NEET SS 2024 Diploma Ophthalmology Question Paper 3 with Solutions

Time Allowed :3 Hours	Maximum Marks :100	Total Questions :10

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 10 questions. The maximum marks are 100.
3. Each Question is of 10 marks.

Q1. A 21-year-old myopic male presented with a total retinal detachment in the right eye, a single causative break at 11 O'clock anterior to the equator, and no PVR.

(a) What are the surgical options for management of retinal detachment?

Solution:
Retinal detachment (RD) is a serious condition that requires prompt surgical intervention to prevent permanent vision loss. The surgical options for managing retinal detachment depend on the location and extent of the detachment, the presence of complications like proliferative vitreoretinopathy (PVR), and the characteristics of the retinal break(s). In this case, the patient is young, myopic, and has a single break without PVR, which influences the choice of surgical technique.

The main surgical options for retinal detachment are:

1. Pneumatic Retinopexy:
- This procedure involves injecting a gas bubble into the vitreous cavity to tamponade the retinal break, allowing the retina to reattach.
- It is typically used for smaller, localized detachments with a single break, especially when no significant PVR is present.

2. Scleral Buckling:
- A scleral buckle involves placing a silicone band around the sclera to indent the wall of the eye and relieve the traction from the detachment, especially around the retinal break.
- It is effective for anterior detachments, such as the case described here (11 o'clock break), and provides long-term success when no significant PVR is present.

3. Vitrectomy:
- A pars plana vitrectomy (PPV) is a more invasive procedure that involves removing the vitreous gel and reattaching the retina using either a gas bubble or silicone oil.

- This technique is often used for posterior or extensive detachments, or in cases with complications like PVR. However, in this case with no PVR, it might not be the first choice.

4. Combined Procedures:
- In some cases, a combination of vitrectomy and scleral buckling is performed, particularly for more complex or recurrent detachments.

Quick Tip

For a young myopic patient with a single break and no PVR, pneumatic retinopexy or scleral buckling are the most commonly recommended surgical options.

Q1. (b) Explain clearly why you would recommend your chosen surgical option and outline the surgical steps.

Solution:
Recommended Surgical Option: Scleral Buckling In this case, scleral buckling is the preferred surgical option due to the following reasons:

1. Myopic Eyes:
- Myopic eyes are at higher risk for retinal detachment, and they often have anterior retinal breaks. Scleral buckling is particularly effective for anterior breaks, such as the one described at 11 o'clock, as it provides long-term support to the retina.

2. Single Break and No PVR:
- The patient has a single break without proliferative vitreoretinopathy (PVR), which makes the detachment more likely to be successfully repaired with scleral buckling. Scleral buckling offers a reliable approach in these cases, providing a tamponade effect on the retina and inducing the reattachment of the retina.

3. Younger Patient:
- In a young patient like this, scleral buckling can be a less invasive and more effective option, with better long-term outcomes in preventing recurrence. It's also less likely to cause complications like cataract formation or secondary glaucoma compared to other techniques like vitrectomy.

Surgical Steps for Scleral Buckling:

1. Preoperative Preparation:
- The patient is positioned under local or general anesthesia.
- Pupil dilation is achieved using tropicamide and phenylephrine drops to facilitate visualization.

2. Exposing the Retina:
- A conjunctival incision is made at the site of the break, and the conjunctiva and tenon's

capsule are carefully dissected.
- The rectus muscles are carefully retracted to allow access to the sclera.

3. Placement of the Scleral Buckle:
- A silicone buckle (usually a sponge or band) is selected based on the size of the detachment and is sutured around the equator of the eye.
- The buckle is placed strategically to indent the sclera and push the retina against the retinal pigment epithelium (RPE), thereby sealing the break and supporting the reattachment.

4. Drainage of Subretinal Fluid:
- Subretinal fluid is drained if necessary by creating a small retinal puncture at the site of the break to allow the fluid to drain into the vitreous cavity.

5. Closing the Incision:
- The conjunctiva is closed with absorbable sutures.
- The eye is typically left with a gas bubble or, in some cases, a silicone oil tamponade if there is concern about maintaining retinal attachment.

6. Postoperative Care:
- The patient is monitored for complications such as intraocular infection or increased intraocular pressure.
- Positioning: The patient is often advised to maintain a specific head position to keep the gas bubble in place.
- Follow-up: Regular follow-up visits are scheduled to monitor for recurrence of the detachment and assess for complications.

> **Quick Tip**
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> Scleral buckling is an effective and minimally invasive method for reattaching the retina in cases of anterior breaks and no PVR. Proper postoperative positioning is crucial for success.

Q2. (a) Enumerate the lamellar corneal surgeries and give indications for each.

Solution:
Lamellar corneal surgeries involve the partial thickness removal or replacement of corneal tissue. These surgeries preserve the underlying corneal structures, such as the endothelium and Descemet's membrane, and are typically used in the management of corneal diseases that do not affect the entire corneal thickness. The main types of lamellar corneal surgeries and their indications are:

1. Deep Anterior Lamellar Keratoplasty (DALK):
- Indications:
- Corneal scarring from keratoconus, bullous keratopathy, and corneal dystrophies.

- For patients with healthy endothelium but severe anterior corneal pathology, DALK preserves the endothelium while removing the affected anterior corneal layers.

2. Anterior Lamellar Keratoplasty (ALK):
- Indications:
- Anterior corneal scarring, astigmatism, and focal corneal opacities.
- Used in cases where only the superficial layers of the cornea are affected, preserving the deeper stromal layers and endothelium.

3. Descemet's Stripping Endothelial Keratoplasty (DSEK):
- Indications:
- Endothelial dysfunction such as Fuchs' endothelial dystrophy or bullous keratopathy.
- It involves the removal of the diseased endothelium and Descemet's membrane, followed by transplantation of a thin endothelial graft.

4. Descemet's Membrane Endothelial Keratoplasty (DMEK):
- Indications:
- Fuchs' dystrophy or post-surgical endothelial dysfunction.
- DMEK is a more advanced procedure than DSEK, involving the transplant of only the Descemet's membrane and endothelial cells, offering faster recovery and better visual outcomes.

5. Limbal Stem Cell Transplantation:
- Indications:
- For patients with limbal stem cell deficiency due to conditions like chemical burns, congenital limbal stem cell deficiency, or ocular surface diseases.
- The surgery involves transplanting limbal stem cells from a donor or from the patient's own eye to restore corneal epithelial regeneration.

> **Quick Tip**
>
> Lamellar corneal surgeries aim to treat corneal diseases while preserving corneal structures like the endothelium, improving postoperative recovery and reducing complications.

