

Curriculum

MCh Vitreoretinal Surgery

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1.1 GOAL

The goal of the MCh course in Ophthalmology is to produce a **competent Vitreoretina Surgeon** at par with national and international standards. He/ she should be an astute clinician, a skilled surgeon, an ethical professional, a keen researcher and a lifelong learner in addition to having good organizational and communication skills

1.2. PROGRAM OUTCOMES

The clinical super-specialty in MCh training program in Vitreoretinal Surgery is intended at developing in a student a blend of qualities: those of a clinical specialist, a skilled surgeon, a teacher and a researcher. This program has been organized so that a super-specialty/ Master's student should possess the following qualities, knowledge and skills:

- a. The student ought to have the **basic knowledge** of retinal structure (anatomy), function (physiology) and development (embryology) and of the factors which may disturb these mechanisms (patho- physiology) and the disorders of structure and function which may result thereafter (pathology and Medical and Surgical Retina).
- b. The student should be able to examine, manage and deal with most day-to-day/ common retinal problems independently. Moreover, the student should recognize his limitations in **clinical knowledge** and be able to judge the need/ optimum time to seek further help.
- c. The student should be conversant with the **epidemiology** related to retinal disease and the environmental effects on not just general and but especially on ocular health.
- d. The student should be able to apply and then counsel, teach or disseminate knowledge of the **preventive methods** along with the curative and rehabilitative measures so as to comprehensively manage the disease.
- e. The student should be aware of the working and components of Mobile Ophthalmic Units as well as their role in **National programs** related to blindness and visual impairment with special focus on *ROP and Diabetic Retinopathy* having higher relevance.
- f. The student should be familiar with the **newer/ current advances** in Medical and Surgical Retina and should be motivated enough to update his skill-set from time to time so as to incorporate these advances into his/ her practice.
- g. The student should be able to conceptualize, plan as well as execute educational

programs in Retina in alliance with senior colleagues and be in touch with the modern methods of **medical education** technology in terms of teaching and evaluation.

- h. The student should be able to identify a question/ problem for **research**, plan a rational approach to its resolution, implement it and have the ability to critically evaluate his/her study in the view of existing knowledge.
- i. The student should reach conclusions by logical deduction by assessing evidence both in terms of its validity, reliability and relevance as well as by the use of relevant **statistical** methods.
- j. The student should have basic knowledge of **medico-legal aspects** of medicine especially in relation to Retinal diseases.
- k. The student should be familiar with empathetic patient **counseling** and appropriate consent taking.

2.3 SUBJECT-SPECIFIC COMPETENCIES

A vitreoretinal surgeon should be able to achieve the following **Core competencies** at the end of 2.5 years, as under the following headings (whereas the final 6 months would be dedicated to independent practice of the branch within the Department with timely supervision):

1. **Patient Care-** that is **compassionate**, appropriate, and effective for the treatment of Retinal problems and the promotion of health. Make informed decisions about **diagnostic and therapeutic interventions**, based on patient information and preferences, up-to-date scientific evidence, and clinical judgment.
2. **Medical Knowledge-** Demonstrate knowledge about established and evolving **biomedical, clinical, and cognate** (eg, epidemiological and social-behavioral) sciences and the apply this knowledge to patient care.
3. **Practice-based Learning and Improvement-** Investigate, evaluate and improve patient care practices; appraise and assimilate scientific evidence;and use **information technology** to manage information. Locate, appraise, and assimilate **evidence from scientific studies** related to patients' health problems.
4. **Communication Skills-** Demonstrate communication skills that result in **effective information**

exchange and teaming with patients, patients' families, and professional associates and students;

5. **Systems-based Practice**- Know how types of medical practice and **delivery systems** differ from one another, and practice **cost-effective health care** and resource allocation that do not compromise quality of care
6. **Professionalism**- Demonstrate a commitment to professional responsibilities, adherence to **ethical principles, respect, compassion and integrity**.
7. **Attitudes and conduct** require that a vitreoretinal specialist must also have developed a style of care, which is **humane, reflective, ethical** and **scientific** (critical appraisal of the scientific literature, evidence-based practice, and use of information technology and statistics).
8. Provide to the community, the latest quality of 'standard of care' in **Retinal diagnosis and therapeutics**, both medical and surgical, at least in the commonest situations encountered at the level of secondary health services.
9. Be capable of periodically self-assessing his /her performance and self-upgrading by staying informed about **latest advances** in the field and being able to apply the same in his/her practice.
10. Be conscious of her/his **limitations** to the application of his/ her services in situations that call for referral to higher centers or more qualified/ experienced individuals.
11. Apply **research and epidemiological methods** through his/her routine practice. The MCh student should be able to present, write or publish research done by him/her.

2.4 DOMAIN-WISE COMPETENCIES:

2.4.1 Cognitive domain

1. Basic Medical Sciences:

- Achieve understanding of Anatomy and Physiology of function of the Retina in

health and disease.

- Achieve understanding and application of knowledge of the structure and function of the parts of the Central and the autonomous Nervous System and other systems of the body which influence or control the structure and function of the eye.
- Achieve understanding of and develop proficiency in performing common laboratory procedures useful in diagnosis and research in Retina.

