2. **The Clinical Examination of the Eye**

In any medical or surgical discipline, the physician does not jump into treatment unless a proper diagnosis is reached. This essentially entails moving in a very systematic manner, through **history taking**, performing clinical **examination**, considering the **differential diagnosis** and, if needed, ordering the appropriate **investigations** or **ancillary tests**.

**History Taking**

History taking is an art. The physician must be a good listener but he or she must also take the lead of the conversation with the patient in order not to get lost in irrelevant details. Asking the right questions in an orderly manner is the key to successful history taking and the latter is often the key to the correct diagnosis.

**History taking includes:**

1. Personal history
2. The complaint
3. Present history
4. Past History
5. Family History
1. **Personal History:**

- **Name:** (To get familiar with the patient)
- **Age:** (Some diseases are more common in certain ages)
- **Sex:** (Some diseases have gender predilection)
- **Residence:** (Can the patient adhere to close follow up? Is the patient living in an endemic area for a certain disease?)
- **Occupation:** (Is the patient a pilot or driver? Is there occupational hazard of ocular trauma?)
- **Marital status**
- **Special Habits:** (is the patient a smoker? How many packs? How many years?, Is there history of alcohol intake or intravenous drug abuse)

2. **The Complaint**

The complaint is the reason why the patient is coming to visit the ophthalmologist. It should be recorded in the patient's own words, with NO medical terminology.

In ophthalmic practice, patients usually present with a complaint under one of four groups:

- Complaints related to vision
- Pain /headache
- Watery eye, Discomfort, burning, stinging, foreign body sensations
- Abnormal ocular appearance

Patients don't always vocalize their complaints properly. It is thus important to make sure that when a patient says pain, they don't mean itching or discomfort or even loss of vision.
3- Present history = analysis of the complaint:

- Onset: Did the complaint begin suddenly, acutely or gradually or discovered accidentally
- Course: Is it getting better (regressive) or worse (progressive) or stationary
- Duration: How long has this complaint existed
- What increases and what relieves the complaint
- Are there any associations in the eye or in the body

3. Past history:

- General disease: diabetes, hypertension, renal disease and arthritis are diseases that may be of importance and could be related to the patient’s problem.
- Past ocular disease, surgery or treatment.
- Past or present systemic disease, operations or treatment: Diabetes, hypertension, renal disease, heart disease are especially important. Autoimmune diseases, arthritis, pregnancy, asthma and history of trauma should be inquired about according to the situation.

4. Family history of:

- Similar condition
- Cataract.
- High myopia.
- Glaucoma.
- Retinal degeneration.
- Positive consanguinity in hereditary diseases.
**Ophthalmic Examination**

The ophthalmic examination room consists of certain tools that are used for clinical assessment of the eye and its adnexa. These are not investigations, rather they are part of the examination.

These include:

Visual acuity charts

A. Visual acuity charts
B. The slit lamp
C. The Direct and the indirect ophthalmoscopes.
D. The Retinoscope/Autorefractometer.
E. The tonometer.
F. Some auxiliary lenses and prisms.

The clinical examination of the eye involves the utilization of these tools to perform the following basic steps:

1. Assessment of Visual acuity and Refraction
2. Examination of the ocular adnexa
3. Examination of the anterior segment of the eye
4. Examination of the posterior segment of the eye
5. Measurement of intraocular pressure (and examination of the angle of the anterior chamber if needed)
6. Assessment of the pupils
7. Assessment of the ocular motility and muscle balance
8. Assessment of the visual field by confrontation
1. **Assessment of Visual acuity and Refraction:**
   - **Visual Acuity:**

   **A. Using Charts**

   Visual acuity is a measure of resolution, meaning if the patient knows that two objects are actually two objects and not one object.

   Different test charts exist; these charts use optotypes which are shapes or letters. Take for example the Landolt's broken rings chart (Fig 1)

   If a patient can see the letters as a C and not as an O then the patient knows that there is a small gap between the two black edges of the C and so the patient can resolve the two edges (objects) as two not as one

   ![Fig 1: (Left) Landolt's broken C Chart. (Right) Optotypes as may be seen by the patient.](image)

   How is Visual acuity testing performed using a chart?
   - The patient sits at a distance of 6 meters from the chart.
   - The lowest line that can be read is recorded. For example, if vision is 6/24, it means that the patient can see at 6 meters what a normal person can see at 24 meters.
   - If the patient cannot see the largest ring (6/60), we ask him to get closer to the chart (one meter at a time) until he sees the largest ring (5/60, 4/60 etc).
• If the patient cannot see the largest ring at a distance of one meter, we ask him if he can count fingers.