Q2. (b) What are the complications after endothelial keratoplasties?

Solution:
Endothelial keratoplasties, such as DSEK and DMEK, have revolutionized the treatment of corneal endothelial diseases. However, like all surgeries, these procedures are associated with potential complications:

1. Graft Failure:
- Endothelial cell loss can lead to graft failure over time, resulting in the need for repeat surgery.

2. Graft Detachment:
- Graft dislocation or detachment is a common complication, especially in the early postoperative period. It may require repositioning or re-grafting in some cases.

3. Infection:
- Infection, including endophthalmitis, can occur after the surgery, though it is rare. It can lead to permanent vision loss if not managed promptly.

4. Raised Intraocular Pressure (IOP):
- Elevated IOP can occur due to inflammation, especially in the early postoperative period. This can lead to glaucoma if not managed.

5. Rejection Reaction:
- Graft rejection is a rare but serious complication, which can lead to graft failure. Symptoms include redness, pain, and reduced vision. Steroid treatment may be required to manage this.

6. Double Vision (Diplopia):
- Some patients may experience double vision, particularly in the early recovery phase due to corneal irregularities or astigmatism.

7. Cataract Formation:
- Although rare, cataracts may develop in the host lens after surgery, especially in older patients or those with pre-existing lens opacities.

Quick Tip

Proper graft ha
ndling, post-operative care, and monitoring for complications like graft detachment and rejection are essential to the success of endothelial keratoplasty.

Q2. (c) What are the causes for secondary glaucoma seen after penetrating keratoplasty?

Solution:
Secondary glaucoma after penetrating keratoplasty (PKP) is a known complication and can arise from a variety of mechanisms. The following are the primary causes of secondary glaucoma after PKP:

1. Steroid-Induced Glaucoma:
- Prolonged use of steroid eye drops to prevent graft rejection can increase intraocular pressure (IOP), leading to steroid-induced glaucoma.
- It is particularly common in postoperative patients who receive high-dose steroids for prolonged periods.

2. Angle Closure:
- Angle-closure glaucoma can develop due to changes in the anatomy of the anterior chamber after PKP, particularly if the corneal graft is large or improperly aligned, leading to pupil block and angle closure.

3. Surgical Trauma:
- Surgical trauma to the trabecular meshwork or drainage angle during the keratoplasty procedure can cause impaired aqueous humor outflow, leading to increased IOP and secondary glaucoma.

4. Cystoid Macular Edema:
- Cystoid macular edema (CME) may occur post-surgery and can cause an increase in the IOP due to inflammation and fluid accumulation in the eye.

5. Chronic Inflammation:
- Chronic uveitis or inflammation following PKP can lead to fibrosis in the drainage angle or posterior synechiae, impeding aqueous outflow and resulting in secondary glaucoma.

6. Graft Failure or Rejection:
- In cases of graft rejection, the associated inflammation can cause iridocorneal adhesions (synechiae) and increased IOP, contributing to glaucoma development.

7. Corneal Edema:
- Corneal edema can occur if there is a failure of the graft or if the corneal endothelium is damaged, impairing the function of the trabecular meshwork and causing elevated IOP.

Quick Tip

Early detection and management of secondary glaucoma after penetrating keratoplasty are essential to prevent optic nerve damage and preserve vision.

Q3. (a) What is the role of anterior segment optical coherence tomography in corneal pathologies and in glaucoma cases?

Solution:
Anterior Segment Optical Coherence Tomography (AS-OCT) is a non-invasive imaging technique that provides high-resolution, cross-sectional images of the anterior segment of the eye. It plays a significant role in the diagnosis, monitoring, and management of corneal pathologies and glaucoma.

Role of AS-OCT in Corneal Pathologies:

1. Corneal Thickness Measurement:
- AS-OCT provides precise corneal thickness measurements, which are crucial in evaluating

conditions such as glaucoma, corneal edema, and keratoconus. Monitoring corneal thickness is also important when assessing the risk of post-surgical complications in procedures like LASIK.

2. Keratoconus Detection:
- AS-OCT is highly effective in detecting keratoconus, a progressive thinning of the cornea. The device provides detailed images of the corneal layers, allowing early detection of stromal thinning and irregularities that are characteristic of this disease.
- It also aids in monitoring the progression of keratoconus and assessing the effectiveness of interventions like corneal crosslinking.

3. Assessment of Corneal Scars:
- AS-OCT is useful in corneal scar evaluation, as it provides images that reveal the depth and extent of scarring, which is difficult to assess with slit-lamp examination alone.

4. Postoperative Monitoring:
- After corneal transplantations, AS-OCT is essential in assessing graft-host junctions and the graft's clarity. It also helps in detecting complications such as graft rejection or cellular infiltration.

5. Detection of Corneal Ectasia:
- In patients who have undergone refractive surgery, AS-OCT is invaluable in detecting ectasia, a condition characterized by corneal thinning and bulging, which may develop months or years after surgery.

Role of AS-OCT in Glaucoma:

1. Evaluation of the Optic Nerve Head:
- AS-OCT provides detailed imaging of the optic nerve head, allowing for the detection of early changes in the optic disc that may indicate glaucomatous damage. This includes evaluation of the cup-to-disc ratio and neuroretinal rim thinning.

2. Retinal Nerve Fiber Layer (RNFL) Analysis:
- The measurement of RNFL thickness using AS-OCT helps in the detection of glaucoma progression. Thinning of the RNFL is a hallmark of glaucomatous optic neuropathy and AS-OCT allows for precise monitoring over time.

3. Corneal Nerve Fiber Layer Evaluation:
- AS-OCT can also be used to assess the corneal nerve fiber layer in glaucoma patients. Changes in the corneal nerve fiber layer may indicate early neurodegenerative changes, even before the appearance of optic nerve damage.

4. Angle-Closure Glaucoma:
- AS-OCT is used to assess the anterior chamber angle and iridocorneal angle structures, which is vital for diagnosing angle-closure glaucoma. It provides high-resolution images to evaluate the iridocorneal angle and helps in planning surgical interventions like laser peripheral iridotomy.

Quick Tip

AS-OCT is an invaluable tool in both corneal pathology and glaucoma management, offering detailed imaging for early diagnosis, monitoring progression, and planning treatment.

Q3. (b) Briefly describe the new advances (diagnostic & therapeutic) in managing dry eyes.

Solution:
Dry eye disease (DED) is a multifactorial condition characterized by a loss of homeostasis of the tear film and symptoms of ocular discomfort. Advances in both diagnostic techniques and therapeutic interventions have significantly improved the management of dry eyes.

