Dissertation on

A CLINICAL STUDY ON ORBITAL INFECTIONS AND THE ROLE OF IMAGING AND MICROBIOLOGICAL STUDY IN ITS OUTCOME

Submitted in partial fulfillment of requirements of

M. S. OPHTHALMOLOGY

BRANCH III

Of

REGIONAL INSTITUTE OF OPHTHALMOLOGY

MADRAS MEDICAL COLLEGE

CHENNAI – 600 003

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

CHENNAI-600 003

APRIL - 2017

CERTIFICATE

This is to certify that this dissertation entitled **"A CLINICAL STUDY ON ORBITAL INFECTIONS AND THE ROLE OF IMAGING AND MICROBIOLOGICAL STUDY IN ITS OUTCOME"** is a bonafide record of the research work done by **Dr.P.PAVITRAA.**., Post graduate in Regional Institute of Ophthalmology, Madras Medical College and Research Institute, 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 2009-2012.

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ACKNOWLEDGEMENT

I would like to thank **Prof. Dr. M.K. MURALIDHARAN., M.S., M, Ch** Dean, Madras Medical College and Research Institute for giving me permission to conduct the study in this Institution.

With respect and gratitude, I thank **Prof**. **Dr. WAHEEDA NAZIR, M.S.,D.O.,** Director and superintendent, Regional Institute of Ophthalmology and Govt. Ophthalmic Hospital, Chennai & Unit Chief, Orbit and oculoplasty and my guide for assigning this topic for study and guidance throughout my Post graduate course. I wish to express my sincere thanks for the valuable help, encouragement and guidance at various stages of the study.

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I wish to express my sincere thanks to my father and mother, friends and all my colleagues who helped me in bringing out this study.

Last but not the least, my heartful gratitude and sincere thanks to all my Patients without whom this endeavor would not have been possible.

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled, **"A CLINICAL STUDY ON ORBITAL INFECTIONS AND THE ROLE OF IMAGING AND MICROBIOLOGICAL STUDY IN ITS OUTCOME"** is a bonafide and genuine research work conducted by me under the guidance of **Prof. Dr. WAHEEDA NAZIR, M.S., D.O.,** Head of Department of Orbit and Oculoplasty services, Regional institute of ophthalmology & Government Ophthalmic hospital. Chennai-600008.

Dr. P.Pavitraa

Place: Chennai

Date:

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

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CERTIFICATE OF APPROVAL

To
Dr.Pavitraa,P.
Post Graduate in M.S. Ophthalmology
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Dear Dr.Pavitraa.P.,

The Institutional Ethics Committee has considered your request and approved your study titled **"A CLINICAL STUDY ON ORBITAL INFECTIONS AND THE ROLE OF IMAGING AND MICROBIOLOGICAL STUDY IN ITS OUTCOME " - NO.30032016.**

The following members of Ethics Committee were present in the meeting hold on **01.03.2016** conducted at Madras Medical College, Chennai 3

1.Dr.C.Rajendran, MD.,	:Chairperson
2.Dr.R.Vimala,MD.,Dean,MMC,Ch-3	:Deputy Chairperson
3.Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3	: Member Secretary
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9.Tmt.J.Rajalakshmi, JAO,MMC, Ch-3	: Lay Person
10.Thiru S.Govindasamy, BA.,BL,High Court,Chennai	: Lawyer
11.Tmt.Arnold Saulina, MA.,MSW.,	:Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary - Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
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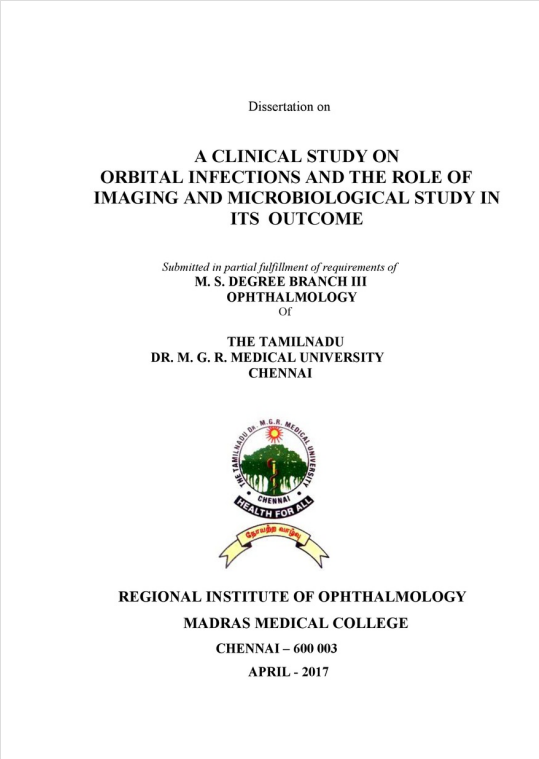

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CONTENTS

PART -I

INTRODUCTION

Orbit is a sterile closed compartment surrounded by bony walls on all sides and anteriorly by orbital septum. The orbit houses the eyeball and has the major function of protection of eyeball and helps in its motility in extreme degrees.

Orbit has many potential spaces that make it a primary site of infections. It may present either as a secondary site for infections from the adjacent structures or intermediary site for infection to other vital sites. Orbital anatomy and its relation with other adjacent structures are important in the pathogenesis of orbital infections. These relationships also explain its devastating consequences and influence therapeutic decisions.

Orbital and periorbital infections may be caused by variety bacterial, fungal and parasitic agents. Appropriate management depends on appreciation of topography of the process within the orbit and periorbital tissues using Radioimaging and identification of responsible organisms and its sensitivity to antibiotics using Microbiological study. Appropriate management by either medical or surgical treatment helps in prevention of complications.[1e]

Integration of history, physical and ocular examination and ancillary testing allow achievement of these primary goals.

REVIEW OF LITERATURE

Study conducted by S.C.Reddy, E.S.Go on Orbital cellulitis revealed that mean age of orbital infections is 12.9 years, and there was male dominance in the presentation. 80% of the patients were in the first decade of life. Ethmoiditis was most common source of infection. It revealed Staphylococcus aureus as the most common pathogen. Orbital abscess was seen in 30% of patients and 25% developed complications in spite of intensive therapy.[2]

Orbital cellulitis in children was studied by Nageswaran, Savithri MD et al. This study also had pediatric age group as the common age group involved, with male: female ratio 2.7:1. Proptosis and ophthalmoplegia were the most common presenting signs. 34% had Sub periosteal abscess or Orbital abscess who improved mainly with surgical drainage.[3]

Article on Journal of cranio maxillo facial surgery on Orbital cellulitis, sub periosteal abscess and intraorbital abscess reported all the three among 5 grades of orbital infections. This article concluded that I.V antibiotics were mandatory in these cases and Surgical drainage is necessary when no improvement is seen within 48 hours.[4]

Study conducted on Pediatric pre and post septal periorbital infections by A.M.Bottling, D.McIntosh et al revealed that Proptosis and ophthalmoplegia are

significant features of post septal infections. Medical treatment was successful in majority of cases with 5% of preseptal and 25% of postseptal infections requiring surgery. This study revealed the importance of early CT imaging and insisted on Multidisciplinary approach involving other departments in the active management of Orbital infections.[5]

Clinical implications of Orbital cellulitis-Study by Kenith Jackson MD and Shan R.Baker showed that preseptal cellulitis is the most common type of Orbital infections and incidence of complications as 23% .This study insisted on the Radiographic importance in the management of Orbital infections.[6]

Steven H.McKinley et al studied on Microbiology of Pediatric Orbital cellulitis. They inferred Staphylococcus species as the most common Organism followed by streptococcus. Microbiological study also revealed the presence of MRSA and Haemophilus species. This study revealed the importance of microbiological studies in the management of Orbital infections.[7]

Study on Orbital abscess by Albert Hornblass M.D et al reviewed the five group classification of Orbital infections and significance of Laboratory testing, Radiography like X ray, ultrasound, CT imaging are discussed and are recommended for medical and surgical management.[8]

ANATOMY OF THE ORBIT

EMBRYOLOGY AND DEVELOPMENT

The orbit as a whole develops from the mesoderm surrounding the optic vesicle and optic stalk. Mesenchymal capsule of the forebrain forms the roof of the orbit and the maxillary process forms the floor and lateral walls of the orbit. Medially, the lateral nasal process forms the medial wall and the bones of base of skull contributes to the roof, medial and lateral walls posteriorly.

Of the seven orbital bones, the first to be laid down is the ethmoid at 6-8 weeks of gestation. The trochlea begins to consolidate at about 9 weeks of gestation. Except for the lesser wing of the sphenoid which is initially cartilaginous, all other bones of the orbit are membranous and begin to ossify during the 3rd month. Fusion takes place between 6-7 month.

At birth Orbit is 55% adult size. It reaches 79% at 3 years and 94% at 7years of age. The growth of cranium, face and paranasal sinuses influence the size and shape of the orbit. The angle subtended by both orbital axes is nearly 180° at first and the orbits are present at both lateral sides of head . Later it diminishes to approximately 105° at 3 months of gestation and at birth the angle is 71° when the orbits are placed anteriorly. By 3 year of age the orbital axes attain its adult condition of 68° between both the orbital axes. During the development, the eyeball develops faster than the orbit resulting in protrusion of anterior half of eyeball from the orbital opening.[9]

WALLS OF THE ORBIT

The orbit consists of roof, floor, medial and lateral wall as its four walls. They are lined by periosteum. The medial walls of the orbits are almost parallel whereas the lateral walls make an angle of about 90 with each other.

ROOF OR VAULT

The roof of the orbit is triangular in shape, formed by orbital plate of the frontal bone and is completed posteriorly by the lesser wing of sphenoid. The roof of the orbit is thin, translucent and fragile except where it is formed by lesser wing of the sphenoid. It faces downwards and slightly forwards. It is concave anteriorly and flattens posteriorly.

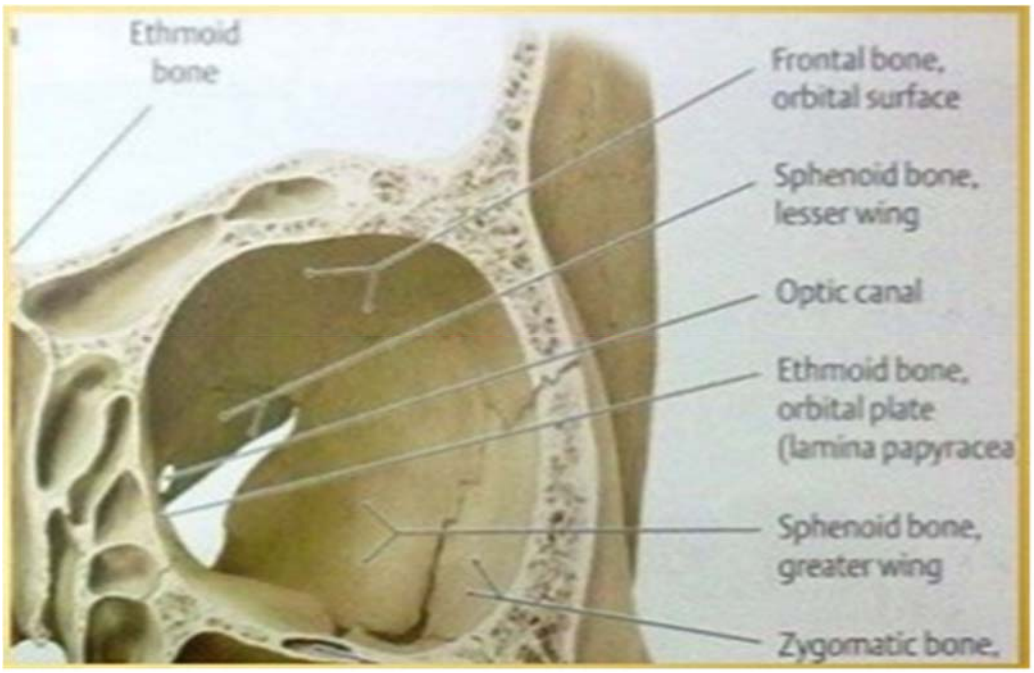


Figure 1: Bones forming roof of orbit

Roof of orbit includes

- Lacrimal fossa - which lies behind the zygomatic process of the frontal bone. It lodges orbital part of lacrimal gland and also some orbital fat in the posterior part called as the accessory fossa of Rochon - duvigneaud.
- The fovea for the trochlea of the superior oblique muscle which is located anteromedially as a smaller depression about 4mm from the orbital margin. Rarely, the ligaments which attach to it are ossified into spicule of bone called spina trochlearis.
- Apertures called cribra orbitalia allows veins to pass and are most marked in fetus and infants.[10]

MEDIAL WALL

Medial wall is approximately oblong and is flat or slightly convex. It lies parallel to the sagittal plane. From the front backwards it is formed by four bones united by vertical sutures. They are

- Frontal process of maxilla
- Lacrimal bone
- Orbital plate of ethmoid-largest
- Small part of the body of sphenoid

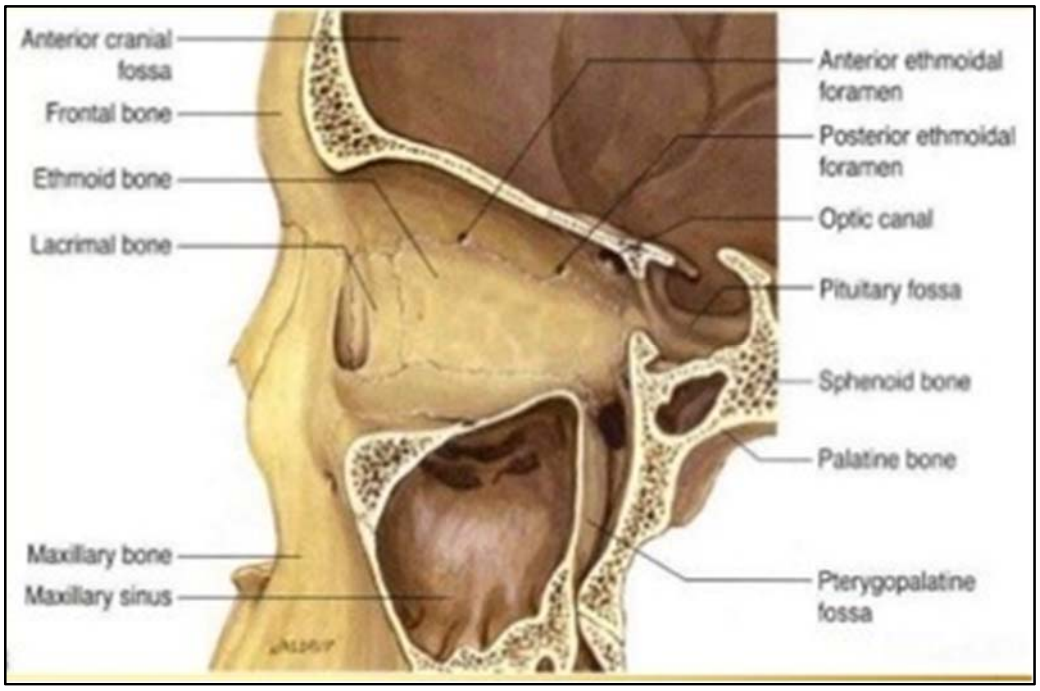


Figure 2: Bones forming medial wall of orbit

Medial wall includes

- Lacrimal groove - formed by the frontal process of the maxilla and lacrimal bone which lodges the lacrimal sac. It is bounded by anterior and posterior lacrimal crests. There is no definite upper boundary but below it is continuous with the osseous nasolacrimal canal. It is around 5mm deep, gradually becoming shallower as it ascends and is about 14 mm high.
- Anterior and posterior ethmoidal foramen lies on the fronto ethmoidal suture at the junction of the roof and medial wall.

