



**College of Health and Medical
Technologies - Al-Dour
Department of Optics Technologies
The second stage**

Optical devices and tools

Ass.Lec .Safaa Diao Saad

الجامعة التقنية الشمالية
NORTHERN TECHNICAL UNIVERSITY



Introduction to Optical Equipment in Optometry

Overview of Optometry

Optometry is a healthcare profession focused on the eye and visual system, emphasizing the diagnosis and management of visual disorders. Optometrists play a crucial role in providing comprehensive eye care, which includes vision examinations, prescribing corrective lenses, and detecting eye diseases.

Importance of Optical Equipment

Optical equipment is essential in optometry as it aids in the assessment, diagnosis, and treatment of various visual impairments. Understanding the types of equipment available and their functions is vital for effective practice in the field.

Types of tests

Objective test: this test hold by devise.

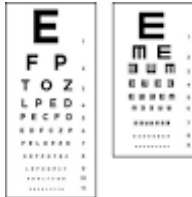
Subjective test: this test hold by examiner.



Manual Lensometry



Auto lensometry



Snellen chart



Trail case and frame

Types of Optical Equipment

1. Refracting Instruments

Snellen chart: test for eye vision done on distance six meters.

Phoropter: Used to measure refractive error and determine the best corrective lenses.

Auto-refractors: Automated devices that provide quick assessments of a patient's refractive status.

Trail lens: group of lenses in specific box contain minus and plus lenses.

Trail frame: specific frame we use it when we examine the patient.

Retinoscope: specific device use for refraction and in case of strabismus.

Lensometer: specific device use to measure spectacle lens power .

2. Visual Field Testers

Equipment like the Visual Field Analyzer helps assess peripheral vision and detect conditions such as glaucoma.

3. Slit Lamps

A specialized microscope that provides a magnified view of the eye's anterior segment, crucial for diagnosing cataracts, corneal diseases, and more.

4. Fundus Cameras

Used to capture detailed images of the retina, enabling the detection of retinal diseases and diabetic retinopathy.

5. Ophthalmoscopes

Handheld devices that allow optometrists to examine the interior of the eye, assessing the health of the optic nerve and retina.

6. Tonometer's

Instruments used to measure intraocular pressure, critical for glaucoma screening.

Innovations in Optical Equipment

Recent advancements in optical technology include:

Digital Imaging: Enhancements in fundus photography and OCT (Optical Coherence Tomography) for better visualization of eye structures.

Tele-optometry: Remote eye exams using digital tools, expanding access to eye care.

Smart Lenses: Innovations in contact lenses that monitor health indicators like glucose levels.

Conclusion

Optical equipment is fundamental in the practice of optometry, facilitating accurate diagnosis and effective treatment. As technology evolves, optometrists must stay informed about new tools and techniques to provide optimal patient care. Understanding the capabilities and limitations of each piece of equipment is essential for future optometrists in delivering high-quality eye care.



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Introduction

2

ophthalmic

instrument

Decontamination

Introduction

- **Decontamination** is the removal and elimination of microbes so that equipment is safe for reuse.
- Proper care and handling of ophthalmic instruments is essential in decreasing the risk of health care-acquired infections.



Steps to care for instruments

- **cleaning**
- **disinfection**
- **sterilization**
- **inspection**
- **packaging**
- **transport**

Cleaning

- **Cleaning** is the removes dust, dirt, and germs from surfaces and objects. Manual cleaning includes wiping instruments clean using a sterile, water-moistened sponge. A soft brush or toothbrush can



Sponge



brush

Disinfection

- **Disinfection** is process that eliminates many or all pathogenic microorganisms on instruments, with the exception of bacterial spores.
- It is usually use of liquid chemicals.





Sterilization

- **Sterilization:** is the complete elimination or destruction of all forms of microbial life and is accomplished in health care facilities by either physical or chemical processes.
- **Methods of sterilization**
 - CHEMICAL METHODS
 - PHYSICAL METHODS

CHEMICAL METHODS

- Phenols
- Dettol
- Alcohols
- Metallic salts
- Gases





PHYSICAL METHODS

➤ **Heat**

➤ **Dry Heat** (**Red heat** , **Flaming** , **Hot air oven** ,
incineration)

➤ **Moist heat**

PHYSICAL METHODS



PHYSICAL METHODS



PHYSICAL
METHODS

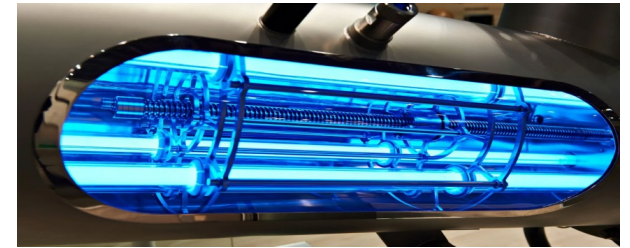
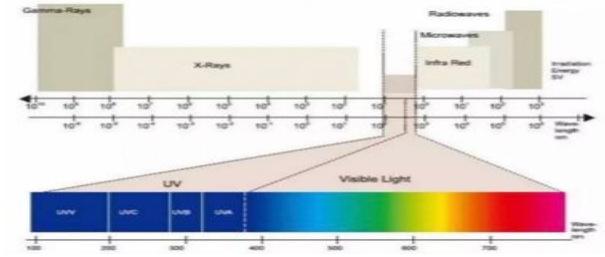


autoclave

PHYSICAL METHODS



Filtration



Radiation



Ultrasonication



Steps to care for instruments

- **Inspection:** devices should be performed in the decontamination of ophthalmic instruments and in identifying damaged tools to repair them.
- **Packaging:** instruments will be packaged in



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L: 3

The background features a series of concentric circles in light gray, some solid and some dashed, creating a ripple effect. A large, solid blue callout box is centered on the page, containing the title text in white. The callout box has a small triangular pointer at the bottom center.

Risk Of Transmission Of Infection In Devices

Introduction

Infection occurs when viruses, bacteria, or other microbes enter your body and begin to multiply.

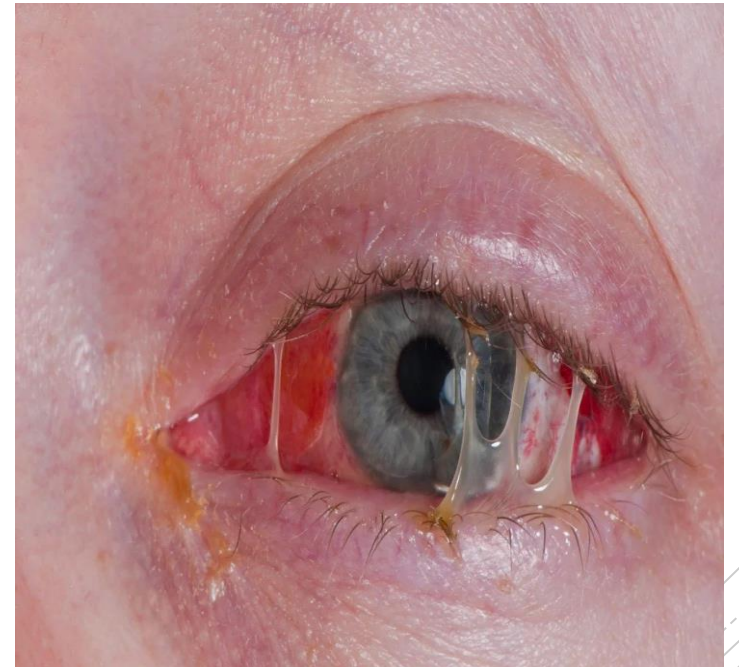
Tonometry

- **Tonometry** is a test to measure the pressure inside the eyes. The test is used to screen for glaucoma and to measure how well glaucoma treatment is working.



Risks Of Tonometry

The direct contact between the tonometer and the eye may contribute to the risk of cross infection, especially of viral particles, from one patient to another.



**infectious diseases
transmitted through the
device?**

- There was limited evidence available regarding the transmission of
- hepatitis B.
 - hepatitis C.
 - prion diseases.
 - human immuno - deficiency virus (HIV).

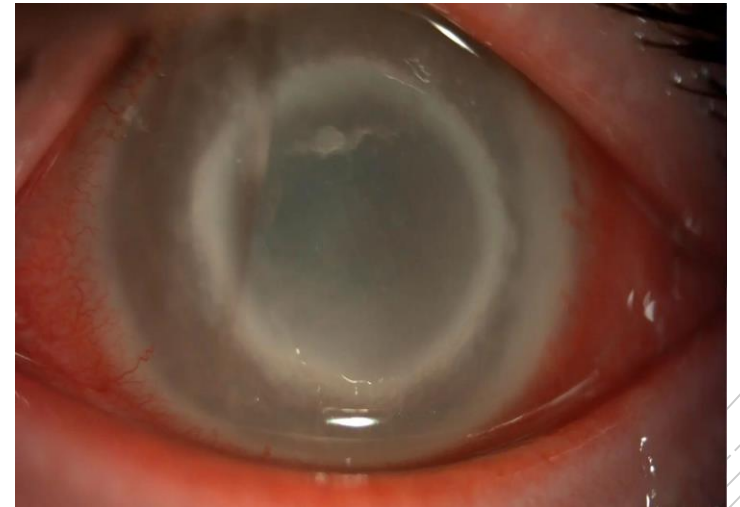
Contact lenses

- **The cornea** is the clear tissue at the front of the eye.
- **Contact lenses** are medical devices, and failure to wear, clean, and store them as directed can increase the risk of eye infections, such as microbial keratitis.



keratitis

- **Keratitis** they're also called corneal ulcers. is the most common eye infection from wearing contact lenses. It is when the cornea becomes infected. In some cases, it can scar the cornea, affecting the vision.



