Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
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Optometry Department

Sub: Refractive Errors
Class: [1]St- Stage
Lecture name: Retinoscopy (1)

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Retinoscopy

One of the most important optical devices used by the ophthalmologist or optometrist to measure and determine objectively a person's refractive error in the eye (farsighted, nearsighted, astigmatism).

-Retinoscopy is very helpful clinical procedure with uncooperative or malingering patients, infants, deafs and difficulty with language and communication.

-Retinoscopy is an objective test, meaning that it does not dependon the patient's input to determine the results. Retinoscopy is a useful tool for eye care professionals because it provides a fast and reliable method of determining the refractive error of a patient's eyes.

-Retinoscopy is also a valuable tool for prescribing corrective lenses, as it helps practitioners determine the exact power of lenses required to correct the patient's vision and help us to identify not only refractive error but also other ocular condition like

a. Media opacities
    - Corneal opacity
    - Vitreal opacity
    - Posterior capsular opacity (PCO)
b. Cataract: Posterior subcapsular opacity
c. Retinal detachment (Rare): Greyish reflex

The examiner uses a retinoscopy to shine light into the patient's eye and observes the reflection (reflex) off the patient's retina. While moving the streak or spot of light across the pupil the examiner observes the relative movement of the reflex then manually places lenses over the eye (using a trial frame and trial lenses) to "neutralize" the reflex.

Types of Retinoscopy

1. Reflecting (mirror) retinoscopes:
- Reflecting (mirror) retinoscopes are cheap and at one time were the most commonly employed.
- However, presently these are rarely used.
- A source of light is required when using mirror retinoscope, which is kept above and behind the head of the patient.

2. Self-illuminated retinoscopes:
- Self-illuminated retinoscopes are costly but handy.
- These have become more popular nowadays.
- Two types of self-illuminated retinoscope available are:
  - i. A spot retinoscope.
  - ii. A streak retinoscope .
- The streak retinoscope is more popular, and most commonly used, as it is more sensitive than spot retinoscope in detecting astigmatism

Spot VS streak retinoscopy

A. Spot self-illuminous retinoscope:
- It provides a round shape illumination thus its called "Spot Retinoscope"
- It consists of a bulb with a tiny wired filament about 1-2 mm in size.
- This is imaged by a convex lens of about 20 mm focal length to give a beam of light which is reflected by a mirror at 45°.

B. Streak Retinoscope:
- In streak retinoscope the illumination is provided by a special bulb that has a straight filament, thus forming a 'streak' in its projection.

In clinical Practice we mostly use Streak Retinoscope. So we will cover details about Streak Retinoscope here.

Components of Device

1. Source Light: The light source contains powerful halogen bulb. The streak retinoscopy contains bulb to project a streak of light.
2. Lens Condensing: Condensing lens is a plus lens that lies in the path of light. It focuses them onto the mirror. The position of this lens in relation to the bulb can be changed by raising or lowering the focusing sleeve.
3. Mirror: The mirror bends the path of light at right angle such that the light beam is projected onto the retina. It also facilitates reflex light from the retina to enter the examiner's eye.
4. Sleeve Focusing
   a. Focusing sleeve varies the distance between the bulb and the lens.
   b. Sleeve up produces plane mirror effect.
   c. Sleeve down produces concave mirror effect.
5. Supply Power: Power supply needed to project the light beam may be generated either through battery or it may be electric operated.