It is the thinnest orbital wall. The orbital plate of the ethmoid (Lamina papyracea) is very thin and hence infection from the ethmoid sinus can easily extend into the orbit.[11]

FLOOR OF THE ORBIT

The floor is triangular and slopes slightly downwards and laterally. It is the shortest orbital boundary and is formed by

- Orbital plate of maxilla
- Orbital surface of zygomatic bone
- Orbital process of palatine bone

The floor is continuous with the lateral wall anteriorly but is separated from it posteriorly by inferior orbital fissure.

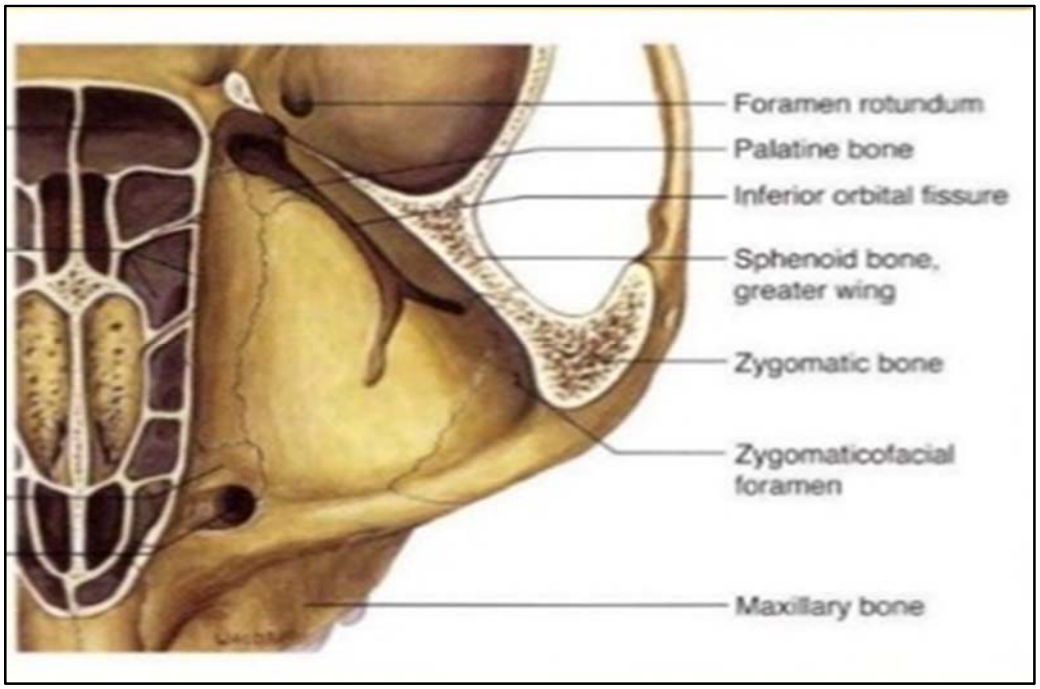


Figure 3: Bones forming floor of orbit

Floor of Orbit includes

- Infraorbital sulcus - floor is traversed by this sulcus which runs forwards from the inferior orbital fissure.
- Infraorbital canal - midpoint of sulcus becomes a canal completed by a plate of bone passing from its lateral side to medial side at the infra orbital suture which further opens at the infraorbital foramen.
- Attachment of the inferior oblique muscle which is located lateral to the opening of the nasolacrimal canal.

The floor is thinnest at the infraorbital groove and canal. Hence, the tumors of the maxillary sinus below can easily invade the orbit. Odontogenic infections can also easily invade the Orbit through the orbital floor via maxillary sinus.

LATERAL WALL

This wall is triangular and makes an angle of 45° with median plane. It faces anteromedially and slightly upwards in its lower part. It is convex posteriorly, flat in the center and anteriorly it is deeply concave. It separates the orbit from temporal fossa and middle cranial fossa.

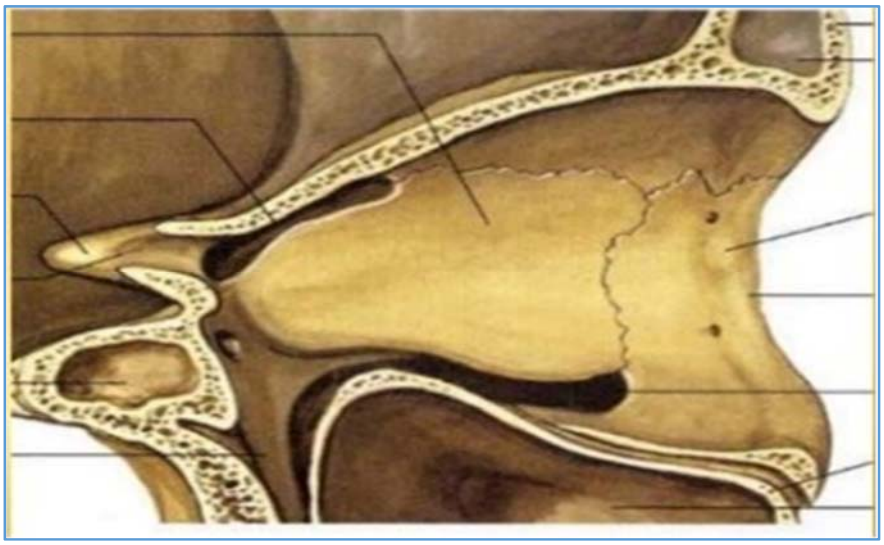


Figure 4: Bones forming lateral wall of orbit

Lateral wall is formed by

- Orbital surface of greater wing of sphenoid posteriorly
- Orbital surface of the zygomatic bone anteriorly.

Lateral wall includes

- Spina musculi recti lateralis is a small bony projection on inferior margin of superior orbital fissure. Part of lateral rectus muscle is attached to it.
- Zygomatic groove and foramen runs from anterior end of inferior orbital fissure to a foramen in the zygomatic bone.
- Whitnall's tubercle - is a small elevation on the orbital surface of the zygomatic bone behind the lateral orbital margin. Gives attachment to lateral check ligament, suspensory ligament of the eyeball and aponeurosis of the levator palpebrae superioris.

It is the thickest orbital wall especially at the orbital margin.

THE ORBITAL MARGINS

The orbital margin or rim is quadrilateral with rounded corners and spiral edges. The inferior orbital margin is continuous with anterior lacrimal crest and superior with the posterior lacrimal crest.

Each side measures about 40mm, but usually the width is greater than the height. The orbital margin is formed by frontal, zygomatic and maxillary elements.[11]

SUPERIOR MARGIN

This is formed by the orbital arch of the frontal bone which is sharp in lateral two third and round in medial one third. At this junction, the supraorbital notch is located about 25mm from the midline. This is occasionally converted into a foramen by ossification of the ligament through which supraorbital nerves vessels passes through.

Sometimes medial to this a second notch or foramen may occur. Supraorbital grooves leading from these notch or foramina are sometimes seen. A supraciliary canal appears in about 50% of skulls. It has a small opening near the supraorbital notch.

LATERAL MARGIN

This margin is strongest of the orbital outlet. It's formed by the zygomatic process of the frontal bone and by zygomatic bone. The suture between the two bones can be easily felt.

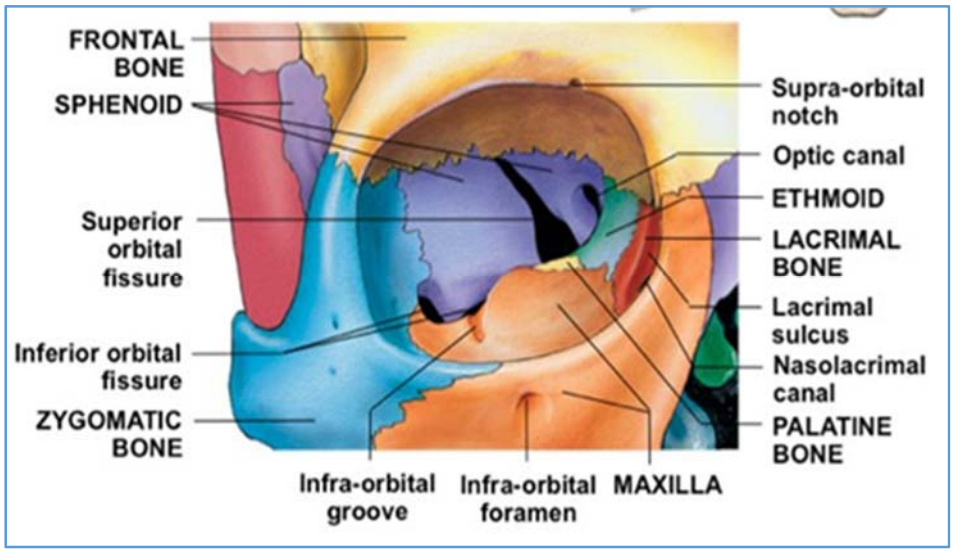


Figure 5: Orbital margins

INFERIOR MARGIN

It is formed by zygomatic bone and maxillary bone. The suture between these two bones is sometimes marked by a tubercle and can be felt about halfway along the margin just above the infraorbital foramen. This margin is slightly raised above the floor of the orbit.

MEDIAL MARGIN

It is the anterior lacrimal crest on the frontal process of the maxilla and posterior lacrimal crest on the lacrimal bone. Medial margin is not continuous, but is considered to ascend from the anterior crest over the maxillary frontal process to the superior margin. Superiorly, the medial margin is difficult to identify whereas inferiorly it is sharp and can be easily felt.

ORBITAL FISSURES

SUPERIOR ORBITAL FISSURE

It lies between lesser and greater wings of sphenoid and connects the middle cranial fossa with the orbital cavity. It is located between the roof and lateral wall of the orbit. It is often described as comma shaped. It is wider at the medial end below the optic foramen and it tapers forward in its lateral extremity. It is about 22m long. The long axis of the fissure is directed laterally, upwards and forwards.[10]

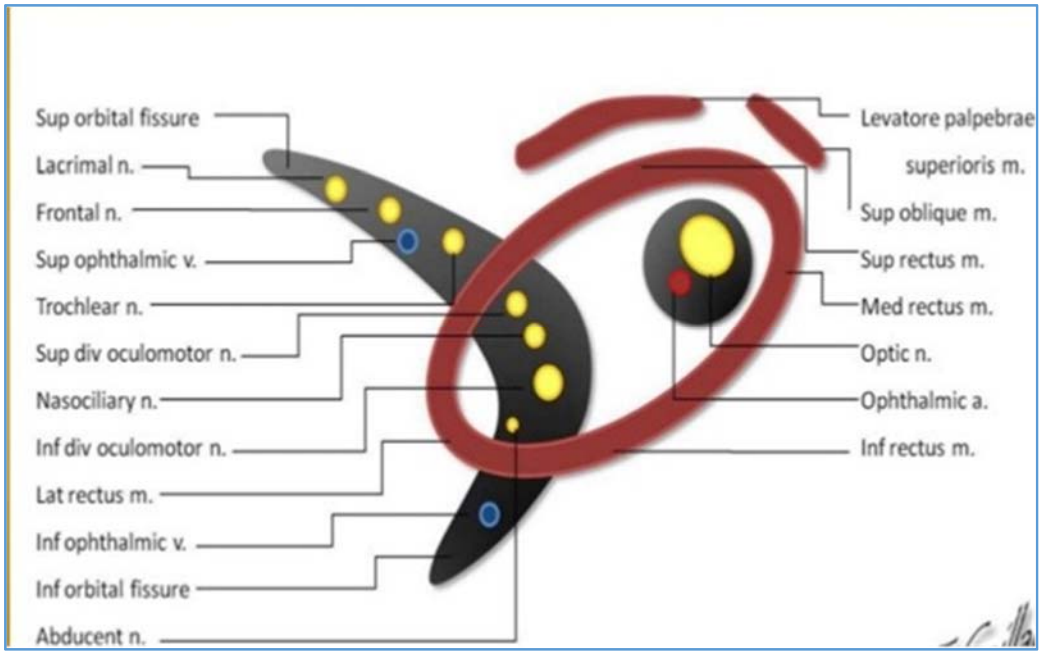


Figure 6: Superior Orbital Fissure and structures passing through it.

The common tendinous ring - *annulus tendinous communis* of the rectus muscle spans the superior orbital fissure between its medial and lateral parts.

This ring divides the fissure into three parts and the structures through each part are as follows:

- In the lateral part, above the annulus passes –
    - Lacrimal nerve
    - Trochlear nerve
    - Frontal nerve
    - Superior ophthalmic vein
    - Recurrent lacrimal artery.
- In the middle part –
    - Superior division of oculomotor nerve
    - Nasociliary nerve
    - Sympathetic roots of ciliary ganglion
    - Inferior division of oculomotor nerve
    - Abducent nerve
    - Sometimes the ophthalmic veins.[12]
- In the medial part, below the annulus –
    - Inferior ophthalmic vein
    - Sympathetic nerves from plexus around Internal carotid artery.

INFERIOR ORBITAL FISSURE

It lies between the lower margin of orbital surface of greater wing of sphenoid and maxilla and orbital process of the palatine bone. It connects pterygopalatine and infratemporal fossa with the orbital cavity. It is located between the lateral wall and the floor of the orbit.[10]

It commences inferolateral to the optic foramen. Runs anterolaterally and is about 20 mm long and ends about 2 cm from the inferior orbital margin. It is closed in the living subject by periorbital and *muscle of muller* and is narrower centrally than at its ends. The width of the fissure depends on the developmental stage of the maxillary sinus and thus is relatively wide in the fetus and infant.

It transmits

- Infraorbital and zygomatic nerves
- Orbital & periosteal branches from the pterygopalatine ganglion.
- Branch from inferior ophthalmic vein to the pterygoid plexus.[12]

RELATIONS OF THE ORBIT

SUPERIOR RELATIONS

The roof formed by the orbital plate of the frontal bone contains between its two laminae anteromedially, the frontal air sinus. Occasionally the ethmoid air cells can also invade the roof. Superior to the roof is the meninges and the frontal bone of the cerebral hemisphere.[10]

The frontal nerve and supraorbital artery are in contact with the periorbita. Inferior to these are levator palpebrae and the superior rectus muscle. The trochlear nerve lies medially in contact with periorbita. Lacrimal gland adjoins the lacrimal fossa. Superior oblique muscle is located in the junction of roof and medial wall.

MEDIAL RELATIONS

Running from front to backwards are the lateral nasal wall, infundibulum, ethmoid sinus and sphenoidal air sinus. The optic foramen is located in the posterior end of the medial wall. The medial wall is related anteriorly to the lacrimal sac, surrounded by lacrimal fascia. Behind it is attached to orbicularis oculi muscle, septum orbitale and check ligament of medial rectus. Medial rectus adjoins the wall.

In between medial rectus and superior oblique muscle are the anterior and posterior ethmoidal and infratrochlear nerves along with the termination of the ophthalmic artery.

INFERIOR RELATIONS

Inferiorly are located the maxillary sinus. The infraorbital nerves and vessels lie within the infraorbital canal. The floor is posteriorly related to a small sinus in the orbital process of palatine bone which may invade it. Inferior rectus adjoins the floor near the apex of the orbit and anteriorly it is separated by inferior oblique muscle and fat. In between the muscles or lateral to the lateral rectus is located the nerve to inferior oblique.

LATERAL RELATIONS

Laterally orbit is related in the anterior part to the temporal fossa containing temporalis muscle and posteriorly to the middle cranial fossa, meninges and temporal lobe of cerebral hemisphere.[10]

The lateral rectus muscle is in contact with the whole of the lateral wall. Lacrimal nerve and artery are above it. Inferior pole of the lacrimal gland reaches the lateral wall.