Types of Microbial Keratitis

- Bacterial Keratitis
- Fungal Keratitis
- Parasitic/Amebic Keratitis
- Viral Keratitis

Symptoms

Eye Infection Symptoms Stop wearing your contact lenses immediately if you have these symptoms:

- blurry vision.
- redness of the eye.
- pain in the eye.
- Swelling.
- Light sensitivity.
- Itching, burning, or a feeling that something's in the eye.

causes

➤ **There are a number of things that can cause a contact lens-related infection. Some causes of infection may include:-**

- ❖ using extended-wear lenses.
- ❖ sleeping in contact lenses.
- ❖ having microbes build up under the lens.
- ❖ herpes virus.- bacteria, fungi, or parasites.
- ❖ not keeping lenses or cases clean.
- ❖ exposing lenses to water.
- ❖ reusing disinfecting solution.

Acanthamoeba

- ❖ **Acanthamoeba** is one of the most common organisms in the environment. It occurs due to wearing poor quality contact lenses. Although it rarely causes infection, when it does occur, it can threaten the vision.





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Introduction

Visual Acuity

- ❖ **Visual acuity:** The ability of the eye to distinguish single targets and form a clear image of sufficient size on the retina, specifically on the macula.
- ❖ **It depends on two factors:**
 - 1) **The size of the object of which an image is formed on the retina.**
 - 2) **The distance of the body from the eye**

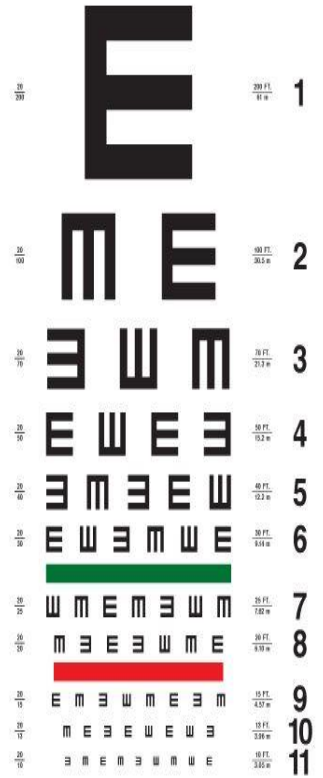
Snellen chart

- ❖ A **Snellen chart** is an eye chart that can be used to measure visual or measures a person's vision by how well they can read and see detail.
- ❖ Its name comes from Dr. Hermann Snellen, who invented the eye chart in 1862.



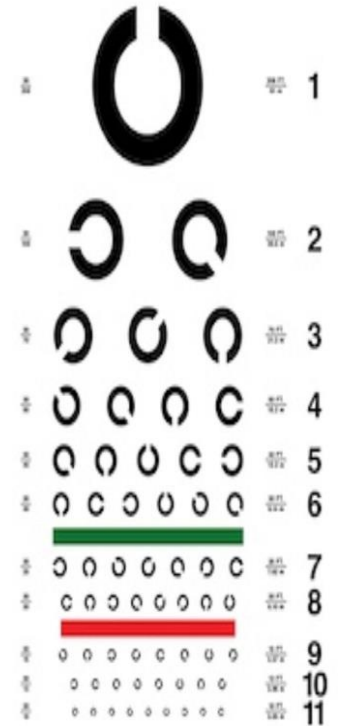
E chart

- ❖ **E chart:** used to measure a patient's visual acuity.
- ❖ **Uses :** This chart is useful for patients who are unable to read the Latin alphabet – for example, very young children. It is also used in countries where people do not use the alphabet in their native language – for example, in China.



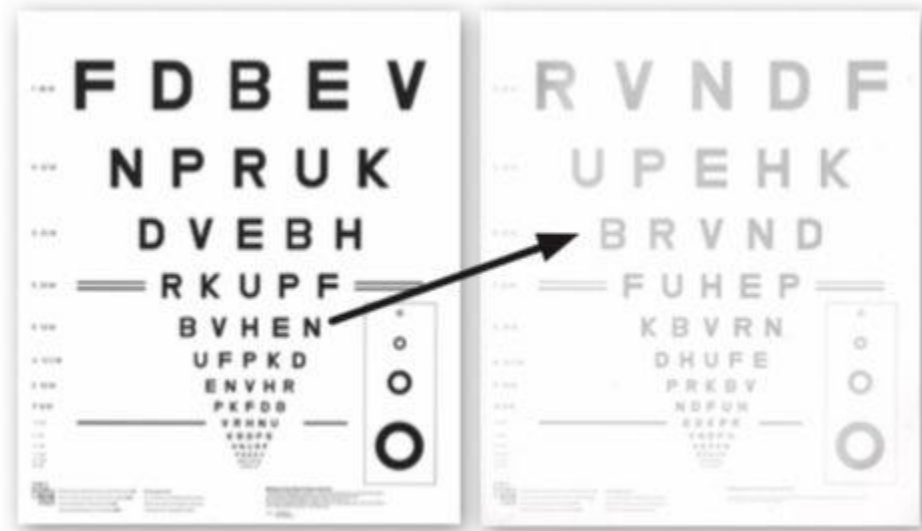
C chart

- ❖ **The Landolt C** also known as a Landolt ring, Landolt broken ring, or Japanese vision test, is an optotype: a standardized symbol used for testing vision.
- ❖ It was developed by the Swiss-born ophthalmologist Edmund Landolt.



Bailey Lovie Chart

- ❖ **The Bailey-Lovie chart** determines the distance of visual acuity at normal and low contrast. The lower contrast version is also available.



Etdrs Chart

- ❖ **The ETDRS** is a test used to measure the visual acuity of patients who suffer from low vision, that is to say, with vision below the desired level and it takes its name from the study for which it was designed: Early Treatment **Diabetic Retinopathy** Study.



Jaeger Chart

❖ **The Jaeger chart** is an eye chart used in testing near vision acuity.

Read from a distance of 14 inches

No. 1.
.37M

In the second century of the Christian era, the empire of Rome comprehended the fairest part of the earth, and the most civilized portion of mankind. The frontiers of that extensive monarchy were guarded by ancient renown and disciplined valor. The gentle but powerful influence of laws and manners had gradually cemented the union of the provinces. Their peaceful inhabitants enjoyed and abused the advantages of wealth.

No. 2.
.50M

four score years, the public administration was conducted by the virtue and abilities of Nerva, Trajan, Hadrian, and the two Antonines. It is the design of this and of the two succeeding chapters, to describe the prosperous condition of their empire; and afterwards, from the death of Marcus Antoninus, to deduce the most important circumstances of its decline and fall; a revolution which will ever be remembered, and is still felt by

No. 3.
.62M

the nations of the earth. The principal conquests of the Romans were achieved under the republic; and the emperors, for the most part, were satisfied with preserving those dominions which had been acquired by the policy of the senate, the active emulations of the consuls, and the martial enthusiasm of the people. The seven first centuries were filled with a rapid succession of triumphs; but it was

No. 4.
.75M

reserved for Augustus to relinquish the ambitious design of subduing the whole earth, and to introduce a spirit of moderation into the public councils. Inclined to peace by his temper and situation, it was very easy for him to discover that Rome, in her present exalted situation, had much less to hope than to fear from the chance of arms; and that, in the prosecution of

No. 5.
1.00M

the undertaking became every day more difficult, the event more doubtful, and the possession more precarious, and less beneficial. The experience of Augustus added weight to these salutary reflections, and effectually convinced him that, by the prudent vigor of

No. 4.
1.25M

his counsels, it would be easy to secure every concession which the safety or the dignity of Rome might require from the most formidable barbarians. Instead of exposing his person or his legions to the arrows of the Parthians, he obtained, by an honor-

No. 7.
1.50M

able treaty, the restitution of the standards and prisoners which had been taken in the defeat of Crassus. His generals, in the early part of his reign, attempted the reduction of Ethiopia and Arabia Felix. They marched near a thou-

No. 8.
1.75M

sand miles to the south of the tropic; but the heat of the climate soon repelled the invaders, and protected the unwarlike natives of those sequestered regions

No. 9.
2.00M

The northern countries of Europe scarcely deserved the expense and labor of conquest. The forests and morasses of Germany were