Diagnostic Advances:

1. Tear Film Break-Up Time (TBUT):
- TBUT is a common diagnostic test to evaluate the stability of the tear film. Recent advances have made TBUT measurement more precise, allowing for better early detection of dry eye disease.

2. Ocular Surface Staining:
- Fluorescein and lissamine green staining are commonly used to assess the damage to the ocular surface. Advanced imaging systems provide high-resolution images of the ocular surface, allowing for better monitoring of corneal and conjunctival changes.

3. Tear Meniscus Measurement:
- High-tech optical coherence tomography (OCT) can measure the tear meniscus height, offering a precise assessment of tear volume, which is essential in the diagnosis of dry eye disease.

4. Meibography:
- This imaging technique evaluates the meibomian glands for dysfunction, which is a major contributor to dry eye disease, especially in meibomian gland dysfunction (MGD).

5. Inflammatory Markers:
- Matrix metalloproteinase-9 (MMP-9) testing is used to detect inflammation on the ocular surface, offering an early indication of dry eye disease.

Therapeutic Advances:

1. Artificial Tears:
- New-generation lubricating eye drops contain lipid-based formulations, which help in maintaining the stability of the tear film in meibomian gland dysfunction. These have improved

efficacy compared to traditional water-based drops.

2. Punctal Plugs:
- Punctal occlusion is an established therapy for reducing tear drainage. Newer types of punctal plugs, including bioabsorbable and dissolvable plugs, offer more comfort and fewer side effects.

3. Intense Pulsed Light (IPL) Therapy:
- IPL therapy has gained popularity for meibomian gland dysfunction (MGD) by improving gland function and enhancing lipid secretion. It has been shown to reduce inflammation and improve tear film quality.

4. Lipiflow:
- Lipiflow is a thermal pulsation treatment for meibomian gland dysfunction, where heat and pressure are applied to the eyelids to help clear blockages in the meibomian glands, thereby improving the lipid layer of the tear film.

5. Autologous Serum Eye Drops:
- For severe dry eyes, autologous serum eye drops made from the patient's own blood are used to provide nourishment and promote healing of the ocular surface, especially when other treatments have failed.

6. Tear-Stimulating Drugs:
- Corticosteroids and cyclosporine A (Restasis) help reduce inflammation in the ocular surface. Recently, lifitegrast (Xiidra), an anti-inflammatory drug, has been approved for treating dry eye disease, particularly in autoimmune dry eye.

7. Surgical Treatment:
- Surgical techniques like meibomian gland duct surgery and lipid layer enhancement procedures are being explored for more advanced cases of meibomian gland dysfunction.

Quick Tip

In managing dry eye disease, a combination of diagnostic testing and tailored treatments, such as lipid-based drops or IPL therapy, can significantly improve patient outcomes.

Q4. (a) Describe techniques for repair of a canalicular injury.

Solution:
Canalicular injuries are commonly caused by trauma, such as blunt or sharp objects impacting the eye or surrounding areas. These injuries involve the lacrimal drainage system, which includes the punctum, canaliculus, and lacrimal sac. The repair of canalicular injuries is essential to restore normal tear drainage and prevent complications such as epiphora (excessive tearing) or chronic dacryocystitis (infection of the lacrimal sac).

Techniques for Canalicular Injury Repair:

1. Primary Repair:
- Indications: Primary repair is performed within 24 hours of the injury to prevent scarring and preserve the normal anatomical structure of the canaliculus.
- Procedure: The canalicular laceration is identified, and the injured ends are re-approximated using a fine suture, such as 6-0 Vicryl or 7-0 Prolene, through the canalicular lumen. The ends of the canaliculus are carefully sutured together without tension to ensure patency.
- Surgical Approach: The punctum is dilated, and the canaliculus is carefully sutured with the use of a canalicular stent or intubation for stabilization.

2. Canalicular Intubation (Stenting):
- In cases where there is a significant gap or a delay in presentation, canalicular intubation is required. A small, flexible tube (such as silicone stents) is passed through the canaliculus to maintain patency and ensure proper healing.
- Stenting Duration: The stents are left in place for several months, with periodic follow-up to monitor the success of the repair and the removal of the stents once healing is complete.

3. Monocaudal and Bicanalicular Intubation:
- In complex canalicular injuries involving both the upper and lower canaliculi, bicanalicular intubation is preferred. A double-lumen stent is placed through both canaliculi, with the ends of the stent exiting through the puncta and securing the canaliculi together.

4. Flap Repair with Mucosal Graft:
- If the canalicular injury is extensive or has caused significant tissue loss, a mucosal graft from the buccal mucosa or nasal mucosa can be used to bridge the gap between the two canalicular ends.

5. Canalicular Reconstruction:
- In cases of severe trauma or large defects, more advanced techniques, such as canalicular reimplantation or canalicular reconstruction using a bony or synthetic graft, may be necessary.

6. Dacryocystorhinostomy (DCR):
- If the injury involves the lacrimal sac or if there is a complete canalicular loss, a DCR procedure may be required in conjunction with other techniques to restore tear drainage.

> **Quick Tip**
>
> Timely repair within 24 hours and the use of silicone stents are critical for optimal functional and cosmetic outcomes in canalicular injury repair.

Q4. (b) Describe types of orbital implants and their advantages.

Solution:

Orbital implants are used in ocular prosthesis surgeries, typically after enucleation (removal of the eye) or evisceration (removal of the eye contents) for cancer, trauma, or inflammatory diseases. The main goals of using orbital implants are to restore facial aesthetics, improve ocular motility, and provide support for a custom prosthesis.

Types of Orbital Implants:

1. Spherical Implants:
- Description: Spherical implants are smooth, round implants typically made from silicone or hydroxyapatite. They are the most commonly used implants and are placed in the orbital cavity to support a prosthetic eye.
- Advantages:
- Simple and reliable with well-established outcomes.
- Provides good cosmetic outcomes and support for a custom ocular prosthesis.
- Easy to implant with minimal complications.
- Silicone implants are the most widely used due to their flexibility and long-term reliability.

2. Hydroxyapatite Implants:
- Description: Hydroxyapatite is a naturally occurring mineral form of calcium apatite, commonly used in orbital implants. The implant is often porous, allowing for the growth of fibrovascular tissue and better integration with the surrounding tissues.
- Advantages:
- Better tissue integration: The porous nature encourages tissue growth, which helps in more stable implant fixation and reduces the risk of implant extrusion.
- Provides better support for a prosthesis that moves more naturally with the remaining ocular muscles.
- Used when a patient has lost significant muscle or tissue support and requires a more stable implant.