SURGICAL SPACES IN THE ORBIT

Orbit is divisible into four spaces.[11]

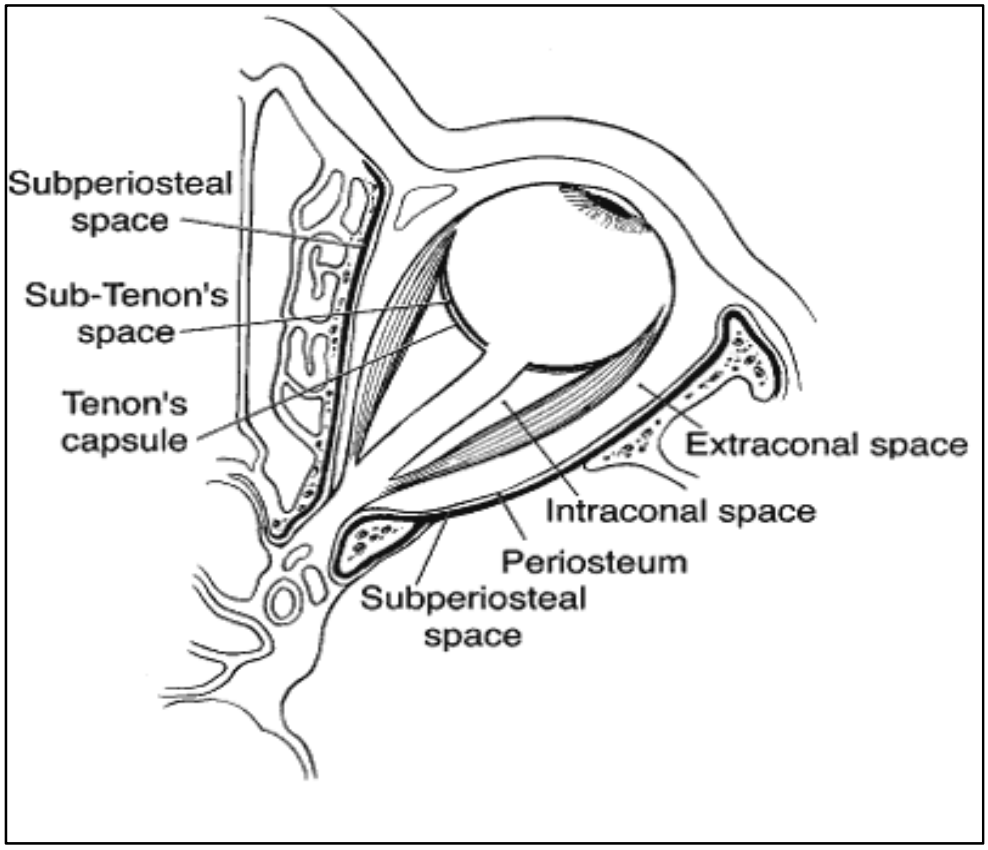


Figure 7: Surgical spaces in orbit

Subperiosteal space:

Potential space between orbital bones and the periorbita. It is limited anteriorly by strong adhesions of the periorbita to orbital rim. Subperiosteal abscess and mucocele are commonly seen in this space.

Peripheral orbital space (Anterior space):

This space is bounded peripherally by periorbita, internally by the four extraocular muscles with the inter-muscular septa and anteriorly by the septum orbitale. Posteriorly it merges with central space.

The content of this space are

- Fat
- Muscles-superior oblique, inferior oblique, levator palpebrae superiosis
- Nerves – lacrimal, frontal, trochlear, anterior and posterior, ethmoidal
- Veins – superior ophthalmic and inferior ophthalmic
- Lacrimal gland
- Half of lacrimal sac

Central space (muscular cone, posterior or retrobulbar space):

It is bounded anteriorly by tenon's capsule lining the back of the eye and peripherally by the extraocular recti muscle and their intermuscular septa. In the posterior part where intermuscular septa are imperceptible, it continues with the peripheral orbital space.

Its contents include

- Optic nerve and its meninges
- Superior and inferior division of oculomotor nerve
- Abducent and Nasociliary nerve
- Ciliary ganglion
- Ophthalmic artery, superior ophthalmic vein
- Central orbital fat

Sub tenon's space:

It is a potential space around the eyeball between the sclera and tenon's capsule. Pus collected in this space is drained by incision of tenon's capsule through the conjunctiva

ORBITAL INFECTIONS

Orbital infections refer to the purulent inflammation of the orbital and periorbital tissues caused due to the infective pathology. It has myriad of clinical presentations ranging from preseptal cellulitis to cavernous sinus thrombosis.

Most common cause of orbital infections is bacterial in origin. Its main sources are direct inoculation from trauma and skin infections, spread from adjacent structures like sinuses and lacrimal system and bacteremic spread from a distant focus like otitis media and pneumonia.

Although the orbital infections are classified as different groups they represent a continuum of spectrum, requiring similar treatment regimens with a common underlying pathology.

Radioimaging helps in the diagnosis of etiology and classification of orbital infections which helps in its appropriate management. Identification of specific microorganisms by Microbiological study helps in the accurate treatment regimens aimed at those organisms. Hence, Radioimaging and Microbiological study have crucial role in outcome of Orbital infection following treatment.

CLASSIFICATION OF ORBITAL INFECTIONS

There are five groups of orbital infections. In general, the symptoms increase in severity down the classification. Group 1 and 2 are mild forms of infection and the group 3 and 4 may be considered as complication of orbital cellulitis.

Group 1 – Preseptal cellulitis

It is also called periorbital cellulitis. It affects the eyelids and skin around the eyes, but not the orbit. It is less serious, but spread to orbit is possible.

Group 2 – Orbital cellulitis

It is an infection of orbital soft tissue without abscess formation.

Group 3 – Subperiosteal abscess

It may result from orbital cellulitis or sinusitis. Pus collects between the bony wall and the periosteum.

Group 4 – Orbital abscess

It occurs within the soft tissue of the orbit. It occurs as a complication of orbital cellulitis.

Group 5 – Cavernous sinus thrombosis

It consists of infection and thrombosis in the cavernous sinus which drains blood from both the orbits

SOURCES OF ORBITAL INFECTIONS

Periorbital sources: Infection involving sinuses, lacrimal sac, teeth and gums, meninges,

Trauma – lacerating injury, open/closed fracture involving sinus and nasal bone, foreign body

Periocular or sinus surgery

maxillary osteomyelitis

cavernous sinus thrombosis

Ocular sources: Panophthalmitis, ocular surgery

Systemic causes: Diabetes mellitus, septicemia, systemic malignancy, AIDS, Immunosuppressants, Steroids

Miscellaneous disorders: Ethmoidal osteoma, Munchausen syndrome

Masquerade syndromes: Intraocular tumors - retinoblastoma, uveal melanoma

Periocular tumors- rhabdomyosarcoma, squamous cell carcinoma, myositis

COMMON SOURCES ACCORDING TO THE AGE

Neonates (up to 1 month):	Nasolacrimal duct Obstruction
	dacryocoele
Infants and toddlers:	Nasolacrimal duct Obstruction
	sinusitis
(1month – 5 years):	respiratory tract infections
children (5-15 years):	Hordeolum
	sinusitis
	dental abscess
Adults:	sinusitis
	debilitation
	trauma
	dental abscess

MOST COMMON CAUSATIVE ORGANISMS

Bacteria:

Common-- Staphylococcus aureus, Group A Streptococci, Haemophilus influenza,

Rare--Pseudomonas and anaerobic bacteria

Fungus: mucor, rhizopus, aspergillus, candida Albicans

Parasites: Taenia solium, Echinococci, microfilariae, Entameoba

EVALUATION OF A PATIENT WITH ORBITAL INFECTION

A patient presenting with orbital infection has to be systematically evaluated to arrive at a correct diagnosis and to manage efficiently.

Evaluation should be started from detailed history which should include the information regarding the onset, progression and duration of symptoms.

History that give clue towards the etiology should be enquired such as

- symptoms of sinusitis
- history of trauma, tooth extraction
- orbital or sinus surgery
- debilitating disorders
- systemic infections
- drug intake – steroids, Immunosuppressants

Detailed examination includes

- visual acuity
- examination of lids
- extraocular movements
- anterior and posterior segment of eye
- intraocular pressure
- fields
- slit lamp examination

Specific Examination of the following should be looked for to get the clue toward the diagnosis

1. Displacement of globe – abscess secondary to sinusitis
2. Discharge – punctual, nasal or fistula – dacryocystitis, sinusitis, maxillary osteomyelitis
3. Tenderness over sinuses – sinusitis
4. Hemifacial swelling – dental abscess, maxillary osteomyelitis
5. Oral cavity examination – dental abscess, mucormycosis
6. Oropharynx and nose – mucormycosis
7. Signs of meningeal irritation – intracranial involvement

Other system Examination: abdomen, RS, CVS, CNS

Other departmental consultations

Otorhinolaryngology, neurology, general and dental surgeon opinion should be obtained when needed.

For final diagnosis and decide about the management following investigations are done whenever necessary

- Laboratory investigations- Complete hemogram
- Radiological investigations- X ray orbit, CT, MRI, B scan
- Microbiological study –smear and culture and sensitivity

ORBITAL INFECTIONS

PRESEPTAL CELLULITIS (PERIORBITAL CELLULITIS)

Preseptal cellulitis refers to the infection of the subcutaneous tissue of the orbit including eyelids but anterior to the orbital septum. The infection is usually the result of localized infection, injury, foreign body or insect bite in the skin of periorbital area.

The site of entry of the infecting agent may not be apparent when acute preseptal cellulitis develops. The edema due to cellulitis may spread to the other eye because of the loose attachment of the connective tissue in the midline.

Figure 8,9: Profile pictures of patients with preseptal cellulitis

Causative organism:

Staphylococcus aureus, group A streptococcus, Haemophilus influenzae are commonly seen in the age group of 6 – 30 months. Pseudomonas aeruginosa and anaerobic bacteria rarely cause preseptal cellulitis.

Signs and symptoms:

It is associated with periorbital swelling, redness, edema of the eyelids and localized tenderness. Here, globe is not involved. No proptosis is associated. Pupillary reaction, visual acuity and ocular movements are not affected. Pain on eye movement and conjunctival chemosis are absent.

Radiological findings:

Computed Tomography-Soft tissue swelling in the anterior orbital tissues with increased density in some areas and fat obliteration in adjacent planes. As the infection progresses fat density increases to form discrete densities that may complicate to form an orbital abscess

Helps to identify the primary source of infection like sinusitis, dacryoadenitis, dacryocystitis, etc.

B Scan- used to differentiate from orbital cellulitis

Complications:

The condition is often associated with abscess formation under the skin of the eyelid. To drain this, incision should be made at the site of maximum fluctuation.

Treatment:

Suitable antibiotics are the treatment of choice. They can be started either orally or intravenously according to the patients clinical findings and severity of the infections. Additional to antibiotics non-steroidal anti-inflammatory drugs are given. The resolution is generally quick and complete.

ORBITAL CELLULITIS

It is an inflammatory process that affects the orbital tissue located posterior to the septum with potentially devastating consequences.

Causative organisms:

Most commonly isolated organisms include Streptococcal species, Staphylococcus aureus, Haemophilus influenza type B. Less commonly Pseudomonas, Klebsiella, Ekinella and Enterococcus are involved. Polymicrobial infection with aerobic and anaerobic bacteria are more common in patients over the age of 15 years.[14]

Figure 10,11: Profile picture of patients with Orbital cellulitis

The fungi causing orbital cellulitis predominantly are Mucor and Aspergillus. They cause fulminant orbital cellulitis in patients who are immunocompromised or who are in a state of uncontrolled diabetes.

The other specific infections include

- Bacterial infections like tuberculosis, syphilis, actinomycosis, nocardiosis, anthrax, typhoid;
- Mycotic infections like phycomycosis, sporotrichosis, maduramycosis, crytococcosis, rhinospridiosis, candidiasis
- Parasitic infections – amoebiasis, filariaisis, trichinasis, schistosomiasis, ecchinoccocosis, cysticercosis

Signs and symptoms :

The clinical picture includes

- Proptosis is usually axial and may be extreme and is always irreducible. It may even result in luxation of the globe.
- Swelling of the lids may become woody hard with redness of skin
- Chemosis is marked and conjunctiva may protrude outside the palpebral aperture
- Limitation of movements of globe usually in all directions and pain with ocular movements

- Decreased visual acuity, impaired colour vision, restricted fields, pupillary abnormalities
- Local pain and general symptoms of profound toxicity, fever, nausea, vomiting and prostration.

Radiological findings:

Computed Tomography: Diffuse fat infiltration characterized by increased intensity of extra and intraconal fat. There is obliteration of normal fat planes and swelling of anterior orbital tissues. If the infection progress, the increased intensity involves intraconal space and abscess formation. There is no definite delineation among the orbital structures. There is extraocular muscles and optic nerve thickening. CT with contrast helps to differentiate edema, phlegmon and abscess

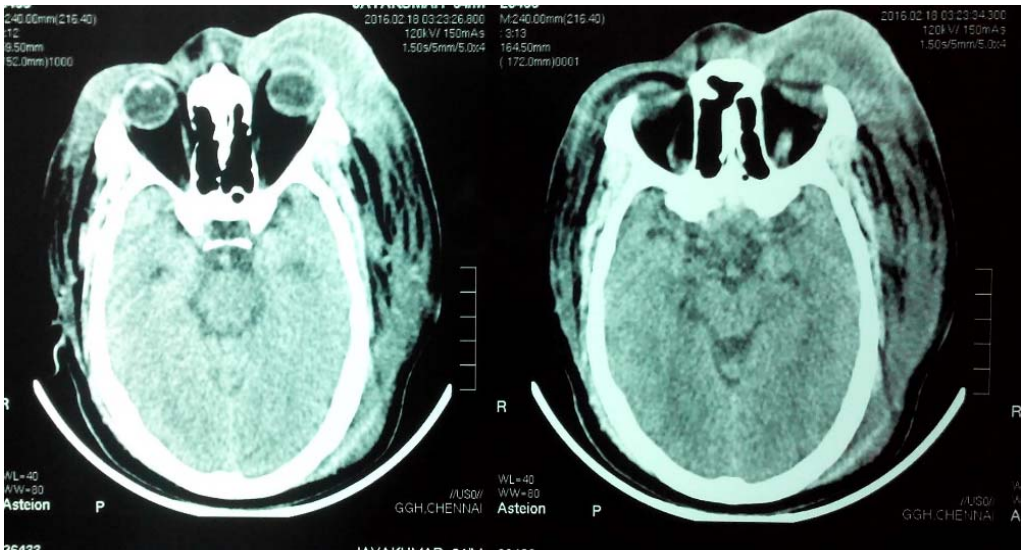


Figure 12:CT orbit Axial view with hyperintense lesion in the intra and extraconal area with fat infilteration.

Magnetic resonance Imaging:

T1 weighted images- high intensity of normal fat with dark inflammatory changes

T2 weighted images- normal findings of dark orbital fat with increased intensity for inflammatory changes

Helps to assess the extension of orbital infection to orbital apex and caveronous sinus. More useful in fungal infections which has increased possibility of extension into Orbit

Complications:

- keratitis – rapid necrosis and perforation
- papilloedema or neuritis, progressive optic atrophy
- retinal haemorrhages, exudative retinal detachment
- venous thrombosis, arterial embolism
- septic uveitis, panophthalmitis
- cavernous sinus thrombosis, meningitis
- acute infarction of sclera, choroid, retina(orbital infarction syndrome)
- orbital compartment syndrome
- intracranial abscess

Differential diagnosis:

- Idiopathic orbital inflammatory disease
- Thyroid ophthalmopathy,
- Neoplasm,
- sarcoidosis,
- Rheumatological diseases like wegeners granulomatosis, polyarteritis nodosa, giant cell arteritis.

Treatment:

Once the patient is diagnosed to have orbital cellulitis he/she should be admitted. Frequent monitoring of systemic and ocular parameters is essential.

Systemic monitoring includes recording heart rate, blood pressure, temperature and evaluation for level of sensorium and deficits. Ocular parameters include evaluation degree of proptosis, state of eyelid, skin, position of globe, visual acuity and papillary response. Any change in vision and pupillary response warrants change in treatment strategy.