No. 10.
2.25M

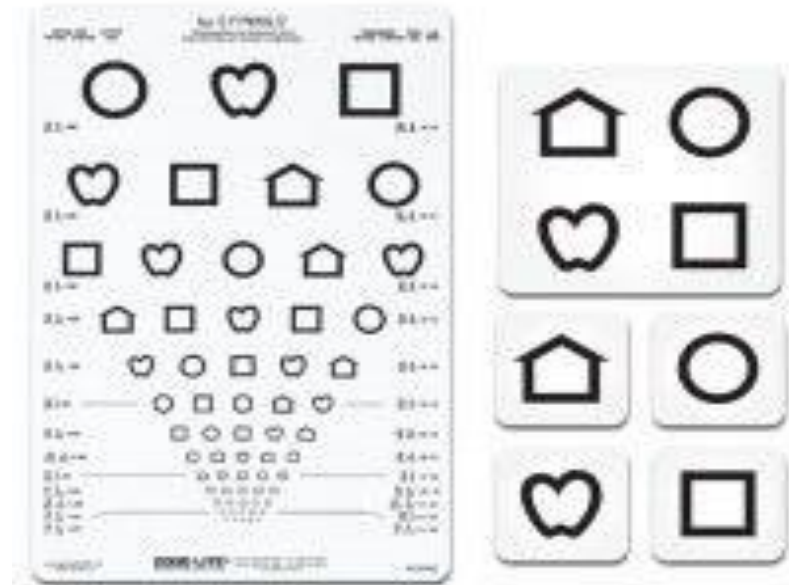
filled with a hardy race of barbarians who despised life when it was separated from freedom; and though, on the first

No. 11.
2.50M

attack, they seemed to yield to the weight of the Roman power, they soon, by a signal

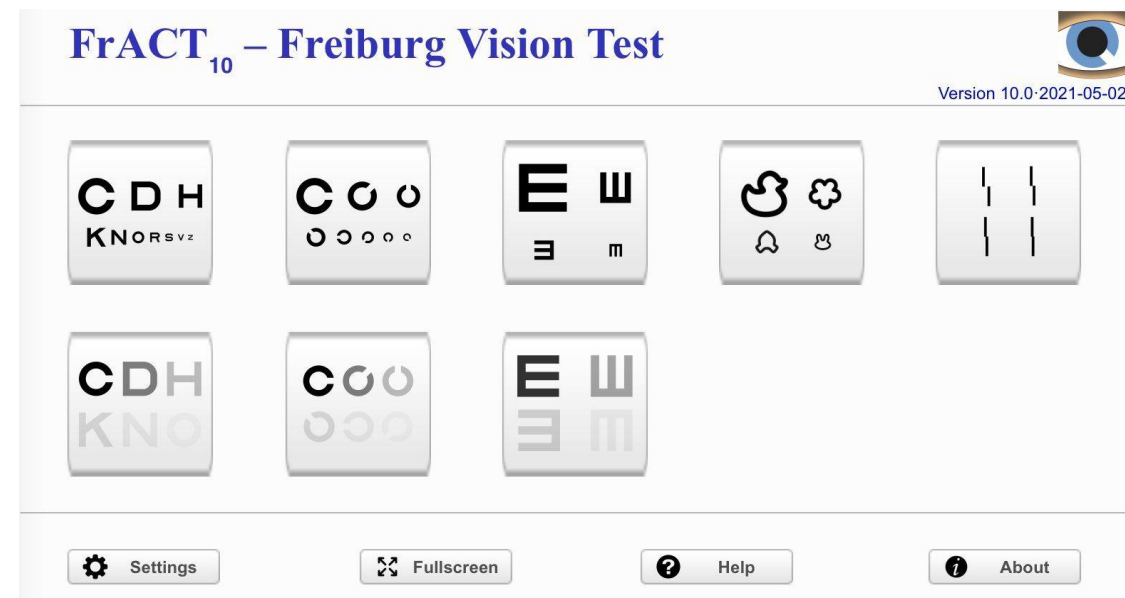
LEA Symbols Chart

- ❖ **LEA Symbols Chart:** This chart was designed for visual acuity screening in children to eliminate the problems of language barriers.



FrACT Chart

- ❖ **The Freiburg Visual Acuity test** is an automated procedure for self-administered measurement of visual acuity. Landolt-Cs are presented on a monitor



Snellen Chart Procedure

- ❖ 1. Position the patient sitting 6m from the chart. Note that projecting the chart on a mirror can be a useful way to simulate the 6m testing distance in shorter clinical lanes.
- ❖ 2. Ensure that the room and Snellen chart are adequately illuminated.
- ❖ 3. The patient may wear his/her current corrective lenses to assess for corrected visual acuity.

Snellen Chart Procedure

- ❖ 4. In the absence of corrective lenses, a pinhole may be used, which often resolves the refractive error. This is done by assessing visual acuity while looking through a pinhole.
- ❖ 5. Test the eyes one at a time, beginning with the worse eye while covering the good eye.
- ❖ 6. Ask the patient to begin reading letters from the top.
- ❖ 7. The smallest line read represents the visual acuity.

Snellen Chart Procedure

- ❖ 8. Patients unable to read the large E on the chart, when wearing the best corrective lens have a visual acuity measuring less than 6/60, which is termed "legally blind" in the United States.
- ❖ 9. For patients unable to see the eye chart, check if they can count fingers (CF vision), see hand movements (HM vision), or perceive the light from a flashlight (LP vision). If the patient fails to identify the light, record this as no light perception (NLP).
- ❖ 10. Repeat the procedure to measurement the opposite eye.

Understanding Abbreviations in Clinical Practice

The following abbreviations are commonly used in the reporting of visual acuity measurements. ➤

OD: Right eye ❖

OS: Left eye ❖

OU: Both eyes ❖

VA: Visual acuity ❖

DVA: Distance visual acuity ❖

NVA: Near visual acuity ❖

Understanding Abbreviations in Clinical Practice

PH: Pinhole ❖

CF: Counting fingers ❖

HM: Hand motion ❖

LP: Light perception ❖

NLP: No light perception ❖



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Introduction

Auto refractor

- ❖ **Auto refractor** : An automated system that uses a source of light reflected off of the retina to reveal the eyes refractive characteristic
- ❖ provides an objective measure of a patient's refractive error detect .



Advantages

- ❖ It's easy to see how light affects eye movement.
- ❖ It's fast, safe, and easy.
- ❖ Many pieces of data are recorded, and an average is given.
- ❖ Doesn't need the pupil dilation.
- ❖ It is possible to print out the prescription.



disadvantages

- ❖ Children can't stay still for long periods of time.
- ❖ Because of accommodations, reading is not correct.
- ❖ Big size of the auto refractor
- ❖ Want to be set up on a table.



Indications

- ❖ Different signs can show in a patient that they have a refractive mistake.
- These signs and symptoms are:
 - Blurred/distorted vision
 - Myopia.
 - Hyperopia.
 - Astigmatism.
 - Squint of the eyes
 - Contact lens prescription.



Parts

- ❖ LCD screen, Measure button
- ❖ Control stick, Stick locker
- ❖ Moving part, Base
- ❖ Function switches
- ❖ Forehead-rest
- ❖ Measuring window, Chin-rest
- ❖ Chin-rest knob, Limit screw
- ❖ Power switch, Power cord.



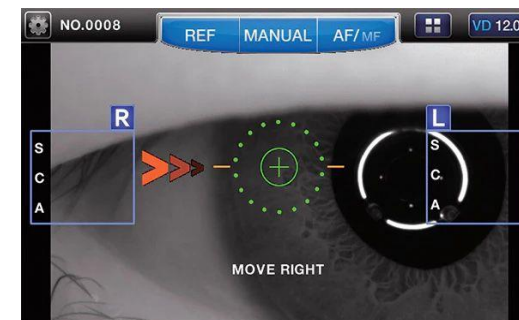
Main Components

- ❖ **There are three key parts to the auto-refractometer::**
 - an infrared light source
 - a fixation target
 - Badal lens system (fogging lens).



Sources of Error

- ❖ poor fixation.
- ❖ corneal, lens and media opacities.
- ❖ Small pupil or a distorted pupil.
- ❖ accommodating variations, creating 'over minus' readings.



Contraindications

- ❖ Patients with mental disabilities
- ❖ Patients suffering from severe poor vision
- ❖ Severe traumatic ocular injury
- ❖ Conjunctivitis, keratitis, uveitis, episcleritis
- ❖ corneal edema
- ❖ Artificial prosthesis
- ❖ Very small children
- ❖ Patients presenting with accommodation anomalies

Procedures

- The patient should be educated regarding how to get seated on the instrument.
- the patient should be explained the procedure and the importance of autorefractometry.
- The patient should be told to remove glasses or contact lenses before performing the investigation.
- The patient should be explained to keep the arms on the table, chin on the chinrest, and head should rest against the forehead rest. Then the chin adjustment should be made to align the visual axis. The height can be moved up and down with a height adjustment knob.
- Each step should be explained to the patient while operating the autorefractor.

