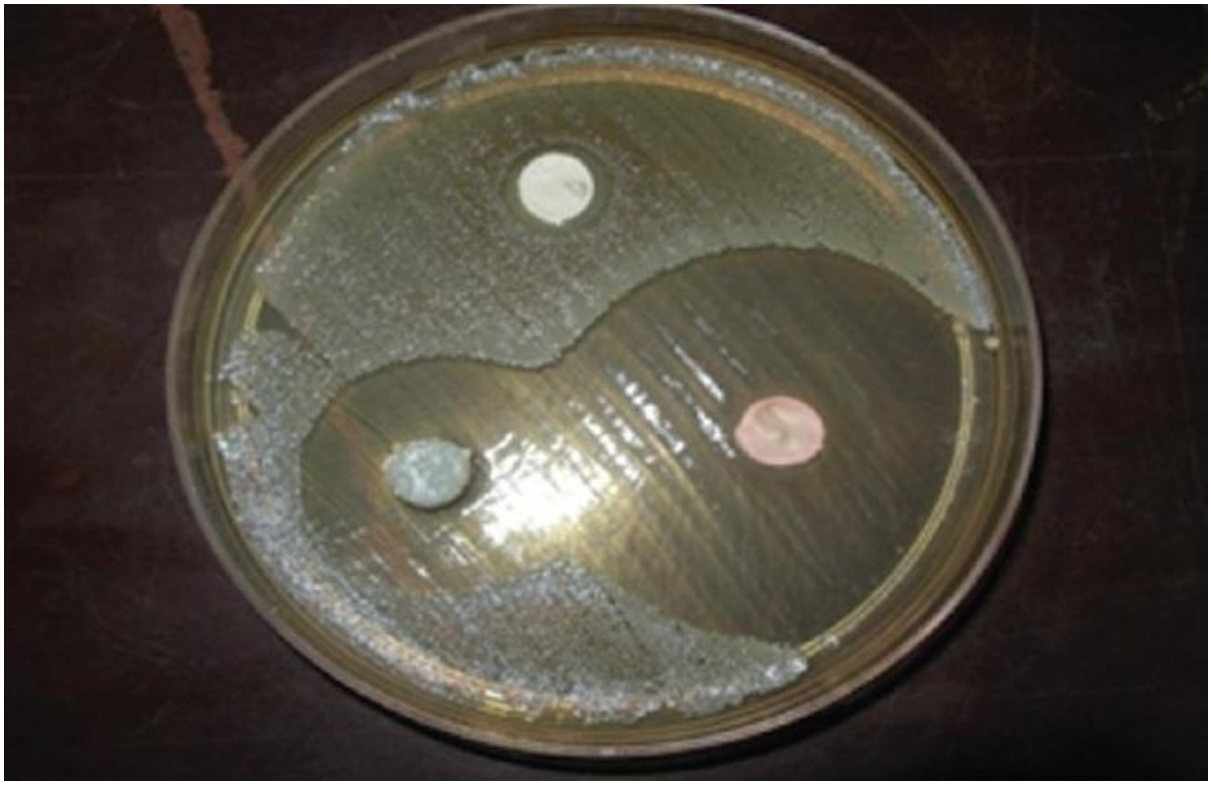
- Inoculating the sample into blood agar plate and streaking carefully with a needle and incubating at 37degree C for identifying aerobic organisms.
- Inoculating the sample into chocolate agar plate and incubating at 37 degree C enriched with 10%CO2.
- Inoculating into thioglycolate broth and incubated at 37 degree C for anaerobes and microaerophilic organisms such as pseudomonas.
- Inoculating into Sabourauds dextrose agar medium and incubated at 25-27degree C to identify fungal growth.

Direct plating is always better than sending the sample in media. If direct plating is not possible sample should be sent as soon as possible for Grams and Giemsa. The lid margin and conjunctival swaps are not recommended. In case of endophthalmitis with sutural abscess culture of the removed suture is recommended.

A culture is defined as positive if the same organism grows in more than one medium. It is called equivocal growth if the organism grows only in liquid medium and scanty growth in solid medium.

Cultures usually require 24 to 48 hours for initial results and need to be checked daily. Vitreous culture tap has got more sensitivity and specificity than aqueous tap. Culture should be examined for 2 weeks in the case of aerobic and anaerobic before reporting as negative. In case of fungal culture minimum 3 weeks should be observed. In 40 to 50% of the cases, culture will be negative. In those cases, molecular diagnosis play an important role in the diagnosis since in many cases in the absence of culture growth, there may be confusion in the diagnosis and treatment.

BLOOD AGAR SHOWING STAPH. AUREUS GROWTH



CULTURE PLATE SHOWING ZONE OF INHIBITION AROUND STAPH. AUREUS

CULTURE TUBE SHOWING ASPERGILLUS FLAVUS

MOLECULAR DIAGNOSIS

Molecular diagnosis is the most sensitive and specific for the identification of organisms from the vitreous cavity. These are versatile methods of DNA amplification. They mainly include

- Polymerase chain reaction (PCR)
- Ligase chain reaction (LCR)
- Fluorescein amplified fragment length polymorphism (FAFLP)
- Enterobacterial repetitive intergenic consensus PCR (ERIC PCR)
- Labelled nucleic acid probe methods
- PCR insitu hybridisation

Polymerase chain reaction (PCR) - is an advanced molecular biology technique used to amplify a single copy of a piece of DNA across high order magnitude, generating millions of copies of a particular DNA sequence. It allows the exponential amplification of impure DNA starting material. Main advantage is rapid positivity and the high sensitivity and specificity.

Ligase chain reaction - is similar to PCR. Here two nucleotide chains will be hybridised to a DNA template and ends are juxtaposed. DNA ligase which is obtained from T4phage joins the 2nucleotide sequence into single fragment. Repeated cycles of annealing and ligation generates exponential amplification of the target sequence.

Enterobacterial repetitive intergenic consensus PCR (ERIC PCR) - Enterobacterial repetitive intergenic consensus sequences are 127-bp imperfect palindromes occurring in multiple copies in the genomes of enterobacteria and vibrios.[30] These palindromes will be distributed in wide variety of species. ERIC-PCR can be used to establish the clonal relationship between clinical and environmental isolates such as to find the reason in an outbreak of postoperative endophthalmitis. (For eg. Contaminated air condition system)

Fluorescein amplified fragment length polymorphism (FAFLP) - FAFLP is an advanced PCR based fingerprinting technique that can detect polymorphism in the whole genome level with very high sensitivity.

MEDICAL MANAGEMENT OF ENDOPHTHALMITIS

Objectives of endophthalmitis treatment

- Control or to eradicate infection
- Manage complications
- Restoration of vision
- Symptomatic relief
- Prevent panophthalmitis
- Maintain the globe integrity.

The mainstay of endophthalmitis treatment is administration of broad spectrum intravitreal antibiotics.

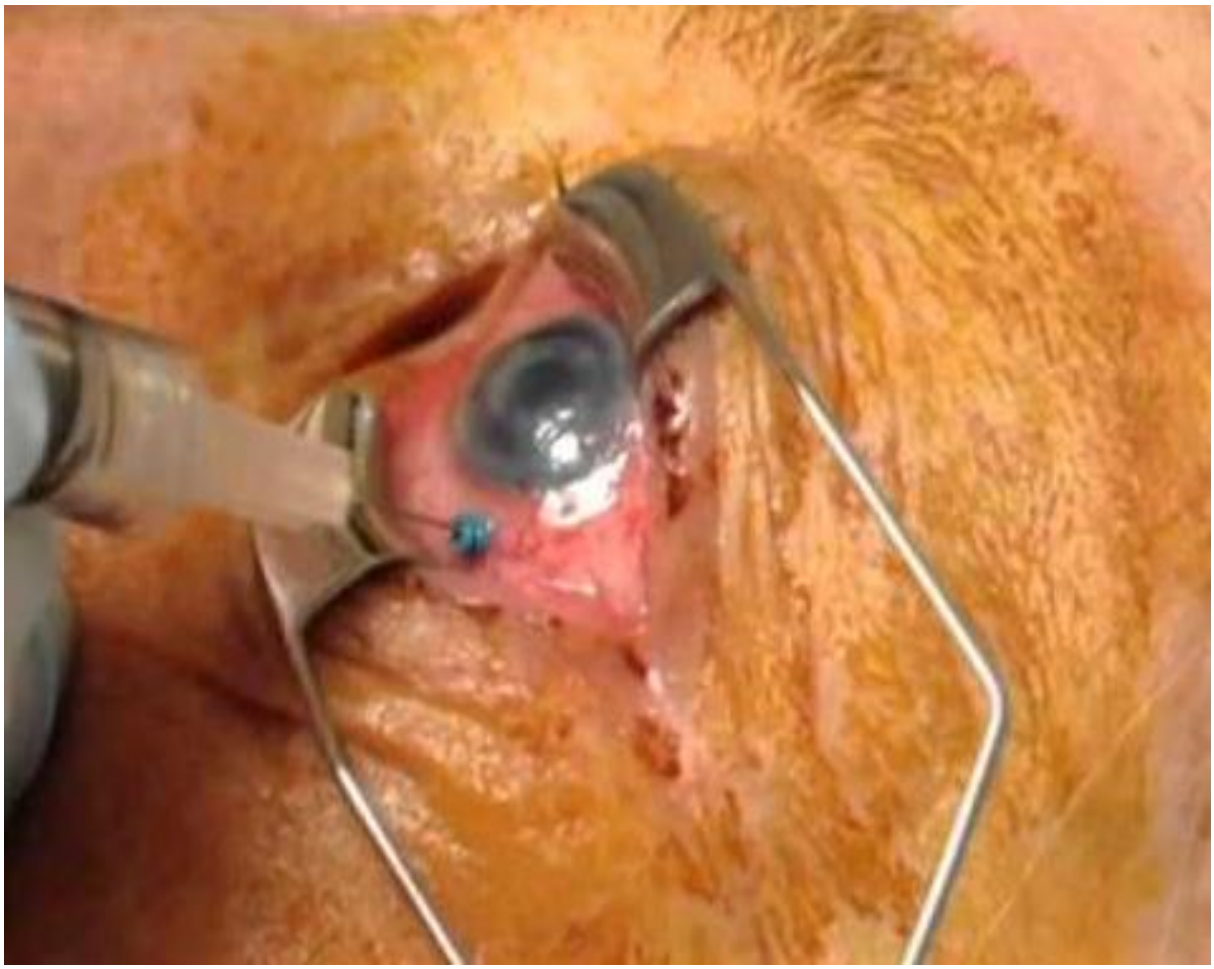
ANTIMICROBIAL THERAPY

- Topical drugs: the ocular penetration is poor. Topical antibiotics are useful in treating coexistent problems as corneal ulcer, sutural abscess.
- Sub conjunctival: anterior chamber penetration is more. But the vitreous penetration is poor.
- Periocular: anterior or posterior sub Tenon injection can be given. Gives more concentration of the drugs and act as a depot.
- Intravitreal: is the principal modality of treatment. It would be ideal to identify the causative agent and to administer specific antibiotics. This is not always practical as it takes time and time delay in initiating the treatment worsens the prognosis. So broad spectrum antibiotics (two drug regimen) is advocated. First Choice is injection Vancomycin and Ceftazidime combination. Second choice is injection Vancomycin and Amikacin combination. Vancomycin provides good cover for Gram-positive bacteria including methicillin-resistant staphylococci.

Ceftazidime is used to cover the Gram-negative spectrum incl. Ps. Aeruginosa.

Method:

- Under topical anaesthesia, 5% povidone iodine is instilled and washed.
- Speculum is inserted.
- Using a 26G needle the site of insertion is marked from the limbus.3mm(aphakic) 3.5mm (pseudophakic) 4mm (phakic)
- 0.2ml of fluid is aspirated to be send for culture and sensitivity.
- Through the same needle inject the prepared antibiotics drop by drop avoiding jet formation.
- The bevel should be facing upwards and the direction of penetration should be towards mid-vitreous.
- IOP should be checked at the end of procedure and needle is withdrawn.
- Sub conjunctival injection of antibiotics is given.



METHOD OF GIVING INTRAVITREAL ANTIBIOTICS

Systemic antibiotics: ocular penetration of systemic antibiotics is significantly reduced by the blood retinal barrier. Cefazolin, Ceftazidime has got better penetration in inflamed eyes. Systemic antibiotics have great significance in endogenous endophthalmitis where there is a focus in the choroid or retinal layers.