Intensive antibiotic therapy is started with the broad spectrum antibiotics. The antibiotics will give a good improvement if chosen according to culture and sensitivity. The chosen antibiotic should cover all pathogens, as well as exhibit

beta lactamase resistance and have the ability to penetrate CSF. Intravenous antibiotics are given for 1-2 weeks and then oral antibiotics for 4 weeks.

If fungal infection is suspected, the underlying metabolic abnormality like Diabetes has to be corrected. Intra venous antifungal therapy has to be started. In fungal etiology – surgical debridement of sinuses can be of help.

Supportive therapy should consist of nonsteroidal anti-inflammatory drugs, analgesics, antipyretics and rehydration therapy.

Surgical treatment is considered depending on visual status, progression of orbital signs, and no clinical improvement while being treated with medical therapy for 24-48hrs.

The main goal is to decrease orbital pressure and to obtain a culture. If imaging suggests drainable fluid collection the surgical intervention is considered. The collected specimen should be sent for Microbiological study that helps in further refinement of treatment options.

SUBPERIOSTEAL ABSCESS

Subperiosteal abscess is a collection of purulent material between the orbital bony wall and periosteum. It may develop from orbital cellulitis as a complication or from spread of an adjacent infection.

The subperiosteal phlegmon/abscess is more common from ethmoidal sinus, hence medial wall is involved. First Initially, it begins as a phlegmon and spreads in the subperiosteal space and it can also spread via the superior ophthalmic vein[15]

Causative organisms:

Similar to that of Orbital Cellulitis

Signs and symptoms:

Symptoms are similar to that of orbital cellulitis. Signs include visual loss, limitation of movements and directional proptosis due to intraorbital mass effect and entrapment of extraocular muscle. Diagnosis is confirmed by the radiological investigations.

Radiological findings:

Computed Tomography: Well defined spindle shaped elevation of periosteum contiguous to sinuses. There is hypodense lesion suggestive of

necrotic center with peripheral enhancement. Post contrast pictures shows diffuse enhancement of soft tissues

B Scan: Irregular poorly defined lesion in the orbital cavity along the orbital walls with medium reflectivity

Complications:

The subperiosteal abscess progresses in an non axial fashion. it tracks forward along the periosteum

- anteriorly causing subcutaneous induration or fistula
- posteriorly causing catastrophic visual loss due to apical compression

Treatment:

- Investigations and initial treatment is as for orbital cellulitis.
- The abscess is drained through most likely area by incision of some 2-3 cm along the orbital margin. Periosteum is incised and pushed away from bone by blunt dissection and abscess drained.

Drainage is easy if the abscess is located in peripheral fascial compartment. In acute cases as little as possible of dissection is done and in chronic cases an extensive opening into nose or sinuses may be done. Part of operation can be done by nasal route(endoscopic) too.

ORBITAL ABSCESS

Orbital Abscess is the collection of pus within the orbital tissue. It occurs due to penetrating injuries, post surgical complication and following systemic infections. These infections are usually secondary to orbital cellulitis and periorbital abscess as its complication when the infection penetrates the periorbita. It can be differentiated from orbital cellulitis by the occurrence of orbital apex syndrome which is consistent with organized infection in posterior orbit.[16]

Figure 13,14: Profile pictures of patients with Orbital Abscess

Causative Organisms:

Similar to that of Orbital Cellulitis

Signs and symptoms :

Symptoms are similar to orbital cellulitis –proptosis, swelling of eyelids, defective vision and redness. Signs include severe exophthalmos, chemosis,

complete ophthalmoplegia, venous engorgement or papilloedema on fundus examination. Systemic toxicity is marked.

Complications:

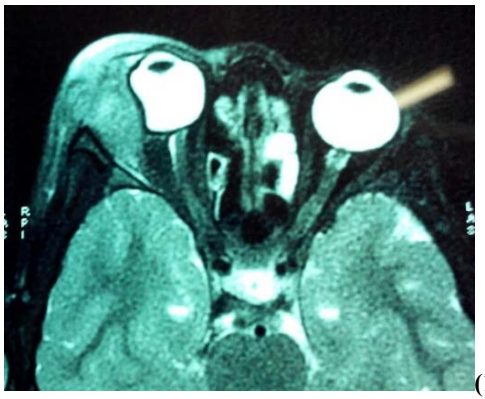
- Infective /toxic neuropathy
- Orbital apex syndrome
- Loss of vision
- Intracranial complications

Radiological Findings:

Computed Tomography: With contrast, it is seen as a well defined lesion with central necrosis and peripheral enhancement. There will be Extraocular muscles thickening and Fat stranding**.**

Figure 15,16: CT orbit coronal view with hyperdense lesions in the orbital cavity with central necrosis suggestive of Orbital abscess

Magnetic Resonance Imaging: Central T1 Hypointense,T2 Hyperintense lesion with thick irregular rim**.**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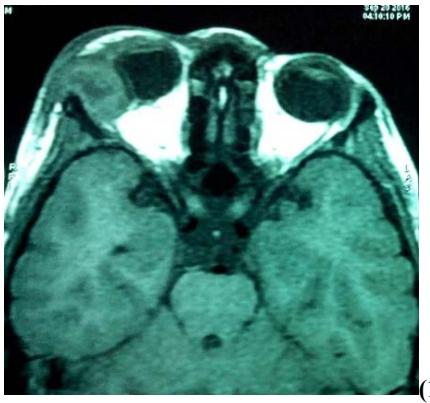
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Figure 17,18: MRI T2 weighted, T 1 weighted axial view showing hyperintense lesion in the superotemporal quadrant with central necrosis suggestive of Orbital abscess

(19)

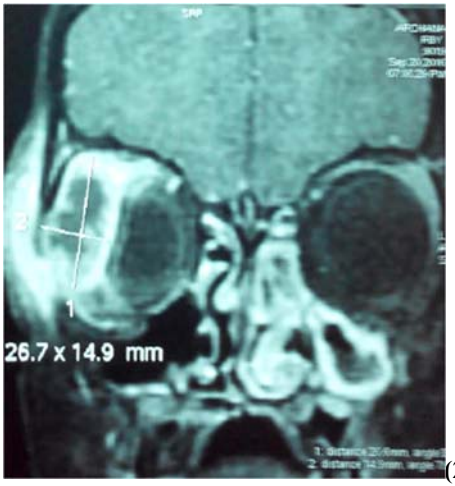

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Figure 19,20: MRI Contrast axial and coronal view showing hyperintense lesion in the superotemporal quadrant with central necrosis suggestive of Orbital abscess

B Scan: Regular poorly defined lesion of medium reflectivity

Treatment :

Initial and supportive treatment is similar to that of Orbital cellulitis. Surgical drainage of abscess – wide free incision is made over the suspected area through the lid in the region of palpebral sulcus. If there is no indication of site, the inferior quadrant should be chosen. If suppuration is in peripheral fascial compartment, the incision should extend to free the lateral palpebral ligament and lateral rectus muscle to provide the access to central compartment.

In fulminating cases, when central abscess exists then drastic surgical measures are indicated. Kronlein lateral approach is usually most effective. If function of eye is lost, then drainage by evisceration is carried out. Post-operative monitoring is warranted to detect reformation of abscess and complications.

CAVERNOUS SINUS THROMBOSIS

Infection of paranasal sinuses particularly those of ethmoid and sphenoid and less commonly the frontal and maxillary can cause thrombophlebitis of the cavernous sinus. The valve less nature of the veins connecting the cavernous sinus causes easy spread of infection.[17] Various causes and routes of spread of Cavernous sinus thrombosis are as follows

Source	Disease	Route
Nose and danger area of face	Furuncle, Septal abscess	Pharyngeal Plexus
Ethmoid sinus	Orbital cellulitis, Abscess	Ophthalmic veins
Sphenoid sinus	Sinusitis	Direct
Frontal Sinus	Sinusitis, Osteomyelitis	Supraorbital and Ophthalmic veins
Orbit	Cellulitis, Abscess	Ophthalmic Vein
Upper eyelid	Abscess	Angular vein and Ophthalmic veins
Pharynx	Acute Tonsillitis, Peritonsillar Abscess	Pharyngeal plexus
Ear	Petrositis	Petrosal venous sinuses

Causative organisms:

Most common are Staphylococcus aureus – 70-92%, frequently penicillinase resistant, streptococci

Fungus like Mucor, Aspergillus, Rhizopus

Clinical features:

Onset is abrupt with chills and rigors. Patient is acutely ill. Eyelids get swollen with chemosis and proptosis. Cranial nerves 3, 4 and 6 related to the sinus get involved individually and sequentially causing total ophthalmoplegia.

Pupil is dilated and fixed. Optic disc shows congestion and edema with diminution of vision. Sensation in the distribution of trigeminal (ophthalmic division) is diminished. Usually unilateral in majority of cases, tends to spread and involve other side which may occur within few hours. Systemic toxic symptoms are severe.

Radiological Features:

Computed Tomography: Enlarged cavernous sinus with non-enhancing areas within the sinus. Dilated superior ophthalmic vein is seen with extraocular muscle thickening. There may be hyperdense areas in the CNS suggestive of infarct or abscess.

Magnetic Resonance Imaging: Superior Ophthalmic vein dilatation is noted. Hyper intense signal within sinus with thrombosed vascular channels.

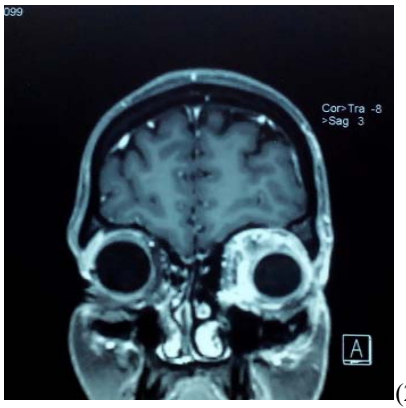
(21)


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Figure 21,22: MRI T1 weighted images Axial and coronal view showing hyperintense signal in the left orbital cavity which is extending to left side of cavernous sinus

B Scan: Increase in size of superior Ophthalmic vein and extraocular muscles

Complications:

There is a risk of developing blood clot in other areas of body like Deep vein thrombosis, pulmonary embolism, stroke. The infection spreads beyond cavernous sinuses resulting in meningitis and sepsis.

Treatment:

Intravenous antibiotics in massive doses which should be promptly and effectively commenced as early as possible. Monitoring of the general and ocular parameters has to be carried out. Attention to the focus of infection, drainage of infected ethmoid or sphenoid sinus should be done. Systemic steroids may prove of some assistance if response to antibiotics is poor.

Role of anticoagulants is not clear. Prognosis depends largely on the prompt commencement of treatment.

RADIOLOGICAL IMPORTANCE

Radiological investigations like X Ray Orbit, B Scan, CT with Contrast, MRI are important in the management of Orbital infections in diagnosing the causative factors, in finding the extension of infection and complications, it also helps to localise the lesion helping in its surgical management.[18]

X ray orbit:

Water's view, Caldwell view and Lateral view are important views available. It mainly reveals paranasal sinus diseases characterized by sinus opacification, mucosal thickening and presence of fluid level.

Gas or fluid gas level in the orbit is strongly suggestive of orbital abscess though its absence does not necessarily rule out an orbital abscess. Blow out fracture and calcification indicates the etiology of infection towards trauma and parasitic infection respectively.

B Scan/Ultrasonography:

In **Orbital cellulitis**, on follow up examination, if there is a progressive decrease of reflectivity in certain areas, abscess formation should be suspected.

In **Subperiosteal abscess** reflectivity of the sub periosteal fluid is typically very low and the internal structure is regular. Break in high reflectivity periosteum suggests the progression into Orbital Abscess.

In **Orbital abscess**, Blood and pus may be difficult to distinguish from one another. However, blood has a tendency to layer more than the pus. With time, abscess tends to increase in size but the blood usually reduces.

Follow up examination may be a way to distinguish between these two conditions. It also helps to assess the response to treatment and be helpful to guide the insertion of the needle into the abscess cavity. B scan is also helpful in diagnosing parasitic Infections-Hydatid cyst, Cysticercosis.

Computed Tomography and Magnetic Resonance Imaging:

Both CT and MRI show the extent of involvement of the soft tissue by the infection. However, CT is more precise in demonstrating the bony changes.

Intracranial complications like frontal lobe infection and epidural inflammation is well shown by CT and MRI. Soft tissue scarring of retrobulbar space can be seen year after bacterial orbital cellulitis. It can also demonstrate intra orbital, sub periosteal and intracranial abscess.

Infection in sub periosteal space is demonstrated by displacement of the contrast enhanced periosteal membrane away from the orbital wall. Once infection has extended into the cavernous sinus or beyond, MRI is the investigation of choice. MRI demonstrates and characterizes the cavernous sinus better and is more sensitive in showing a thrombosis and intracranial site of inflammation.[18]

MICROBIOLOGICAL STUDY IMPORTANCE

Ideally aspirates from the involved structures should be obtained and examined for organisms. Eye swabs are of limited importance in orbital and preseptal cellulitis. In case of lacrimal sac infection, infective material is obtained after incision and drainage

In orbital cellulitis, cases that improve with empirical antibiotic therapy need not to be investigated further, whereas cases which worsen in spite of treatment need to investigated to find the specific organisms. In those cases, nasal swabs are done. In cases where sinusitis is the preliminary pathology, aspirate from the sinuses is used to find the infective organisms.[19]

In Subperiosteal and Orbital abscess, Image guided aspiration is done and used for microbiological study. Whenever surgical debridement is done, debrided material is used. Conditions where ocular conditions like trauma and panophthalmitis is the source of infection, conjunctival swab help in the diagnosis.

The infective material obtained is subjected to Gram staining, culture in specific agar plates like blood agar, nutrient agar according to the suspected organisms. Antibiotic sensitivity is mandatory in order to prescribe the most sensitive antibiotics and avoid drug resistance. Fungal organisms can be identified by KOH mount, culture in Sabouraud Dextrose agar. Blood culture is necessary in cases of sepsis.[19]

PART-II

AIM OF THE STUDY

To evaluate orbital infections and analyse the role of Radioimaging and Microbiological study in early diagnosis, management and outcome.

OBJECTIVES:

1. To analyse the prevalence, etiopathogenesis and various clinical presentations of orbital infections and role of Radioimaging and Microbiological study in its early diagnosis, treatment and outcome.
2. To assess prevention of complications following early treatment in orbital infections

MATERIALS & METHODS

This prospective study was conducted at Orbit and Oculoplasty department, RIOGOH, Egmore, Chennai for a period of 12 months during when 30 patients with Orbital infections were evaluated

INCLUSION CRITERIA:

Patients presenting with

1. Orbital infections associated with infection of contiguous structures.
2. Acute proptosis with suspected sepsis
3. Acute lacrimal apparatus infection

EXCLUSION CRITERIA:

Patients presenting with

1. Proptosis associated with malignancy
2. Isolated Intraocular infection

EVALUATION OF PATIENTS

Patients presenting to Orbit and Oculoplasty services were registered, evaluated and followed up during the study period

- Detailed history of presenting illness, associated systemic illness
- Complete general examination of the patient and vitals measurement
- Visual acuity using Snellen's acuity chart
- Extra Ocular Movements
- Intraocular pressure measurement
- Direct and Indirect ophthalmoscopy
- Fields, Colour vision
- Hertels exopthalmometry
- Examination of ENT, abdomen, RS, CVS, CNS were done.

INVESTIGATIONS DONE:

- Complete hemogram
- Radiological imaging-x ray orbit, CT, MRI, B scan
- Microbiological study –smear and culture and sensitivity
- Patients referred to ENT, neurology, dental surgeon, physician for expert opinion whenever indicated

Management:

All cases were treated according to the clinical presentation. All orbital infections were treated initially with empirical oral antibiotics and iv antibiotics as and when needed. Supportive therapy with nasal decongestants, anti-inflammatory and antipyretics drugs were added. Identification and treatment of the primary source of infection is necessary to control the infection.