Procedures

- The patient should be told that they will observe a hot air balloon.
- The fine horizontal alignment is performed by moving the joystick right and left and vertical up and down to get a proper focus.
- The patient should be told to relax once they see the target.
- After completing the investigation, the patient should be complimented for good cooperation and told to take another seat and relax.
- then examined to check visual acuity and prescribed a prescription.

Risks & Complications

- ❖ There are no risks or complications associated with this test.



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LENSOMETER

- ❖ **The lensometer** (an instrument sometimes referred to as a focimeter, vertometer, or lensometer) measures the strength and prescription of eyeglasses or contact lenses.



INDICATIONS

❖ **The indications for lensometry include**

- measuring the power lens
- measuring optic center lens
- measuring prismatic power and direction of a lens
- measuring marking the optical axis and lens alignment before fitting.

USES OF LENSOMETER

- ❖ Single Vision lenses
- ❖ Bifocal lenses
- ❖ Trifocal lenses
- ❖ Progressive Addition lenses
- ❖ Determine the Sphere power
- ❖ Determine the Cylindrical lens power
- ❖ Mark the optical center
- ❖ Contact lens power
- ❖ Power of prism



TYPES OF LENSOMETER

- ❖ Manual Lensometer
- ❖ Automatic Lensometer



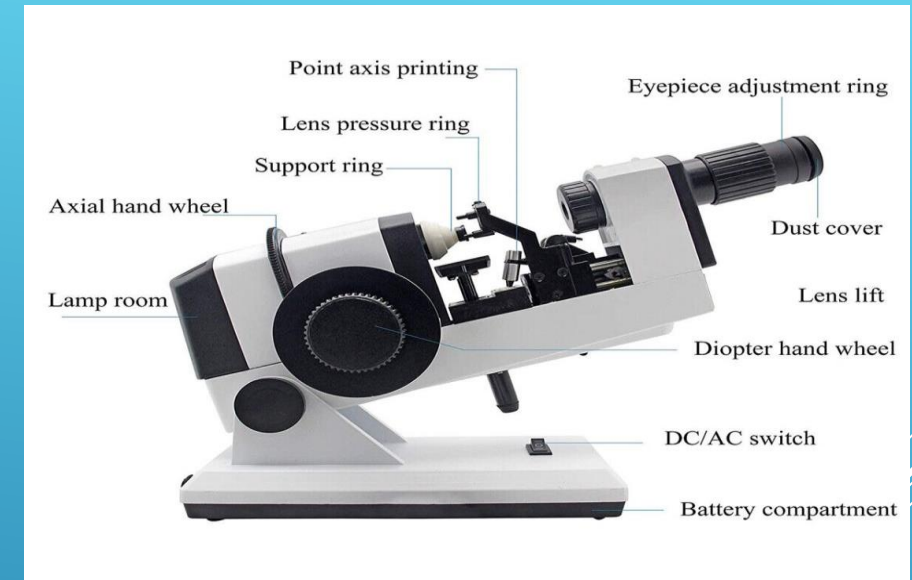
MANUAL LENSOMETER

- ❖ A manual lensometer provides the precise power of a lens.
- ❖ can be transported anywhere and is portable.



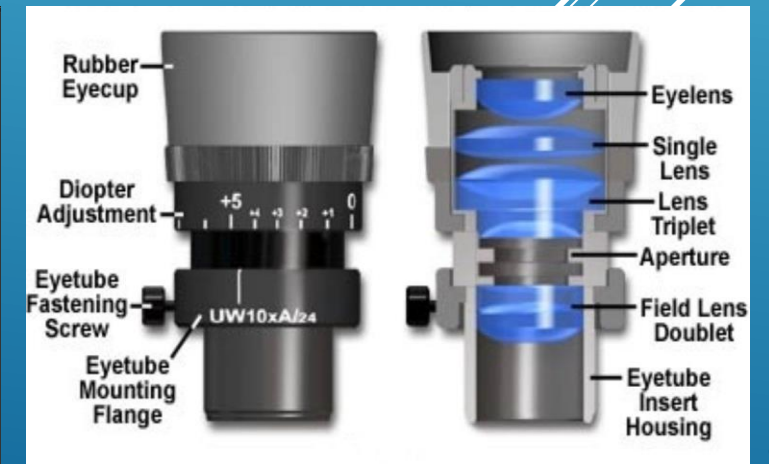
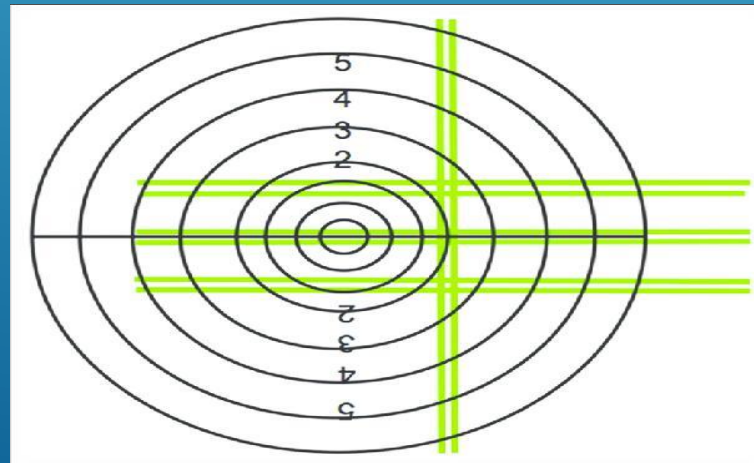
PARTS OF LENSOMETER MANUAL

- ❖ Power switch
- ❖ Illumination system
- ❖ Focusable eyepiece
- ❖ Power wheel
- ❖ Axis scale
- ❖ Reticle
- ❖ Instrument table or lens stop aperture
- ❖ Lens holder
- ❖ Lens height adjustment knob or lever
- ❖ Lens ink well or marker
- ❖ Prism control system



BASIC PARTS

- ❖ **adjustable eyepiece** : to measure the axes of cylindrical lenses and power of the prism.
- ❖ **illuminated target** : is a ring of dots formed by a disc with punched circle of holes.
- ❖ **collimating lens** : is to change the path of the light rays to parallel.



PROCEDURE

1. The device is operated and the standard is set to obtain the clear target at ZERO degrees by rotating the eyepiece clockwise and counterclockwise.
2. Put lens of the eyeglasses to be measured on lens table and lowering the lens holder to fix in the center of the grid, and one of the hands must be holding the power wheel.
3. Because of the placement of the lens in the device, the target in grid will become unclear, so we move the power wheel up or down to obtain accurate clarity.
4. If the target (the circle in blue) is clear for both axes together, then the lens type is SPHERICAL, as in the figure below.

PROCEDURE

5. If the target is clear on one axis and the other is not clear, then this means that the lens is **CYLINDRICAL**.
6. If the target is clearly in the form of a cylinder (close and parallel horizontal lines), then we read the degree that represents the **FIRST** reading, as in the figure below
7. After that, we move the power wheel to obtain the **SECOND** reading, which is perpendicular to the axis of the first reading, which will appear in the form of a cylinder (close and parallel vertical lines) as shown in the figure below.

AUTOMATED LENSOMETER

- ❖ An automated lensometer is an automatic instrument that measures repeatable, fast, and reliable lens prescriptions.
- ❖ It is relatively less accurate but easily operable compared to a manual lensometer.
- ❖ It employs a white light and ray-trace system to measure the powers of the sphere, cylinder, axis, add, and prism of a lens in a single operation.
- ❖ The values of each measure are then displayed digitally and can be printed or recorded manually



PART OF AUTOMATED LENSOMETER

- ❖ **Power switch:** switches the equipment on and off.
- ❖ **LCD screen:** displays lens parameters.
- ❖ **Lens-holding device:** to hold the lens in place.
- ❖ **Lens frame table:** to rest the lens.
- ❖ **Printer:** may be built-in or a separate accessory.
- ❖ **Lens marker lever and pins:** to mark the lens.
- ❖ **Nosepiece holder**



ADVANTAGE

- ❖ UV Transmittance Measurement
- ❖ Easy and Fast Operation
- ❖ Auto—Mono and Multi Focal Detection
- ❖ LCD Touch Panel
- ❖ Fast and Easy Loading of Printer Paper



A 3D rendered pink flower with multiple layers of petals, set against a light blue background. The text "THANK YOU" is overlaid in a bold, black, serif font. Several white lines radiate from the top right corner towards the center of the flower.

THANK YOU



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Introduction

Trial case

- ❖ **Trial case** It is a box made of wood or plastic and contains a different set of lenses for the purpose of correcting refractive errors in the patient's eyes to achieve good visual acuity.



Uses Of Trial Case

- ❖ Objective Refraction
- ❖ Subjective Refraction
- ❖ Diplopia Charting
- ❖ Diagnosis Of Squint
- ❖ Assess Binocular Vision



Accessories Of Trial Case

- ❖ **Trial Frame**
- ❖ **Trial Lens**
- ❖ **Prism**
- ❖ **Other Accessories**



Trial Frame

- ❖ **Trial frame** an eyeglass frame designed to permit insertion of different lenses used in correcting refractive errors of vision.