2. Medical and Surgical Vitreoretina:

The MCh student shall be given adequate graded opportunity to work on the basis of responsibilities in outpatients, inpatient and operation theatres on a rotational basis in the clinical sections from the day of entry to the completion of the training program. They should be able to:

- Attain a scientific and rational approach to **diagnose Retinal** cases.
- Develop inquisitiveness and acquire understanding to **investigate** a patient appropriately to arrive at the cause and estimate the effect of disease.
- To competently **manage** and treat all types of medical and surgical retina cases.
- To **perform** retinal LASERS
- To competently **operate**, handle and execute safely all routine and emergency major and minor surgical procedures in the field of retina.
- To demonstrate knowledge of the **pharmacological** (including ADRs and interactions) aspects of common drugs used in Ophthalmological practice and those commonly used in general diseases affecting the retina.
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3. Refraction: With special focus on low vision aids

- Acquire competence in diagnosis, classification and assessment of refractive errors and prescription of glasses for all types of refractive errors.
- Acquire basic knowledge of Low vision aids and their prescription.

4. Community Ophthalmology in relation to retina

- Be able to help in the conduct as per specified methodology
 - Eye camps (Screening)- Diabetic retinopathy/ Retinopathy of prematurity
 - Community

- School surveys

Training and guidance in Organizations for blind

5. Ophthalmic subspecialties:

A MCh student will be given an opportunity to work on a rotational basis in various special clinics of subspecialties of Ophthalmology.

The student should be able to examine, diagnose and demonstrate understanding of management of the problems of

- **Neuro-ophthalmology** and refer appropriate cases to the neurologist and neurosurgeon.
- Squint and **pediatric ophthalmology**: ROP and congenital anomalies
- **Glaucoma**
- Oculoplasty
- Cornea
- **Low vision Aids and Prosthetics**: To demonstrate understanding of the prescription/ dispensing, manufacture and fitting of contact lenses (basics), low vision aids (advanced) and ocular prosthesis.

6. Ophthalmic pathological/microbiological/biochemical sciences

- Be able to provide adequate and appropriate samples and interpret the diagnosis in correlation with the clinical data from the routine reports received in such cases.

7. Other Allied sciences- incorporated as *extra departmental posting* (details on age 29)

- Radiology
- Endocrinology (Diabetology)
- Rheumatology- Immuno-rheumatology
- Hematology- Immuno-hematology
- Neurology
- Neurosurgery
- Oncology
- Radiotherapy

8. Research :

- Identify a research problem.
- Understand the objectives: what is expected to be achieved in the end?
- Plan a rational and statistically valid approach.
- Design the appropriate methodology and execute most technical procedures required for the study.
- Accurately and objectively record data and arrive at results.
- Analyze the data with appropriate statistical methods.
- Interpret the observations as per existing knowledge and
 - Justify/ highlight how the study has advanced existing knowledge and
 - Spot its limitations/ shortcomings lie or
 - The scope for more research.
- Write a thesis in accordance with the prescribed format.
- Write at least one scientific paper as expected of International Standards from the material of this thesis.

Research Methodology Training: Periodically (every 6 months) training through online or offline mode participation will be encouraged to cover the following topics:

- Research paper writing : basics
- Basics of epidemiology and biostatistics
- Regulatory issues in human research (Indian and Foreign)
- Good clinical Practice (GCP) training

2.4.2 Affective Domain:

1. Should be able to function as a useful part of a **team**, develop an attitude of collaboration with colleagues, and interact with the patient and other clinicians or colleagues to provide the best possible diagnosis or opinion.
2. Without exception, adopt **ethical** principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to confidentiality, information and second opinion.
3. Cultivate **communication skills**: written, to word reports and professional opinion as well as spoken, to interact with patients, relatives, peers and paramedical staff, as also for effective teaching.

2.4.3 Psychomotor domain

At the end of the course, the student should acquire following clinical skills:

A. ESSENTIAL DIAGNOSTIC SKILLS: GENERAL:

1. General Ophthalmological Examination techniques along with interpretation

- A. Slit lamp Examination
- B. Fundus evaluation

2. Basic investigations along with their interpretation

- A. Automated perimetry for glaucoma and neurological lesions
- B. Retinal Acuity Meter
- C. **Tonometry** - Applanation/Indentation/Non-contact
- D. Gonioscopy- grading of the anterior chamber angle
- E. Refraction- Subjective and objective refraction/ focimetry, Low vision aids trial and prescription
- F. Colour Vision evaluation

3. Squint Diagnosis and assessment**6. Conformer fitting, socket cleaning****4. Exophthalmometry****5. Contact lenses****B. OPD PROCEDURES: Specific to MCh Course****1. OPD Examination skills (to be mastered): 0-6 months:**

- a. Fundus Examination: Indirect Ophthalmoscopy with scleral indentation, draw a large diagram with localization of all breaks
- b. Slit lamp Examination Biomicroscopy
 - Non-contact: with +78 D / +90D/ Hruby lens
 - Contact: Widefield Pan-fundosopic lenses, Goldmann 3 mirror lenses
- c. Gonioscopy
- d. Automated Perimetry and interpretation
- e. Intraocular Pressure Measurement- Goldmann Applanation Tonometry
- f. Amsler grid and interpretation
- g. Color Vision testing in detail
- h. Refraction- with respect to low vision aid prescription

2. OPD Procedures**A. 0-6 months**

- a. **Perform** Fluorescein Angiography, Indocyanine Green Angiography (supervised)
- b. **Perform** B scan ultrasonography and Immersion scan (Supervised)
- c. **Perform** Optical Coherence tomography (Supervised)
- d. **Observe and Assist** ROP screening
- e. **Observe** VEP, ERG, EOG, PVEP, PERG and understand interpretation
- f. **Observe** Laser Photocoagulation- (Double Frequency Nd:YAG Laser)- Barrage, Panretinal Photocoagulation, Macular Laser, ROP lasers
- g. **Observe-** Nd:YAG Hyaloidotomy
- h. **Observe** Transpupillary thermotherapy (after it is available)