3. Polyethylene Implants:
- Description: Polyethylene implants are solid, non-porous implants used in orbital reconstruction.
- Advantages:
- Inert and biocompatible with minimal risk of rejection.
- High durability and strength.
- Excellent for cases requiring stable, long-term results.
- These implants are often used in patients with small defects or those requiring enhanced support for a prosthesis.

4. Porous or Mesh-Style Implants:
- Description: These implants feature a mesh-like design that encourages fibrovascular growth and tissue integration. They can be made from materials like porous polyethylene or titanium.
- Advantages:
- Enhances vascularization and integration into the orbital tissues.
- Reduces the risk of implant extrusion compared to smooth, non-porous implants.
- Provides better motility and functional outcomes as the implant integrates well with the surrounding muscles and tissues.

5. Custom Shaped Implants:
- Description: These implants are custom-designed based on a patient's specific orbital dimensions and needs. Often made of silicone or hydroxyapatite, they provide a more tailored fit.
- Advantages:
- Best suited for patients with unique orbital shapes or anatomical challenges.
- Customization offers improved fit and comfort, reducing complications related to poorly fitting implants.

6. Titanium Implants:
- Description: Titanium is a durable, lightweight material used for orbital implants. Titanium implants are more commonly used in surgical reconstructions or cases with significant tissue loss.
- Advantages:
- Titanium is strong and biocompatible, making it a good option for patients who require stable and durable implants.
- It promotes minimal risk of infection and rejection due to its inert properties.

7. Expanded Polytetrafluoroethylene (ePTFE):
- Description: ePTFE implants are a type of synthetic polymer used in orbital reconstruction. These implants are relatively lightweight and flexible.
- Advantages:
- Good tissue integration and minimal extrusion risk.
- Lightweight and flexible properties allow for better anatomical compatibility.
- Effective for small defects and orbital floor fractures.

Quick Tip

Hydroxyapatite implants provide superior tissue integration and motility, while silicone implants remain the most commonly used due to ease of placement and reliability.

Q5. (a) What are extended depth of focus intraocular lenses (EDOF)?

Solution:
Extended Depth of Focus (EDOF) intraocular lenses are a type of multifocal intraocular lens (IOL) designed to improve visual acuity across a range of distances, particularly benefiting patients who have undergone cataract surgery. EDOF lenses are engineered to extend the depth of focus, providing better near, intermediate, and distance vision without the abrupt visual jumps seen with traditional multifocal lenses.

- EDOF lenses are typically used in patients who wish to achieve functional vision at multiple distances with a focus on intermediate vision (such as for computer use), while minimizing the visual disturbances like halos or glare that are common with traditional multifocal IOLs.

Quick Tip

EDOF lenses provide a continuous range of vision with less visual disturbance compared to traditional multifocal lenses, making them an ideal choice for cataract patients who seek a broader range of vision.

Q5. (b) What is the optical principle of EDOF lenses?

Solution:
The optical principle of EDOF lenses is based on the creation of a extended range of focus through a combination of optical design strategies. Unlike traditional monofocal lenses, which focus on a single point, EDOF lenses extend the focus to allow for clearer vision at multiple distances. The two primary optical principles used to achieve this are:

1. Wavefront Shaping:
- EDOF lenses utilize wavefront shaping technology, where the lens is designed to manipulate light in a way that produces a continuous range of focal points. This process involves creating an elongated focus, typically around the intermediate distance, which provides a better depth of field.
- This wavefront shaping helps in achieving a smooth transition between distances, reducing the abrupt changes in vision that can occur with traditional multifocal lenses.

2. Aspheric Surface Design:
- EDOF lenses often have an aspheric design, meaning the curvature of the lens is altered to reduce spherical aberration. This helps to maintain image quality across different distances.
- The aspheric surface also contributes to reducing glare and halos, which are common issues with multifocal lenses. This design allows the lens to focus over a broader range, especially for intermediate vision.

3. Non-Diffractive Optics:
- Unlike traditional multifocal lenses that use diffractive optics to split light into multiple focal points, EDOF lenses typically rely on non-diffractive optics to elongate the focal range without compromising the quality of vision at any distance.

Quick Tip

EDOF lenses use wavefront shaping and aspheric designs to provide an extended focal range, minimizing visual disturbances such as halos or glare commonly seen with multifocal lenses.

Q5. (c) What are the advantages and disadvantages of EDOF lenses?

Solution:
Advantages of EDOF Lenses:

1. Improved Range of Vision:
- EDOF lenses provide continuous vision across a wide range of distances, from near to intermediate and distance. This is particularly useful for activities like reading, computer work, and driving, without the abrupt transitions seen with traditional multifocal lenses.

2. Reduced Visual Disturbances:
- One of the biggest advantages of EDOF lenses is their ability to minimize common visual disturbances associated with multifocal lenses, such as halos and glare, especially in low-light conditions.

3. Better Intermediate Vision:
- EDOF lenses are specifically designed to provide superior intermediate vision, which is beneficial for daily activities that require clear vision at arm's length, like using computers or smartphones.

4. Enhanced Depth of Field:
- The continuous focus range provided by EDOF lenses helps reduce depth of field problems that patients often face with traditional IOLs, leading to a more natural and comfortable visual experience.

5. No Need for Reading Glasses:
- In many cases, patients with EDOF lenses can avoid reading glasses, providing a better overall visual experience and reducing dependence on eyewear.

Disadvantages of EDOF Lenses:

1. Limited Near Vision:
- While EDOF lenses provide a broader depth of field, their near vision (close-up focus) is not as sharp as that provided by multifocal lenses or monovision.
- Patients may still need reading glasses for tasks requiring near vision, such as reading fine print.

2. Cost:
- EDOF lenses are often more expensive than traditional monofocal IOLs. Insurance coverage for these lenses may also be limited, making them less accessible for some patients.

3. Visual Compromises at Extreme Near Distances:
- Although EDOF lenses provide extended depth of focus, they may not be as effective for very near vision tasks, like reading small print or threading a needle, where a more specialized near-vision lens might be preferred.

4. Learning Curve:
- Some patients may take time to adjust to the new depth of field, especially if they have been accustomed to monofocal lenses or traditional glasses. The adjustment period may include discomfort or difficulties in focusing on very close objects.

5. Possible Reduced Contrast Sensitivity:
- In some cases, EDOF lenses may lead to a slight reduction in contrast sensitivity, particularly in low-light environments, as the depth of focus extends across multiple distances.