STEROIDS IN ENDOPHTHALMITIS TREATMENT

Corticosteroids are recommended as an important adjunct to antibiotics and vitrectomy in the management of infectious bacterial endophthalmitis. Corticosteroids limit the degree of inflammation caused by toxins liberated from the micro-organisms. The Endophthalmitis Vitrectomy Study (EVS) recommends oral prednisolone (1 mg/kg body weight), starting a day after the intraocular antibiotic (IOAB) therapy, with or without vitrectomy. But has no independent role in visual outcome. Intravitreal dexamethasone is recommended in patients who cannot take systemic prednisolone.

SPECIFIC ANTIBIOTIC OF CHOICE FOR TREATMENT OF BACTERIAL ENDOPHTHALMITIS

Microorganism	Intravitreal antibiotic	Systemic therapy	Topical/sub conjunctival
Staphylococcus	Vancomycin / Cefazolin	Cefazolin	Cefazolin
Streptococcus	Vancomycin / Cefazolin	Cefazolin + Ampicillin	Cefazolin
Haemophilus	Chloramphenicol	Ceftazidime	Ciprofloxacin
Propionibacterium	Vancomycin	Penicillin	Vancomycin
Corynebacterium	Vancomycin + Cefazolin	Cefazolin	Cefazolin
Bacillus	Clindamycin + Amikacin	Clindamycin + Gentamicin	Clindamycin + Gentamicin
Listeria	Ampicillin+ Vancomycin	Ampicillin	Vancomycin
Clostridium	Clindamycin / Penicillin	Clindamycin	Clindamycin
Nocardia	Amikacin	Trimethoprimsulfa	Amikacin
Pseudomonas	Amikacin / Ceftazidime	Ciprofloxacin	Amikacin
Proteus	Gentamicin + Cefazolin	Cefazolin + Ciprofloxacin	Gentamicin
Serratia	Amikacin	Gentamicin + Ciprofloxacin	Gentamicin
Klebsiella	Amikacin	Gentamicin + Cefazolin	Gentamicin + Cefazolin

STANDARD RECOMMENDED DOSES FOR INFECTIOUS ENDOPHTHALMITIS

TOPICAL

DRUG	CONCENTRATION	DOSAGE
Cefazolin	50mg/ml	Hourly during day time
Gentamicin	15mg/ml	Two hourly during night
Natamycin	5%	
Corticosteroids (Predforte acetate)	1%	8TD
Atropine Sulphate	1%	BD

SYSTEMIC

Vancomycin	1gm IV 12th hourly
Cefazolin	1.5gm IV 6th hourly
Ceftriaxone	2gm IV 8th hourly

Ciprofloxacin	750mg 12th hourly
Chloramphenicol	1gm IV 8th hourly
Amikacin	240mg 8th hourly (15mg/kg/day)
Tobramycin	80mg 8th hourly (5mg/kg/day)

ANTIFUNGAL

Amphotericin B	0.7-1mg/kg/day (given slow IV over 2 to 6 hours)
Fluconazole	200mg/day in single or divided doses
Ketoconazole	400mg/day in dingle or divided doses
Flucytosine	50-100mg/kg/day
Voriconazole	6mg/kg BD for the 1st day followed by 4mg/kg BD as a maintenance dose

INTRAVITREAL ANTIBIOTICS AND ANTIFUNGALS

Vancomycin	1mg in 0.1ml
Amikacin	400ugm in 0.1ml
Voriconazole	50ugm in 0.1ml
Cefazolin	2.25mg in 0.1ml
Gentamycin	100ugm in 0.1ml
Amphotericin B	5ugm in 0.1ml

PREPARATION OF INTRAVITREAL INJECTIONS

DRUG	VIAL SIZE	DILUENT in ml	CONC in 1ml	ALIQUOT (ml)	FINAL conc/ml	INTRA VITREAL DOSAGE /0.1ml
Vancomycin	500mg powder	10	50mg	0.2ml	10mg	1mg
Cefazolin	500mg powder	2	250mg	0.1ml	22.5mg	2.25mg
Amikacin	100mg In 2ml		50mg	0.2ml Add 2.3ml	4mg	0.4mg
Gentamycin	80mg In 2ml		40mg	0.1ml Add 1.9ml	2mg	0.2mg
Voriconazole	200mg powder	20	10mg	1ml Add 9ml	1mg	0.1mg
AmphotericinB	50mg powder	10	0.5mg	0.1ml Add 9.9ml	0.05mg	5ugm
Dexamethasone	8mg In 2ml		4mg	0.1ml	0.4mg	0.4mg

SURGICAL MANAGEMENT IN ENDOPHTHALMITIS

The gold standard of treatment of acute post-operative endophthalmitis is immediate "complete" three port pars plana vitrectomy. Vitrectomy is technically more demanding, needs experience. Vitrectomy may be primary during acute infections to decrease the microbial load or secondary in the resolved stage for removal of membranes.

Indications:

- Visual acuity of perception of light at presentation
- Worsening of the clinical scenario after 48hours of treatment.
- Endophthalmitis associated with retained intraocular foreign body.
- Fungal endophthalmitis.
- Chronic endophthalmitis with remissions.
- Delayed vitrectomy once the infection has been controlled and with presence of multiple vitreous opacities and membranes.

Advantages:

- Decrease microbial load
- Decrease the amount of inflammatory mediators
- Better diffusion and penetration of antibiotics
- Provide good material for culture
- Removes media opacities
- Removes the vitreous scaffold for the formation of scar and vitreous membranes which could lead to tractional retinal detachment.

Disadvantages:

- Poor visualisation due to oedematous cornea, membranes or cheesy material stuck to the pupil.
- Iatrogenic retinal breaks or detachment while pulling the vitreous strands.
- Bleeding from conjunctival and episcleral vessels
- Associated choroidal detachment making placement of infusion cannula difficult.

STEPS:

Done under peribulbar or retrobulbar anaesthesia. The infusion port is inserted through the pars plana, 3.5mm from the limbus, but is not turned on. The vitreous cutter is inserted through a separate 3.5mm sclerotomy and directly visualised through the pupil. A hand-held syringe is attached to the aspirating line and fluid is aspirated whilst the surgeon activates the cutter until the eye visibly softens. The infusion is turned on to reform the globe and the cutter removed. The syringe and the tubing now contain 1-2ml of infected, undiluted vitreous are promptly sent to the laboratory for immediate Gram stain, culture and PCR analysis.

The vitreous cutter is now connected to the machine for aspiration control and a light pipe is inserted through the pars plana. A standard three-port vitrectomy is performed within the limits of visualisation. It is better to do a posterior capsulotomy with the cutter and aspirate the fibrin and pus from the anterior chamber and intraocular lens surface. This procedure not only improves visualisation but permits flow through the entire eye and facilitates recovery. Caution must be exercised against too aggressive surgery

Once the vitrectomy is as complete as possible, the intravitreal antibiotics are injected. The dose should be reduced by 50% if a full vitrectomy has been performed. This injection should be given slowly, the needle pointed away from the macula. The important points to be considered are use maximal cutting rate, minimal suction and never go very close to retina.

THREE PORT PARSPLANA VITRECTOMY

ENDOPHTHALMITIS VITRECTOMY STUDY (EVS)

EVS was a multicentric randomized clinical trial conducted in 420 patients who developed bacterial endophthalmitis within 6 weeks of cataract surgery.

PURPOSE

- To determine the role of initial pars plana vitrectomy in comparison to intravitreal injection alone in the management of postoperative bacterial endophthalmitis
- To determine the role of intravenous antibiotics in the management of bacterial endophthalmitis
- To determine which factors, other than treatment, predict outcome in post-operative bacterial endophthalmitis.

CONCLUSIONS:

- If initial vision is hand movements or better there was no difference in outcome between immediate vitrectomy and intravitreal antibiotics.
- If initial visual acuity is only PL then the visual outcome and media clarity was substantially better in the group undergoing initial vitrectomy than in patients receiving intravitreal antibiotics alone.
- No difference in final visual acuity or media clarity with or without systemic antibiotics.
- EVS identified 9 baseline risk factors of poor outcome. They included old age, diabetics, presence of corneal infiltrate, disrupted posterior capsule, low(<5mm) or high (>25mm)IOP, RAPD, rubeosis iridis, absent red reflex.

LIMITATIONS OF EVS:

- EVS included only acute postop endophthalmitis not the more aggressive post traumatic, bleb induced or endogenous endophthalmitis.

- 80% of the cases in EVS were due to coagulase negative staphylococci which responds to intravitreal antibiotics. So the conclusion was based on that. But in the clinical scenario with other bacteria like streptococci may need urgent vitrectomy in order to remove the highly inflammatory bacterial cell wall from the vitreous.
- EVS showed difference between the diabetic and nondiabetic. But the results were not statistically significant because of the less number of diabetic participants in the study.
- EVS didn't include the use of steroids in endophthalmitis. Revised EVS studies all recommend the use of steroids. Steroids serve as the main anti-inflammatory agent in endophthalmitis treatment. Systemic steroids should be administered to all patients after ruling out systemic contra indications. In those cases one dose of intra vitreal steroid can be used. Steroids are contraindicated in fungal endophthalmitis.

ESCRS, EUROPEAN SOCIETY OF CATARACT & REFRACTIVE SURGEONS STUDY IN ENDOPHTHALMITIS

The ESCRS study evaluated effects of an intracameral injection of Cefuroxime 1mg at the close of surgery and compared postoperative endophthalmitis rates with other study groups that included perioperative antibiotic drops, and control. ESCRS was a 2x2 factorial design in prospective, randomized fashion conducted in 16000 patients.

4 groups were allocated

Group A: no perioperative drops or injection

GroupB: placebo eye drops and intracameral 1mg Cefuroxime injection

Group C: topical Levofloxacin eye drops, no injection.

Group D: topical Levofloxacin with intracameral Cefuroxime.

RESULTS:

- The risk for contracting postoperative endophthalmitis was significantly reduced – 5 fold by an intracameral injection of 1mg cefuroxime at the close of surgery.
- Lowest incidence rate was observed in Group D
- 5.88 fold increase in risk of postoperative endophthalmitis in clear corneal incision compared to sclerocorneal tunnel.
- 3.13 fold increase in risk in use of silicon IOL compared to that of acrylic IOL.

RECOMMENDED PROPHYLAXIS FOR POST OPERATIVE ENDOPHTHALMITIS

It is very important to take meticulous precautions to ensure sterility and total asepsis at the time of surgery. As said prevention is always better than cure, strict aseptic precautions is the most important measure in controlling the occurrence of endophthalmitis.

Emphasis must be given to four key sources of contamination as

Patient Personnel Instruments Environment

It's a proven fact that the most common source of organisms in post-operative endophthalmitis is residual flora from the conjunctival sac. This encourages the habit of using antibiotics in the preoperative period. Ideally topical antibiotics must be applied for about 3 days preceding the surgery. As the incidence of endophthalmitis increases with uncontrolled diabetes and in presence of focal sepsis, care must be given to both in the pre-operative period. Syringing must be done in all patients before cataract surgery. In case of any purulent regurgitation, endonasal or external DCR or DCT must be performed.

Placing half strength of povidone iodine solution (5%) in the conjunctiva sac for a minimum of 3 minutes just before surgery, considerably decreases the bacterial load. There is an increased risk of carrying the residual flora into the posterior chamber while inserting the lens. The practice of using povidone iodine reduces that risk also. Povidone iodine has strong antibacterial, antifungal and antiviral properties.

Use of sub conjunctival and intracameral antibiotics[9] at the end of surgery considerably reduces the incidence of endophthalmitis.

SURGICAL ASEPSIS AND STERILIZATION

Word sepsis means "I putrefy"

Sterile surgical technique and asepsis remains the main pillar for protecting the eye as eyes are extremely delicate organs. Asepsis means rendering free of pathogenic organisms whereas sterilization means rendering free of all living organisms including both vegetative and spore form.

Asepsis of the operating room should be planned in such a way that it keeps the flow traffic only from clean areas to dirty ones and it should prevent cross contamination. Theatre should be in a blind wing with

controlled laminar air flow system. Outside air will be filtered and then circulated after moisturization with optimal humidity. Ideally every hour there should be 16 air exchanges.

Theatre sterilization should be done atleast once in a week. Usual method used is washing the floor with water followed by formalin vapour fumigation. Room should be then closed for 6 hours followed by carbolisation with 2% carbolic acid. The other method is to use Aldekol mixture (6% gluteraldehyde +6% formaldehyde +5% benzalkonium chloride). Room should be closed for 2 hours. It's a faster method of sterilization.