- i. **Prepare** a Gram stain slide and KOH mount from aqueous tap

B. 6 - 12 months

- a. 1-3 of 0- 6 mo (independently perform and write the report as dictated by senior)
- b. **Perform** ROP screening (supervised)
- c. **Perform** VEP, ERG, EOG, PVEP, PERG (perform supervised and write report as dictated by senior)
- d. **Perform** Nd:YAG Hyaloidotomy (supervised)
- e. **Assist** Laser Photocoagulation- (Double Frequency Nd:YAG Laser)- Barrage, Panretinal Photocoagulation, Macular Laser, ROP laser
- f. **Assist** Transpupillary thermotherapy

C. 12-18 months

- a. 1-3 of 0 - 6mo (independently perform, interpret, write the report and get it verified by the senior)
- b. **Perform** ROP screening independently and confirm with senior in difficult cases
- c. **Perform** VEP, ERG, EOG, PVEP, PERG (perform independently and start trying to interpret few reports and write most under supervision)
- d. **Perform** Laser Photocoagulation- (Double Frequency Nd:YAG Laser)- Barrage, Panretinal Photocoagulation (supervised)
- e. **Perform** Nd:YAG Hyaloidotomy (supervised)
- f. **Assist** Macular Lasers- Grid and focal leak
- g. **Assist** ROP laser
- g. **Assist** Transpupillary thermotherapy

D. 18- 24 months:

- a. 1-4 of 6 to 12 months (**independently perform, interpret, write the report** and get it verified by the senior in case of doubt)
- b. **Perform** VEP, ERG, EOG, PVEP, PERG (perform independently, **interpret** and write all reports under supervision)
- c. **Perform** Macular Lasers- Grid and focal leak

- d. Perform Laser Photocoagulation-(Double Frequency Nd:YAG Laser)- Barrage, Panretinal Photocoagulation
- e. Perform Nd:YAG Hyaloidotomy
- f. Assist ROP laser
- g. Assist Transpupillary thermotherapy (optional)

E. 24-30 months:

1-5 of the previous semester independently except:

- no.6 of 1.5-2 y which can be performed under supervision
- no.7 of 1.5-2 y Can be performed after training in ocular oncology only.

C. OT PROCEDURES/ ESSENTIAL OPERATIVE SURGICAL SKILLS: Minor and Major

The MCh Student shall be provided with an opportunity to perform operations in a graded manner, both extra-ocular and intra-ocular, with the assistance of a simulator, followed by the MCh senior students, sub-speciality senior residents and/or under the direct supervision of a faculty member. The student shall be provided with an opportunity

To learn special and complex operations by assisting the senior MCh graduate student / Subspeciality Resident or the faculty in operations of cases of the specialty and be responsible for the post- operative care of these cases.

A. 0-6 months

(Observe Major OT procedures and perform Minor OT procedures supervised)

1. Perform Subtenon injections of triamcinolone acetonide for uveitic conditions (supervised)
2. Perform Intravitreal injection of anti-vascular endothelial growth factor (VEGF) drugs for the treatment of Age-related macular degeneration and diabetic maculopathy.
3. Aqueous and Vitreous tap and intravitreal antibiotic injections for the treatment of endophthalmitis. (supervised)
4. Eye donation calls- Cadaveric enucleation (supervised)
5. Cyclocryotherapy for Neovascular Glaucoma (supervised)

6. Anterior retinal cryotherapy for non-resolving vitreous hemorrhage in Painful NVG eye (supervised)
7. Practice of vitrectomy steps on VR simulator (perform independently)
8. To observe and assist intraocular and extraocular Vitreoretina surgery

B. 6-12 months

(Observe and Assist Major OT, Perform minor OT independently)

1. Perform 1-7 of previous semester independently
2. Scleral Buckle Removal (Observe and Assist)
3. Silicone Oil Removal (Observe and Assist)
4. Vitrectomy +Intraocular Antibiotics for Endophthalmitis (Observe and Assist)
5. Vitrectomy- For Non resolving vitreous hemorrhage (Observe and assist)
6. Lensectomy + vitrectomy for subluxated/dislocated lens (Observe and Assist)
7. IOL Removal + Vitrectomy for dislocated IOL (Observe and Assist)
8. SFIOL (Observe and assist)
9. Scleral Buckling Surgery (Observe and Assist)
10. Vitrectomy +RD surgery (Observe and Assist)
11. Vitrectomy + Membrane Peeling+ Endolaser+ Silicone Oil Injection/ C3F8 gas for Diabetic vitrectomy/ Chronic RD with PVR changes (Observe and Assist))
12. Vitrectomy + Intraocular Foreign body removal+ Additional procedure (Observe and Assist)
13. Complex VR surgeries- Vitrectomy +Membrane Peeling+ Endolaser +Relaxing Retinotomy +PFCL +Silicone oil injection for Giant retinal tear/ chronic RD with PVR changes/ Recurrent RD (Observe and Assist)
14. Scleral tear repair with vitrectomy+ wound exploration + additional procedure (Observe and Assist)
15. Macular hole surgeries (Observe and Assist)
16. Enucleation for Retinoblastoma (Observe and Assist)

C. 12 -18 months:**(Depending upon of the competency - perform steps independent /supervised)**

1. 1-4 from 6-12 months- complete procedure (supervised)
2. Perform 5-7 from 6-12 months- stepwise (supervised)
3. Perform 8-9 from previous semester stepwise (supervised) * (Stepwise learning of RD surgeries, supervised, moving to next step as previous is performed satisfactorily)
4. Observe and assist 11-16 of previous semester
5. Assisting diabetic vitrectomies, closely observing membrane peeling, segmentation, delamination.
6. Assisting complex retinal detachments, giant retinal tears, advanced diabetic vitrectomies, intraocular foreign body, dropped IOL, dropped nucleus
7. Assisting in macular hole surgeries.