Preseptal and orbital cellulitis were mainly treated with medical management –Oral and I.V antibiotics, anti fungals, anti-inflammatory drugs and antipyretics.

Subperiosteal and Orbital abscess were treated with surgical Management-Drainage of pus followed by Medical treatment. Cavernous sinus thrombosis was intensively treated with I.V antibiotics.

Medical Management:

Most of the orbital infections responded to broad spectrum antibiotics, which were started orally or intravenously and later changed to oral administration. In cases where Microbiological study was done, antibiotics were used according to the Culture and sensitivity report.

In our study we analysed the efficacy of cefotaxime and gentamicin which were started empirically. Cefotaxime is the prototype of the cephalosporins of third generation. It exerts potent action on aerobic gram negative as well as some gram positive bacteria but is not so active on anaerobes, staphylococcus aureus and pseudomonas aeuroginosa. In adults it was given at a dose of 1-2 G intramuscularly or intravenously, 6-12hourly and in children 50-100mg/kg/day.

According to the Culture and sensitivity study, treatment was switched over to IV Cloxacillin, Piperacillin-Tazobactam and ampicillin in needed cases

Gentamicin is more potent and has broader spectrum of action. It is active against pseudomonas aeuroginosa and most strains of proteus, E coli, Klebsiella and staphylococcus aureus. For an average adult with normal renal function it was given in dose of 1-1.5mg/kg intramuscular or intravenous 8 hourly.

In suspected cases of anaerobic infections metronidazole was administered. It is generally used in combination with gentamicin or

cephalosporins. In serious cases it was administered intravenous at dose of 15 mg/kg infused over 1hour followed by 7.5mg/kg every 6 hours till oral therapy could be instituted. According to sensitivity report we switched to Ceftrioxone, Amikacin, intravenously in Pseudomonas cases and Ampicillin-Sulbactam in Klebsiella case.

In cases of parasitic infections Albendazole 15mg/kg for 8 days was administered. Switching to oral antibiotics was based on the clinical judgement.

If fungal etiology is suspected then treatment included intravenous amphotericin-B and voriconazole along with prompt debridement. The supportive treatment consisted of nasal decongestants, anti-inflammatory drugs and antipyretics.

Surgical treatment:

When the presence of pus was apparent and the case does not seem to be controlled by the medical treatment, surgical management was done.

In cases of abscess, where the pus presents under the skin or conjunctiva a free incision was made into the abscess and was drained. Subcutaneous induration was the early localizing sign in those cases. Sub periosteal abscess and abscess of orbital tissue were managed by wide excision and drainage. The pus drained was sent for Gram staining and Culture and sensitivity. They were also sent for fungal culture in suspected cases.

Cases of fungal etiology, where there was extensive sinus involvement were managed by surgical debridement which was done in Ent department to remove the source of infection and was sent for Microbiological study.

Since the introduction of newer generation antibiotic drugs the need for drastic surgery has considerably reduced. In this study, according to the microbiological studies, the cases were managed by appropriate antibiotics and antifungals after the surgical management.

Follow up: 1st day

3rd day

5th day

One week

As and when needed

During the follow up period the following parameters were assessed.

- Improvement in visual acuity
- Extra ocular movements
- Assessment of reduction in signs of infections in the orbit
- Incidence of complications encountered.

RESULTS AND ANALYSIS

AGE DISTRIBUTION

Age group	No of cases	% of Total cases
< 1year	2	6.7
1-10 years	9	30
11-20 years	2	6.7
21-30 years	2	6.7
31-40 years	6	20
41-50 years	2	6.7
51-60 years	5	16.7
61-70 years	2	6.7

Table:1 Age distribution in the study group

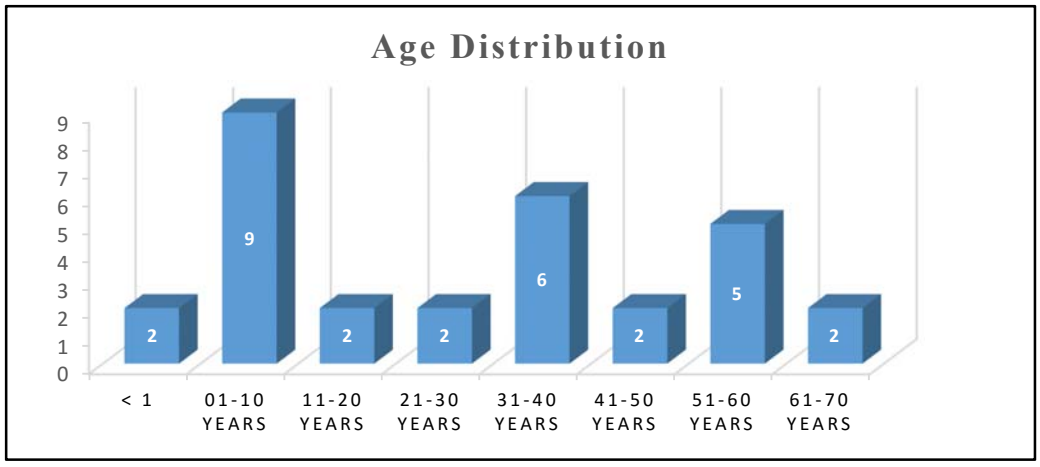

Chart 1: Bar diagram - Age distribution in the Study patients

It is evident from the study that Paediatric age group is the most common affected group with periocular infection as the common etiology, followed by 31-40 years with sinusitis as the major cause. This may be due to the increased susceptibility of these age groups to the etiology of the orbital infections.

SEX DISTRIBUTION

Sex	No. Of cases	% of cases
Male	21	70
Female	9	30

Table 2: Sex distribution in the study group

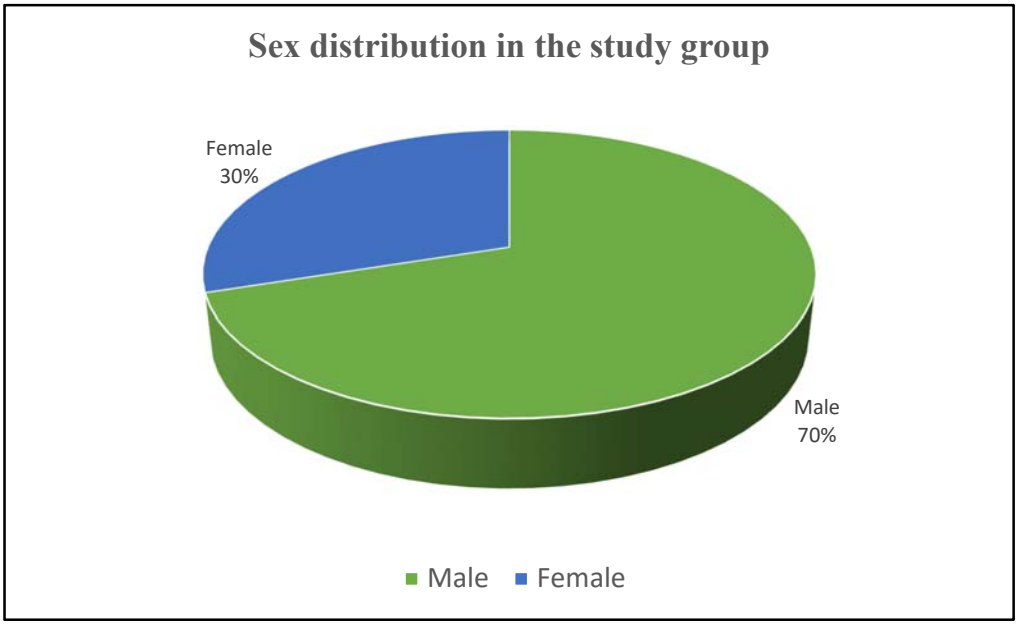

Chart 2: Distribution of sex in the study group

There was a male preponderance in this study in both pediatric and adult age group. Similar age preponderance was noted in previous studies Trauma is a major etiology contributing to the male predilection as male gender is more prone to trauma

LATERALITY OF ORBITAL INFECTIONS

Laterality	No of cases	% of cases
Right	10	66.7
Left	20	33.3

Table 3: Laterality of eye in the study group

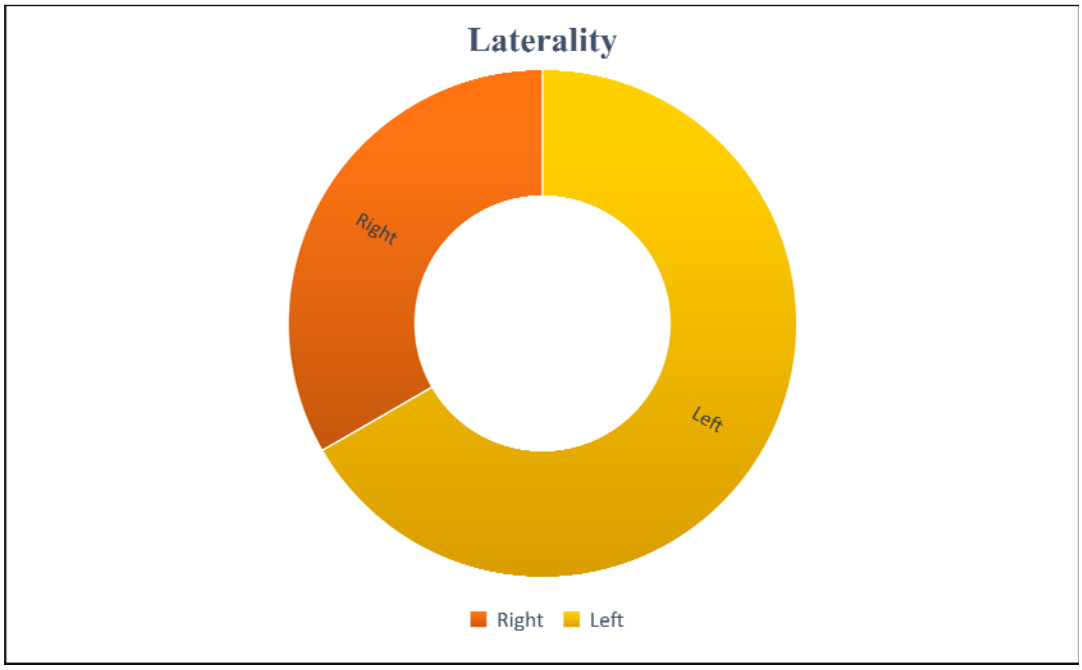

Chart 3:Laterality of eye in the study group

All the cases in our study had unilateral affection of the disease and the left eye was more commonly involved compared to the right eye. There is no significant similarity in the previous studies.

ETIOLOGY OF ORBITAL INFECTIONS

Etiology	No.of cases	% of total
Ocular causes	1	3.33
Systemic predisposition	2	6.67
Combined causes (sinusitis with systemic causes, Trauma with ocular infections)	6	20
Sinusitis	6	20
Trauma	5	16.7
Total	30	100

Table 4: Distribution of different causes of Orbital infections

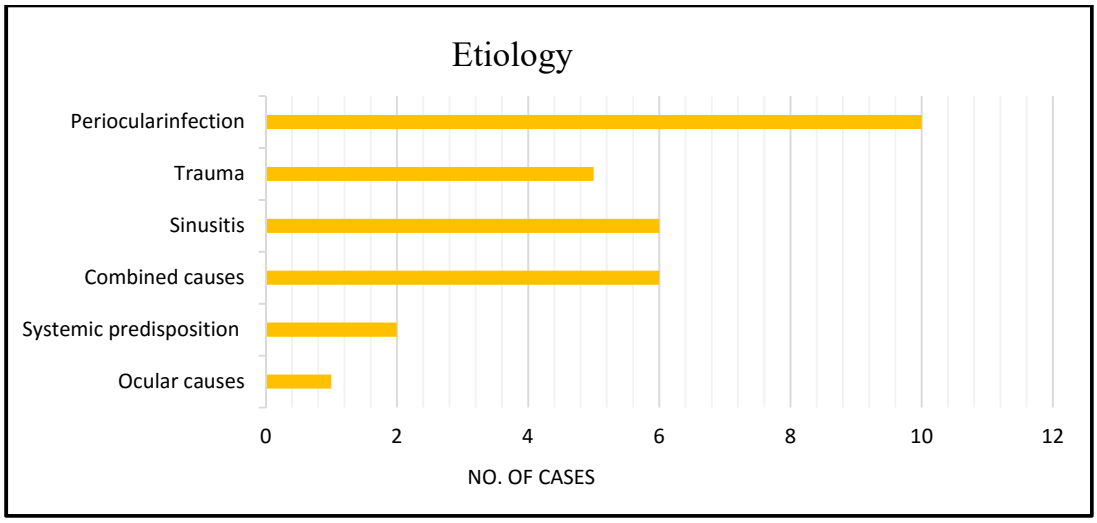

Chart 4: Distribution of different causes of Orbital Infections

In this study, Periocular infections including acute dacryocystitis were the commonest cause, followed by sinusitis and Trauma. Systemic conditions like Diabetes and immunocompromised state predisposed to Fungal infections. Combined conditions including Sinusitis with systemic predisposition and trauma with Ocular infection contributed to significant number of cases.

VISUAL ACUITY AT THE TIME OF PRESENTATION

Vision acuity	No. of cases	% of Total
Fixing and following light	6	20
6/6 to 6/18	8	26.7
6/18 to 6/60	6	20
<6/60	4	13.3
Only perception of light	2	6.7
No perception of light	4	13.3

Table 5: Visual Acuity at the time of presentation

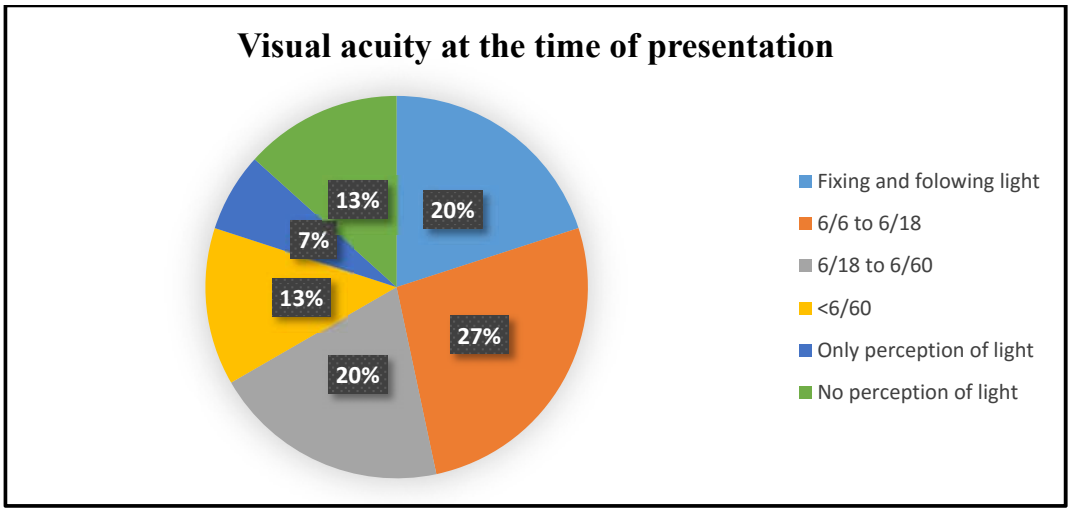

Chart 5: Visual acuity at time of presentation

In this study, most of the pediatric and adult cases who had Preseptal cellulitis had good vision (> 6/18). Patients with Orbital cellulitis and abscess had V/A less than 6/60, whereas patients with severe ocular infections presented with only perception of light. Debilitated patients who presented with Fungal sinusitis with Orbital abscess presented with no perception of light and had very poor prognosis

OCULAR MOVEMENTS AT TIME OF PRESENTATION

Ocular movements	No.of cases	% of Total
Full	17	56.7
Restricted	13	43.3
Total	30	100