PERSONNEL AND THEATRE ASPECTS

As these cannot be sterilized, personnel remain the greatest source of contamination. Dress code should be strictly maintained. It includes laundered dress, a disposable cap that covers all the scalp hair and a face mask (high filtration 95%) that completely covering the nose and mouth.

RECOMMENDED WAY OF SURGICAL HANDWASHING[31]

- All jewellery must be removed before washing
- Wash hands and arms with an antimicrobial soap in luke warm water.
- First clean subungual areas
- Scrub each side of each finger, between the fingers, and the back and front of the hand for two minutes. Start timing.
- Followed by scrubbing of the arms, keeping the hand higher than the arm at all times. This prevents bacteria-laden soap and water from contaminating the hand.
- Wash each side of the arm to three inches above the elbow for one minute.
- Repeat the process on the other hand and arm. If the hand touches anything and becoming unsterile, the scrub must be lengthened by one minute for the area that has been contaminated.
- Rinse hands and arms with water passing only in one direction only, from fingertips to elbow. Proceed to the operating room holding hands above elbows.

- During the scrub, care should be taken not to splash water onto surgical attire.
- Once entering the operating room, hands and arms should be dried using a sterile towel in aseptic technique.

DON'T'S IN THEATRE STERILISATION

- Rushing through surgical scrubbing.
- Preparing the trolley by an unsterile person with chittle forceps.
- Continuing surgery in a doubtful sterile technique.
- Preparing the trolley long before the need.
- Wearing a cap that not fully covering the scalp hair.
- Wearing a mask that not covering nose and mouth.
- Throwing blood contaminated substances into theatre floor.
- Scrubbed persons keeping their hands folded.

RECOMMENDED PROPHYLACTIC MEASURES

Pre-Operative

- Preoperative assessment of the patient for all risk factors such as diabetes, focal sepsis.
- Syringing for all cataract patients.
- Treatment of eyelid infections.
- Controlling of all systemic infections.
- Prophylactic topical antibiotic therapy atleast 24 hours prior to the surgery.

Intra-Operative

- Sterile draping to exclude eyelashes and lids from the field of operation.
- Using an adhesive such as opsite.
- 5%povidone iodine to paint the ocular and periocular surfaces. Half the strength is applied inside the palpebral conjunctiva and allowed to be in place for minimum 3 minutes before washing.
- Flushing the IOL with sterile water before insertion.
- Minimize the duration of IOL exposure prior to insertion.

- In case of any PC rent and vitreous loss, vitreous must be cleared from the AC and sutures must be applied.
- Careful wound closure. There should not be exposure of the sclerocorneal tunnel. Always cover it with conjunctiva.
- Intracameral injection of antibiotic at the end of surgery.

Post-Operative

- Appropriate use of postop antibiotics and steroid combination.
- Careful follow up.
- Suture removal under strict aseptic precautions.
- Creating awareness in the patients that in any case of pain or decreased vision seek the help of an ophthalmologist immediately.

Part II

AIM OF THE STUDY

- To evaluate the clinical presentations and assess visual outcomes of Endophthalmitis.
- To evaluate the various etiological factors and predisposing factors leading on to endophthalmitis.
- To assess the clinical presentation in different types of endophthalmitis.
- Whether the treatment is controlling or eradicating the infection and giving symptomatic relief to the patient.
- Whether the treatment is preventing secondary complications such as panophthalmitis.
- To assess efficacy and visual outcome after medical and surgical intervention (including intravitreal antibiotics and PPV).

METHODOLOGY:

PATIENT SELECTION**:** All cases (including referred cases from outside) attending the ophthal department with typical signs and symptoms of endophthalmitis during the study period October 2013 to August 2014 were registered, evaluated, managed and followed up.

INCLUSION CRITERIA**:** A series of 50 patients with typical symptoms and signs of endophthalmitis such as loss of vision, anterior segment and posterior segment findings which was confirmed with an Ultrasound report (B Scan). Both genders were included. Age was not as a part of this study.

EXCLUSION CRITERIA:

- Patients who were unwilling to undergo interventional therapy.
- Patients who lost for follow up.

MATERIALS AND METHODS

For all 50 patients included in the study, a detailed history was taken with special emphasis on the mode of insult including intraocular surgeries, trauma, focal sepsis and systemic diseases. All patients included in the study were evaluated first by measuring the visual acuity using Snellen's chart. Anterior segment was thoroughly examined by slit lamp biomicroscopy. Posterior segment was examined with indirect ophthalmoscope. Vitritis grading was done for all the patients. Ultrasound (B scan) was done for all patients to confirm the diagnosis, to rule out intra ocular foreign body and to rule out associated choroidal or retinal detachment.

All basic necessary investigations such as random blood sugar, blood pressure, complete hemogram, X-ray orbit was done. General examination with special emphasis to rule out septic foci such as dental caries, dacryocystitis were also done. Vitreous tap was taken from all the patients and was subjected for grams stain, KOH stain and culture and sensitivity.

METHODS OF COLLECTING SPECIMEN:

Under topical anaesthesia, 5% povidone iodine is instilled into the eye and washed. Speculum is inserted. Using a 26G needle attached to tuberculin syringe, the site of insertion is marked on the superotemporal aspect of sclera 3mm (aphakic) 3.5mm (pseudophakic) 4mm (phakic) from the limbus.0.2ml of fluid is aspirated. The syringe is capped and labelled and sent to the lab immediately.

TREATMENT PROTOCOL:

Treatment decision was based on the visual acuity at the time of presentation. For all cases of endophthalmitis (early or late postop and traumatic endophthalmitis) with visual acuity of hand movements or better was treated with intravitreal antibiotics. The possibility of choroidal detachment which is a contraindication for intravitreal drugs was ruled out by taking Bscan. The choice of antibiotics Vancomycin 1mg in 0.1ml and Amikacin 400 ugm in 0.1ml, given as early as possible after taking the vitreous tap. The vitreous sample will be sent for culture and sensitivity results. In case of any post-

operative wound dehiscence, wound repair was done. If associated with iris tissue prolapse, iris abscission with wound suturing was performed.

All cases were treated as inpatients. Simultaneously systemic antibiotics and topical antibiotics were given. The choice of topical antibiotic was broad spectrum 0.5% Moxifloxacin hourly. Cycloplegics such as 1% atropine eye drops BD or Cyclopentolate eye drops TDS was also given. Systemic steroids were given to all patients (T.Prednisolone 1mg/kg/body weight OD) after ruling out systemic contraindications such as diabetes and hypertension. In such situations, intravitreal Dexamethasone of 400ugm in 0.1ml was given. But in suspicion of fungal endophthalmitis, both systemic and intravitreal steroids were avoided.

Culture and sensitivity reports are collected after 48 hours. In case of any strong suspicion of fungal endophthalmitis or culture showing fungal growth intravitreal Voriconazole 50ugm in 0.1ml was given. Systemic T. Ketoconazole 400mg was given for 14 days duration.

In case of any improvement in the visual acuity or symptoms or signs repeat intravitreal antibiotics were given in selected patients at an

interval of 72 hours. Maximum 3 doses were given. Those cases of worsening of signs or visual acuity were proceeded with core vitrectomy.

All cases of endophthalmitis with vision of perception of light were treated with core vitrectomy, if the onset was acute or visualisation of the vitreous cavity was present. Other cases were treated with intravitreal antibiotics for the containment of the infection. Uncontrolled infections with no perception of light were given the option of evisceration with systemic antibiotics.

OBSERVATION AND DISCUSSION

The clinical study on endophthalmitis was conducted at the Regional Institute of Ophthalmology, Government Ophthalmic Hospital, Chennai. 50 cases were studied over a period of eleven months. Out of 50 patients included in the study 24 cases were from our institute and 26 cases were referred from other hospitals. The various observations in our study are discussed below.

OCCURRENCE OF VARIOUS FORMS OF ENDOPHTHALMITIS

Among the 50 cases, 25 cases (50%) were postoperative, 22cases (44%) were post traumatic, 2 cases (4%) were secondary to perforated corneal ulcer and 1 case (2%) was endogenous endophthalmitis.

Post-Operative	Post Traumatic	Perforated Ulcer	Endogenous
25 (50%)	22 (44%)	2 (4%)	1 (2%)