b. Counting fingers (CF):
   In a well illuminated room, ask the patient to count fingers. Write down the distance at which he could count fingers, 60 cm, 40 cm, 30 cm etc. If the patient cannot count fingers as close as 20 cm, proceed to testing for hand movement.

c. Hand Motion (Movement):
   Move your hand in front of the patient, if the patient can see the hand moving, vision is hand movement (HM).

d. Perception of Light:
   If the patient cannot see HM do the perception of light test, if he can see light, write (PL). If he cannot see light, vision is (No PL).

e. The projection test:
   In both HM and PL vision, we must determine whether the patient is able to recognize the direction from which the light is coming. This is done by shining the penlight onto his eye from different directions (up, down, nasal, temporal). If he can see the light in all directions, the projection is good (good projection GP), if he cannot see the light in all directions, the projection is bad (bad projection BP).
Note: In all tests of visual acuity including projection, one eye only is tested at a time. The other eye must be completely and properly occluded otherwise the vision testing result is not reliable. Visual acuity testing is crucial and cannot be taken lightly since the whole diagnosis, treatment and follow up is often centered about it

- **Refraction:**

  This involves the use of the Retinoscope (Fig2) or auto-refractometer (Fig3). These devices give the clinician an idea about the refractive state of the eye and accordingly aid in the prescription of spectacles, contact lenses or the decision to perform refractive surgery. This will be discussed in more detail in chapter 3 (Normal and abnormal image capture).
2. **Examination of the ocular adnexa:**

This involves the use of a penlight or torch and occasionally a ruler. The slit lamp can also be used for added magnification as will be discussed later on.

The eyelids: should be examined for:

- Position.
- Lid margin thickness and position.
- Signs of inflammation.
- The presence of misdirected lashes.

- The regurgitation test: pressure on the skin below the medial canthal ligament while observing the punctum shows **no** regurge in the normal person but pus or mucopurulent secretion is seen in cases of naso-lacrimal duct obstruction associated with dacryocystitis.

- The palpebral conjunctiva should be examined by everting the eyelid (Fig 4), signs of trachoma as PTDs or Arlt’s line should be noted.
• The bulbar conjunctiva should be examined in all directions of gaze. Any abnormality in color should be noted. The normal conjunctiva is transparent through which the white sclera could be seen.

3. **Examination of the anterior segment of the eye:**

This can be achieved using the slit lamp or a flash light.

The slit lamp (Fig 5) is simply a microscope. It is made up of 2 main parts; a magnifying viewing system and a light source mounted onto a table. The light source can be widened or narrowed to form a slit beam that can helps the ophthalmologist view optical sections in the transparent structures of the eye and assess the different thicknesses and depths and their relation to each other.
The anterior segment includes the structures extending from the cornea till the lens.

- The cornea should be examined for its diameter (normally 12mm), transparency (normally transparent). Any opacity should be noted (nebula, leucoma, leucoma adherent).
- The anterior chamber (AC) should be examined for depth (Fig 6), clearness or cloudiness of the aqueous, the presence of blood (hyphema), the presence of pus (hypopyon). Abnormalities in depth should be noted. The anterior chamber may be shallow as in hypermetropia and angle closure glaucoma or deep as in aphakia and high myopia.
• The iris should be examined for color and pattern. Any difference between the color in the right and left eyes should be noted.
• The lens is normally clear. Any opacity in the lens should be noted. The lens normally lies just behind the iris; any abnormality in position should be noted (as in subluxation or dislocation of the lens).

4. Examination of the posterior segment of the eye (Ophthalmoscopy and Biomicroscopy)

Fundus examination is done after dilating the pupil with a short acting mydriatic as tropicamide or occasionally cyclopentolate. Fundus is a generic name comprising some structures of the inside of the eye which cannot be examined by the slit lamp or the pen light alone. These include the posterior 2/3 of the vitreous, the retina, the optic nerve and the choroid. These structures can be examined by either the direct ophthalmoscope (Fig 7), the indirect ophthalmoscope (Fig 8) or by means of slit lamp bio-microscopy which is the examination of the fundus using the slit lamp and a hand held lens.
Before fundus examination the red reflex is assessed (Fig 9); when parallel light enters the eye and pass through the clear media, they hit the choroid and reflect back, travelling through the clear media, and this result in a reddish color being seen in the pupil. In everyday life we see this phenomenon when a photograph is being taken and the camera and face of the subject are exactly opposite each other, resulting in red pupils. In ophthalmic practice the direct ophthalmoscope is used to shine light and the red color produced is viewed. If the red color is absent or changed this may indicate pathology in any of the clear media. White reflex might indicate mature cataract or retinoblastoma especially in a child. Black reflex is seen in vitreous hemorrhage. Grey reflex indicates retinal detachment and yellow reflex means endophthalmitis.
5. Measurement of intraocular pressure and examination of the angle of the anterior chamber:

This can be done either digitally by pressing on the eye with one index finger and feeling with the index of the other hand if the globe is soft, hard or near normal (Fig 10) or with the use of tonometers, like the Goldman's applanation tonometer (Fig 11).