> **Quick Tip**
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> While EDOF lenses provide a broader range of vision and reduced visual disturbances compared to multifocal lenses, they may not provide optimal near vision for tasks that require close-up clarity.

Q6. What is corneal crosslinking? Discuss its principles, indications, and different protocols.

Solution:
(a) What is Corneal Crosslinking?
Corneal crosslinking (CXL) is a non-invasive procedure used to strengthen the cornea by inducing the formation of chemical bonds between collagen fibers. This process helps to stabilize the cornea, particularly in diseases like keratoconus, where the cornea becomes thinned and weakened. Corneal crosslinking is most commonly performed using riboflavin (vitamin B2) combined with ultraviolet (UV) light.

(b) Principles of Corneal Crosslinking
The basic principles of corneal crosslinking are based on the use of riboflavin and UV-A light to enhance the biomechanical properties of the cornea. The key steps involved in the process are:

1. Riboflavin Application:
- Riboflavin, a photosensitive agent, is applied to the corneal stroma. This allows the cornea to absorb UV-A light, which is critical for the crosslinking process.

2. UV-A Irradiation:
- UV-A light of a specific wavelength (typically 370 nm) is then used to irradiate the cornea. The energy from UV-A light interacts with the riboflavin molecules, generating free radicals that form covalent bonds between collagen fibers, effectively "crosslinking" the collagen and increasing the stiffness of the cornea.

3. Stiffening of Collagen:
- The result is a strengthened and stabilized cornea, which helps in preventing further progression of keratoconus or flattening of the corneal curvature.

4. Effect on Corneal Biomechanics:
- The crosslinking process improves the cornea's structural integrity, thus reducing ectasia, thinning, and irregularity. This helps in improving visual acuity and stabilizing the condition.

(c) Indications for Corneal Crosslinking

Corneal crosslinking is primarily used in the treatment of ectatic corneal diseases and conditions that involve progressive thinning of the cornea. The main indications are:

1. Keratoconus:
- The most common indication for CXL, keratoconus is a progressive thinning and bulging of the cornea. CXL is used to stabilize the cornea and halt the progression of the disease.

2. Post-LASIK Ectasia:
- CXL can be used to treat ectasia that may occur after LASIK surgery, where the cornea becomes weakened and unstable after refractive surgery.

3. Corneal Ectasia:
- In patients with corneal ectasia, where the cornea becomes steepened and distorted, CXL is used to prevent further progression and improve visual outcomes.

4. Corneal Scarring:
- CXL may also be used in cases where corneal scarring occurs due to trauma or infections, to enhance the structural stability of the cornea and improve its clarity.

5. Other Ectatic Diseases:
- CXL may be explored for other less common ectatic conditions such as pellucid marginal degeneration.

(d) Different Protocols for Corneal Crosslinking

1. Standard (Epi-Off) Protocol:
- Procedure: The most commonly used protocol, where the epithelium is removed to allow better penetration of riboflavin. Riboflavin is then applied to the cornea for about 30 minutes, followed by UV-A irradiation for 30 minutes.
- Advantages: Proven efficacy in stabilizing keratoconus and improving visual outcomes.
- Disadvantages: Longer recovery time due to epithelial removal, increased risk of infection, and potential for discomfort after the procedure.

2. Epi-On (Transepithelial) Protocol:
- Procedure: In this modified technique, the epithelium is not removed. Riboflavin is applied directly to the intact corneal epithelium, often with the use of special riboflavin solutions that enhance penetration.
- Advantages: Faster recovery time, less discomfort, and a lower risk of infection.
- Disadvantages: Slightly less effective than the Epi-Off protocol in terms of crosslinking efficacy due to the barrier presented by the intact epithelium.

3. Accelerated Crosslinking:
- Procedure: This technique uses a higher intensity of UV-A light for a shorter duration, which reduces the overall treatment time.
- Advantages: Shorter treatment duration and potentially reduced corneal stromal damage.
- Disadvantages: It requires precise control of the UV-A exposure to avoid complications. Not

as well studied as the traditional protocol.

4. Custom Crosslinking:
- Procedure: In some cases, individualized treatment may be used, with adjustments to UV intensity and riboflavin application based on the patient's specific corneal characteristics.
- Advantages: Tailored treatment to suit specific needs.
- Disadvantages: More complex and less standardized than the other protocols.

> **Quick Tip**
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> The choice of corneal crosslinking protocol depends on the patient's condition, with Epi-Off being the gold standard for efficacy and Epi-On offering quicker recovery times.

Q7. (a) What is Micro Invasive Glaucoma Surgery (MIGS)?

Solution:
Micro Invasive Glaucoma Surgery (MIGS) refers to a group of surgical techniques that aim to lower intraocular pressure (IOP) in glaucoma patients through less invasive means compared to traditional glaucoma surgeries like trabeculectomy or tube shunt surgery. MIGS procedures typically involve smaller incisions, minimal tissue disruption, and a faster recovery time. The goal of MIGS is to reduce the need for long-term medication while preserving the eye's anatomy and reducing the risk of complications.

- MIGS is often used in mild to moderate glaucoma or in cases where medical therapy fails to control intraocular pressure effectively. MIGS devices and techniques target the aqueous humor drainage system to improve the outflow of fluid and decrease IOP.

> **Quick Tip**
>
> MIGS procedures provide a safer, minimally invasive option for patients with mild to moderate glaucoma, allowing for faster recovery and fewer complications compared to traditional glaucoma surgeries.

Q7. (b) Enumerate types of MIGS devices available.

Solution:
There are several MIGS devices designed to enhance aqueous humor drainage and lower intraocular pressure (IOP) with minimal invasiveness. These devices primarily target different parts of the trabecular meshwork, schlemm's canal, and drainage pathways in the eye. The types of MIGS devices available include:

1. iStent (Glaukos):
- The iStent is a small, titanium device that is implanted into the trabecular meshwork to improve aqueous humor drainage through Schlemm's canal. It is typically implanted during cataract surgery.

2. iStent Inject (Glaukos):
- A more advanced version of the iStent, the iStent Inject involves the implantation of two stents into the trabecular meshwork, improving drainage and IOP control.

3. Hydrus Microstent (Ivantis):
- The Hydrus Microstent is a small, flexible device that is placed into the trabecular meshwork and Schlemm's canal, providing a scaffold to allow for improved aqueous outflow.

4. Xen Gel Stent (AbbVie):
- The Xen Gel Stent is a non-absorbable, gelatin stent that creates a drainage pathway from the anterior chamber to the subconjunctival space, bypassing the trabecular meshwork and Schlemm's canal.