Work Principle of Device

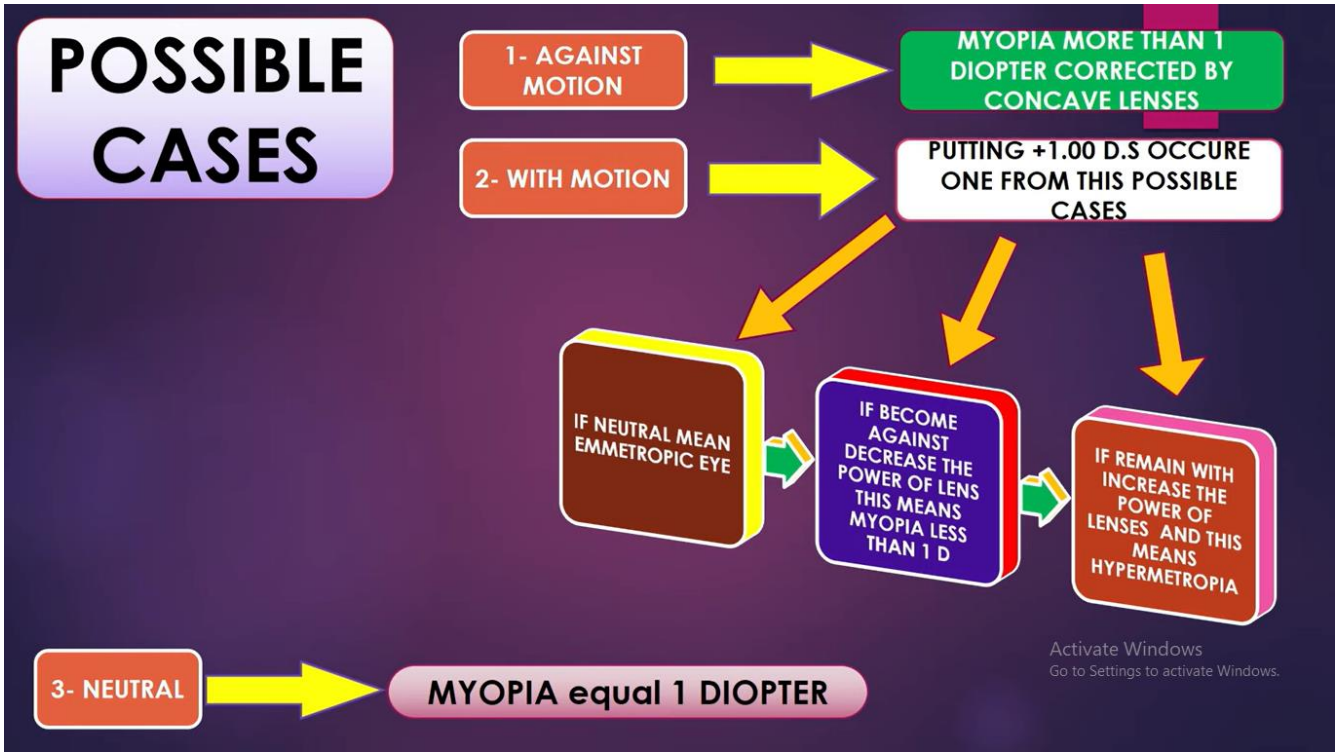
1. A handheld instrument shines a beam of light on the patient's pupil
2. Observing the red reflex light that is reflected from the retina, and as a result, the refractive power of the eye is determined.
3. Move the device vertically or horizontally on the two axes to evaluate the refractive position.

Put the lenses in front of the eye and as the power of the lenses changes, there is a corresponding change in the direction and pattern of the reflection

Characteristics of retinoscopy reflex

The direction of movement of retinoscopy reflex:

1. Retinoscopy reflex moves with the movement of the retinoscopy (i.e. when you sweep your retinoscopy from left to right even reflex will also appear to move from left to right).
2. Retinoscopy reflex moves against with movement of retinoscope (i.e. when you sweep your retinoscopy from left to right even reflex will appear moving against from right to left)



1. Intermediate VA (66 Cm)

Purpose:

a. Determine the patient's functional losses as a result of RE, pathology at intermediate distance
b. Computer uses

Sloan Letter Chart

Procedure: same the distance VA with 66 Cm

2. Near VA (40 Cm)

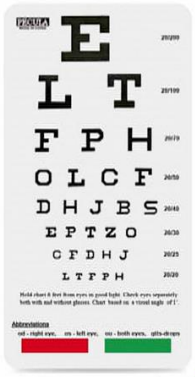
Purpose:

a. Determine the patient's functional losses as a result of RE, pathology at near distance
b. Computer uses

Procedure: same the distance with 40 Cm and near illumination should be on

Record the size of the print that the patient was able to see and the test distance

Jaeger Chart



Reduced Snellen Chart

Factor affecting visual acuity

1. Refractive error
    a. Myopia: decreases the VA by one line for every 0.25DS error
    b. Hyperopia:
        i. Young patient: does not affect VA adversely because they can accommodation factor
        ii. Elderly patient: decreases the VA by one line for every 0.25DS error

c. Astigmatism: decreases the VA by two lines for every 0.25DS error, and depending on (Oblique astigmatism>vertical astigmatism>horizontal astigmatism).