Trial Frame

❖ Compartments Of Trial Frame

- 3-4 compartments
- 1st - High powered lens
- 2nd - spherical lens
- 3rd - cylindrical lens
- 4th - accessory lens & prisms 2nd 3rd 4th



LEA Symbols Chart

❖ Types Of Trial Frames

❖ Full Aperture Frame



❖ Reduced Aperture Frame



❖ Half Eye Trial Frame



Trial lenses

During refraction the practitioner utilize a set of known lenses called as Trial lenses, Types of lenses:

1. Optical lenses

❖ Use to correct the refractive errors.

2. Accessory lenses

❖ Use to diagnose the pathology.



Spherical lenses

❖ Present in plus and minus form

- Range: + & -0.12D to + & - 20.00D.

❖ Variation:-

- 0.25 to 4.00D in increment of 0.25D
- 4.00 to 6.00D in increment of 0.50 D
- 6.00 to 14.00D in increment of 1.00 D
- 14.00 to 20.00D in increment of 2.00DLaxmi



Cylindrical lenses

❖ **Present in plus & minus form.**

• Range:- (+&-0.25D) to (+&-6.00D).

❖ **Variations:-**

• 0.25 to 3.50D in increment of 0.25D

• 3.50 to 6.00D in increment of 0.50D

Prism

❖ Uses to:

- correct and measure Strabismus
- For the measurement and correction of the angle of deviation.

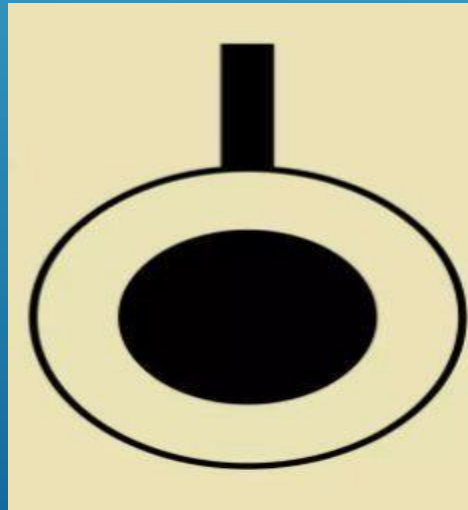


Other Accessories

- ❖ **Occluder**
- ❖ **Plano Lens**
- ❖ **Pin Hole**
- ❖ **Fogging Lens**
- ❖ **Maddox Rod**
- ❖ **Stenopaic Slit**
- ❖ **Red And Green Filter**
- ❖ **Jackson Cross Cylinder**
- ❖ **Near Vision Chart**

Occluder

- ❖ **Occluder:** is an opaque disc used to close or cover one eye during refraction examination . It blocks one eye vision while performing the test on the fellow eye, so that we can check each eye separately.



Plano Lens

- ❖ Zero power.
- ❖ It is used to satisfy & identify the malingering patients.



Fogging Lens

❖ **Used to** relax the muscles. It works like a occluder



Pin Hole Disc

- ❖ **PH** is an opaque disc used for determining whether the decreased vision is due to refractive error or to pathological diseases of the eye.
- ❖ **PH** are available in the ranges of (1mm and 2mm) in diameter.



Maddox rod

❖ **Maddox rod:** is constructed of a series of red cylindrical rods. Each rod acts as a strong ‘+’ cylindrical lens that forms a red streak band before the eye. It is used to detect the presence of heterophoria and to measure the amount of heterotropia.



Stenopic Slit

- ❖ **Stenopic Slit** : It consists of a rectangular aperture with a linear slit (1mm) in width and up to (15 mm) in length. It is useful for refining the axis of high irregular astigmatism.



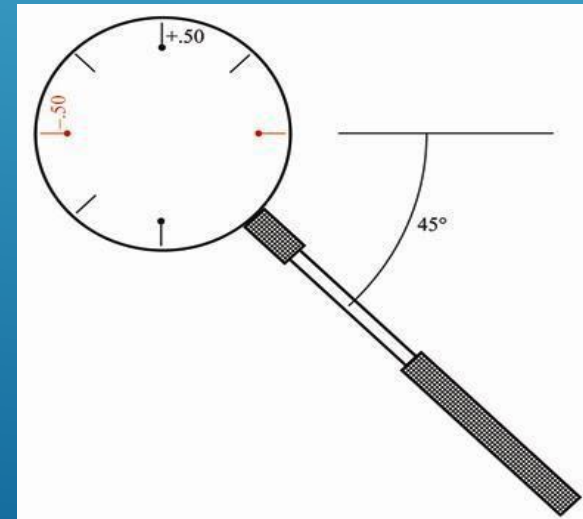
Red And Green Filter

- ❖ **Red in RE & Green in LE**
- ❖ **TEST** (worth 4 dot test & FRIEND test) .
- ❖ Used for color dissociation.
- ❖ Used to find out suppression of eyes.
- ❖ To find out diplopia.
- ❖ Used to measure the Fusion, squint.



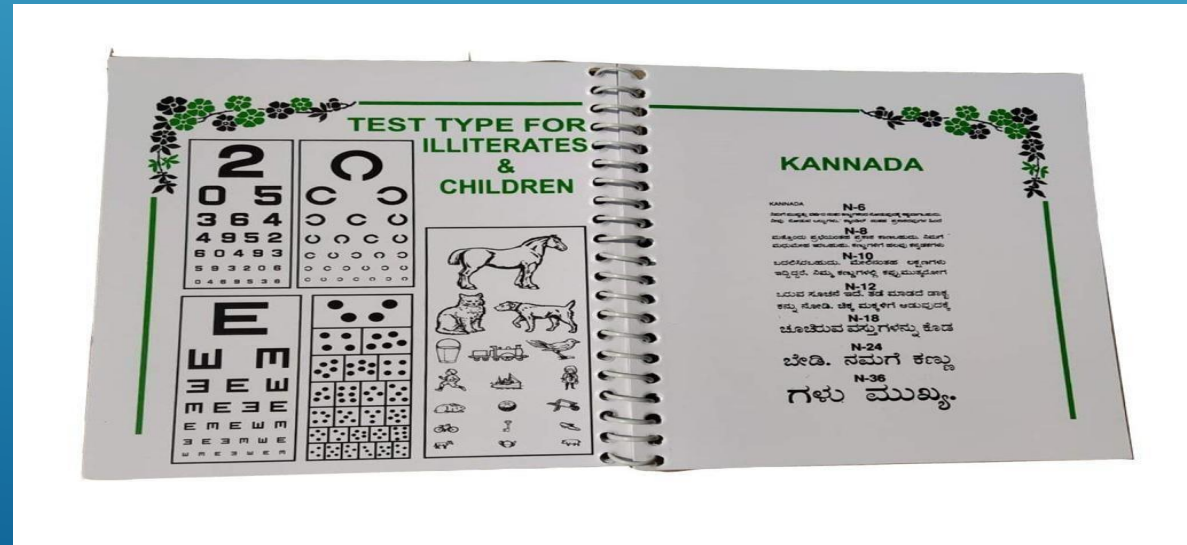
Jackson Cross Cylinder

- ❖ It is a combination of plus cylinder & minus cylinder 90° apart.
- ❖ Handle is located at 45° between two axis.
- ❖ **Principle:** spherical equivalent is zero.
- ❖ **Used to:** determine both power & axis of the astigmatic correction ± 0.25 and ± 0.50 .



Near Vision Chart

- ❖ It was introduced by Snellen.
- ❖ It is a photographic reduction of Snellen's distant chart.
- ❖ **Uses :-** Mainly used for visual acuity. Also used to measure the near point of accommodation.





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Optical devises

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MSC OPTOMETRY

L:7

Retinoscope

- ❖ **Retinoscope** is an objective method of measuring the optical power of the eye through illuminate the inside of the eye and to observe the light that is reflected from the retina and determine the refractive error of the eye.