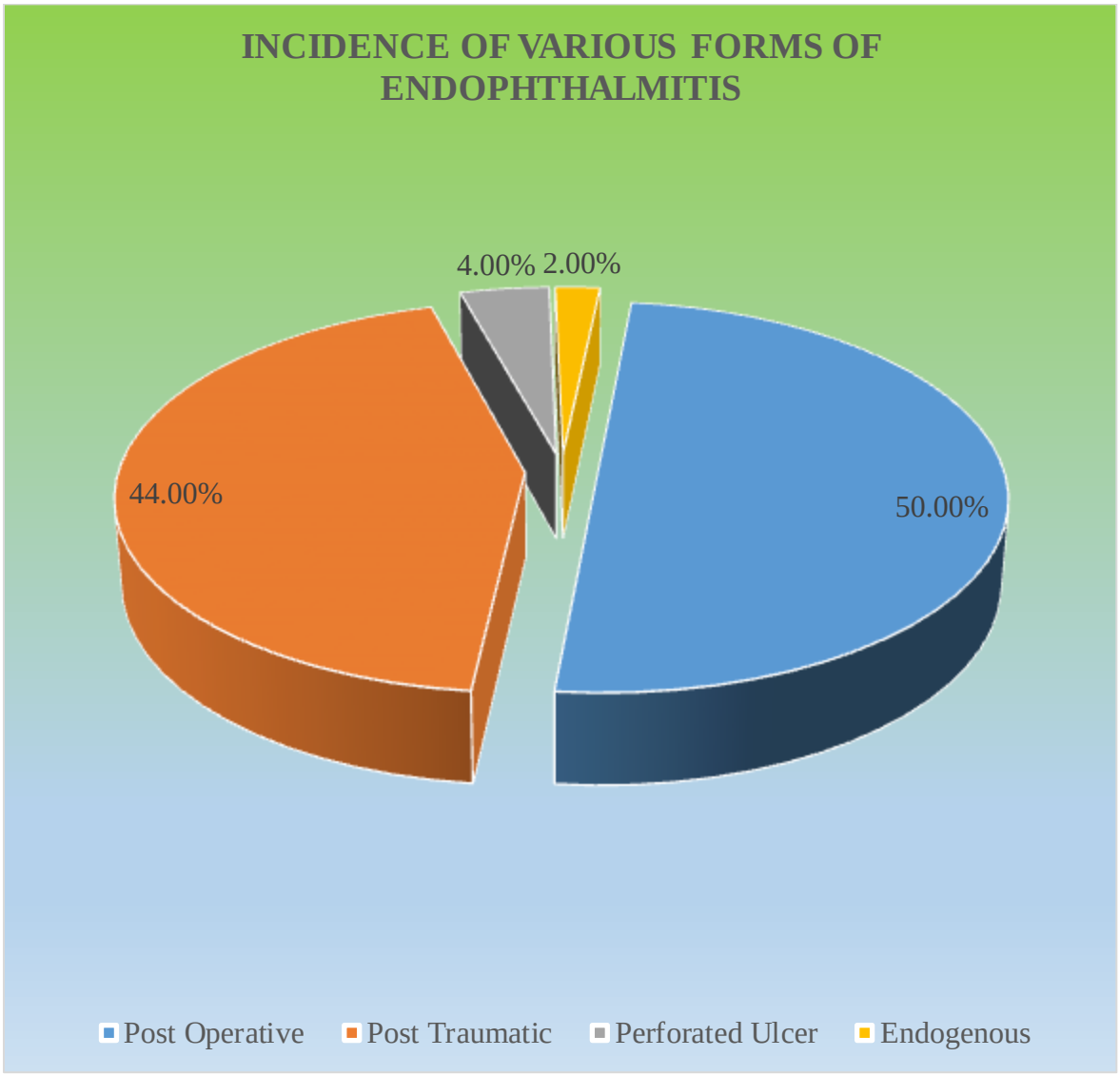
POST OPERATIVE ENDOPHTHALMITIS

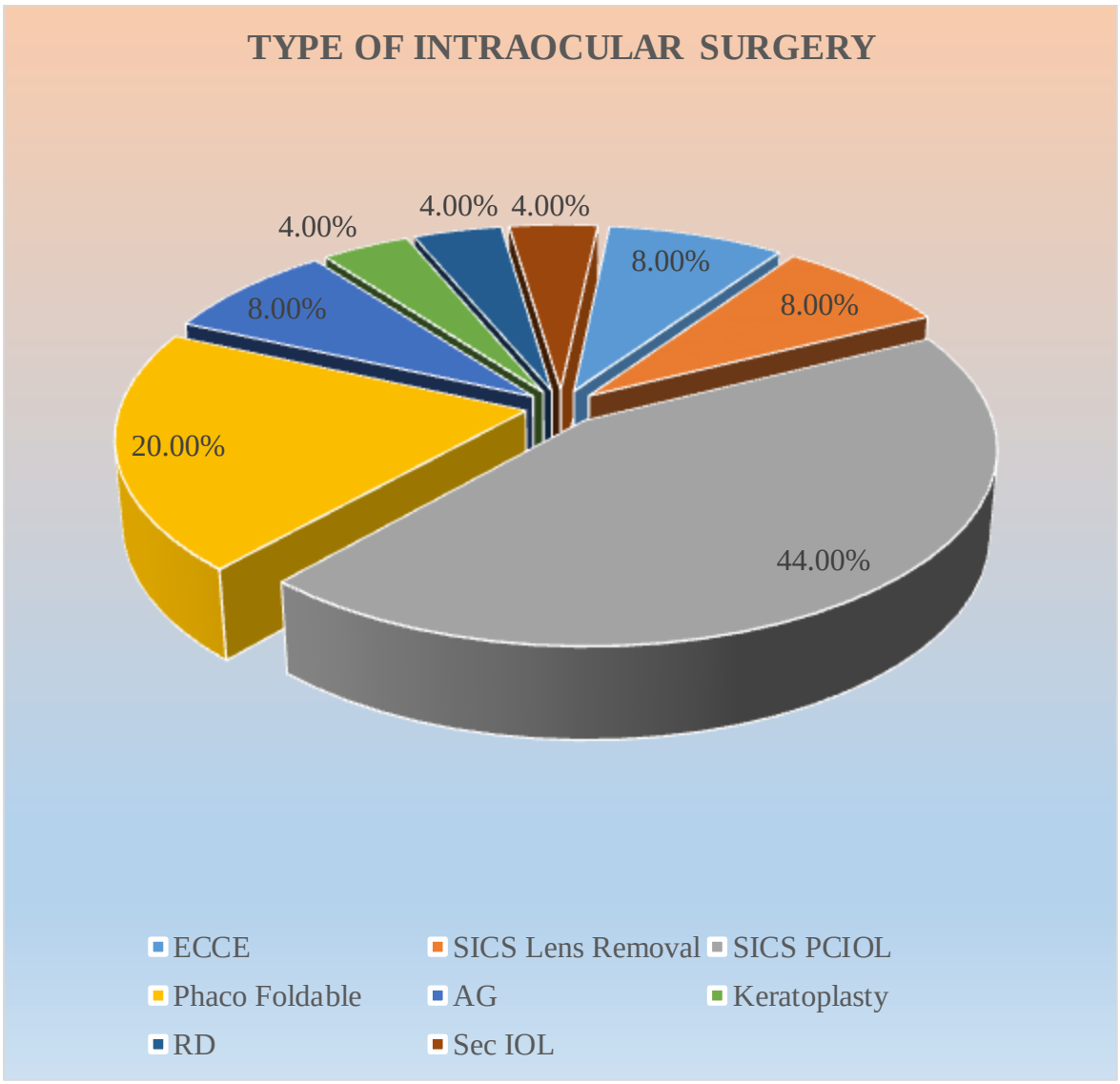
Out of the 25 post-operative cases, 14 cases were referred from outside. 44%of the cases were following SICS with PCIOL. Out of 25 cases PC rent was documented in 8 cases. Out of the 5 Phaco cases, 2 cases were clear corneal sutureless incision.

ECCE	SICS Lens Removal	SICS PCIOL	Phaco Foldable	AG	Keratoplasty	RD	Sec IOL
2 (8%)	2 (8%)	11 (44%)	5 (20%)	2 (8%)	1 (4%)	1 (4%)	1 (4%)

POST TRAUMATIC ENDOPHTHALMITIS

Of the 22 cases of endophthalmitis following penetrating ocular trauma, 6 cases followed injury with metal rod, 5 cases following road traffic accident, 5 cases following injury with stick, 3 cases following injury with plastic rod, 2cases following injury with cardboard box and 1 case following fish hook injury. 2 cases were associated with retained intra ocular foreign body (IOFB).


INCIDENCE OF VARIOUS FORMS OF ENDOPHTHALMITIS
4.00%
2.00%
44.00%
50.00%
Post Operative
Post Traumatic
Perforated Ulcer
Endogenous


TYPE OF INTRAOCULAR SURGERY
4.00%
4.00%
4.00%
8.00%
8.00%
8.00%
20.00%
44.00%
ECCE
SICS Lens Removal
SICS PCIOL
Phaco Foldable
AG
Keratoplasty
RD
Sec IOL

MODE OF PRESENTATION

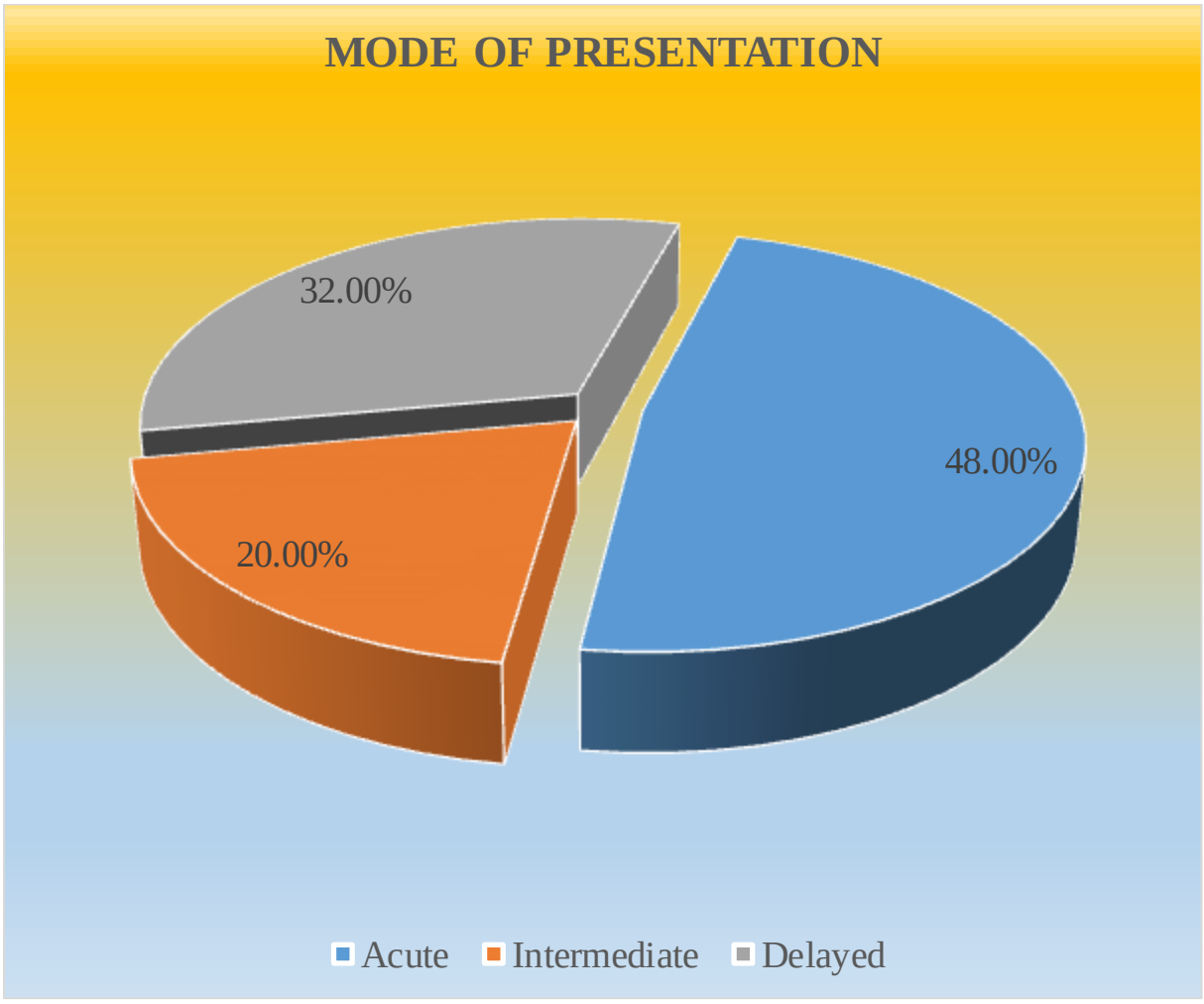
Acute	Intermediate	Delayed
24 (48%)	10 (20%)	16 (32%)

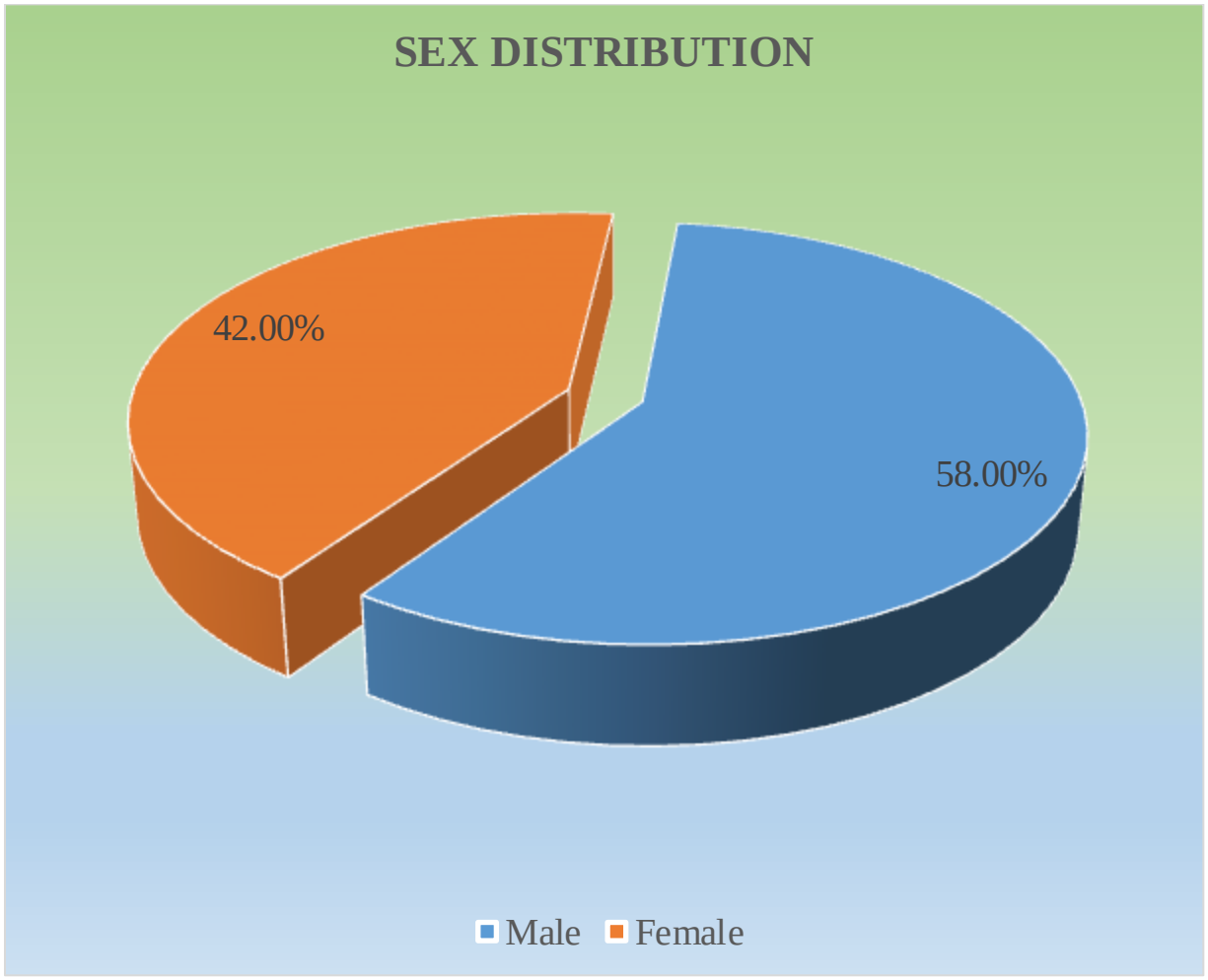
2 cases with fulminant onset was associated with Pseudomonas infection. Majority of the acute onset endophthalmitis was associated with Staph. Epidermidis.