Table 6: Ocular movements of the patients at the time of presentation

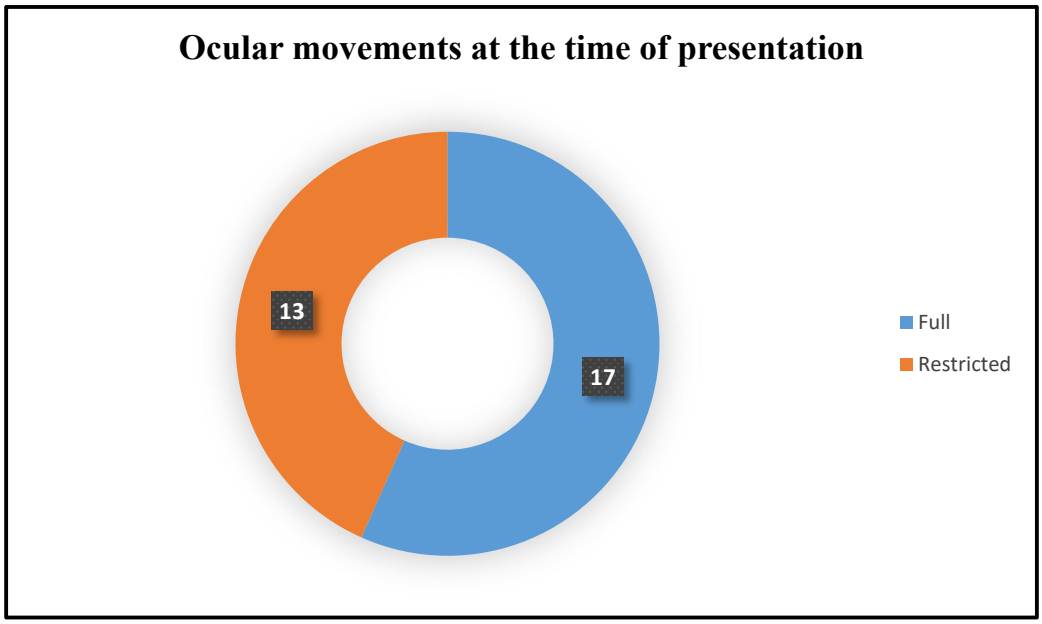

Chart 6: Ocular movements of the patients at the time of Presentation

In our study, we inferred that 56.7% of patients (17) had full ocular movements. Those patients were all cases of Preseptal cellulitis, and one case of Orbital cellulitis. All other cases of Orbital cellulitis, Orbital abscess and Cavernous sinus thrombosis presented with restricted Ocular movements.

DISTRIBUTION OF SIGNS ON EVALUATION

Signs on Evaluation	No.of cases	% of Total
Lid edema	30	100
Proptosis	24	80
Congestion	22	73.3
Chemosis	18	60
Movement restriction	13	43.3
Pupil involvement	12	40
Discharge	4	13.3
Toxic Features	5	16.7

Table 7: Signs among the patients of Orbital infections

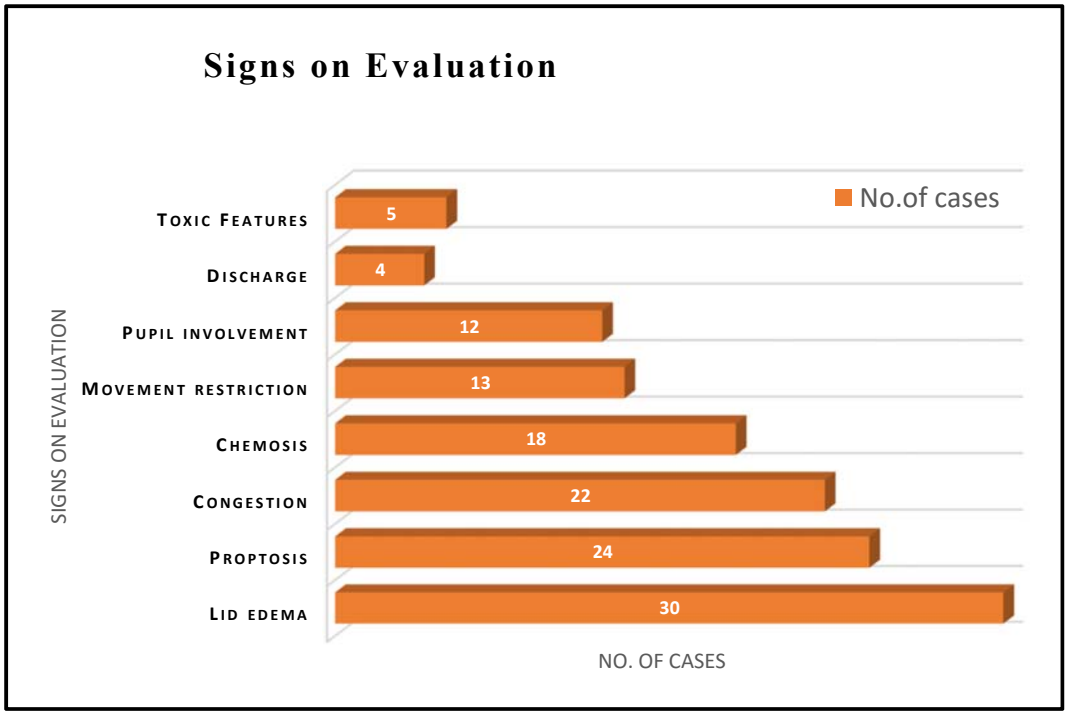

Chart 7: Signs among the patients of Orbital infection

In this study we can infer that all the patients-100%(30) in the study group presented with Lid edema and 80%(24) of the patients presented with proptosis. Congestion and chemosis were the next common among the presenting signs followed by movement restriction. Pupil involvement was there in 40% of patients, Discharge was present only in Ocular infection patients. Toxic features were present in cases of fungal sinusitis with orbital abscess and cavernous sinus thrombosis.

In cases of preseptal cellulitis, follow up of motility restriction and pupil involvement is necessary as appearance of these two signs signify the progression of infection to orbital cellulitis.

These results were similar to the results of study on 'Orbital cellulitis in children'

Figure23:Patient with Preseptal cellulitis

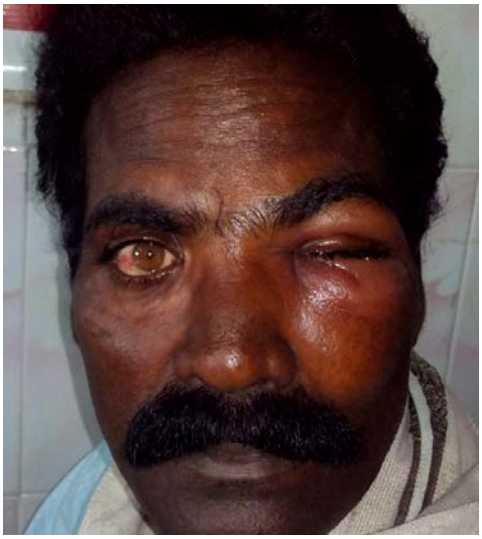

Figure 24:Patient with Orbital cellulitis

LABORATORY FINDINGS IN THE STUDY GROUP

Laboratory findings	No.of cases	% of Total
Within normal limits	14	46.6
Elevated TC	12	40
Elevated Neutrophils	9	30
Elevated eosinophils	3	10
elevated ESR	16	53.3

Table 8: Laboratory findings in the study Group

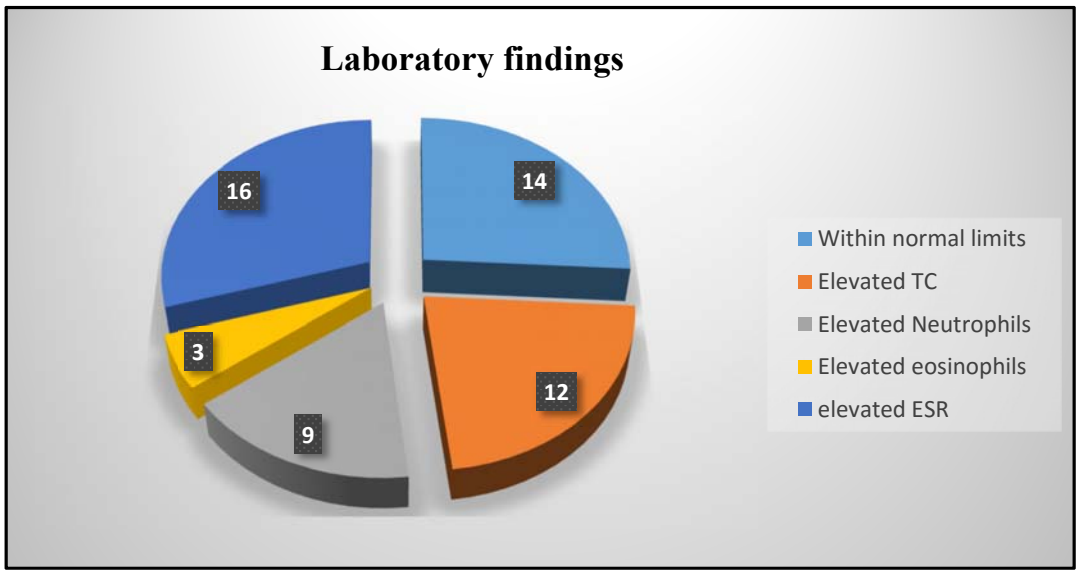

Chart 8: Laboratory findings in the study Group

Here,46.6% (14) of patients had normal laboratory values, among which most of had preseptal cellulitis.40%(12) of patients had elevated Total count who were having Orbital cellulitis and abscess.53.3% (16) of patients had elevated ESR which was a nonspecific lab test but it showed the presence of some infection in the patients.

RADIOLOGICAL INVESTIGATIONS

Radiological Investigations	NO. of cases	% of Total
X ray	15	50
B scan	16	53.3
CT	19	63.3
MRI	3	10

Table 9: Radiological Investigations done in the study group

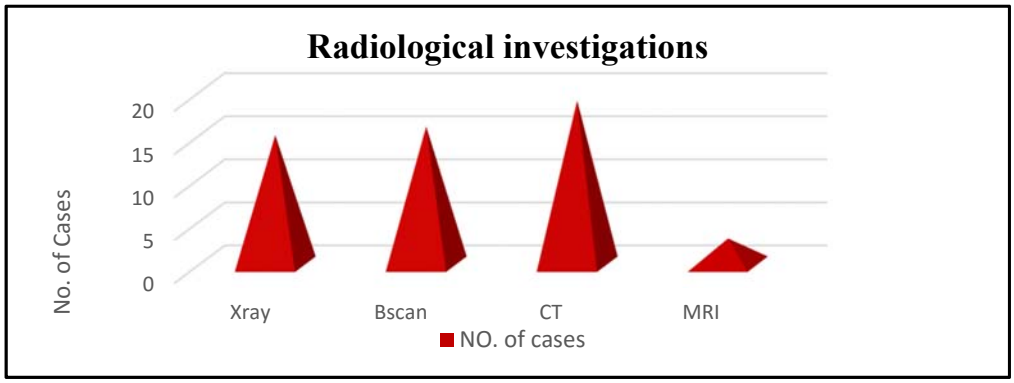

Chart 9: Radiological Investigations done in the study group

Out of 30 patients,50% (15) were taken X Ray as primary investigation for Trauma and periocular infection where 7 patients had sinus haziness. B scan was done in 53.3% (16) patients of Trauma and Ocular Infections to find the extent of Orbital infections. CT Scan was done in 63.3% (19) of patients with Trauma, Sinusitis, systemic conditions and Periocular infections. It mainly helped us to diagnose Orbital abscess in cases of Orbital cellulitis, to look for intracranial complications and to assess the prognosis following treatment. MRI was done is only in 3 patients who were diagnosed to have sinusitis as primary infection causing Orbital abscess and cavernous sinus thrombosis.

MICROBIOLOGICAL STUDY

Microbiological study	No. of cases	% of total
Gram Staining, C/S	5	16.7
Gram staining, C/S, Fungal Culture	11	36.7
Only Fungal Culture	2	6.7
Not needed	12	40

Table 10: Microbiological study done

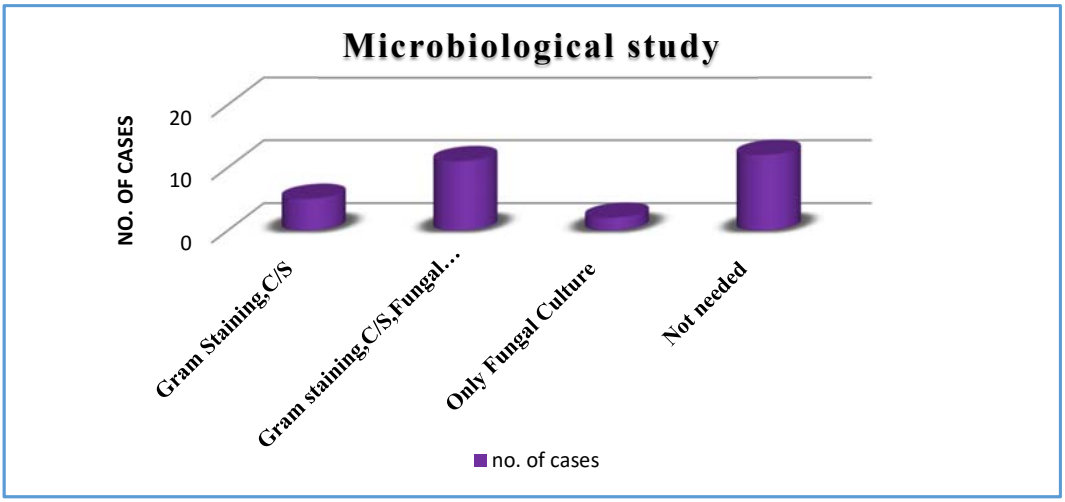

Chart 10: Microbiological study

In this study, Gram staining and Culture and sensitivity were done in 16.7% (5) of cases of suspected bacterial aetiology like periocular infections and Sinusitis. Fungal culture was added to them in 36.7% (11) of cases with Trauma (3), Ocular and periocular infections (6), sinusitis with systemic predisposition (5) which caused Orbital cellulitis in most cases.

Fungal Culture was alone done in cases Suspected fungal sinusitis (2). Microbiological Study was not done in clear cut preseptal cellulitis that got cured with empirical antibiotic therapy.