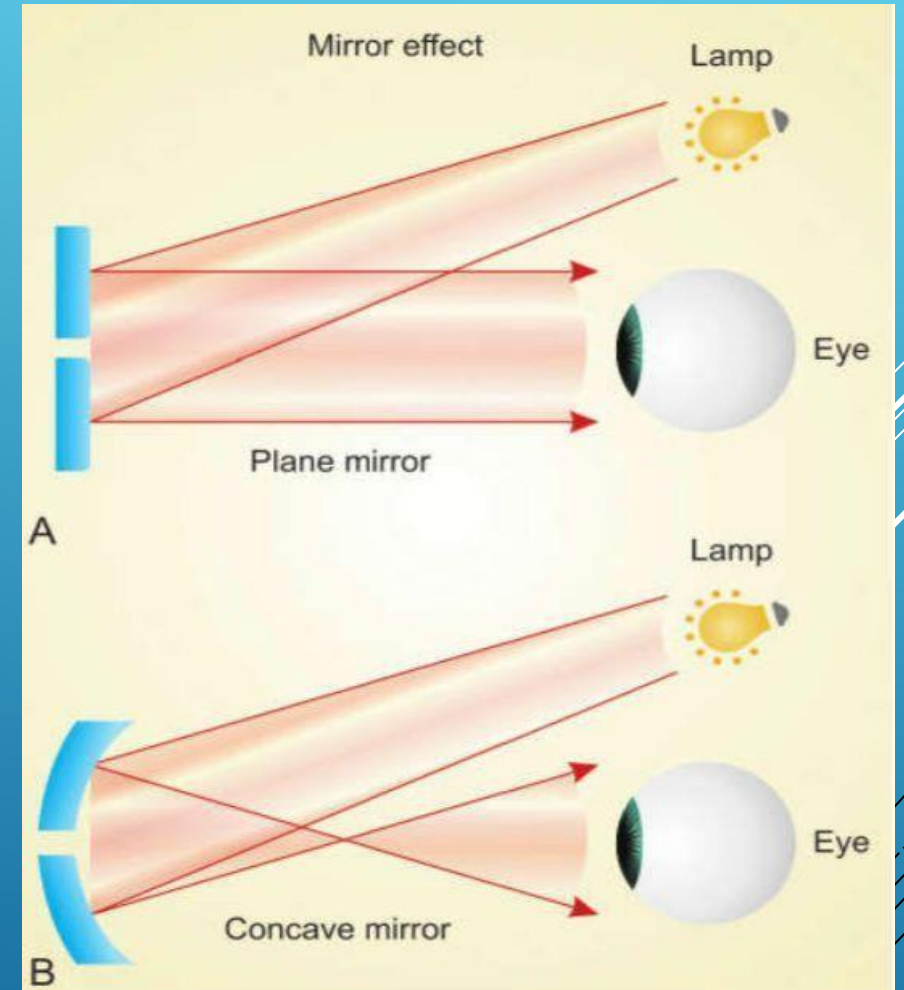
Types of Retinoscope

❖ Reflecting mirror retinoscope

1) single plane mirror



2) plane & concave mirror



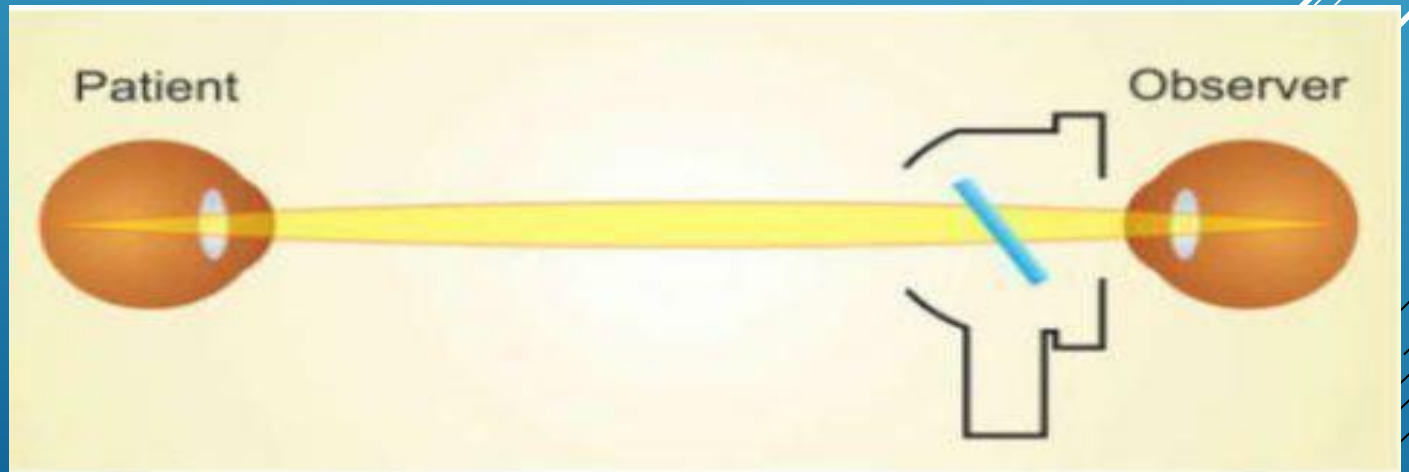
Types of Retinoscope

❖ Self illuminating Retinoscopes

1) Spot Retinoscope

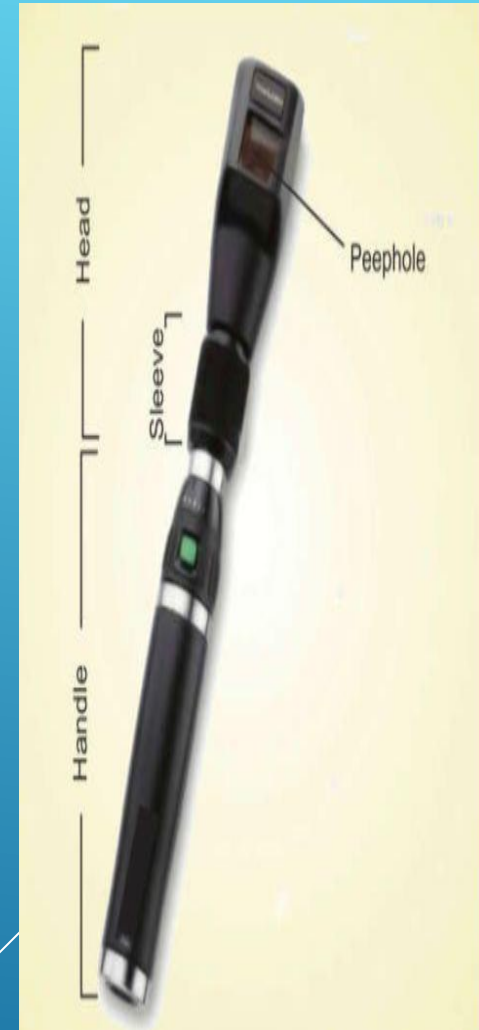


2) Streak Retinoscope



Parts of Retinoscope

- ❖ **Head piece:** It is the upper portion of retinoscope **which consists of :-**
 - **A peephole:** through which examiner looks the retinal reflex.
 - **A sleeve:** which rotates the projected streak of light, hence increases or decreases the width of projected beam.
 - **A socket** for source of illumination, i.e. bulb at its terminal end.



Parts of Retinoscope

- ❖ **Handle piece:** It is the lower portion of retinoscope and has an elongated hollow tube where battery is inserted inside.



Internal Components of Streak Retinoscope

- **Light projection system:** The projection system is the one which provides illumination to the retina and involve the following major components.
 - **Light source**
 - **Condensing lens**
 - **Mirror**
 - **Focusing sleeve**
 - **Electric current source**
- **Examiner observation system:** The observation system enables examiner to see the reflex from the retina.

Advantages

- ❖ Reduces the refraction time and error
- ❖ Extremely important when communication is difficult or impossible
 - Retarded, deaf persons
 - Foreigners
 - Children , infants

Characteristics of Retinoscope

❖ **Direction:**

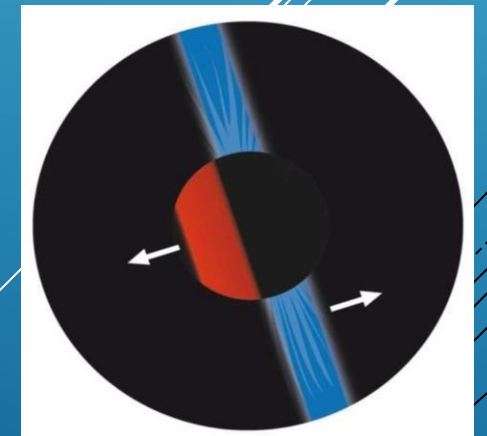
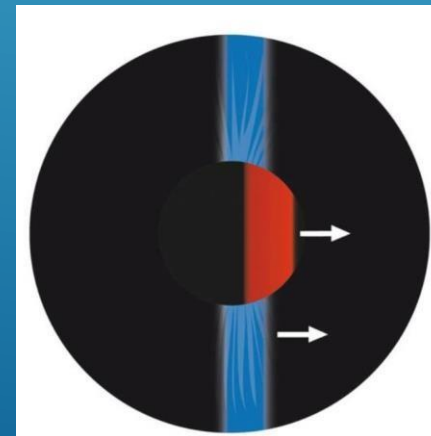
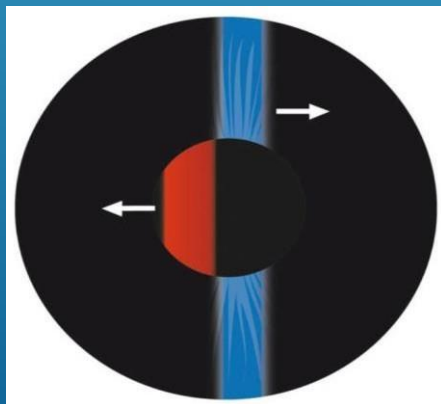
- with or against or neutralized.

❖ **Orientation:**

- vertical, horizontal or oblique scissor reflex.

❖ **Brightness and speed:**

- bright and fast
- dull and slow.