SEX DISTRIBUTION

Male	Female
29 (58%)	21 (42%)

There was a slight preponderance in the incidence of endophthalmitis in males. 58% as compared to females (42%)

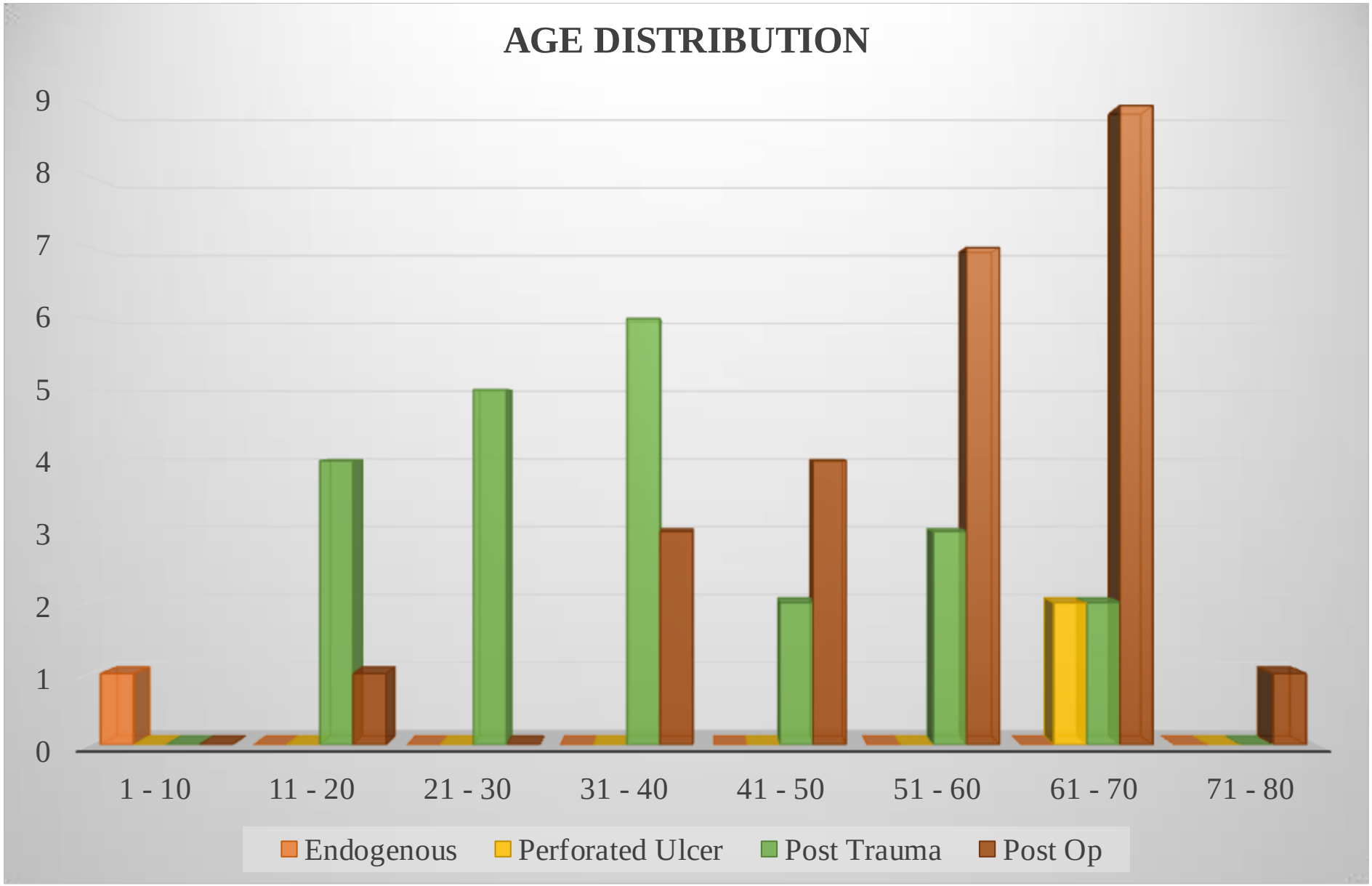

MODE OF PRESENTATION
32.00%
48.00%
20.00%
Acute
Intermediate
Delayed


SEX DISTRIBUTION
42.00%
58.00%
Male
Female

AGE DISTRIBUTION

Age	Endogenous	Perforated Ulcer	Post Trauma	Post Op
1 - 10	1	-	-	-
11 - 20	-	-	4	1
21 - 30	-	-	5	-
31 - 40	-	-	6	3
41 - 50	-	-	2	4
51 - 60	-	-	3	7
61 - 70	-	2	2	9
71 - 80	-	-	-	1

- Only one case of endogenous endophthalmitis was reported and the age was less than 10 years. 2 cases of perforated corneal ulcer came under the age group between 61 and 70.
- The incidence of post-traumatic endophthalmitis was more common in age group less than 40 years.
- Maximum age incidence of post-operative endophthalmitis was between 51 and 70, which is the most common age group undergoing cataract surgery.


AGE DISTRIBUTION
9
8
7
6
5
4
3
2
1
0
1 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
Endogenous
Perforated Ulcer
Post Trauma
Post Op

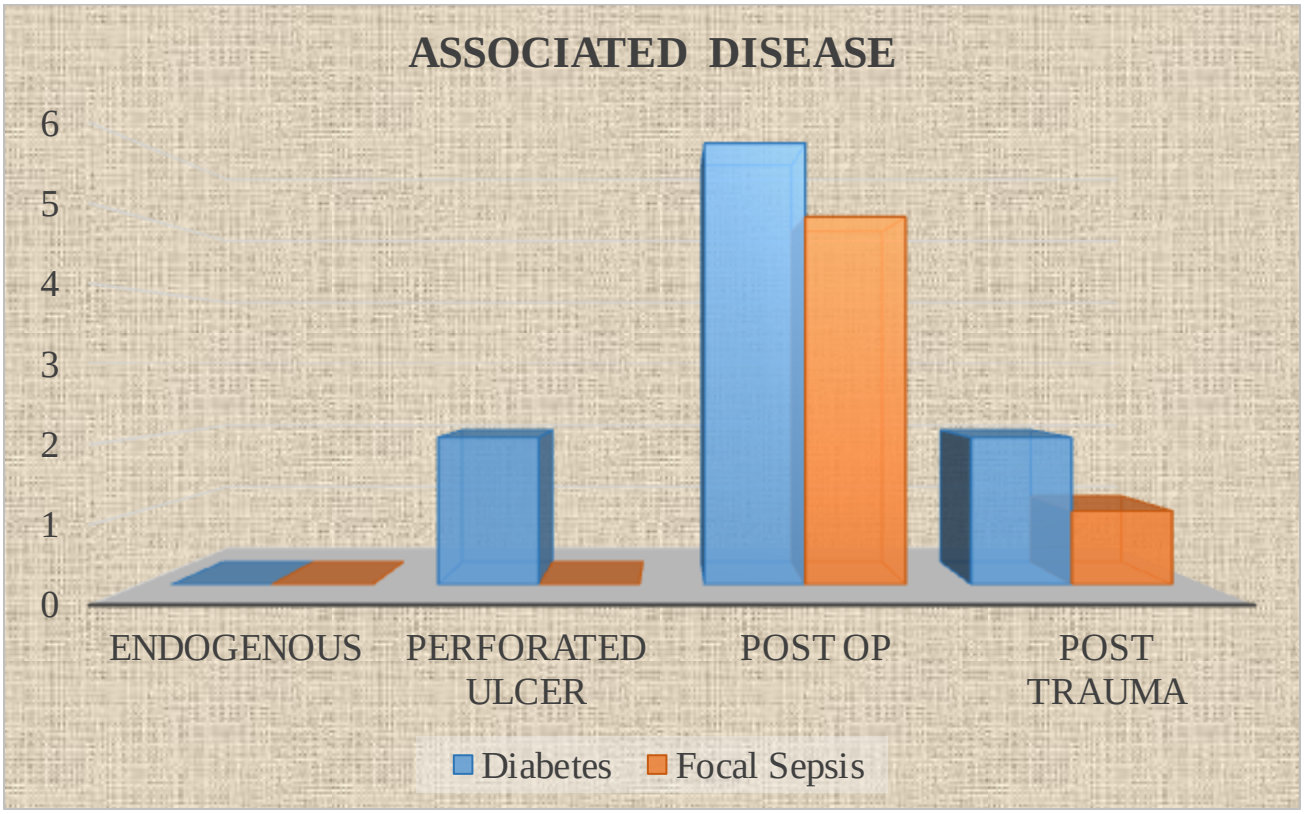
ASSOSIATED DISEASE

Type	Diabetes	Focal Sepsis
Endogenous	0	0
Perforated Ulcer	2	0
Post Op	6	5
Post Trauma	2	1

Out of 50 cases, 10 cases had Diabetes mellitus. 6 patients were known cases of diabetes on treatment. 3 cases had uncontrolled hyperglycemia. Out of the 4 eviscerated cases, 3 cases had diabetes. Pre-existing diabetes is not been confirmed as an isolated risk factor for post-op endophthalmitis. According to EVS, endophthalmitis in diabetics is caused more often by Gram-negative organisms; our study also showed the same finding. In the EVS, endophthalmitis patients with diabetes benefited from vitrectomy when their initial vision was better than light perception. In our study one patient with diabetes underwent core vitrectomy improved vision from HM to 6/18.

Septic focus was found in 6 patients (5 Post-Operative and 1 Post Traumatic Endophthalmitis). 2 patients had sinus infection, diagnosis

confirmed by X RAY paranasal sinuses. 2 patients had associated dacryocystitis who later underwent DCT. 2 patients had caries tooth.



SMEAR REPORT

Sample	Grams Stain			KOH Stain	Smear Positivity
	GPC	GNB	GPB		
Vitreous	8	2	1	4	14

CULTURE REPORT

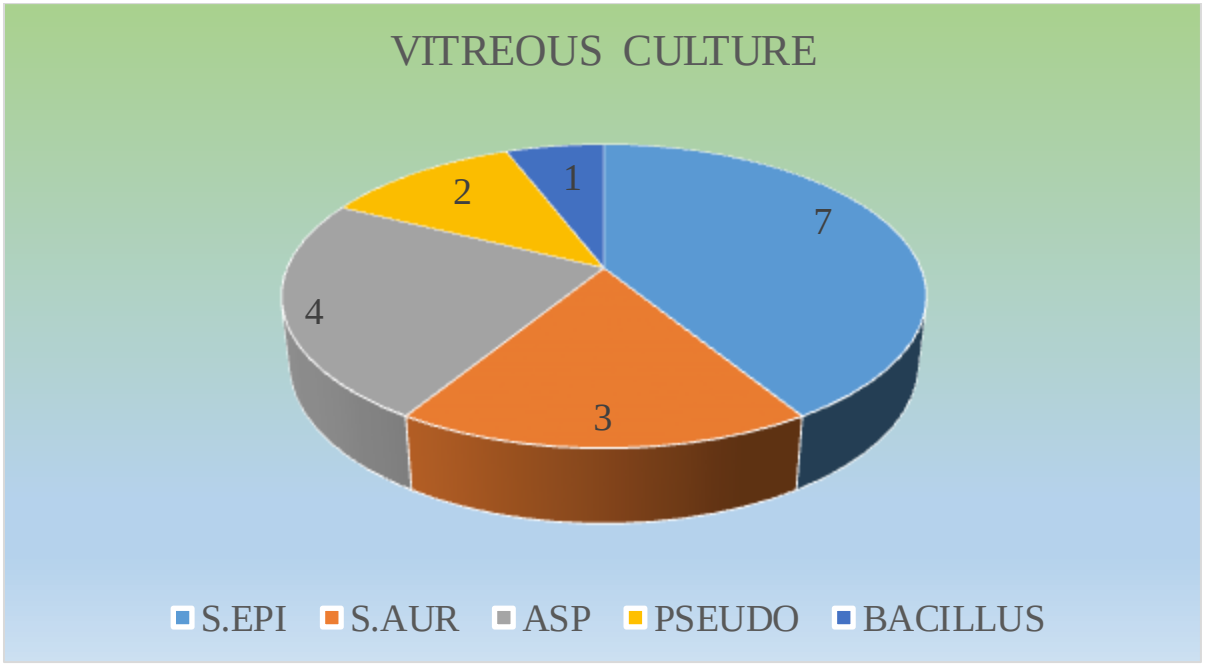
Sample	S.EPI	S.AUR	ASP	PSEUDO	BACILLUS
Vitreous	7	3	4	2	1