D. 18 -24 months:**(Depending upon of the competency perform full procedures- independent/supervised)**

- 1 1-4 from 6-12 months- complete procedure (Independently)
- 2 Perform 5-7 from 6-12 months- Management of Nucleus drop and IOL drop full procedure (supervised)
- 3 Scleral Buckling drainage full procedure: for simple retinal detachments with single break (supervised)
- 4 Performance of complete RD surgery (No PVR changes) (supervised)
- 5 Advanced buckling procedures DACE (supervised)
- 6 Performing steps of Diabetic vitrectomy: segmentation, delamination and membrane peeling (supervised)
- 7 Performing complex RD Sx with PVR changes, GRT and Diabetic vitrectomy surgeries (supervised)
- 8 Performing macular hole surgeries, ILM peeling (supervised)
- 9 Performing RD sx for redetachments (supervised)
- 10 Performing under oil surgeries (supervised)
- 11 Observing and assisting in ROP surgeries

12 Observing and assisting vitrectomy in Kpro eyes

E. 24-30 months:

(Depending upon of the competency perform complete procedures- independent/supervised)

1. Perform 1-4 of 18-24 months independently
2. Advanced buckling procedures DACE (supervised)
3. Performing steps of Diabetic vitrectomy: segmentation, delamination and membrane peeling (supervised)
4. Performing complex RD Sx with PVR changes, GRT and Diabetic vitrectomy surgeries (supervised)
5. Performing macular hole surgeries, ILM peeling (supervised)
6. Performing RD sx for re-detachments (supervised)
7. Performing under oil surgeries (supervised)
8. Assisting Macular Buckle
9. Assisting ROP surgeries, perform a part of core vitrectomy
10. Assisting vitrectomy in Kpro eyes, perform core vitrectomy

F. 30-36 months : OT and OPD Procedures

1. Independently perform all VR surgeries and Lasers
2. Independent Outpatient consultations
3. Exposure to more complex cases and advanced procedures
4. Performing in ROP surgeries (supervised)
5. Performing vitrectomy in Kpro eyes (supervised)

3. SYLLABUS IN DETAIL- SEMESTER-WISE COURSE CONTENTS

3.1. Basic Level Goals: 0- 6 months

A. Cognitive Skills

1. **Describe** basic principles of **retinal anatomy and physiology**
2. **Describe** fundamentals of **retinal diagnostics** such as fluorescein angiography (angiographic phases), optical coherence tomography (OCT)
3. **Describe** pathological anatomy, physiopathology, and clinical pictures of the
 - a. most **common retinal vascular diseases**:^{**}: Diabetic retinopathy, Central vein occlusion, Branch vein occlusion, Arterial occlusions^{**}, Hypertensive retinopathy
 - b. Different **types of retinal detachment**
 - c. **Common macular diseases** (eg, age-related macular degeneration [AMD], macular hole, macular pucker, central serous chorioretinopathy, chloroquine maculopathy, pseudophakic cystoid macular edema).^{**}
 - d. **Posterior segment trauma**: Commotio retinae, Traumatic choroidal rupture, Purtscher retinopathy
 - e. Retinitis pigmentosa, main macular dystrophies (eg, Stargardt, Best, cone dystrophy), and other hereditary pathologies.
 - f. **postoperative/posttraumatic endophthalmitis**.
4. **Describe** basic principles of **laser photocoagulation** (eg, laser response to change in power, duration, and spot size) and **photodynamic therapy** for retinal treatment.
5. **Describe** basic principles, techniques, and safety of **intravitreal injections**.

B. Technical/Surgical Skills

1. **Perform**^{**} direct ophthalmoscopy (**DO**), indirect ophthalmoscopy(**IO**), slit-lamp biomicroscopy (**SLO**) with precorneal lenses, 3-mirror contact lenses, or other wide-field contact lenses.
2. **Diagnose** the presence of common retinal disorders based on results of fundus examination, fundus photographs, OCT, and fluorescein angiography.

3.2. Standard Level Goals: (intermediate) 6-12 and (standard)12-18 months

A. Cognitive Skills-

1. **Describe** more **advanced retinal anatomy and physiology**.^{**} and more **advanced ocular**