5. Kahook Dual Blade (New World Medical):
- The Kahook Dual Blade is a device used to perform goniotomy, where a portion of the trabecular meshwork is removed to increase aqueous outflow. It is used in combination with other MIGS techniques.

6. Trabectome (NeoMedix):
- The Trabectome is a minimally invasive surgical device that removes part of the trabecular meshwork to improve fluid drainage through the trabecular outflow pathway.

7. Omni Surgical System (Sight Sciences):
- The Omni Surgical System is a device that can perform both goniotomy and trabeculotomy via a single micro-incision, addressing both the trabecular meshwork and Schlemm's canal to enhance drainage.

8. CyPass Micro-Stent (Alcon):
- The CyPass Micro-Stent was designed to provide drainage by creating an outflow pathway from the anterior chamber to the suprachoroidal space. However, its use has been discontinued due to concerns about long-term endothelial cell loss.

Quick Tip

The choice of MIGS device depends on the patient's specific glaucoma type, the severity of the disease, and the desired surgical outcome.

Q7. (c) Write briefly about the mechanism of action of these devices.

Solution:
The mechanism of action of MIGS devices is to improve aqueous humor drainage, thereby reducing intraocular pressure (IOP) without the need for large incisions or significant tissue disruption. The different MIGS devices achieve this goal in various ways, primarily targeting the trabecular meshwork, Schlemm's canal, or creating alternative drainage pathways. Below is a summary of the mechanisms for some of the most commonly used MIGS devices:

1. iStent (Glaukos):
- The iStent is a small titanium device that is implanted into the trabecular meshwork to create a permanent bypass, allowing aqueous humor to flow directly into Schlemm's canal and then into the eye's venous system, bypassing the resistance of the trabecular meshwork.

2. iStent Inject (Glaukos):
- The iStent Inject places two microstents into the trabecular meshwork. These stents open up Schlemm's canal and improve fluid drainage, helping to reduce IOP by increasing the outflow of aqueous humor through the natural drainage pathway.

3. Hydrus Microstent (Ivantis):
- The Hydrus Microstent is a flexible scaffold that is inserted into Schlemm's canal to create a larger outflow pathway. It extends the canal and provides a scaffold for better drainage, which reduces IOP by improving aqueous humor flow through the trabecular meshwork.

4. Xen Gel Stent (AbbVie):
- The Xen Gel Stent is inserted into the anterior chamber and provides an artificial outflow pathway for aqueous humor, bypassing the trabecular meshwork entirely. The stent directs the fluid into the subconjunctival space, where it is absorbed into the bloodstream.

5. Kahook Dual Blade (New World Medical):
- The Kahook Dual Blade performs goniotomy, where a small portion of the trabecular meshwork is excised, creating a new pathway for aqueous humor to drain from the anterior chamber to Schlemm's canal and the outflow system.

6. Trabectome (NeoMedix):
- The Trabectome removes part of the trabecular meshwork through a small incision, allowing aqueous humor to flow more freely into the trabecular outflow system, thereby reducing IOP.

7. Omni Surgical System (Sight Sciences):
- The Omni Surgical System performs goniotomy and trabeculotomy in a single step. It removes part of the trabecular meshwork and clears the Schlemm's canal, creating a more open channel for aqueous humor to drain out of the eye.

8. CyPass Micro-Stent (Alcon):
- The CyPass Micro-Stent created an outflow pathway for aqueous humor from the anterior chamber to the suprachoroidal space, bypassing the trabecular meshwork and canal entirely, and allowing fluid to be absorbed through the choroidal vasculature.

Quick Tip

MIGS devices work by improving aqueous humor outflow through bypassing or modifying natural drainage pathways, providing an effective and minimally invasive way to reduce IOP.

Q8. (a) What are different types of phakic IOLs and their indications?

Solution:
Phakic Intraocular Lenses (IOLs) are lenses that are implanted into the eye without removing the natural lens (keeping the eye "phakic"). They are mainly used for correcting refractive errors such as myopia, hyperopia, and astigmatism in patients who are not candidates for laser refractive surgery (LASIK) or those with higher degrees of refractive error.

Types of Phakic IOLs:

1. Anterior Chamber Phakic IOLs:
- These IOLs are implanted in the anterior chamber of the eye, between the cornea and the iris.
- The most common type is the angle-supported anterior chamber IOL, which is placed in the anterior chamber angle and is supported by the angle structures.

Indications:
- Primarily used in patients with high degrees of myopia or hyperopia.
- Suitable for patients with thin corneas or large refractive errors where LASIK is not an option.

2. Posterior Chamber Phakic IOLs (e.g., Visian ICL):
- These lenses are implanted in the posterior chamber, behind the iris and in front of the natural lens.
- The implantable collamer lens (ICL) is the most common posterior chamber phakic IOL.

Indications:
- Used for high myopia or hyperopia in patients who are not suitable for LASIK.
- Suitable for patients with thicker corneas, low endothelial cell counts, or high refractive errors (up to -20 diopters or +10 diopters).

3. Torical Phakic IOLs:
- These IOLs are designed for patients with astigmatism. They are a combination of the standard anterior or posterior chamber IOLs with additional astigmatic correction built into the lens.

Indications:
- Patients with high myopic astigmatism or hyperopic astigmatism who need both astigmatic correction and refractive correction.

Quick Tip

Phakic IOLs are ideal for patients with high refractive errors or thin corneas who are not suitable candidates for laser refractive surgery (LASIK).

Q8. (b) What are their intraoperative & postoperative complications and their management?

Solution:
While phakic IOLs are generally safe and effective for correcting refractive errors, there are potential intraoperative and postoperative complications that must be managed carefully.

Intraoperative Complications and Management:

1. Corneal Injury:
- During the implantation of the IOL, there is a risk of corneal damage due to the surgical technique, especially when working in the anterior chamber.
- Management: Careful surgical technique, including proper hydration and use of protective shields, can prevent such injuries. In case of corneal abrasion, antibiotics and anti-inflammatory medications are prescribed.

2. Incorrect IOL Positioning:
- The IOL may become improperly positioned within the eye, which can cause visual disturbances and require repositioning.
- Management: Proper preoperative measurement and intraoperative checks are crucial. If necessary, the IOL can be repositioned during surgery.

3. High Intraocular Pressure (IOP):
- High IOP can result from overfilling of the anterior chamber during the procedure or blockage of the aqueous outflow by the IOL.
- Management: If high IOP occurs, medications such as mannitol or acetazolamide may be used to reduce pressure. In some cases, the IOL may need to be repositioned or removed.