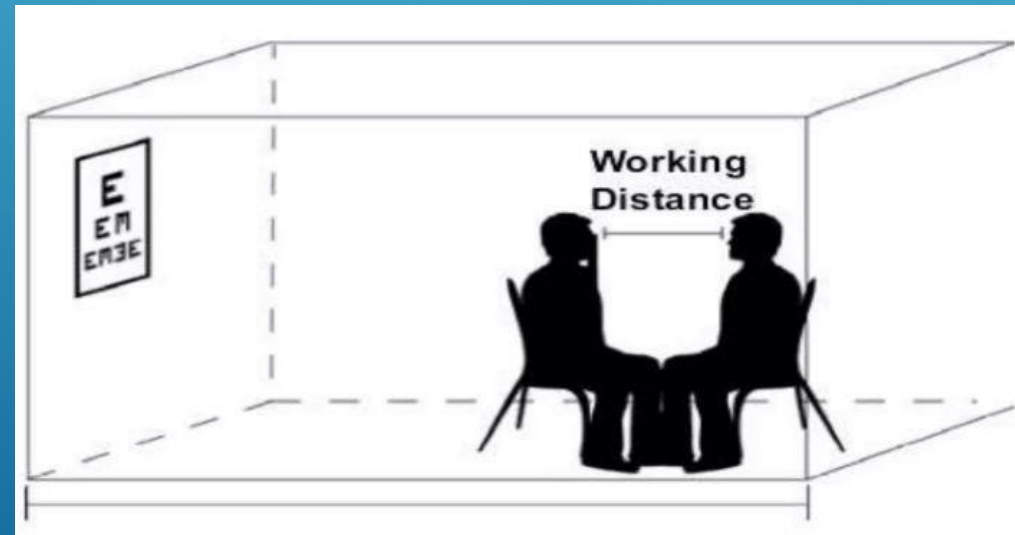


Key points for Retinoscope

- ❖ Establish a dim room.
- ❖ Fog (or occlude, if necessary) the fellow eye.
- ❖ Scope the patient's right eye with your right eye/right hand.
- ❖ Scope the patient's left eye with your left eye/left hand.
- ❖ Keep your scope as close as possible to their visual axis, without interrupting continuous distant fixation.
- ❖ Correct for working distance
 - **0.75 m equal + 1.5 D**
 -
 -

Fixation target

- ❖ The target given to the patient should be 20/200 or 6/60 in the Snellen chart.
- ❖ It is given to the patient to relax accommodation during retinoscopy.



Sources of error during Retinoscopy

- ❖ Incorrect working distance
- ❖ Corneal scar
- ❖ Small pupil
- ❖ Uncontrolled accommodation
- ❖ Cataracts
- ❖ Inexperienced
- ❖ Defects in trial lenses



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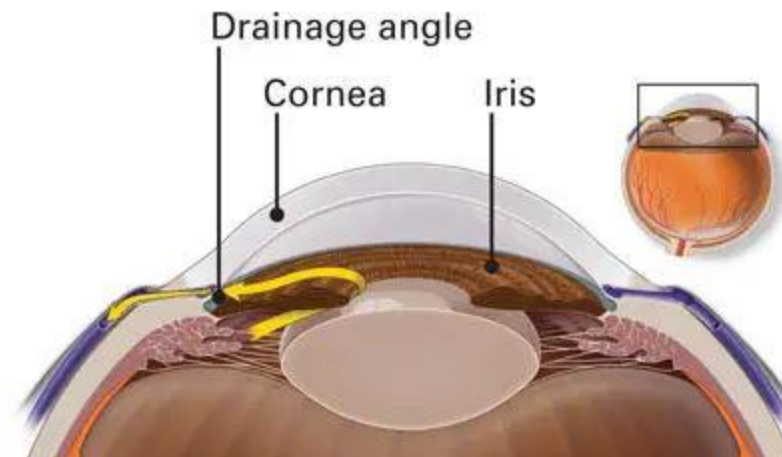
MSC OPTOMETRY

Introduction

- ❖ Tonometry involves diagnostic testing to measure the pressure inside the eye or intraocular pressure (IOP).
- ❖ Glaucoma is a silent disease that causes blindness if not treated.
- ❖ IOP must be monitored periodically during the management of patients with glaucoma, ocular hypertension (OHT), and subjects at risk of developing glaucoma.

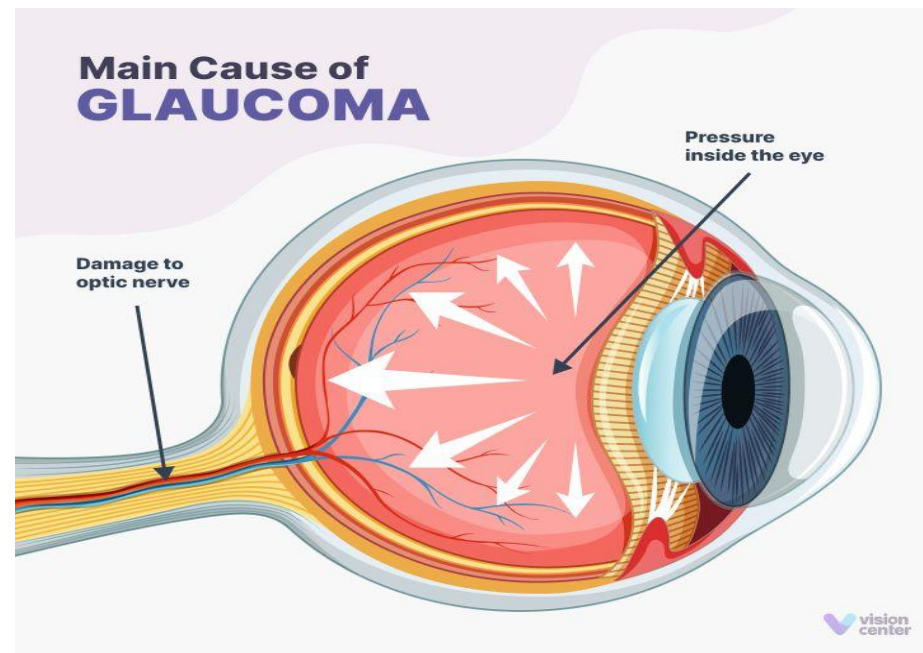
Intraocular Pressure

- ❖ Eye pressure—also called intraocular pressure or IOP
- ❖ Intraocular pressure (IOP) is the fluid pressure inside the eye, IOP is a measurement involving the magnitude of the force exerted by the aqueous humor on the internal surface area of the anterior eye.



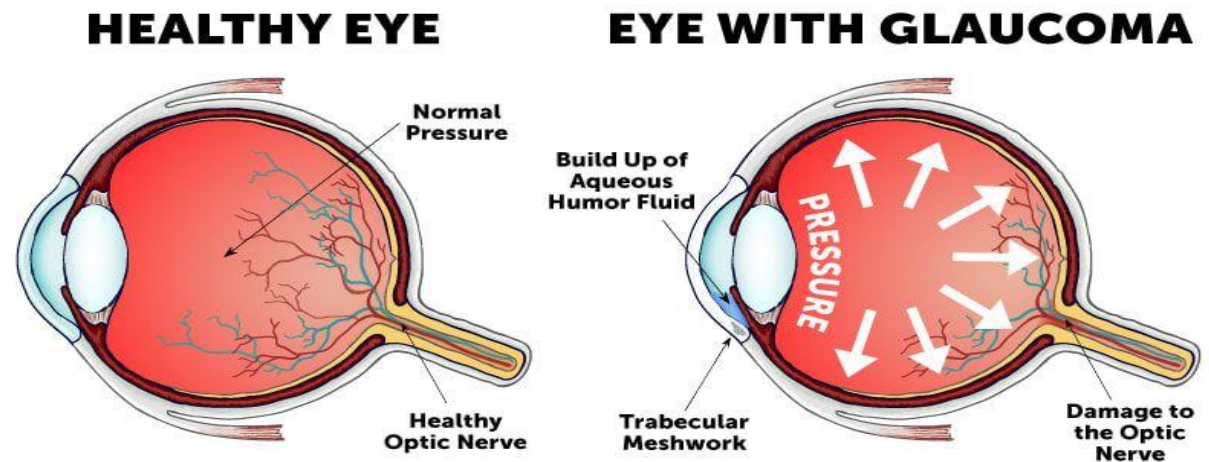
Intraocular Pressure

- ❖ Elevated intraocular pressure (IOP) is a major risk factor for the development and progression of glaucoma.
- ❖ Pressures of between 10 and 21 mmHg are considered normal



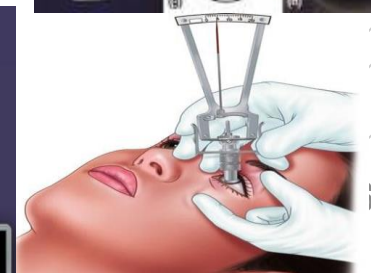
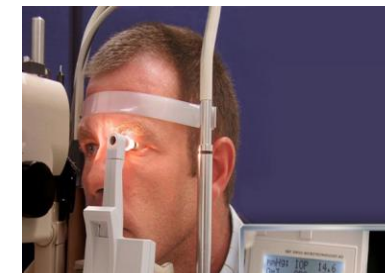
Risk Factors

- ❖ often implicated in the development of pathologies such as
 - glaucoma
 - optic nerve damage
 - visual field changes
 - retinal detachment
 - External stress



Diagnosis

- ❖ **Non-contact tonometry** : it means don't touch patient's eye (cornea),no need for topical anesthesia.
 - palpation method
 - Air-puff tonometry
- ❖ **Contact tonometry** : it means touch patient's eye (cornea),so need topical anesthesia.
 - Goldman tonometry
 - Perkins tonometry
 - Dynamic contour tonometry
 - Electronic Schiottz tonometer



Digital tonometry (palpation method)

- ❖ Intraocular pressure (IOP) is estimated by response of eye to pressure applied by finger pulp.