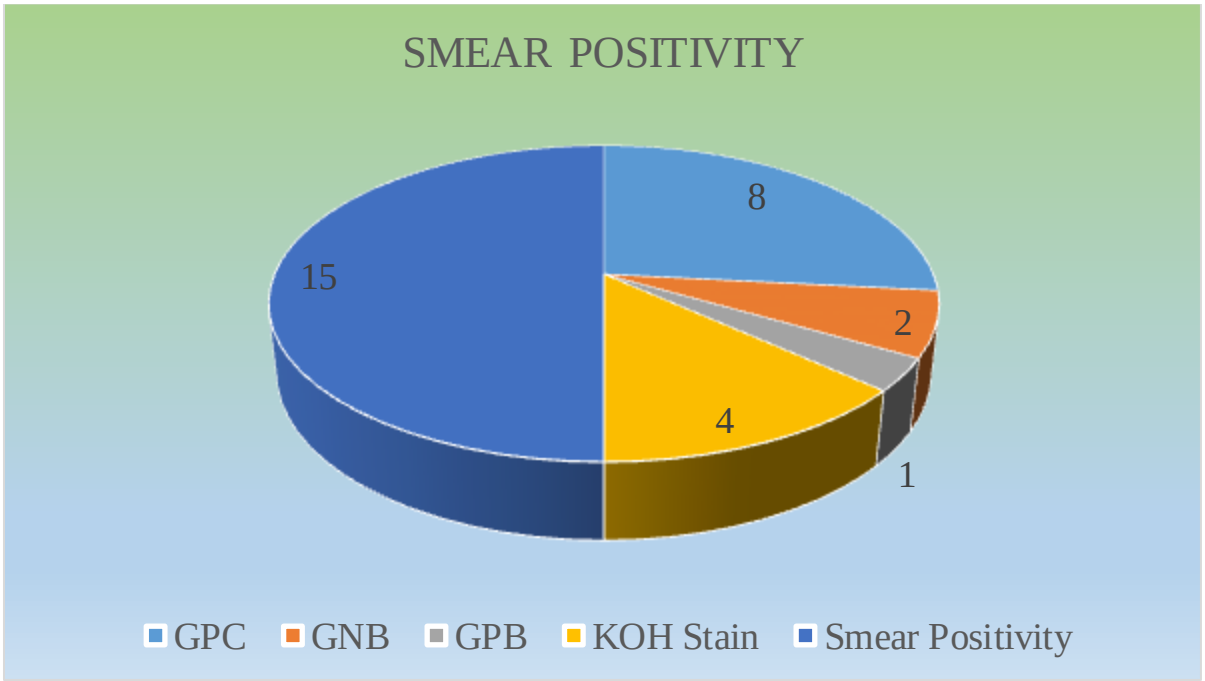
17 cases out of 50 showed culture positive results. (34%) Staphylococcus Epidermidis was the most common isolated organism.

From 3 cases, Staphylococcus Aureus was isolated. Aspergillus was cultured from 3 cases. Pseudomonas from 2 cases and Bacillus species from one case.

14 cases showed smear positivity reports. All 4 aspergillus cases were KOH smear positive.

Vitreous culture and sensitivity was found to be more specific and sensitive compared to vitreous smear positivity.


VITREOUS CULTURE
1
2
7
4
3
S.EPI
S.AUR
ASP
PSEUDO
BACILLUS


SMEAR POSITIVITY
8
15
2
4
1
GPC
GNB
GPB
KOH Stain
Smear Positivity

VISUAL RECOVERY FOLOWING MANAGEMENT

VISUAL RECOVERY IN VARIOUS MODES OF ENDOPHTHALMITIS

Visual Acuity	Endogenous		Perforated Ulcer		Post-Operative		Post Traumatic	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
NO PL	1	1	1	-	8	6	8	7
PL+	-	-	1	1	5	3	7	3
HM	-	-	-	-	6	4	4	2
CFCF	-	-	-	-	2	1	2	2
1/60	-	-	-	-	2	1	1	1
2/60 - 6/60	-	-	-	-	2	6	-	5
>6/60	-	-	-	-	-	3	-	1

VISUAL RECOVERY IN COMPARISON WITH INITIAL VISUAL ACUITY

VA at Presentation	Total Patients	EVIS	NIL Improvement	Visual Recovery (VR)		
				Poor	Satisfactory	Good
NO PL	17	4	13	-	-	-
PL+	13	-	7	3	2	1
HM	11	-	3	2	5	1
CFCF	4	-	1	1	2	-
1/60	3	-	-	-	2	1
> 1/60 < 6/60	2	-	-	-	1	1
> 6/60	-	-	-	-	-	-

34% (17) of the endophthalmitis cases presented with no perception of light. 4 of the patient had uncontrolled spreading infection. Infected eye was eviscerated in fear of complications as panophthalmitis. The other 13 patients were given atleast one dose of intravitreal antibiotics. The same resulted in containment and non-progression of the infection. But these group showed no visual improvement with intravitreal antibiotics.

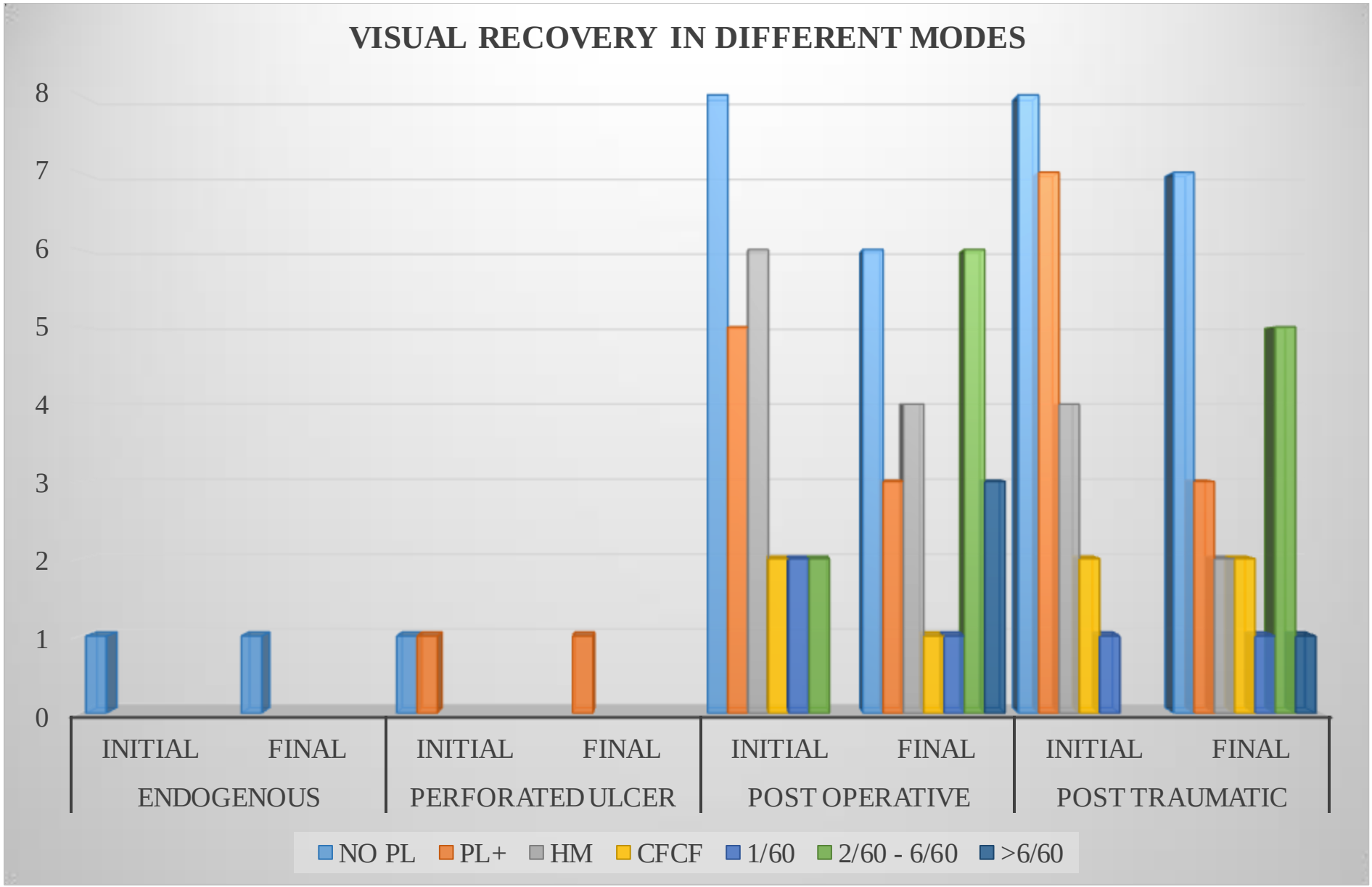
26% (13) of the cases presented with vision of perception of light. Of those, 6 patients underwent core vitrectomy. All 13 patients were treated with intravitreal antibiotics. 7 patients out of 13 (54%) showed no improvement in the vision. 3 patients showed poor visual recovery. (<=1/60) 2 patients showed satisfactory visual recovery (2/60- 6/60). And 1 patient got good visual recovery who regained vision upto 6/36.

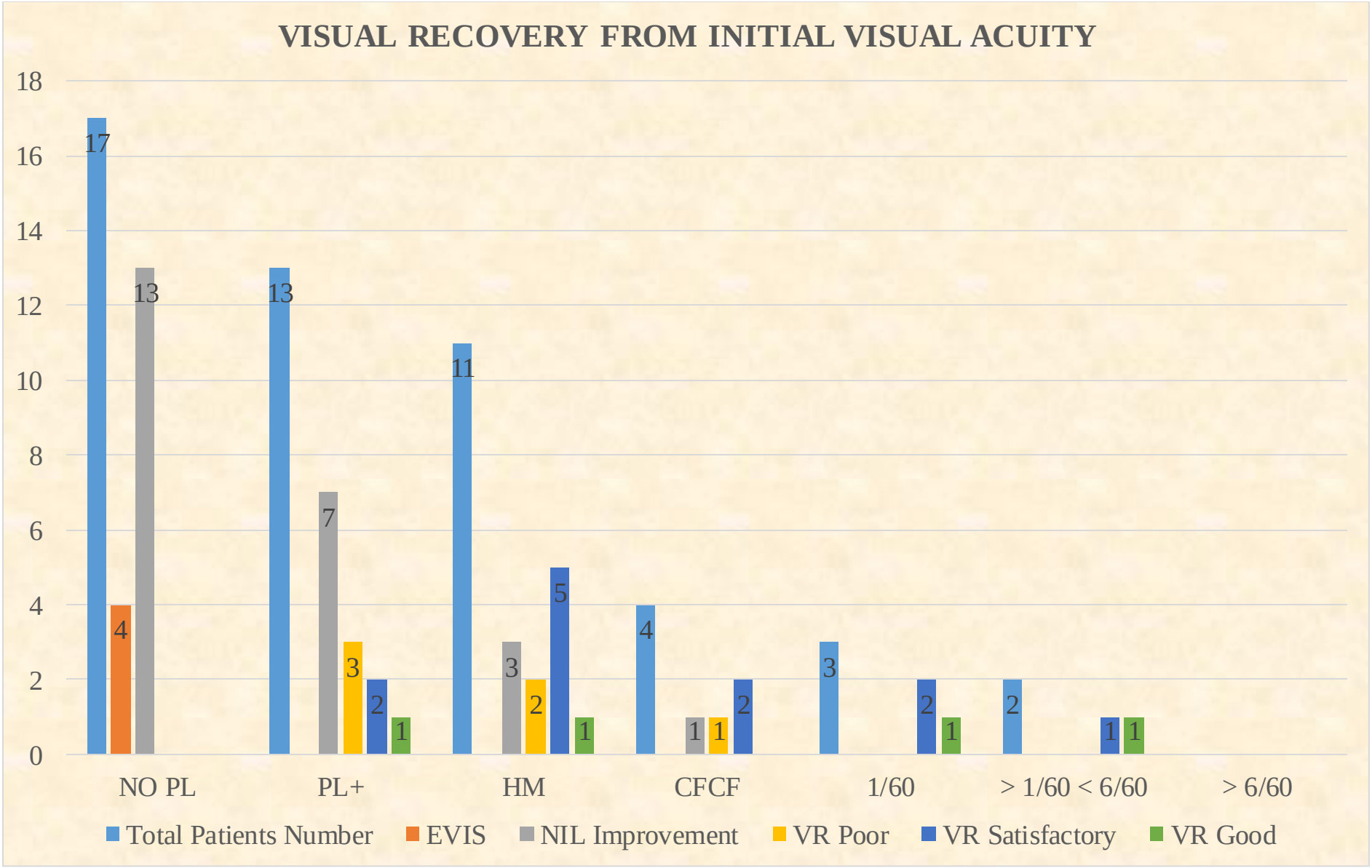
22% (11) patients presented with vision of hand movements. All patients were treated with intravitreal antibiotics. Of which 2 had poor visual recovery, 5 with satisfactory visual recovery and 1 with good visual recovery.