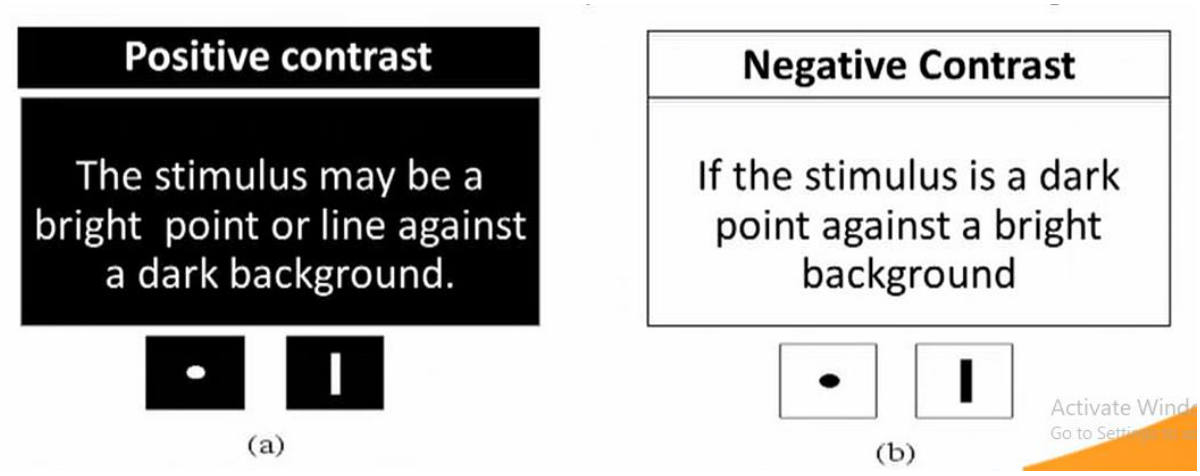
2. Illumination and pipil size
   a. The brighter the room illumunatin, the smaller the pupil size, thus increas the depth of focus
   b. In a dark, the pupil will enlarge and spherical aberration increase, thus an increase in the myopia in most emmetropic and myopic patients.
3. Spacing between letters and lines (crowding phenomenon)

The closer the spacing of the letters the more difficu it is to discern the letter

a. Single letter acuity is therefore better than line acuity
b. This crowding phenomenon is especially important in the diagnosis and prognosis of amblyopic patients

Resolution Acuity

Involves the determination of the presence or the absence of a target/stimulus



Grating acuity is measured in cycles per degree (CPD)

One cycle is one black strip and one white strip

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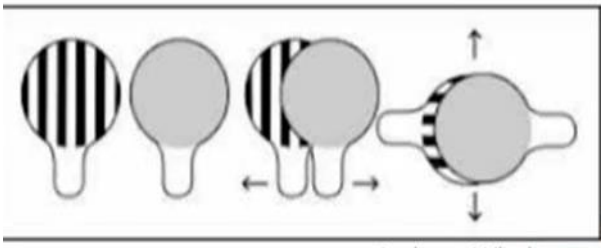
Principle: "preferential looking"

The eye will spontaneously move towards objects that are either more colorful or complex

Procedure

1. Present the patient with two panels
   - One with black and white strioes (grating) and the other one plain grey
   - The patient will spend more time looking at the striped surface
2. Observe the eye movement of the patient
3. Record the VA in cpd
4. Convert VA to the other notation (i.e. meter feel or decmal)



Detection Acuity

- Informal preferential looking situation
  - Using attractive objects
  - Presented at a fixed distance from the child
  - Without making sound

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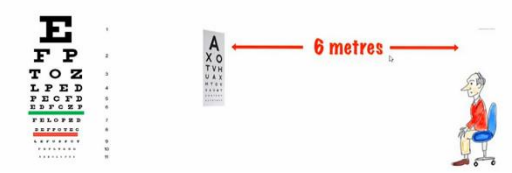
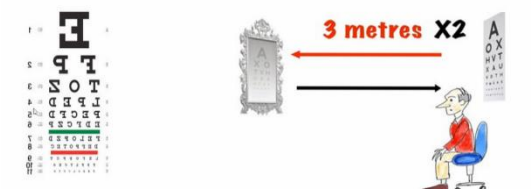
Classification of recognition acuity according to distance