4. Perforation of the Iris:
- Iris perforation or damage to the pupil can occur during implantation, particularly with anterior chamber IOLs.
- Management: Careful handling of the iris and use of appropriate surgical instruments can reduce the risk. Postoperatively, the use of anti-inflammatory drops may be required for healing.

Postoperative Complications and Management:

1. Endothelial Cell Loss:
- Phakic IOLs, particularly anterior chamber IOLs, can lead to endothelial cell loss over time due to contact with the corneal endothelium.

- Management: Regular monitoring of corneal endothelial cell count and early detection of any corneal edema can help in managing this complication. If significant endothelial damage occurs, the IOL may need to be replaced or removed.

2. Cataract Formation:
- The development of a cataract is a known risk with posterior chamber phakic IOLs over time, particularly in older patients.
- Management: If cataract formation occurs, phacoemulsification and IOL exchange may be necessary.

3. Intraocular Lens (IOL) Dislocation:
- Phakic IOLs, especially anterior chamber lenses, can become dislocated due to improper fixation or trauma.
- Management: If the IOL dislocates, repositioning or re-implantation may be required. In some cases, a different type of IOL may be necessary.

4. Glaucoma:
- Increased intraocular pressure (IOP) can occur postoperatively, particularly if the phakic IOL obstructs the outflow of aqueous humor.
- Management: Monitoring and treatment of IOP with antiglaucoma medications or surgical intervention, such as trabeculectomy, may be required.

5. Uveitis:
- Inflammation (uveitis) can occur as a result of irritation from the IOL.
- Management: Postoperative use of topical steroids and anti-inflammatory medications can help manage inflammation. If persistent, the IOL may need to be adjusted or removed.

Quick Tip

Regular follow-up visits after phakic IOL implantation are crucial to detect complications early, such as cataract formation, endothelial damage, or glaucoma.

Q9. (a) What are the stages of thyroid eye disease?

Solution:
Thyroid Eye Disease (TED), also known as Graves' orbitopathy, progresses through various stages. The classification of TED is based on the disease's progression and clinical features:

Stages of Thyroid Eye Disease:

1. Acute (Inflammatory) Stage:
- This stage is characterized by inflammation of the extraocular muscles, leading to swelling and redness of the eye. The inflammation can also cause pain and watery eyes.
- The ocular muscles may become swollen and infiltrated, leading to symptoms of double vision

(diplopia) and eye bulging (proptosis).

2. Chronic (Fibrotic) Stage:
- In this stage, the inflammation subsides, and fibrosis of the extraocular muscles may develop. This leads to scarring, which can result in permanent double vision and reduced eye movement.
- The proptosis (bulging of the eyes) may persist, and the risk of optic nerve compression increases.

3. Stable Stage:
- This stage follows the inflammatory and fibrotic processes, and the disease tends to stabilize. In some patients, proptosis and muscle involvement may remain, but further progression of the disease stops.
- There is minimal inflammation, and the patient's symptoms may become less severe or subside.

Quick Tip

Thyroid Eye Disease progresses through inflammatory, fibrotic, and stable stages, with inflammation being the most prominent in the early stages.

Q9. (b) Detail the clinical features and risk factors for thyroid eye disease.

Solution:
Clinical Features of Thyroid Eye Disease:

1. Proptosis (Exophthalmos):
- Bulging eyes are a hallmark of TED, due to orbital fat expansion and extraocular muscle swelling. Proptosis can cause ocular surface exposure and dry eyes.

2. Diplopia (Double Vision):
- Caused by extraocular muscle involvement leading to misalignment of the eyes, especially when the inferior rectus or medial rectus muscles are affected.

3. Orbital Pain and Pressure:
- Inflammation of the extraocular muscles can cause discomfort, particularly when moving the eyes. Pain may be more severe in the acute inflammatory phase.

4. Redness and Swelling of the Eyes:
- Conjunctival redness, chemosis, and swelling of the eyelids are common, particularly in the early stages due to inflammation.

5. Dryness and Irritation:
- Reduced eyelid closure due to proptosis can cause corneal dryness, leading to burning, itching, or sandy sensation in the eyes.

6. Reduced Eye Movement:
- Restricted extraocular movements occur due to swelling or fibrosis of the extraocular muscles, resulting in difficulty moving the eyes and double vision.

7. Optic Nerve Compression:
- Loss of vision or visual field defects can occur if the optic nerve becomes compressed by the swollen muscles or retrobulbar fat.

Risk Factors for Thyroid Eye Disease:

1. Thyroid Dysfunction:
- Hyperthyroidism, particularly due to Graves' disease, is the most significant risk factor. Hypothyroidism, though less common, can also be associated with TED.

2. Smoking:
- Smoking is the most significant modifiable risk factor for TED. It increases the severity of the disease and the risk of developing optic nerve compression.

3. Age and Gender:
- TED is more common in middle-aged women, but it can occur in both genders. The disease typically presents between the ages of 30-50 years.

4. Family History:
- A family history of Graves' disease or thyroid disorders can increase the likelihood of developing TED.

5. Thyroid Antibody Levels:
- Elevated thyroid-stimulating immunoglobulin (TSI) and anti-thyroid peroxidase (TPO) antibodies can indicate an increased risk of developing TED.

> **Quick Tip**
>
> Smoking is the strongest modifiable risk factor for the severity of Thyroid Eye Disease and can significantly impact the prognosis.

Q9. (c) Draw a flow diagram on management protocols of thyroid eye disease causing optic nerve compression.

Solution:
A flow diagram for managing optic nerve compression due to Thyroid Eye Disease (TED) typically follows these steps:

Management Flow:
- Step 1: Initial Assessment:

- Confirm diagnosis of TED and optic nerve compression via clinical examination and imaging (CT/MRI).
- Step 2: Treat Thyroid Dysfunction:
- Control thyroid function (e.g., anti-thyroid medications, radioactive iodine, or surgical thyroidectomy).
- Step 3: Medical Management:
- Corticosteroids for inflammation and swelling reduction.
- Orbital decompression if necessary.
- Step 4: Surgical Intervention:
- Consider orbital decompression surgery to relieve pressure on the optic nerve if vision is threatened.
- Step 5: Follow-up Care:
- Regular follow-up to monitor vision, optic nerve status, and response to treatment.

Quick Tip

Managing optic nerve compression in TED requires a combination of thyroid control, anti-inflammatory therapy, and potentially surgical intervention for severe cases.

Q9. (d) What are the symptoms and signs of optic nerve compression in thyroid eye disease?

Solution:
Symptoms of Optic Nerve Compression in TED:
1. Vision Loss:
- Progressive visual loss or blurry vision due to the compression of the optic nerve.