8% (4) cases presented with vision of counting finger close to face. Of that 2 had satisfactory and 1 had poor visual recovery.

Only 10% of the cases presented with vision >1/60. Of which 60% had satisfactory visual recovery and 40% had good visual recovery following intravitreal antibiotics.

Patients who had better visual acuity at the time of presentation, final visual acuity was also better. Patients who presented relatively late (more than 1 week) of having the symptoms had poor visual outcome. The patients who had dense vitritis also had poor visual outcome. Those patients with positive culture and infection with highly virulent organisms had poor visual outcome. 2 patients with fungal infection with aspergillus were found to resistant to treatment and was associated with very poor visual outcome.


VISUAL RECOVERY IN DIFFERENT MODES
8
7
6
5
4
3
2
1
0
INITIAL
FINAL
ENDOGENOUS
INITIAL
FINAL
PERFORATED ULCER
INITIAL
FINAL
POST OPERATIVE
INITIAL
FINAL
POST TRAUMATIC
NO PL
PL+
HM
CFCF
1/60
2/60 - 6/60
>6/60


VISUAL RECOVERY FROM INITIAL VISUAL ACUITY
18
16
14
12
10
8
6
4
2
0
17
4
13
13
7
3
2
1
11
3
2
5
1
4
1
1
2
3
2
1
2
1
1
NO PL
PL+
HM
CFCF
1/60
> 1/60 < 6/60
> 6/60
Total Patients Number
EVIS
NIL Improvement
VR Poor
VR Satisfactory
VR Good

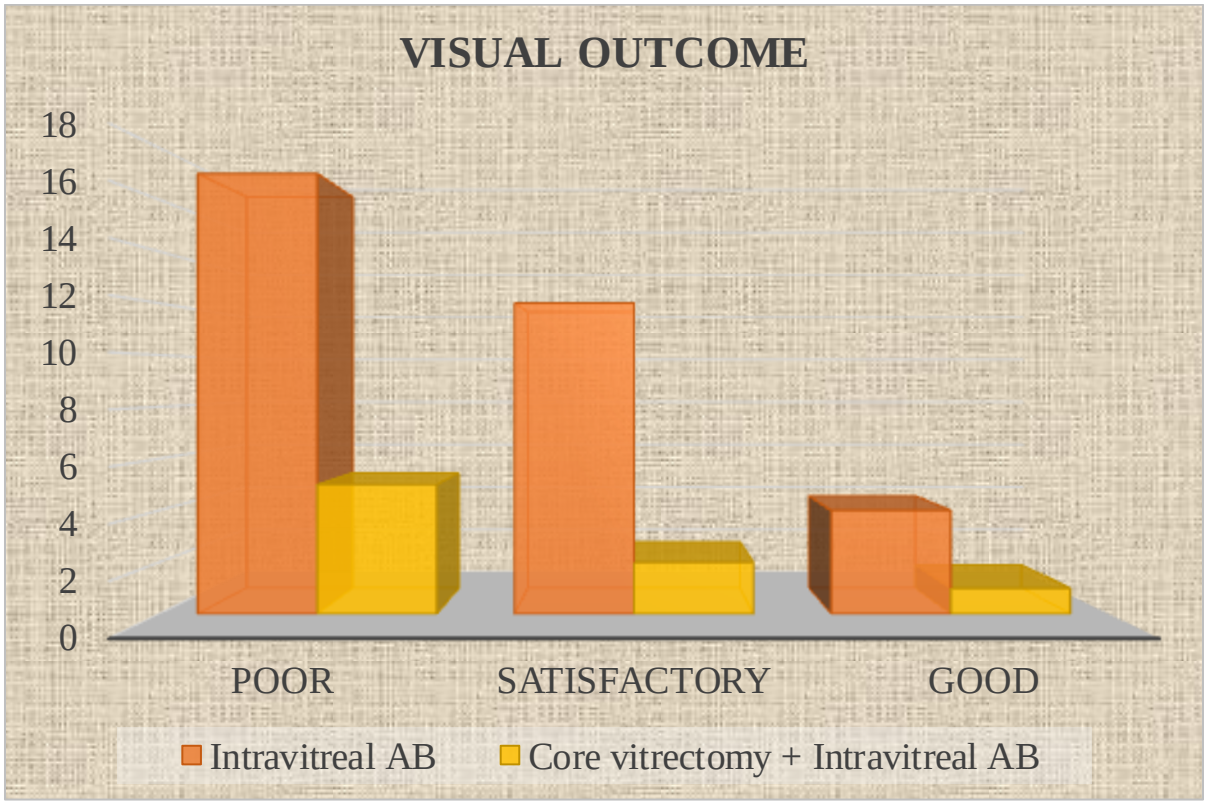
VISUAL OUTCOME AFTER MEDICAL AND SURGICAL THERAPY

Visual Outcome	Intravitreal AB	Core vitrectomy + Intravitreal AB
Poor	17	5
Satisfactory	12	2
Good	4	1

Out of 50 patients, 49 patients were given intravitreal antibiotics. One patient had uncontrolled spreading infection which was eviscerated immediately. All patients had symptomatic improvement. But the visual outcome was unpredictable. 13 patients had no perception of light. 1 patient had poor visual recovery. 12 patients had satisfactory recovery and 4 patients had good visual recovery.

8 patients underwent core vitrectomy. All patients were given intravitreal antibiotics also. The major criterion to select for the procedure was visualisation of the vitreous cavity and the perception of light at the time of presentation. Of which 5 patients had poor visual recovery, 2 had satisfactory and 1 had good visual recovery.

One patient with vision of hand movements also underwent core vitrectomy who regained his vision up to 6/18.



SUMMARY

- Out of the 50 cases of endophthalmitis included in our study, 24 cases were from our institution. 26 cases were referred from other hospitals.
- Four different entity of endophthalmitis were included in the study namely post-operative, post traumatic, perforated corneal ulcer (with no history of ocular trauma) and endogenous endophthalmitis.
- Post-operative endophthalmitis was more common after small incision cataract surgery.
- (50%) were postoperative, (44%) were post traumatic, (4%) were secondary to perforated corneal ulcer and (2%) was endogenous endophthalmitis.
- Post-operative endophthalmitis was more common after small incision cataract surgery (44%) followed by phacoemulsification cataract surgery (20%).

- PC Rent with vitreous loss was documented in 32% of the cases which is a strong risk factor for the development of endophthalmitis.
- 3 out of 5 Phaco surgeries were associated with clear corneal sutureless incision. The same is a risk factor for the development of endophthalmitis.
- 44% of the cases were secondary to post trauma. Majority of the cases were associated with injury in a contaminated environment such as road traffic accident.
- There was a slight preponderance in the incidence of endophthalmitis in males. 58% as compared to females (42%).
- 48% of the cases had acute onset endophthalmitis. 10% intermediate onset and 32% presented with delayed onset endophthalmitis.
- All postop endophthalmitis cases secondary to Anti glaucoma surgery, Penetrating Keratoplasty, internal RD surgery (other than cataract surgery) had delayed onset endophthalmitis.
- 62% of the post traumatic cases presented with acute onset endophthalmitis.

- The incidence of post-traumatic endophthalmitis was most common in age group less than 40 years.
- Maximum incidence of post-operative endophthalmitis was between 51 and 70 years, which is the most common age group undergoing cataract surgery.
- There was an increased incidence of endophthalmitis in association with systemic diseases as diabetes mellitus. 20% had diabetes.
- 12 % of the cases were associated with focal sepsis.
- 34% of the cases were culture positive.
- The most common organism isolated was gram positive cocci Staphylococcus Epidermidis (coagulase negative staphylococci).
- 4 cases were associated with Aspergillus species (2 cases Post-Operative and 2 cases Post Traumatic of which 1 patient had retained intraocular foreign body). All the cases were highly resistant to treatment.
- Vitreous culture and sensitivity was found to be more specific and sensitive compared to vitreous smear positivity.

- Culture positivity was associated with poor treatment outcome and poor visual recovery.
- Ultrasound (Bscan) confirmed the diagnosis in all cases. B scan also aided in ruling out associated pathologies such as choroidal detachment. Retained intra ocular foreign body was picked up in2 cases.
- 4 patients underwent evisceration was associated with highly virulent organisms such as pseudomonas and aspergillus.
- Patients who had better visual acuity at the time of presentation, final visual acuity was also better.
- Patients who presented relatively late (more than 1 week) of having the symptoms had poor visual outcome.
- The patients who had dense vitritis of grade 1V or V had poor visual outcome.
- Systemic steroids were found to give symptomatic improvement in the patients.
- Intravitreal antibiotics helped in containment of the infection to a limit even though the visual recovery was highly unpredictable.

- 8 patients underwent core vitrectomy. Of which 5 patients had poor visual recovery, 2 had satisfactory and 1 had good visual recovery.
- Visual recovery is highly variable in cases of endophthalmitis.
- 24% of the total cases had satisfactory visual recovery and 8% of cases had good visual recovery.
- Post-operative endophthalmitis patients had better prognosis than other categories of endophthalmitis.
- The more the duration between the onset of symptoms and the initiation of the treatment, poorer the visual outcome.

CONCLUSION AND RECOMMENDATIONS

Even in this era of recent advances and technologies, endophthalmitis still remain as a devastating complication of intraocular surgeries and ocular trauma. Post-operative endophthalmitis remains the most common followed by post traumatic endophthalmitis. Incidence of endogenous endophthalmitis have considerably decreased.

Gram positive organisms are the most common isolate in culture. The incidence of fungal endophthalmitis have slightly increased and are found to be more resistant to treatment.

Patients who had better visual acuity at the time of presentation, final visual acuity was also better. Patients who presented relatively late (more than 1 week) of having the symptoms had poor visual outcome. The patients who had dense vitritis is associated with poor visual recovery. Those patients with positive culture and infection with highly virulent organisms had poor visual outcome.

Post-operative endophthalmitis patients had better prognosis than other categories of endophthalmitis. The more the duration between the onset of symptoms and the initiation of the treatment, poorer the visual outcome.

Systemic diseases such as diabetes mellitus, focal sepsis were associated with an increased incidence of endophthalmitis.

Intravitreal antibiotics stay as the first choice therapy in all forms of endophthalmitis. Core vitrectomy needs skill and experience. But is the gold standard as it removes the bacterial load toxins and helps in clearing the ocular media allowing a rapid recovery.

Ultrasound Bscan is an excellent aid in confirming the diagnosis as well as complications. Even though a rapid destroying infection endophthalmitis can be controlled if the patient presents soon after developing the signs and symptoms and is rapidly intervened with intravitreal antibiotics. The visual recovery is highly unpredictable in all endophthalmitis cases.

RECOMMENDATIONS:

- Careful and thorough pre-operative assessment of the patients posted for cataract surgery should be done.
- Special emphasis must be given to control the diabetic status and focal infection.
- Strict aseptic precautions throughout the surgery should be maintained by the doctors and theatre staff.
- In case of any intraoperative complication, documentation is must especially in referrals.
- All postoperative patients must use a topical steroid antibiotic combination.
- Early medical intervention should be the protocol in endophthalmitis.
- In case of suspicion of endophthalmitis urgent referral is recommended if there is no provision for intravitreal antibiotics.
- Or else one dose of intravitreal antibiotic and referral to higher institutions are recommended.

- Systemic steroids are recommended for all patients after ruling out other contraindications.
- Bscan before intravitreal antibiotics is recommended to confirm diagnosis and to rule out other complications.
- Prophylactic antibiotic therapy is recommended in all post traumatic patients.
- Careful follow-up of the patients should be done.