1. Distance VA (6 m)

a. Direct chart



b. Indirect Chart

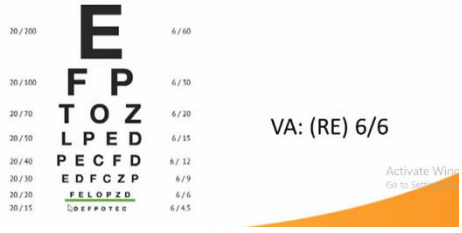


Procedure

1. Give proper instruction to the patient (I will assess how well you can see)
2. Use adequate illumination
3. Examine the RE first
   a. Use the occlude to cover the patients LE
   b. Ask the patent to read the letters loudly
   c. Record the best VA of the RE
4. Repeat for the LE
5. Remove the occlude and record the VA of both eyes.
6. If a patient scores 6/6, perform +2.00D check to be ascertain that he is emmetrope and not hyperope
   a. If VA worsens… patient is emmetrope
   b. If VA remained the same or better, patient is hyperope

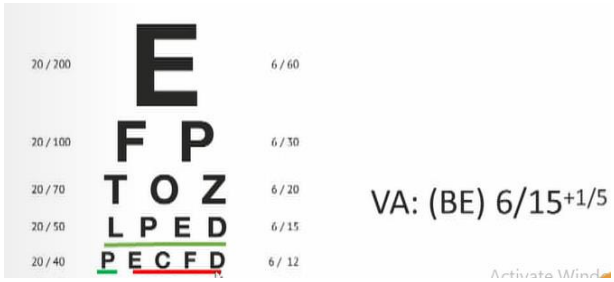
Recording the distance visual acuoty according to recognition acuity

1. If a patient reads an entire line correctly and stops there, you record that line as his VA



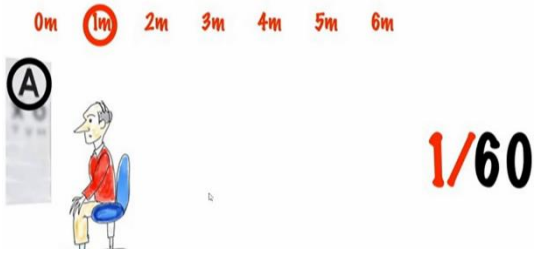
2. If the patient correctly reads more the half the number of letters on a line, you score him as line minus the number of letters that could not be read or were miscalled.

3. If the patient reads less than half the number of letters on a line, you score him as the previous line plus the number of letters that he correctly identified in the last line.



4. If the patient cannot see the largest letters in the chart, the examiner should either move the chart closer to the patient or the patient closer to the chart.

   a. Move the patient progressively until they can see the top line (LogMAR Charts only)



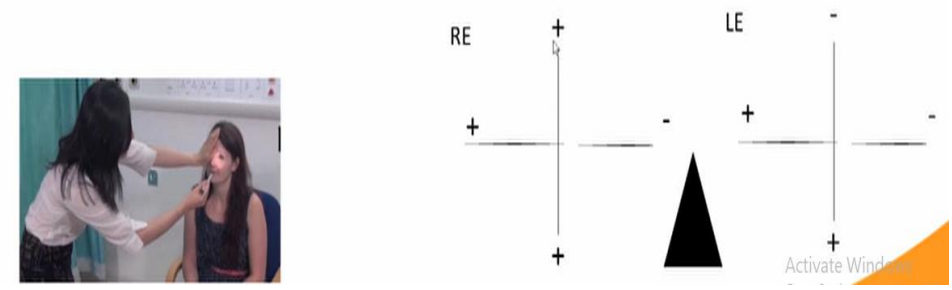
   b. Can also be expressed al letter size (M) at the distance tested

$$VA\ in\ decimals = \frac{Distance\ in\ meter}{Letter\ size\ (M\ size)}$$

Example: if a person can read 19 M line at 1m?

$$VA = \frac{1.0}{19} = 0.05\left(\frac{6}{120}\right)$$

5. If the patient is unable to read the letters on the chart *even at the closest distance*. One may follow the sequence below for recording the VA (Finger counting (FC), Hand movement (HM), Light projection and Light perception)
    a. Finger counting: start from the maximum distance the come closer (Record the farest distance the patient the patient could count your fingers. E.g. VA (RE): CF @35Cm.
    b. Hand movement: check if the patient can see a hand moving from a certain distance (Record the farest distance the patient could see your hand. E.g. VA (RE) HM @ 1m
    c. Light projection: check the patient's ability to detect a penlight at different quadrants at 50Cm away (Ask the patient to report which direction light is coming from and record a (+) sign for each light direction the patient could identify and (-) sign for the direction he could not identify.



    d. Light perception: check the patient's ability to respond a penlight that can see the light but not where it is coming from (Record the LP: when light is detected)

*NLP (no light perception): when the patient failed to detect the light.

2. Intermediate VA (66 Cm)
3. Near VA (40 Cm)