diagnostics **

2. **Describe** the fundamentals of retinal **electrophysiology** and basic ophthalmic **echography**.
3. **Diagnose**, evaluate, treat (or refer) the following
 - a. **Advanced retinal vascular diseases****: Macular telangiectasia, Coats disease, Acquired retinal macroaneurysms, Ocular ischemic syndrome, Sickle cell retinopathy, Eales Disease
 - b. **Peripheral retinal diseases** and **vitreous pathologies**** (eg, vitreous hemorrhage, posterior vitreous detachment, retinal tears, giant retinal tears, lattice degeneration with atrophic holes).
 - c. **less common macular diseases****: Myopic maculopathy, Serous retinal detachment secondary to optic disc pit, Ocular histoplasmosis syndrome, Phenothiazine/tamoxifen toxicity
 - d. postoperative/posttraumatic choroidal detachments and **sympathetic ophthalmia** **
 - e. hereditary pathologies, such as juvenile retinoschisis and choroidal dystrophies (eg, choroideremia, gyrate atrophy). **
4. **Describe** the findings of **major studies** in: **
 - a. **Diabetic retinopathy****: Early Treatment Diabetic Retinopathy Study (**ETDRS**), Diabetes Control and Complications Trial (**DCCT**), United Kingdom Prospective Diabetes Study (**UKPDS**), Diabetic Retinopathy Clinical Research Network (**DRCRnet**) Trials
 - b. **Central vein occlusion****: Central Vein Occlusion Study (**CVOS**), Standard Care vs. Corticosteroid for Retinal Vein Occlusion (**SCORE**), Global Evaluation of intravitreal triamcinolone in retinal Vein occlusion with macular edema (**GENEVA**) Study Group, Central Retinal Vein Occlusion (**CRUISE**) Study
 - c. **Branch vein occlusion****: Branch Vein Occlusion Study (**BVOS**), Standard Care vs. Corticosteroid for Retinal Vein Occlusion (**SCORE**), **GENEVA** Study Group, BRANCH Retinal Vein Occlusion (**BRAVO**) Trial
 - d. **Retinopathy of prematurity****: Cryotherapy for Retinopathy of Prematurity (**CRYO-ROP**), Early Treatment for Retinopathy of Prematurity (**ETROP**)
5. **Describe** the **techniques for retinal detachment repair**, including indications, mechanics, instruments, basic techniques, and surgical adjuvants, including heavy liquids, expandable gases, and silicone oil for the following Pneumatic retinopexy, Scleral buckling and Vitrectomy

6. **Diagnose**, evaluate, treat, and classify open and closed globe trauma (eg, **Birmingham Eye Trauma Terminology System**).**
7. **Describe** the indications/complications for laser treatment for diabetic retinopathy (eg, panretinal photocoagulation, macular grid).

B. Technical/Surgical Skills

1. Perform indirect ophthalmoscopy (**IO**) with **scleral indentation**, ophthalmoscopic examination with contact lenses, including **panfunduscope lenses and Goldmann 3 mirror lens**, fluorescein (**FFA**) and indocyanine green (**ICG**) angiography and correlate findings with differential diagnosis.**
2. **Diagnose** the presence of pigment granules in the anterior vitreous (ie, **Shafer sign**) during a retinal detachment or retinal break.
3. Describe the **indications for, perform and interpret** retinal imaging technology (eg, **OCT**, retinal thickness analysis); basic electrophysiological tests (eg, electroretinogram [**ERG**], electrooculogram [**EOG**], visual evoked potential [**VEP**], dark adaptation), basic echographic (**B scan**) patterns (eg, rhegmatogenous retinal detachment, tractional retinal detachment, posterior vitreous detachment, choroidal detachment, intraocular foreign body); fundus drawings (**Large diagrams**) of the retina, showing vitreoretinal relationships and findings.**
4. **Perform** posterior segment **laser** photocoagulation, peripheral scatter photocoagulation (panretinal), laser **retinopexy** (demarcation) for isolated retinal breaks and laser **barrage**, **Assist** diabetic **focal/grid** macular laser treatment ..
5. **Perform (or assist during)** cryotherapy of retinal holes and other pathology.
6. **Perform steps of pars plana vitrectomy and scleral buckling.**
7. **Perform (or assist during)** vitreous tap and intravitreal antibiotic injections for the **treatment of endophthalmitis.**
8. **Perform subtenon injections of triamcinolone acetonide** for the treatment of macular edema.
9. **Perform intravitreal injection of anti-vascular endothelial growth factor (VEGF) drugs** for the treatment of AMD.

3.3. Advanced Level Goals: 18-24 months and 24 - 30 months

A. Cognitive Skills

1. Apply into clinical practice the **most advanced knowledge** of retinal anatomy and physiology (eg, surgical anatomy) and the most advanced ancillary testing concepts of fluorescein/ICG angiography in complex retinal vascular disease and other vascular diseases.
2. **Describe and apply retinal electrophysiology.**
3. Evaluate, treat, or refer the **most complex forms of retinal vascular diseases**: Combined arterial and venous obstructions, Advanced diabetic retinopathy, Advanced hypertensive retinopathy, Peripheral retinal vascular occlusive disease
4. Describe the treatment algorithm for each specific retinal condition, with special emphasis on pros and cons.**
5. Diagnose, evaluate, treat (or refer) the most **complex forms of retinal vascular diseases** and diagnose/manage risk factors (eg, blood dyscrasia) and systemic complications.
6. Diagnose, evaluate, and treat inherited, congenital, and acquired **macular diseases**.
7. Evaluate and diagnose / refer **complex cases of retinal detachment** (eg, acute retinal necrosis, proliferative vitreoretinopathy); **complex trauma cases** (eg, chorioretinitis sclopetaria, intraocular foreign body, shaken baby syndrome); **hereditary vitreoretinal degenerations** (eg, Stickler syndrome, Wagner syndrome, Goldmann-Favre degeneration).
8. **Diagnose and classify retinopathy of prematurity.**
9. **Describe the findings of major studies in age-related macular degeneration:****: Treatment of Age-Related Macular Degeneration with Photodynamic Therapy Study (**TAP**), Verteporfin in Photodynamic Therapy Study (**VIP**), Minimally Classic/Occult Trial of the Anti-Vascular Endothelial Growth Factor (VEGF) Antibody Ranibizumab in the Treatment of Neovascular AMD (**MARINA**), Anti-VEGF Antibody for the Treatment of Predominantly Classic Choroidal Neovascularisation in AMD (**ANCHOR**), The Comparisons of Age-Related Macular Degeneration Treatments Trials (**CATT**).