Part III

Annexure

PROFORMA

NAME:	AGE:	SEX:	ADDRESS:
SYMPTOMS			
ONSET	Acute - (1 -14 Days)	Insidious - (2 - 4 Weeks)	Delayed (> 6 Weeks)
Duration			
Pain:	Watering:	Congestion:	Def Vn:
Discharge:	H/O C/L Wear:		
H/O Focal Sepsis	Dental:	ENT:	Skin:
H/O Previous Treatment:			
H/O Allergy:			
H/O Collagen Vascular Disorders/HIV/TB:			
H/O Trauma:			
H/O Tetanus Immunization:			
H/O DM			

Type of
Surgery:

1. ECCE with/without IOL

2. SICS
with/without IOL

3.PHACO
CLEAR
CORNEAL/SC
LEROCORNE
AL

4. SUTURE
REMOVAL

5. RETINAL/VITREOUS SURGERY

6. STRABISMUS

7. KERATOPLASTY

8. PTERYGIUM

9. AG SURGERY

INTRA OP COMPLICATIONS

PC RENT

VITREOS LOSS

SUTURED OR NOT

SIGNS

	RE	LE
LIDS	:	
CONJUCTIVA	:	
CORNEA	:	

AC :

IRIS :

PUPILS DR :

CR :

LENS :

S/L EXAMINATION

CONJUCTIVA

AC

IRIS

PUPILS

LENS

VITREOUS

FUNDUS EXAMINATION - Direct Ophthalmoscopy

Indirect Ophthalmoscopy - Grade - I/II/III/IV/V

TENSION:

V/A:

INVESTIGATIONS:

BLOOD - HB: TC: DC: ESR:

URINE: ALB/SUGAR: BLOOD SUGAR:

USG - B SCAN:

VITREOUS TAP: SMEAR CULTURE/SENSITIVITY

GRAMS/KOH

MANAGEMENT

1 MEDICAL

a. Topical b. Systemic c. Intracameral d. Intravitreal

2 SURGICAL

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MASTERCHART

SL. No.	Name	Age	Sex	IP NO.	Onset			Asst. Illness		Type			HYPOPYON	Vitreous Loss	IDO vitritis	B Scan	Gm Stain VIT	KOH Stain VIT	Culture VIT	Visual Acuity		INTRAVITREAL	CV
					A/C	IM	D	DM	FS	END	PT	PostOp								Initial	Final		
1	Manikandan	45	M	493871	+	-	-	-	-	-	-	+	+	+	IV	+	-	SH	ASP	NO PL	EVIS	1	-
2	Mohan	65	M	495203	-	+	-	+	+	-	-	+	+	-	IV	+	-	-	-	CFCF	1/60	2	-
3	Kathirvel	60	M	492911	+	-	-	+	-	-	-	+	-	-	IV	+	-	-	-	HM	5/60	2	-
4	Selvi	53	F	496553	-	-	+	-	-	-	-	+(K)	+	-	V	+	-	-	-	NO PL	NO PL	2	-
5	Vasumathi	64	M	496477	+	-	-	+	-	-	-	+	+	-	V	+	-	-	-	PL+	3/60	2	+
6	Obul Raj	65	M	496421	+	-	-	+	-	-	-	+	+	-	V	+	GPC	-	S.EPI	HM	HM	2	-
7	Chandrasekhar	57	M	486787	+	-	-	+	-	-	-	+	-	+	IV	+	-	-	-	HM	6/18	2	+
8	Neelakandan	51	M	497021	-	-	+	+	-	-	-	+(AG)	-	-	IV	+	-	-	-	PL+	PL+	2	-
9	Bappisha	38	F	493062	-	+	-	-	-	-	-	+	+	-	III	+	-	-	-	1/60	2/60	2	-
10	Kanagammal	69	F	496611	+	-	-	-	-	-	-	+	-	+	IV	+	GNB	-	Pseudomonas	NO PL	NO PL	2	-
11	Neelakandan	51	M	497021	-	-	+	-	-	-	-	+	-	-	IV	+	-	-	-	CFCF	4/60	3	-
12	Ramadoss	61	M	467642	-	-	+	-	+	-	-	+	-	-	IV	+	-	-	-	HM	5/60	2	-
13	Viswanathan	35	M	497870	+	-	-	-	-	-	-	+	+	+	III	+	-	-	-	2/60	6/36	2	-
14	Vikas Gandhi	12	M	497627	-	-	+	-	-	-	-	+	-	-	III	+	GPC	-	S.EPI	1/60	2/60	3	-
15	Thangam	44	F	477869	-	-	+	-	+	-	-	+	-	+	IV	+	-	-	S.EPI	PL+	CFCF	1	+
16	Rajamma	53	F	496393	-	+	-	-	-	-	-	+	-	-	V	+	-	-	-	NO PL	NO PL	1	-
17	Vasundara	39	F	497701	-	-	+	-	-	-	-	+(AG)	+	-	IV	+	-	-	-	NO PL	NO PL	2	-
18	Krishnan	72	M	476539	-	-	+	-	-	-	-	+	-	-	IV	+	-	-	-	NO PL	NO PL	2	-
19	Kothandaraman	45	M	490031	-	-	+	-	-	-	-	+	-	-	V	+	GPC	-	S.AUR	NO PL	NO PL	1	-

SL. No.	Name	Age	Sex	IP NO.	Onset			Asst. Illness		Type			HYPOPYON	Vitreous Loss	IDO vitritis	B Scan	Gm Stain VIT	KOH Stain VIT	Culture VIT	Visual Acuity		INTRAVITREAL	CV
					A/C	IM	D	DM	FS	END	PT	PostOp								Initial	Final		
20	Pachaiammal	63	F	487330	+	-	-	+	+	-	-	+	-	+	V	+	GPB	-	-	PL+	PL+	1	-
21	Kuyilmani	69	F	497103	-	+	-	-	+	-	-	+(RD)	-	-	IV	+	-	-	-	HM	HM	3	-
22	Ganeshan	65	M	492738	-	+	-	-	-	-	-	+	+	-	V	+	-	-	-	NO PL	EVIS	-	-
23	Chinnaswamy	66	M	480113	-	-	+	-	-	-	-	+	-	+	III	+	-	-	-	2/60	6/60	2	-
24	Murekeshan	58	M	490493	+	-	-	-	-	-	-	+	-	+	IV	+	-	-	S.EPI	HM	HM	2	-
25	Maina	19	F	499837	+	-	-	-	-	-	+	-	-	-	IV	+	-	-	-	PL+	6/36	2	-
26	Kashirajan	54	M	500541	-	-	+	-	-	-	+	-	+	-	V	+	GPC	-	S.EPI	CFCF	CFCF	3	-
27	Varathappa	39	M	500481	+	-	-	-	-	-	+	-	+	-	IV	+	-	-	-	CFCF	2/60	2	-
28	Chetikaran	37	M	499655	-	-	+	-	-	-	+	-	-	-	IV	+	-	-	-	PL+	PL+	1	+
29	Vyakulam	62	F	489812	-	+	-	-	-	-	+	-	-	-	IV	+	-	-	-	PL+	PL+	2	-
30	Chentamarai	23	F	499362	+	-	-	-	-	-	+	-	-	-	IV	+	GNB	-	Pseudomonas	NO PL	EVIS	1	-
31	Vinod	13	M	498456	+	-	-	-	-	-	+ (IOFB)	-	+	-	V	+ (IOFB)	-	SH	ASP	HM	CFCF	3	-
32	Radhammal	38	F	498713	+	-	-	-	-	-	+ (IOFB)	-	+	-	IV	+ (IOFB)	-	-	-	PL+	PL+	2	+
33	Kannama	29	F	500201	+	-	-	-	-	-	+	-	-	-	IV	+	-	-	-	NO PL	NO PL	2	-
34	Dasharathan	34	M	500632	+	-	-	-	-	-	+	-	-	-	IV	+	-	-	-	NO PL	NO PL	1	-
35	Chandran	42	M	495433	+	-	-	-	-	-	+	-	-	-	V	+	GPC	-	S.AUR	PL+	HM	2	+
36	Paappa	26	M	492324	+	-	-	-	-	-	+	-	-	-	IV	+	GPC	-	S.EPI	HM	1/60	2	-
37	Thulukkaanam	45	M	498865	+	-	-	-	-	-	-	+	-	-	V	+	-	SH	ASP	PL+	PL+	2	-
38	Vasuki	55	F	492764	+	-	-	-	-	-	+	-	-	-	IV	+	-	-	-	NO PL	NO PL	1	-
39	Gayathri	13	F	498335	+	-	-	-	-	-	+	-	-	-	IV	+	-	-	-	PL+	6/60	2	+
40	Vembelu	37	F	492873	+	-	-	-	-	-	+	-	+	-	III	+	-	-	-	1/60	6/36	2	-
41	Subramani	49	M	493219	-	-	+	-	-	-	+	-	-	-	IV	+	-	-	-	NO PL	NO PL	1	-

SL. No.	Name	Age	Sex	IP NO.	Onset			Asst. Illness		Type			HYPOPYON	Vitreous Loss	IDO vitritis	B Scan	Gm Stain VIT	KOH Stain VIT	Culture VIT	Visual Acuity		INTRAVITREAL	CV
					A/C	IM	D	DM	FS	END	PT	PostOp								Initial	Final		
42	Paraman	58	M	498280	+	-	-	-	-	-	+	-	-	-	IV	+	GPC	-	S.EPI	HM	2/60	2	-
43	Panchalai	32	F	493234	-	+	-	-	-	-	+	-	-	-	IV	+	-	-	-	NO PL	NO PL	3	-
44	Jayavel	20	M	493862	-	+	-	-	-	-	+	-	+	-	IV	+	-	-	-	HM	2/60	2	-
45	Vimal	24	M	497657	-	+	-	-	-	-	+	-	+	-	V	+	-	SH	ASP	NO PL	NO PL	2	-
46	Pakirappan	62	M	497658	-	+	-	+	+	-	+	-	-	-	V	+	-	-	-	NO PL	NO PL	1	-
47	Mumtaz	29	F	429264	+	-	-	-	-	-	+	-	-	-	IV	+	GPC	-	S.AUR	PL+	HM	2	+
48	Raman	68	M	497660	-	-	+	+	-	-	-	-	+	-	IV	+	-	-	-	HM	CFCF	2	-
49	Anjalai	61	F	21582	-	-	+	+	-	-	-	-	+	-	IV	+	GNB	-	Pseudomonas	NO PL	EVIS	2	-
50	Anbarasu	4	M	58622	-	-	+	-	-	-	-	-	+	-	V	+	-	-	-	PL+	PL+	2	-

ABBREVATIONS

A/C	Acute
IN	Insidious
D	Delayed
DM	Diabetes Mellitus
FS	Focal Sepsis
AC	Anterior Chamber
PC	Posterior Chamber
PT	Post traumatic
Post op	Post-operative
IDO	Indirect Ophthalmoscopy
VIT	Vitreous tap
V/A	Visual acuity
PL	Perception of light
PR	Projection of rays
HM	Hand movements
CFCF	Counting fingers close to face
SH	Septate hyphae
GPC	Gram positive cocci
GPB	Gram positive cocci
GNB	Gram negative bacilli
AG	Anti-glaucoma
RD	Retinal detachment
K	Keratoplasty
ECCE	Extra Capsular Cataract Extraction
SICS	Small Incision Cataract Surgery
PHACO	Phacoemulsification
IOL	Intraocular lens

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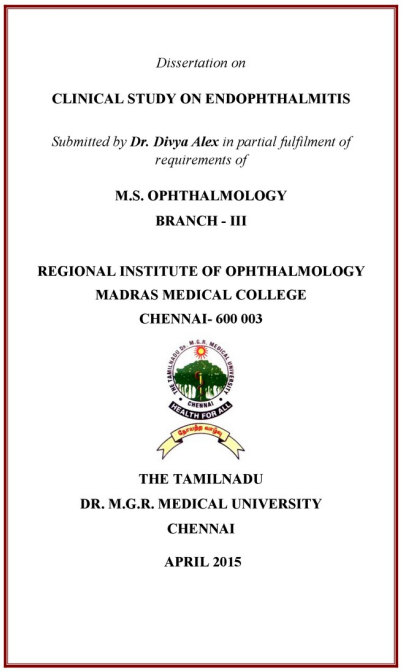

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