CLASSIFICATION OF ORBITAL INFECTIONS IN THE STUDY GROUP

Classification of Orbital Infections in the Study Group	No. of cases	% of Total
Preseptal Cellulitis	16	53.4
Orbital cellulitis	8	26.7
Periosteal Abscess	1	3.3
Orbital Abscess	4	13.3
Cavernous sinus thrombosis	1	3.3
Total	30	100

Table 11: Classification of Orbital Infections in the Study Group

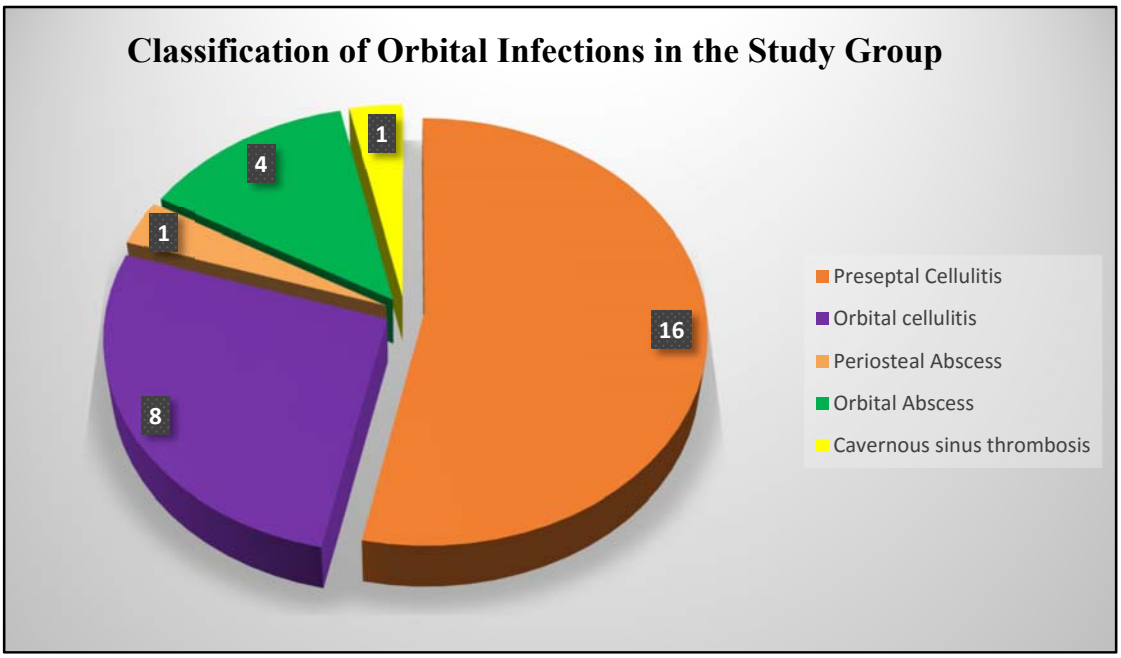

Chart 11: Classification of Orbital Infections in the Study Group

In this study,

- Preseptal cellulitis was diagnosed in 53.4 %(16) of the patients who had periocular infection (9) as the major cause followed by Trauma (5). Other causes were Sinusitis(1) and systemic cause(1).
- Orbital cellulitis was seen in 26.7 % (8) of patients who had Ocular infection (3) as the major cause followed by Trauma (2), periocular infection (2), Sinusitis (2) and factors (2).
- Periosteal Abscess was seen in 3.3% (1) of patients in whom ocular infection was the main cause.
- Orbital abscess was diagnosed in 13.3% (4) of patients where Fungal sinusitis (3) was the major cause with bacterial sinusitis as the second cause (1).
- Cavernous Sinus Thrombosis was diagnosed as a complication of sinusitis in 3.3% (1) of patient.

Figure 25 : Patient with Orbital abscess

Figure 26:Patient with Subperiosteal abscess

ORGANISMS CAUSING ORBITAL INFECTIONS:

Organisms causing orbital infections	No. of cases	% of Total
Bacteria	26	86.7
Fungi	3	10
Parasitic	1	3.3

Table 12: Organisms causing orbital infections

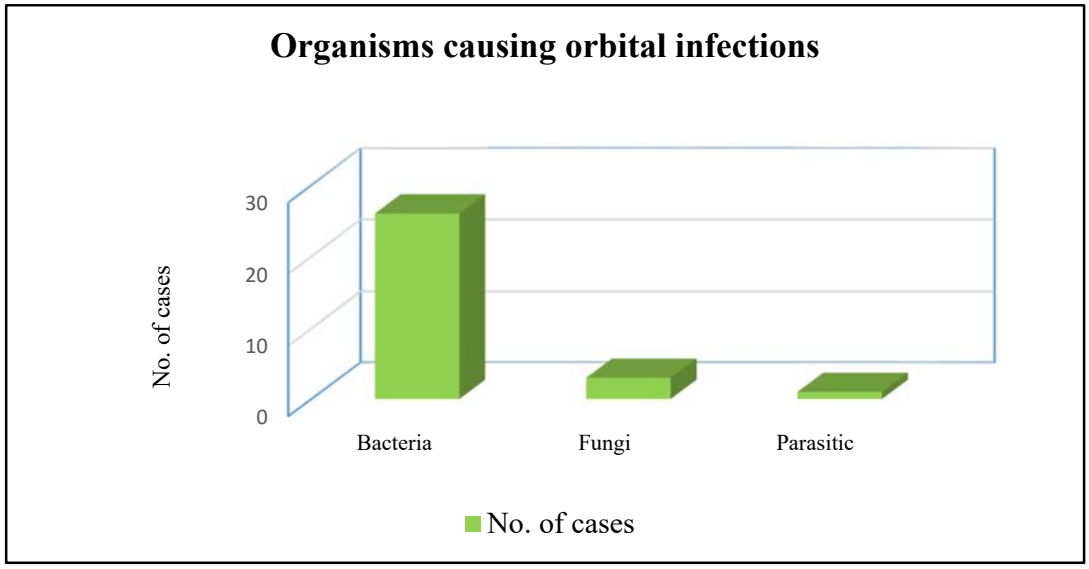

Chart 12: Organisms causing orbital infections

Bacteria formed the major causative organism in our study. Among the cases who had Gram Staining, 7 cases showed Staphylococcus aureus,5 showed Streptococcus with Pseudomonas in 2 cases followed by Klebsiella in 1 case. Second commonest cause was Fungus which was proved by fungal culture in 3 cases with Apergillus and mucor Species followed by parasitic.

MODES OF TREATMENT:

Mode of Treatment	No.of cases	% of Total
Medial	20	66.7
Surgical	10	33.3

Table 13: Mode of Treatment

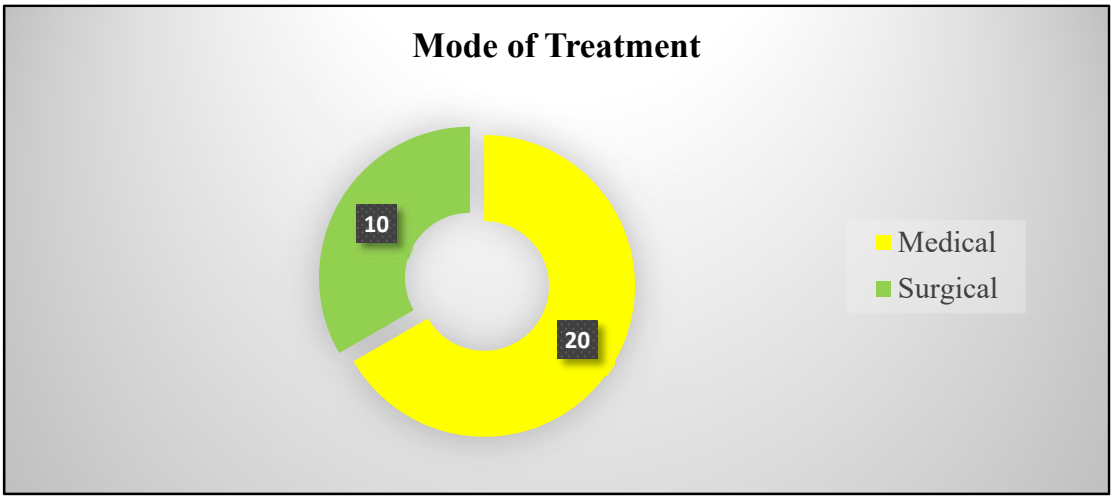

Chart 13: Mode of Treatment

67% of the cases were treated with medical management. They were in total 20 cases which most commonly included preseptal cellulitis (13) followed by Orbital cellulitis (6). In our study, cavernous sinus thrombosis patient also improved with intensive medical management.

33%(10) of Cases with Orbital abscess, subperiosteal abscess and acute dacryocystitis were managed surgically with incision and drainage. The pus collected was sent to microbiological study. Then it was followed by medical management according to the culture and Sensitivity report.

ANALYSIS OF COURSE OF ORBITAL INFECTIONS FOLLOWING TREATMENT

Patients treated with medical treatment

Group	No.of cases	% of cases	Prognosis within 2 wks	No.of cases
Preseptal Cellulitis	13	65	cured	10
			improved	3
Orbital cellulitis	6	30	cured	2
			improved	4
Caveronous sinus thrombosis	1	5	cured	1

Table 14: Distribution of Patients treated with medical treatment

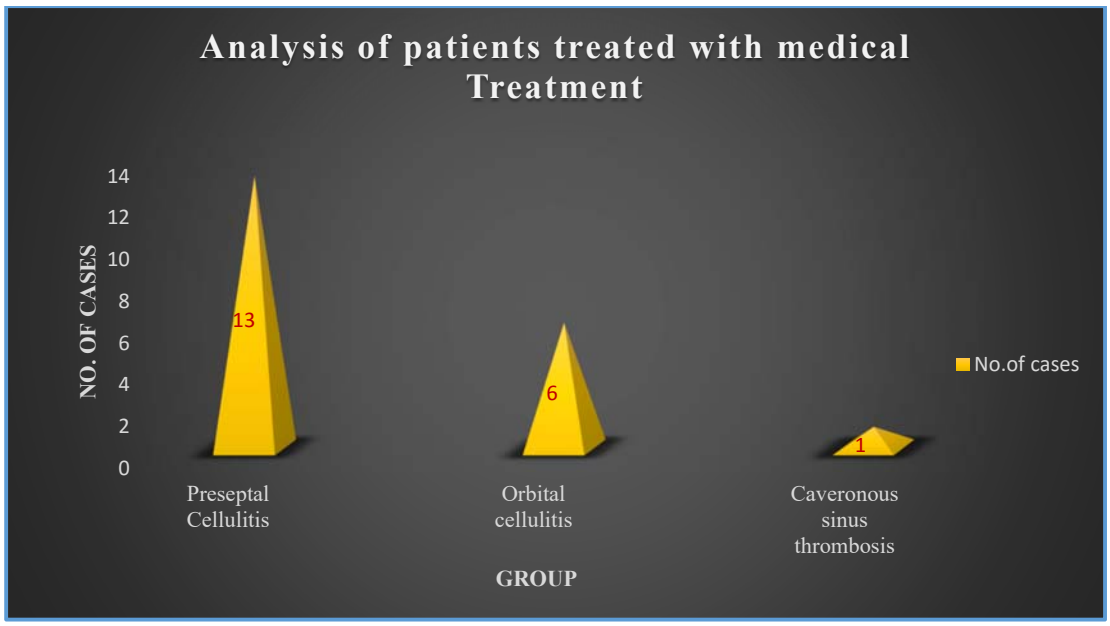

Chart 14: Distribution of Patients treated with medical treatment

65%(13) of the medically treated patients were of preseptal cellulitis. Out of them,10 patients were completely cured and 3 patients showed improvement in the signs and symptoms in the period of 2 weeks. 30% (6) of them were with Orbital cellulitis, of which 2 got cured and 4 improved.5%(1) of the medically treated was a case of cavernous sinus thrombosis, treated with broad spectrum antibiotics and got completely cured. The patients who showed improvement were maintained with oral antibiotics and found to be completely cured in the follow up period after 2 weeks

Patients treated with surgical treatment

Group	No. of cases	% of cases	Prognosis within 2 weeks	No. of cases
Preseptal Cellulitis with acute dacryocystitis	3	30	cured	3
Orbital cellulitis	2	20	cured	1
			improved	1
Subperiosteal abscess	1	10	Deteriorated	1
orbital abscess	4	40	improved	3
			Deteriorated	1

Table 15: Distribution of Patients treated with surgical treatment

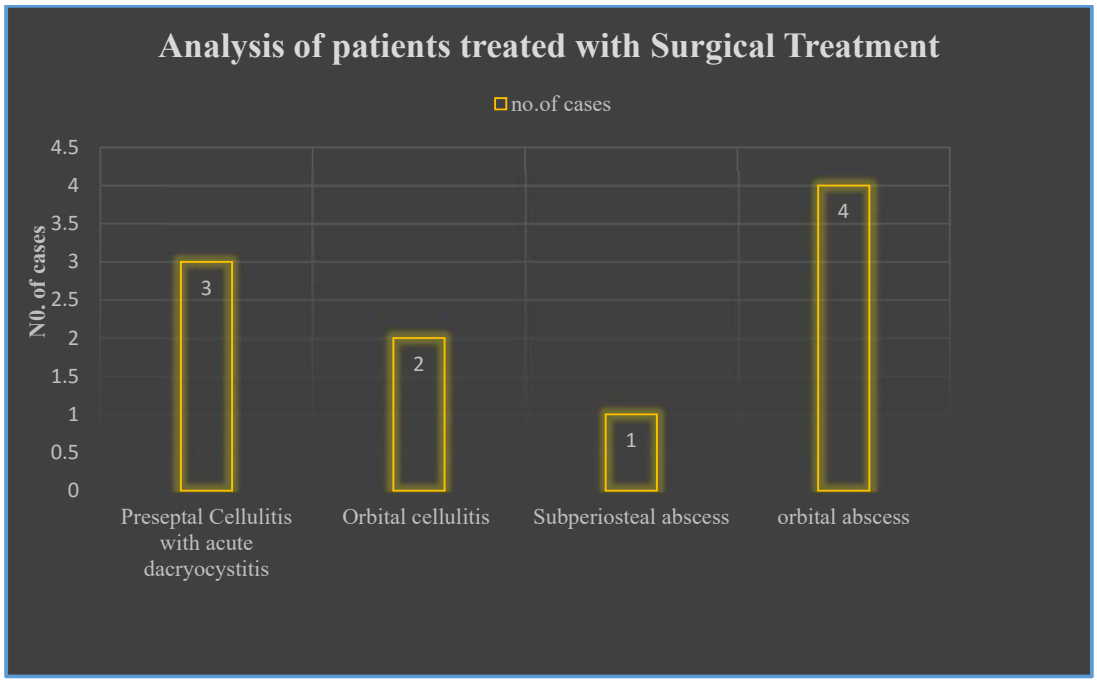

Chart 15: Distribution of Patients treated with surgical treatment

40%(4) of the surgically treated were cases with orbital abscess, among whom 3 patients improved and 1 patient deteriorated in spite of incision and drainage and treatment with appropriate antibiotics.30%(3) them were cases of preseptal cellulitis with acute dacryocystitis, all got completely cured after surgical treatment within 2 weeks. 20%(2) of the patients who underwent surgical management had Orbital cellulitis, among whom 1 got cured and 1 improved in signs and symptoms.10%(1) of the patient had subperiosteal abscess progressed to Orbital abscess in spite of treatment. All these patients were maintained on oral antibiotics after surgical management.

In this study, following parameters were included in analysing the outcome.

Cured:

Patients who had improvement in visual acuity, decrease in pain and symptoms and decrease in signs like, lid oedema, proptosis, congestion and chemosis and improvement in the ocular motility following treatment. These patients completely got rid of infective pathology and there were no complications in the follow up period of 2 weeks .

Improved:

Patients who had improvement in signs and symptoms, increased visual acuity and decrease in motility restriction following treatment but had minimal infection in the follow up period of 2 weeks. These patients had low incidence of complications in spite of active management.

Deteriorated:

Patients who deteriorated even after treatment to next grade of Orbital infection suggesting the severity of infection. These patients had more incidence of complications following treatment.

INCIDENCE OF COMPLICATIONS IN THE STUDY GROUP

Complications encountered	No. of cases	%of total
Exposure keratitis	5	16.7
Lid abscess	3	10
Panophthalmitis	2	6.7

Table 16:Complications encountered

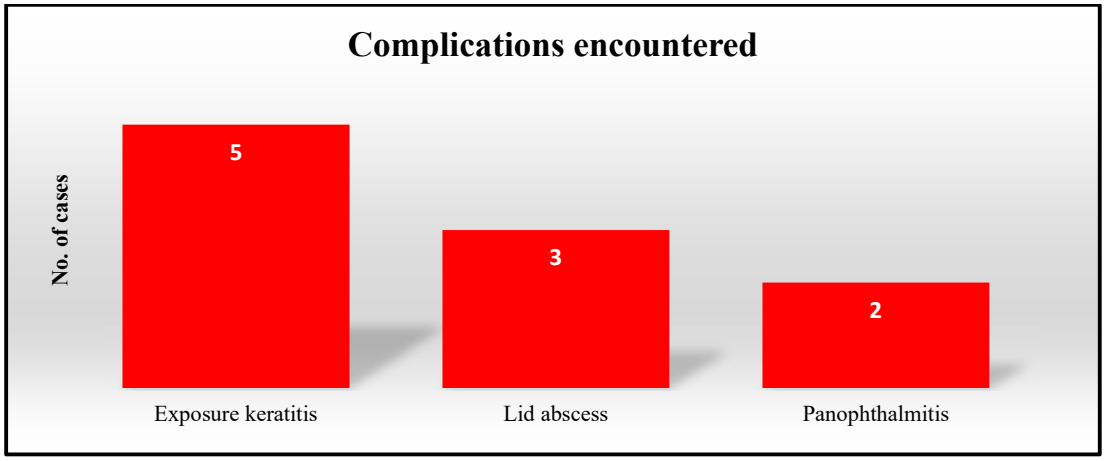

Chart 16: Complications encountered

In this study 5 patients had exposure keratitis who were with fungal sinusitis and orbital abscess with severe Proptosis. These patients were treated with topical antibiotics, lubricating eye drops and eye ointment.