2. Visual Field Defects:
- Central or peripheral vision loss, which may manifest as scotomas (dark spots) or visual field constriction.

3. Color Vision Deficits:
- Reduced color perception, particularly in the red-green spectrum, which can be indicative of optic nerve damage.

Signs of Optic Nerve Compression in TED:
1. Optic Disc Edema:
- Swelling of the optic nerve head, seen during fundoscopy.

2. Optic Nerve Pallor:
- Paleness of the optic nerve head due to chronic compression and ischemia.

3. Increased Cup-to-Disc Ratio:
- A widening of the optic cup due to optic atrophy.

Quick Tip

Early identification of optic nerve compression in TED is crucial to prevent irreversible vision loss. Prompt treatment can significantly improve outcomes.

Q10. (a) Evolution of Anti-VEGF factors.

Solution:
Anti-VEGF (Vascular Endothelial Growth Factor) therapies have revolutionized the treatment of various ocular diseases, particularly those involving neovascularization and vascular leakage. The evolution of Anti-VEGF therapies has progressed over time, with the introduction of newer agents improving efficacy and safety profiles.

Evolution of Anti-VEGF Factors:

1. First Generation: Bevacizumab (Avastin):
- Bevacizumab was the first systemic anti-VEGF therapy, initially developed for cancer treatment. It was later found to be effective in ocular conditions such as wet age-related macular degeneration (AMD), diabetic macular edema (DME), and retinal vein occlusion (RVO).
- Bevacizumab is off-label used for ocular conditions, where it has been shown to reduce neovascularization, macular edema, and improve visual outcomes.

2. Second Generation: Ranibizumab (Lucentis):
- Ranibizumab is a monoclonal antibody fragment derived from bevacizumab but with a smaller molecular size and higher ocular bioavailability. It was developed specifically for ocular use and approved by the FDA for the treatment of wet AMD, DME, and RVO.
- Ranibizumab works by directly binding to VEGF-A, preventing its interaction with the VEGF receptor and inhibiting angiogenesis.

3. Third Generation: Aflibercept (Eylea):
- Aflibercept, also known as VEGF Trap-Eye, is a fusion protein that binds to multiple forms of VEGF-A and placental growth factor (PlGF). It has a higher affinity for VEGF and longer half-life than ranibizumab, allowing for less frequent injections (up to every 8 weeks).
- It is FDA-approved for the treatment of wet AMD, DME, RVO, and myopic choroidal neovascularization.

4. Emerging Anti-VEGF Agents:
- Brolucizumab (Beovu): A newer anti-VEGF agent that binds to VEGF-A with higher affinity and has a longer duration of action (up to 12 weeks).
- Faricimab (Vabysmo): This bispecific antibody targets both VEGF-A and Ang-2, which may improve outcomes in wet AMD and other retinal conditions by addressing both angiogenesis and vascular permeability.

> **Quick Tip**
>
> The evolution of Anti-VEGF therapies, from bevacizumab to newer agents like aflibercept and faricimab, has dramatically improved the treatment options for retinal diseases, offering better efficacy and longer intervals between injections.

Q10. (b) Role of Rho kinase inhibitors in Ophthalmology.

Solution:
Rho kinase inhibitors are a class of drugs that target the Rho kinase pathway, a key regulator of cellular contraction, actin cytoskeleton dynamics, and endothelial permeability. In ophthalmology, Rho kinase inhibitors have emerged as a promising treatment for various ocular conditions.

Role of Rho Kinase Inhibitors in Ophthalmology:

1. Glaucoma Management:
- Rho kinase inhibitors (such as Netarsudil) work by reducing intraocular pressure (IOP) through two mechanisms:
- Increasing aqueous humor outflow by relaxing the trabecular meshwork.
- Enhancing uveoscleral outflow, another drainage pathway for aqueous humor.
- Netarsudil (Rhopressa) is the first FDA-approved Rho kinase inhibitor for open-angle glaucoma. It works as both a pressure-lowering agent and a vasodilator, improving blood flow to the optic nerve.

2. Retinal Diseases:
- Rho kinase inhibitors can improve retinal blood flow and reduce vascular leakage, which is important in conditions like diabetic retinopathy, age-related macular degeneration (AMD), and retinal vein occlusion (RVO).
- Their role in modulating inflammation and vascular permeability is still under investigation but shows promise in improving retinal function and reducing edema.

3. Post-surgical Healing:
- Rho kinase inhibitors have also been explored to enhance wound healing in the eye following procedures such as trabeculectomy and cataract surgery by promoting cell migration and tissue repair.

> **Quick Tip**
>
> Rho kinase inhibitors offer an alternative mechanism for lowering IOP and improving retinal health, especially in glaucoma and retinal vascular diseases.

Q10. (c) Sequel of COVID in the eye.

Solution:
The COVID-19 pandemic has had a significant impact on ocular health, both directly and indirectly. The virus can affect the eyes in multiple ways, from causing ocular manifestations to exacerbating existing conditions.

Sequel of COVID in the Eye:

1. Conjunctivitis (Pink Eye):
- COVID-19-associated conjunctivitis has been widely reported, often presenting as redness, itching, and watery eyes. It is thought to be one of the initial symptoms of COVID-19, although it is not specific to the disease.
- Management: Symptomatic treatment with artificial tears and anti-inflammatory drops can be used for relief.

2. Retinal Changes:
- There have been reports of retinal abnormalities in COVID-19 patients, including retinal vein occlusion (RVO) and microvascular changes in the retina. These changes may be linked to the hypercoagulable state induced by the virus.
- Management: In some cases, treatment with anti-VEGF therapy or corticosteroids may be required for retinal complications.

3. Dry Eye Disease:
- Dry eyes have been reported as a secondary symptom of COVID-19, possibly due to increased screen time during quarantine or the effects of the virus on tear production.
- Management: Lubricating eye drops and lid hygiene can help manage symptoms of dry eye.

4. Optic Neuropathy:
- There have been reports of optic neuropathy or optic neuritis associated with COVID-19, although the incidence is rare.
- Management: Patients with optic nerve involvement should be evaluated for systemic inflammatory diseases and may require steroids or immunosuppressive therapy.

5. Post-COVID Fatigue and Vision:
- Some individuals report visual disturbances as part of post-COVID fatigue syndrome, possibly due to the prolonged impact of the virus on the central nervous system.

Quick Tip

COVID-19 can affect the eyes through conditions like conjunctivitis, retinal changes, and dry eye disease. Early detection and management of ocular complications can help prevent long-term damage.