B. Technical/Surgical Skills

1. Perform indirect ophthalmoscopy (**IO**) with **scleral indentation in complex retinal cases** (eg, multiple holes, documented with detailed retinal drawing).

2. Perform ophthalmoscopic examination with **panfundusoscopic** or other lenses in **complex retinal conditions** (eg, giant retinal tears, proliferative vitreoretinopathy).
3. Interpret and apply in clinical practice the results of fluorescein (FFA) and ICG angiography (**ICGA**) and **OCT** in **complex retinal or choroidal pathology**.
4. Perform **posterior segment photocoagulation** in more **complicated retinal cases****: focal/grid macular treatment (eg, monocular patient, repeat treatment); Repeat peripheral scatter photocoagulation (panretinal); Laser retinopexy (demarcation) of large or multiple breaks; cryotherapy**
5. Perform, interpret and apply in clinical practice **electrophysiology** (eg, ERG, EOG, VEP, dark adaptation); **ocular imaging techniques** (eg, B-scan echography)
6. **Perform laser therapy or cryotherapy** of retinal holes and other **more complex retinal pathologies in 24-30 months**.**
7. Assist ROP lasers (supervised) in 24-30 months
8. **Perform** scleral buckling and pars plana vitrectomy surgeries supervised in 18-24 months and independently 24-30 months**

3.4. Very Advanced Level Goals: Subspecialist- Vitreoretina- 30-36 months

*Subspecialty training level should require a **greater understanding of the cognitive skills outlined in the previous levels**. The trainee should be able to **independently manage** current medical treatment for vitreoretinal diseases and to discuss recent discoveries and possible future treatments for these disorders.***

A. Cognitive Skills

1. Compare the current **therapeutic retinal treatment** strategies and be able to discuss the future improvements of the therapeutic armamentarium.
2. Evaluate and treat **traumatic injuries to the retina**, including **complex cases** such as intraocular foreign body with rhegmatogenous retinal detachment and traumatic macular holes, and be able to manage complications to the other ocular structures.
3. Applications of **gene therapy for hereditary diseases**.
4. Develop surgical proficiency in different surgical techniques for management of **retinal detachment, including complex cases** (eg, combined rhegmatogenous/ tractional retinal detachments, advanced pars plana vitrectomy in post-keratoprosthesis, post-Penetrating

keratoplasty, retinopathy of prematurity).

B. Technical/Surgical Skills

1. Perform **posterior photocoagulation in complicated retinal cases**:
 - a. Retinal breaks with vitreous hemorrhage
 - b. Cases with intraocular tamponade (ie, gas, silicone oil)
2. Interpret and apply **electrophysiology** in clinical practice.
3. Interpret and apply **ocular imaging** techniques in clinical practice (eg, B-scan echography) and in more complex cases (eg, choroidal osteoma).
4. Perform ROP lasers
5. Perform **scleral buckling in complex retinal detachment**.
6. Assist advanced pars plana vitrectomy in post- keratoprosthesis, post-Penetrating keratoplasty, retinopathy of prematurity.

4.1. SELECTION PROCESS: INICET PG EXAM/AIIMS PG Entrance Examination

- **Twice a year** for January and July session
- Exam months- May/June & November/December

4.2. ELIGIBILITY: MD/MS/DNB Ophthalmology

4.3 Syllabus- summary

1. Basic Sciences

- i. Retinal anatomy- Gross anatomy, Histology, Embryology
- ii. Retinal Physiology
- iii. Retinal Pathology
- iv. Ocular Biochemistry

2. Optics

- a. Basic physics of optics
- b. Applied optics of Indirect ophthalmoscope and Binocular Indirect Ophthalmoscope
- c. Optics of Low vision aids
- d. Disorders of Refraction

3. Clinical Ophthalmology

- i. Disorders of the Retina
- ii. Disorders of the Optic Nerve
- iii. Disorders of the Uveal Tract
- iv. Disorders of the Choroid

4. Immunology

(with particular reference to ocular immunology- Rheumatology and Hematology and the Retina)

5. Community Health in relation to Retina

6. Disorders of the Orbit

7. Paediatric Retina

8. Strabismus and Amblyopia

9. Ocular Microbiology- specific microbiology in relation to retina

10. Ocular Genetics in Retina- Tapetoretinal Degenerations, Hereditary macular degenerations

11. Optic Nerve and Visual Pathway

12. Neuro-ophthalmology

13. Ocular involvement in systemic disease

14. Ocular Diagnostics

15. Ocular oncology

16. Ocular Infections

17. Ocular Pathology

18. Ocular Trauma

4.19 Recent Advances in Ophthalmology under the following headings:

- i. Lasers in Ophthalmology
Pascal laser
- ii. Newer Intravitreal injections in Ophthalmology
- iii. Advances in Vitreous Surgery-
In Keratoprosthesis eyes
Macular Buckle
Endoscopic vitrectomies
- iv. Retinopathy of prematurity: Latest Recommendations and Guidelines for screening, Recent advances in screening (RETCAM) and surgery
- v. Newer advances in Scleral fixated IOL's
- vi. Vitreous stains and vitreolytic agents
- vii. Subretinal implants for retinitis pigmentosa- Alpha IMS and Argus-II
- viii. Diagnostic tools in Ophthalmology
 - Ultrasound Biomicroscope
 - Laser Interferometry
 - Optical Coherence Tomography
 - OCT Angiography
- ix. Newer Drugs in Ophthalmology
- x. Artificial Intelligence in Retina

5.0 TEACHING PROGRAM

5.1. Academic: Teaching sessions

S.No.	Class Type	Frequency
1.	<i>Journal club</i>	Once a month
2.	<i>Thesis review</i>	Once every 6 months
3.	<i>Inter-departmental presentations</i>	Once every term
4.	<i>Grand Rounds</i>	Once a month
5.	<i>Seminar</i>	Once a week
6.	<i>Case discussion/ Case review</i>	Once a week
7.	<i>Group Discussion/ Symposium</i>	Once a week
8.	<i>Clinical Meeting, CME, Workshop, Conferences, Videoconferencing</i>	<i>As and when scheduled</i>

5.2. Practical Training

1. Clinical Skills in Outpatient department, Bedside teaching, Ocular diagnostics and refraction
2. Surgical skills in Minor OT, VR simulator and major OT (Extraocular and Intraocular OT)

During the training program, patient safety is of paramount importance; therefore, skills are to be learnt initially on the models in the skills' lab, later to be performed under supervision, followed by performing independently.