The angle of the anterior chamber can only be viewed with the use of a special lens, known as the goniolens (Fig 12). Tonometry and gonioscopy
will be discussed in more detail in chapter 5 (Aqueous humour, IOP and glaucoma).

6. Examination of the pupils:

This can be achieved using a flash-light in dim light and then in ambient light

The pupils should be examined and compared for:

- Size
- Shape
- Regularity
- Color
- Reflexes

The reflexes include the pupillary light reflex and near reflex.

The Direct and Consensual Light Reflex:

- Preparation: The patient is examined in dim light, and asked to look at a distant target. The doctor stands to one side of the patient.
- The light is shone on the right eye and pupillary constriction is observed in the right eye (This is the direct light reflex).
- The light is shone again in the right eye and pupillary constriction is observed in the left eye (This is the consensual light reflex).
- The same is repeated for the Left eye.
The swinging flash-light test (Fig 13):

- Preparation: The patient is examined in dim light, and asked to look at a distant target. The doctor stands to one side of the patient
- The light is shone on the right eye and kept for 3 seconds, then swiftly swung to the left eye and kept for seconds. It is repeated many times to observe if the pupil actually constricts when light returns or if it dilates. If the pupil is seen to paradoxically dilate with exposure to the flashlight this is called a positive test and indicates an optic nerve disease in the corresponding eye (relative afferent pupillary defect).

The Near reflex:

- Preparation: The patient is examined in dim light, and asked to look at a distant target in the doctor's hand. The doctor stands to one side of the patient
- The patient is asked to fix on the distant target, as it moves towards the patient
- Observe pupillary constriction (notice convergence aswell)

Normally the pupils are described as being equal in size (around 5 mm in dim illumination), round, regular and reactive to light.

The significance and underlying basis of these tests will be discussed in the chapter 9 (The connection of the eye to the brain).
7. Assessment of ocular motility and balance:

A. Motility:

- Binocular Conjugate movements (Versions)
- Binocular Dysconjugate movements (Vergence)
- Monocular movements (Duction)
- Binocular Conjugate movements (Versions): Here ocular motility of both eyes are assessed together by asking the patient to look at a moving target (A pen or finger) in the different directions of gaze with both eyes moving towards the same target.

![Diagram of swinging flash light test](image-url)
• Binocular dysconjugate movements (Vergence):
Here ocular motility of both eyes are assessed together by asking the patient to look at a moving target (A pen or finger) as it comes closer and then moves farther from the patient's line of sight. Here both eyes will converge or diverge, thus moving in opposite directions.

• Monocular movements (Duction):
Here ocular motility of each eye is assessed alone, by asking the patient to follow a moving target with one eye closed.
B. Balance :

This can be achieved using a pen light with the aid of prisms:

- **Hirschberg test (Corneal light reflex test):**

  **Preparation:** The patient is asked to look at a distant target
  Light is shone at both eyes. The position of the reflex of light on the
  surface of the cornea is observed in relation to the pupil, it should be
  symmetrical and centered in the pupils, if the light is not centered, squint
  is present.

![Hirschberg Test Diagram](image)

Fig 16: Hirschberg test.

Ocular motility, Cover tests in addition to the significance and underlying basis of
the Hirschberg test will be discussed in chapter 7 (Ocular motility in health and disease).

8. **Assessment of field of vision by confrontation:**

While visual acuity testing is a reflection of the foveal function, visual field
testing is a reflection of the function of all retinal points. Each point of the
retina has its corresponding point in the visible space. The fovea corresponds to the **fixation point**. The nasal retinal points are responsible for the temporal field, The superior points see the inferior field and so on. The optic disc has no photoreceptors and therefore corresponds to the **blind spot**.

The confrontation test is a rough method suitable for the detection of large field defects involving the vertical half of the field (hemianopia) or the horizontal half (altitudinal). The confrontation method is not suitable for small defects. The examiner compares his own field of vision with that of the patient.

- Preparation: The examiner and patient both sit at the same level with 1 meter apart
- The examiner asks the patient to always look at his/her open eye, and not to follow the target
- The examiner covers his/her right eye and the patient covers the left eye
- The examiner begins moving a target from four directions and repeats the same for the 2nd eye, the patient is asked to identify when the target is seen

The significance of different abnormalities of the visual field will be discussed in chapter 5 (Aqueous humour, IOP and glaucoma) and chapter 9 (The connection of the eye to the brain).