Air-puff tonometry

- ❖ **Air-puff tonometry** is an applanation method using a standardized puff of air to flatten the cornea. This method has the advantage that no topical anesthetic or risk of corneal abrasion is involved



Advantages & Disadvantages

❖ **ADVANTAGES**

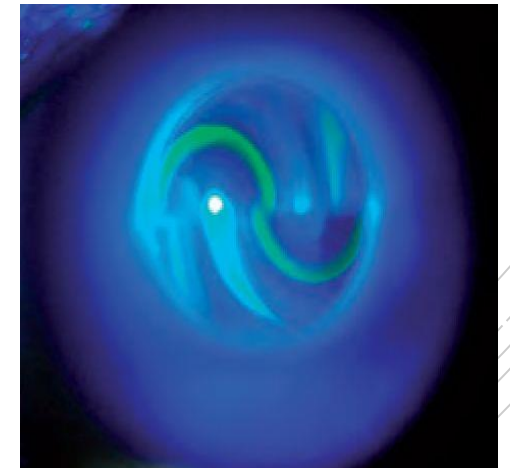
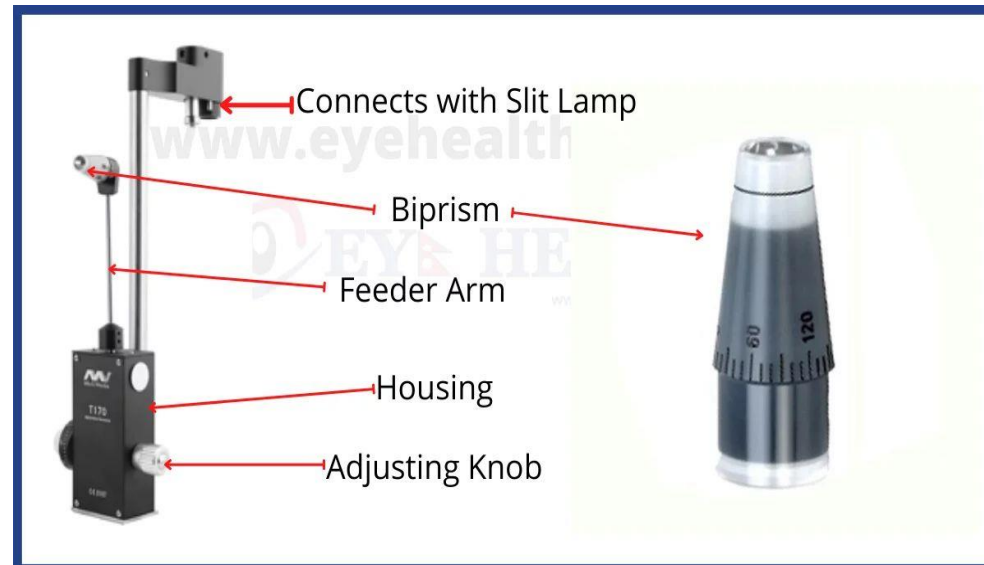
- ❖ Screening procedure
- ❖ Can be operated by non-medical personnel
- ❖ No anesthetic required
- ❖ No direct contact between instrument & eye

❖ **Disadvantages**

- ❖ IOP is near normal
- ❖ accuracy decreases with increase in IOP
- ❖ in eyes with abnormal cornea/poor fixation.

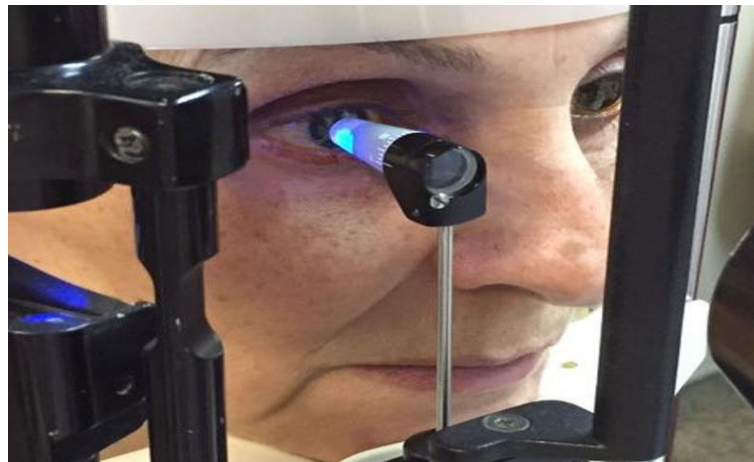
Goldman tonometry

- ❖ **Goldman tonometry** measures IOP by providing a force that flattens the cornea over a circular area of 3.06 mm with the help of topical anesthetic and fluorescein dye, which are instilled in the tear film to outline the area of flattening.

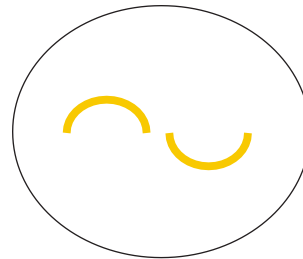
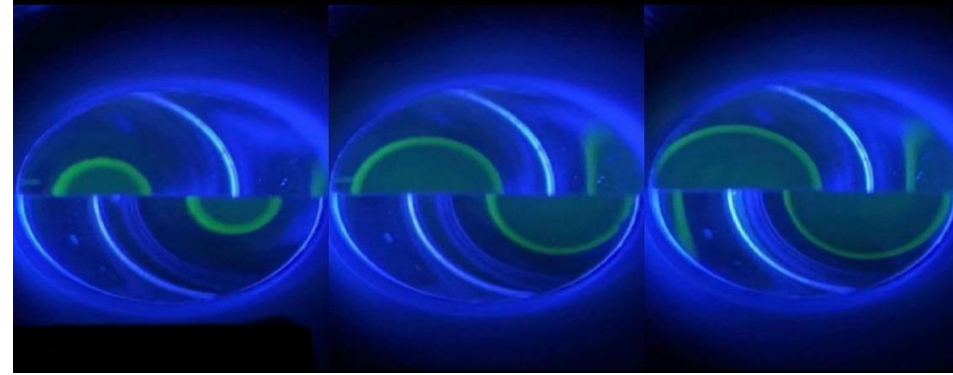


Procedure

- ❖ Topical anesthesia
- ❖ maintaining tear film with fluorescein.
- ❖ The cornea and biprisms are illuminated with cobalt blue light.
- ❖ Biprism just touches the apex of the cornea.
- ❖ At this point, two fluorescent semicircles are viewed through a prism.
- ❖ The application force against the cornea is adjusted until the inner edges of two semicircles just touch.

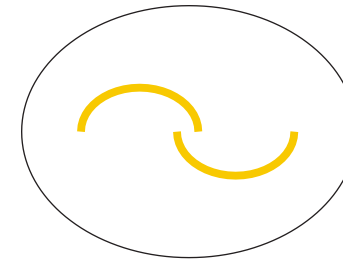


Readings



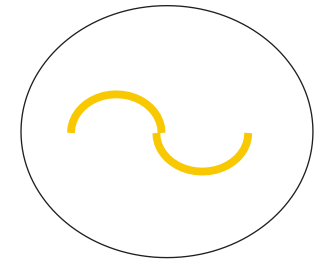
High intraocular pressure will result in this image.

- Turn the calibrated dial on the tonometer backwards to reach the accurate end point.



Low intraocular pressure will result in this image.

- Turn the calibrated dial on the tonometer forwards to reach the accurate end point.



This is the correct end point

– the inner edges of the semi-circles are just touching. This will give an accurate reading of intraocular pressure.

Advantages & Disadvantages

❖ **Advantages**

- Safe, easy to perform
- Most accurate
- Not much force is applied to the cornea.
- Does not get affected by corneal-scleral rigidity
- Readings are directly from the knob.
- Can be done on post-cases or injury cases

❖ **Disadvantages**

- Need slit lamp, dark room, fluorescein and topical anesthesia

Contraindications

- ❖ Active Infection
- ❖ Patients with recurrent corneal erosions
- ❖ Corneal abrasions that are not totally healed





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