6. POSTINGS-

- Main postings in the Retina department will be in Outpatient department, Operation theater, Ocular diagnostics, and Subspecialty Clinics

The following extra-departmental postings are proposed in the MCh curriculum

S.No	Posting	0-6 months	6-12 months	12-18 months	18-24 months	24-30
1.	Microbiology	1 week				
2.	Pathology with emphasis on Ocular pathology	1 week				
3.	Biochemistry with special emphasis on Ocular Genetics-Testing and counselling	1 week				
4.	Community Ophthalmology-any semester	1 week	1 week	1 week	1 week	1 week
5.	Radiology		1 week			
6.	Endocrinology		1 week			
7.	Rheumatology (Immunorheumatology)			1 week		
8.	Hematology (Immunohematology)			1 week		
9.	Neurology				1 week	
10.	Neurosurgery				1 week	
11.	Oncology(Medical)					1 week
12.	Radiotherapy					1 week

*There will be no extra departmental postings in the last 6 months which will be like an internship.

7. Other Academic activities

7.1. CMEs, Symposia, Conferences:

PG must attend accredited scientific meetings. An MCh student would be required to present atleast:

One poster presentation,

One paper at a national/state conference

One research paper which should be published/accepted for publication/sent for publication during the period of his/her course so as to make him/her eligible to appear at the Final examination.

7.2. Training workshops:

Additional sessions on basic sciences, biostatistics, research methodology, teaching methodology, hospital waste management, health economics, medical ethics and legal issues related to ophthalmology practice will be taken.

Note: These additional sessions shall be organized as an institutional activity for all postgraduates from time to time.

7.3. UG and PG and intern teaching: In the form of tutorials, demonstrations and UG/PG lectures

7.4. E-learning: Attending and presenting in webinars/ online conferences/ PG educational fora.

7.5. Maintenance of log book: The PG student will maintain Log-Book which will contain details of all the teaching learning activities, number of cases examined in Outpatient Department, number of Major/Minor surgeries, Lasers, ROP screenings observed/assisted/performed. He / She will submit the completed Log-Book, signed by the concerned PG Guide, Unit Head, to the Head of the Department by the 7th of every month.

8.0 Thesis

8.1. Guidelines

While selecting thesis topics, following should be kept in mind:

- (i) The scope of study should be limited so that it is possible to conduct it within the resources and time available to the student;
- (ii) The emphasis should be on the process of research rather than the results;
- (iii) The research study must be ethically appropriate and must receive IEC sanction;
- (iv) The protocol, interim progress as well as final presentation must be made formally to the entire department;
- (v) Number of students per teacher/thesis guide will vary as per designation;
- (vi) There will be periodic departmental review of the thesis work as per following schedule:

8.2. Timing of six monthly progress report submission to Academic Section

Synopsis submission and approval: Process to be completed within six months of admission to MD Radiotherapy program

Report	July Session		January session	
	Period	To be submitted	Period	To be submitted
First	July to December	7th January	January to June	7th July
Second	January to June	7th July	July to December	7th January
Third	July to December	7th January	January to June	7th July
Fourth	January to June	7th July	July to December	7th January
Fifth	July to December	7th January	January to June	7th July

Note: The first four reports will be taken into consideration to decide the eligibility of the student to appear for the Professional Examination.

8.5. Synopsis submission and approval:

Process to be completed within six months of admission to MCh program as follows:

Activity	July admission	January admission
Selection of topic in consultation with PG Guide	September / October	March / April
Approval by Department PG Committee		
Institute Scientific Committee approval	November / December	May / June
Institute Ethics Committee approval		
Final approval letter by Academics Section	31st December	30th June

The Dissertation will be submitted to Academic Section at least six months prior to the scheduled examination, i.e. by 31st December for June examination and by 30th June for December examination.

9.0 Assessment

9.1. Formative Assessment

(A) **Theory#:**

Schedule	Marks
1st year	100 (1 Paper)
2nd year	100 (1 paper)
3rd year	400 (1 paper)
Total	600 Marks

Commented [1]: Can it be every year? Like for MS?

Commented [2]: Ok mam but how will we say it is conforming with PGI?