3 patients with Orbital abscess and Subperiosteal abscess developed Lid abscess and was treated with incision and Drainage.

2 patients of Trauma followed by Orbital Abscess complicated with panophthalmitis, out of which 1 was taken for evisceration and 1 settled with Broad spectrum antibiotics.

Figure 27: Profile picture of case complicated with panophthalmitis

Figure 28: Profile picture of a case complicated with exposure keratitis

Figure 29: Profile picture of a case complicated with lid abscess.

DISCUSSION

A study on Preseptal and Orbital cellulitis conducted by Datta G Pandian et al at JIPMER in 2010 showed that Paediatric age group was the most common affected age group followed by age group between 30-40 years which supports our study which also shows the same distribution of age group .[20]

This study also tells that among the paediatric age group there was no sex predilection whereas males were more common in the adult group. These results were also similar to our study. Also our study showed periocular infection and trauma constituted the major part of causative factors and most of preseptal cellulitis cured with empirical antibiotics. These were also similar to the previous mentioned study**.[20]**

According to the study done by Nicholas J.Potter et al, most patients with Orbital cellulitis presented with decrease in visual acuity and restricted ocular movements. These results are comparable to our study where decrease in visual acuity and restricted ocular movements were common on Orbital cellulitis and Orbital abscess group.[21]

CT scan was an important Radiological investigations done in this study for diagnosing the various grades of Orbital infections. Its importance is cited in the study by Nicholas J.potter.[21]

In the Microbiological study we can infer that bacteria -Staphylococcus and Streptococcus constitutes the most common pathogens. This is supported by the study done by Mithra O. Gonazalez and Vikram D.Durairaj on Orbital cellulitis and Preseptal cellulitis.[22] Same is proved by study of Steven H.Mckinley et al.[23]

Most of the patients were treated medically with broad spectrum antibiotics and drugs according to culture and sensitivity. All patients showed good results. Remaining were treated surgically followed by medical management. This had correlation with the results of Starkey et al study.[24]

Patients presented with complications like exposure keratitis, lid abscess and panophthalmitis. This result had similarity with study of RT Younis et al and A Chaudry et al. [25,26]

SUMMARY

This study was conducted to evaluate orbital infections and analyse role of Imaging and Microbiological study in its outcome. The results are as follows

- The most common age group presented with Orbital infections were from 1-10 years followed by 31-40 years.
- There was a male preponderance both in paediatric and adult group.
- There was more common involvement of left eye.
- Periocular infections were the most common aetiology followed by Trauma and combined causes which included Sinusitis with systemic predisposition and trauma with ocular infection.
- Visual acuity at the time of presentation is more than 6/18 in most of the adult cases and Fixing and Following Light in paediatric cases. Only 13% of patients had visual acuity lesser than 6/60
- There was restricted Ocular motility in 43% of patients.
- Most common presenting signs were Lid Oedema, congestion, chemosis and Ocular motility restriction.
- In laboratory investigations,47% had normal findings and 53% had elevated ESR followed by elevated Total count and Neutrophils in 40% and 30% of patients respectively.

- 63% patients underwent CT as a mandatory investigation,53% had B scan and 50% had X Ray. These radiological investigations helped in the early diagnosis and appropriate management.
- 37% of patients had Gram staining, Culture and Sensitivity and Fungal culture to identify the infective pathogen.17% had only Gram Staining, Culture and Sensitivity to identify the specific species of bacteria and appropriate antibiotics. Fungal Culture alone was done in 7% of patients in whom Fungal sinusitis was diagnosed in CT scan.
- In diagnosis,53% constituted Preseptal cellulitis followed by Orbital Cellulitis and Orbital Abscess in 27% and 13% respectively.
- 67% of patients were treated medically with IV and oral antibiotics and antifungals.33% were treated surgically with Incision and Drainage/ Debridement followed by medical management.
- Among the causative organism, Bacterial strains constituted 83% of infections, followed by fungal in 10% and Parasitic in 3 %.
- In the medically treated group 65% of patients got completely and 35% improved in visual acuity, signs and symptoms
- In the surgically treated group,40% cured,40% improved and 20% deteriorated in spite of treatment.
- In incidence of complications,17% had exposure keratitis,10% had Lid abscess and 7% of Panophthalmitis.

CONCLUSION

Orbital infections are more common in paediatric age group and preseptal cellulitis is the commonest infection encountered. Periocular infections are the most common causative factor for the orbital infections.

Bacteria is the major causative organism for orbital infections. Among it, gram positive organisms predominate the cause. Fungi constituted the second major cause.

Radioimaging like X Ray, B scan, CT Scan and MRI help in diagnosis, identification of complications and in assessment of response of treatment in orbital infections. They are complimentary to one another.

Microbiological study with Gram Staining, Culture and Sensitivity and Fungal culture help in the identification of Strain of Organism and in Correct choice of antibiotics that is important in the complete cure of infections.

Most of the orbital infections resolve with the prompt treatment.

Surgical approach forms the treatment of choice in abscess and it should be followed by medical treatment according to the microbiological study.

Radioimaging and Microbiological study play a significant role in the choice of treatment. Radioimaging is used to assess, response to treatment and to modify treatment for a better outcome

PART-III

PROFORMA

NAME :

AGE/SEX :

ADDRESS :

I.P NO :

CHIEF COMPLAINTS :

HISTORY OF PRESENTING ILLNESS:

- H/O swelling of lids
- H/O redness, watering, irritation, photophobia and discharge
- H/O proptosis
- H/O defective vision/field of vision
- H/O pain-nature/severity/aggravating and relieving factors
- H/O fever, headache
- H/O trauma/insect bite
- H/O contact with pet animals
- H/O ENT symptoms-nasal block, ear discharge
- H/O diabetes, hypertension, chronic illness

PAST HISTORY:

- H/O similar episodes in the past
- H/O tuberculosis, syphilis, malignancy
- H/O any ocular/ENT surgery

FAMILY HISTORY:

- H/O tuberculosis
- H/O similar problems in family/siblings

TREATMENT HISTORY

- Any medical/surgical treatment underwent earlier

GENERAL EXAMINATION

- Built
- Nourishment
- Anaemia/jaundice/cyanosis/clubbing/lymphadenopathy
- Vitals-pulse, temperature, blood pressure, respiratory rate

OCULAR EXAMINATION

- Head posture
- Facial asymmetry

RIGHT EYE	EXAMINATION	LEFT EYE
	Visual acuity	
	Eyelids	
	Eyelashes	
	Extraocular movements	
	Conjunctiva	
	Cornea	
	Anterior chamber	
	Iris	
	Pupil	
	Lens	
	Proptosis	
	Axial/eccentric	
	Retropulsion	
	Pulsation	
	Orbital margins	
	Exophthalmometry	
	Fundus examination	
	Intraocular pressure	

OTHER SYSTEMS EXAMINATION

CNS, CVS, ABDOMEN.RS, ENT

OTHER CONSULTATION

Paediatrics/ENT/Neurology/diabetology/dental surgeon/radiology

PROVISIONAL DIAGNOSIS

INVESTIGATIONS:

Complete hemogram

Radiological- x ray orbit

CT/MRI

B scan

Microbiological-smear of aspirate/swab

Culture/sensivity to antibiotics

FINAL DIAGNOSIS

TREATMENT

Medical/surgical

FOLLOWUP PERIOD

I DAY

III DAY

V DAY

I WEEK

AS AND WHEN NEEDED

INDEX TO MASTER CHART

1. Serial number:
2. Name:
3. Age: M –months
4. Sex: M-Male, F-Female
5. ID No.
6. Eye involved: RE-Right eye, LE-Left eye
7. Visual Acuity: R-Right Eye, L-Left Eye, FL-
8. Fixing and Following light, PL-Perception of light present, NPL- No perception of light
9. Associated signs- C- congestion, CH- chemosis, MR- movements restricted, P-proptosis, L-lid edema, D-Discharge, P-Pupil involvement, EK-Exposure keratitis, TF-Toxic features
10. Fundus- N- normal, NV- no view, C- changes, VH- View very hazy
11. Predisposing causes- T- Trauma, S- Sinusitis, PI-Periocular infection, OI-Ocular infection, SP-Systemic predisposition

12. Lab Investigations – WNL- Normal haemogram, TC- Increased total WBC count, N-Neutroplils count increased, E- eosinophils increased, ESR- increased ESR
13. Radiological Investigations: X-Plain X ray orbit, CT-Computed Tomography with and without contrast, B-BScan Ultrasonography, MRI- Magentic Resonance Imaging
14. Microbiological study: G-Gram staining. C/S-Culture and sensitivity, FC- Fungal culture
15. Specialty clinic referral- ENT- Otorhinolaryngologist, DM-diabetologist, GP-General Physician, DP-Dental Physician
16. Diagnosis – P-Preseptal cellulitis, OC- Orbital cellulitis, SPA- Subperiosteal abscess, OA- Orbital abscess, CST- Cavernous sinus Thrombosis, AD-Acute dacryocystitis, DA-Dacryoadenitis, SA-Scleral abscess
17. Treatment- M- Medical, S- Surgical.
18. Follow up – C- cured, I- improved, D- Deteriorated
19. Complications-EK-Exposure keratitis, LA-Lid Abscess,P-Panophthalmitis N-No complication

MASTER CHART

Sl. No.	Name	Age	Sex	ID no.	Eye involved	Vision	Signs	Fundus	Predisposing Causes	Laboratory Investigations	Radiological Investigations	Microbiological Study	Speciality Clinics referral	Diagnosis	Treatment	Outcome	Complication
(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
1	PITCHANDI	51	M	49598	LE	R-6/24c PH6/18, L-PL+	L,P,C,CH,MR,EK,PI	VH	S,SP	TC,ESR	CT	FC	ENT,DM	FS ,OA	S	I	EK
2	NAZIYA	2	F	52035	LE	FL	L,C,CH	N	T	WNL	X			PC	M	C	N
3	RAMKUMAR	5	M	40213	LE	R-6/6,L-NPL	L,C,CH,MR,D,	NV	T,O	WNL	X,B,CT	G,C/S,FC		OC	M	I	LA
4	VALARMATHY	32	F	20896	LE	R-6/6,L-3/60	L,P,C,CH,MR,PI,TF	C	S	TC,N,ESR	B,MRI		ENT,DM	CST	M	C	EK
5	PALANIAPPAN	49	M	35621	LE	R-6/36,L-NPL	L,P,C,CH,MR,PI,TF	VH	S,SP	TC,N,E,ESR	B,CT,MRI	FC	ENT,DM	FS ,OA	S	I	EK,LA
6	PRADEEP KUMAR	14	M	7457	LE	R-6/9,L-NPL	L,C,CH,MR,PI	VH	T,O	TC,N,ESR	B,CT	G,C/S,FC		OC	M	I	P
7	JAYAKUMAR	30	M	7908	LE	R-6/9,L-PL	L,P,C,CH,MR,PI	NV	PI	TC,ESR	CT	G,C/S		OC	M	I	N
8	NAUSHEEN	2	F	7955	LE	FL	L,P,C	N	PI	WNL	X			PC	M	C	N
9	PARTHIBAN	40	M	56820	RE	R-6/60,L-6/9	L,P,C,CH,MR,PI,TF	N	SP	TC,N,ESR	B,CT	G,C/S,FC	ENT,GP,DP	OC	M	I	N
10	MOHAN	35	M	58527	LE	R-6/6,L-5/60	L,P,C,CH,MR,PI,	N	S	TC,ESR	B,CT	G,C/S,FC	ENT	OC	M	C	N
11	NAVEEN	10	M	48518	LE	R-6/6,L-6/6	L,P	N	PI	ESR	X	G,C/S	ENT	PC,AD	S	C	N
12	SELVARAJ	7	M	46239	LE	R-6/6,L-6/6	L,C	N	PI	WNL	B,CT	G,C/S,FC		PC,DA	M	C	N
13	DHANDAPANI	43	M	50007	LE	R-6/6,L-6/6	L,P,C,CH,D	N	T,PI	ESR	CT	G,C/S,FC		PC	M	C	N
14	SENTHAMARAI	38	F	36295	RE	R-6/24,L-6/6	L,P,C,CH,MR,PI	N	S	TC,N,ESR	B,CT	G,C/S	ENT	OC	M	C	N
15	LOKESH	1	M	7639	RE	FL	L,P	N	PI	WNL	X			PC	M	C	N
16	SRIRAM	10M	M	8012	RE	FL	L,P	N	PI	WNL	X			PC	M	C	N
17	SUBBULAKSHMI	63	F	46217	RE	R-6/60,L-6/24	L,P,C,CH,MR,PI,TF	VH	S	TC,N,ESR	B,CT	G,C/S,FC	ENT,DM	FS ,OA	S	I	EK
18	MUKESH	4	M	43782	LE	FL	L,P,C,CH,MR,PI	VH	SP,O	TC,N,E,ESR	B,CT	G,C/S,FC		OC,SA	S	C	N
19	SRINIVAS	3M	M	8304	RE	FL	L,P	N	PI	WNL	X			PC,AD	S	C	N
20	RAVI	13	M	54652	RE	R-6/6,L-6/6	L,C	N	T	WNL	B,X			PC	M	C	N
21	SELVI	5	F	7321	LE	R-6/6,L-6/6	L,C,CH	N	PI	WNL	X			PC	M	C	N
22	MARIAPPAN	56	M	56328	LE	R-6/6,L-6/6	L,P	N	SP	WNL	B,CT		GP	PC	M	I	N
23	SARANYA	7	F	72189	RE	R-6/6,L-6/6	L,P,C,CH	N	T	WNL	X			PC	M	C	N
24	RAJESWARI	35	F	79215	LE	R-6/12C PH 6/6, L-6/12 C PH 6/6	L,P,C,MR,PI	VH	PI	ESR	X,CT	G,C/S,FC		OC,AD	S	I	N
25	MANISH	22	M	72253	LE	R-6/6,L-1/60	L,P,C,CH,D	NV	T	WNL	X,B,CT	G,C/S		PC	M	I	N
26	SEVASUNDARI	51	F	65296	RE	R-1/60,L-6/36	L,C,P,CH,D	C	O	TC,N,ESR	B,CT	G,C/S,FC	ENT	SPA	S	D	P
27	KANNAN	65	M	55534	LE	R-5/60,L-NPL	L,P,C,CH,MR,PI,TF	VH	S	TC,N,E,ESR	CT,MRI	G,C/S,FC	ENT,GP,DM	OA	S	D	EK,LA
28	PATIAPPAN	57	M	51749	LE	R-5/60,L-5/60	L,P	VH	PI	ESR	X,B,CT	G,C/S	ENT	PC,AD	S	C	N
29	KUMARAN	40	M	52275	RE	R-6/24,L-6/24	L,P	N	S	WNL	X,B		ENT	PC	M	C	N
30	KASIAPPAN	55	M	55882	LE	R-6/18,L-6/36	L,P	N	T	WNL	X,CT		DP	PC	M	I	N

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