Commented [3]: And Exit exam is at 2.5y

(B) **Practical*:**

Schedule	Marks
1st year- Annual Exam	100
2nd year- Annual Exam	100
3rd year Preliminary	400
Total	600 Marks

9.2. Paper pattern:

For Annual Internal Exams

A. **Theory Paper:** 10 questions of 10 marks each (10 out of 10).

B. **Practical :**

S.No.	Station	Marks
1.	Long Case	30
2.	Short Case	20
3.	OSCE- Clinical Procedure/Photo/spot/ LVA	25
4.	Table Viva-Instruments, Pathology specimens, Drugs, Radiological imaging, Optical tests	25

For Preliminary Exams: Pattern is same as the final exit exam as given below

A. **Theory Paper**– 400 Marks

B. **Practical** – 400 Marks

9.3. Eligibility criteria for appearing for the Final Exit exam:

S.No.	Criteria
1.	Attendance: > 80% in each year of training*
2.	Performance grade: Minimum of four satisfactory remarks at six monthly progress reports
3.	Acceptance of Dissertation
4.	Presentation of minimum one Scientific Poster and one Paper at International / National / State Conference.
5.	Publication : one Original research in a peer-reviewed indexed scientific Journal: Sent/accepted/published
6.	Minimum 50% in research methodology exam.
7.	Minimum 50% marks in formative assessment in theory and practical separately. Candidates should secure a minimum of 40% in each written paper.

*Nothing over and above the leaves sanctioned as per rules of the Institution should be permitted in terms of attendance and residency must be complete.

9.4. Summative Assessment*

A	Theory	4 Papers each of 100 Marks = 400 Marks
B	Practical	Clinical 300 + Viva 100 = 400 Marks

*The Final exit exam format and timing shall be as per Institutional norms and similar to the other MCh courses.

9.5. Final Result

(A) Theory – 400 Marks

(B) Practical – 400 Marks

Criteria for Passing: Candidates should secure a minimum of 40% in each written paper and 50% marks in Theory and Practical separately, in order to successfully pass the Final MCh Exit Examination.

9.6. Theory Papers:

Paper 1:	Basic Sciences related to Retina, Refraction & Optics, Biostatistics, Research Methodology	100 marks
Paper 2:	Medical Retina and Uvea	100 marks
Paper 3:	Retinal Surgery	100 marks
Paper 4:	Recent Advances in Retina and Systemic Diseases in Ophthalmology	100 marks

9.7. Paper pattern:

Paper 1, 4: 10 questions of 10 marks each (10 out of 10).

Paper 2, 3: 2 Questions of 25 marks each, 5 questions of 10 marks each (5 out of 5)

9.8. Practicals

SN	Subject	Type	Marks Distributi on
Case Presentations			
1	Surgical Retina	Long case	100

2	Medical Retina and Uvea	Short case (2) 40 marks each	80
3	Neuro-Ophthalmology	Short case (2) 40 marks each	80
4	OSCE- 4*10 marks each	1. Clinical procedure (Observed OSCE) -IDO/90D/Applanation 2. Clinical photo- Rheumat/Hemat/Endocrine 3. Clinical Spot- Eg. Ocular Oncology 4. Low vision Aid	40
TOTAL			300
Viva Voce			
5	Instruments	Viva Voce: Extra-ocular 10 marks Intra-ocular 15 marks (including Microvitreoretinal instruments)	25
6	Pathology specimens / Microbiology	Viva Voce: Gross specimen 10 marks Histopathology slide 10 marks Culture media 05 marks	25
7	Drugs	Viva voce	20
8	Radiological/Imaging - X-rays, USG/OCT/CT/MRI Scans/ FFA/ FP etc.	Viva voce	15
9	Optical tests- Fields and other ophthalmic diagnostic charts	Viva voce	15
TOTAL			100
PRACTICALS GRAND TOTAL (CASE PRESENTATIONS+VIVA VOCE)			400

10.0 Recommended reading

10.1. Reference Books (latest edition)

1. The Current American Academy of Ophthalmology Basic and Clinical Science Course (12 volumes)
2. Abrams D. Duke Elder's *Practice of Refraction*. Churchill Livingstone. This text covers the basic principles of refraction.
3. Duane's Clinical Ophthalmology By William Tasman, Edward A. Jaeger, Thomas David Duane 2005
4. Principles and Practice of Ophthalmology by Daniel Myron Albert, Frederick A. Jakobiec - 2000.
5. *Principles and Practice of Ophthalmology* . WB Saunders.
6. Ophthalmology, 2nd Edition By Myron Yanoff, MD and Jay S. Duker, MD
7. Kanski JJ *Clinical Ophthalmology* . Butterworth/ Heinemann . Fifth Edition
8. The Wills Eye Manual : Office and Emergency Room Diagnosis and Treatment of Eye Disease

10.2. Retina specialty specific books:

S.No.	Book	Author
1.	Retina -The Fundamentals	Gloria
2.	Retinal Detachment – Second Edition	Charles. P. Wilkinson
3.	Vitreo Retinal Surgical Techniques	Gholam A Peyman
4.	Retina – Second Edition – Vol 1	Stephen J. Ryan
5.	Retina – Second Edition – Vol 2	Stephen J. Ryan
6.	Macular Diseases – Fourth Edition – Vol 1	Gass
7.	Macular Diseases - Fourth Edition - Vol 2	Gass
8.	Atlas of Optical Coherence Topography	Vaishali Gupta
9.	Atlas of Fundus Fluorescence Angiography	Shetty, Sharma
10.	The Surgical Rehabilitation of Vision-Gower	Lee T Nordan
11.	Clinical Retina	David A Quillen
12.	Retina-Vitreous-Macula-Vol 1 & Vol 2	Green and Shield

10.3. Journals:

National

- Indian Journal of Ophthalmology (IJO)
- Insight
- **Indian Journal** of Clinical and Experimental Ophthalmology (IJCEO)

International

- Ophthalmology
- American Journal of Ophthalmology
- British Journal of Ophthalmology
- Archives of Ophthalmology
- Survey of Ophthalmology
- Journal of Glaucoma
- Cornea
- Journal of Cataract & Refractive Surgery
- Retina
- Journal Paediatric Ophthalmology & Strabismus