THE NEOTIA UNIVERSITY

THE NEOTIA UNIVERSITY
ज्ञानम् आत्म प्रदीपाय

Clinical Refraction II
Practical Manual
Course Code: BO 373
2020

Santanu Ray, M.Optom. FLVPEI

Assistant Professor - Optometry

Department of Optometry

School of Life Sciences

The Neotia University

CONTENTS		
S. No	**TITLES**	**Page No**
1	Practice of Retinoscopy	
2	Practice of Direct Ophthalmoscopy	
3	Practice of Slit Lamp Procedures	
4	Practice of Subjective Refraction	
5	Jackson Cross Cylinder Test	
6	Astigmatic Fan & Dial Test	
7	Practice of NPA	
8	Practice of NPC	
9	Cover Tests	
10	Practice of Autorefractometry	

PRACTICAL 1: PRACTICE OF RETINOSCOPY

Introduction

Retinoscopy is a procedure by which value of objective refraction is obtained with the help of an instrument called Retinoscope.

There are two types of Retinoscopy techniques -

1. Static Retinoscopy: Static Retinoscopy is performed where the accommodation in the eye is relaxed and convergence is also relaxed. Mainly it is done to estimate static errors of refraction at distance. Fixation target is at 6 meters or 20 feet away (Optical Infinity).

2. Dynamic Retinoscopy: It is performed with accommodation and convergence active in the eye. This is done to assess the accommodative response of "Lead" or "Lag" when the eye is focusing a target at 40 cms. There are several forms of Dynamic Retinoscopy and each has its own indications and set of interpretations.

Principle/ Theory

Retinoscopy is based on Foucault's principle which states that the examiner should stimulate the optical infinity at the working distance to determine the refractive power of the eye.

Working distance: Working distance is the distance between the patient's eye and the Retinoscope while performing Retinoscopy. To compensate the working distance it is converted into dioptre and this dioptric value is subtracted from the value of objective refraction.

Apparatus required

1. A streak Retinoscope
2. Trial lens set
3. Trial frame
4. Distance vision chart

Procedure

- ✧ As a prerequisite illumination of the testing room is made dim.
- ✧ The patient is made to sit comfortably and the examiner has to at the same line with the patient. The examiner also needs to adjust the height of the chair so that the patient's eyes and the examiner's eyes are at the same level.
- ✧ The distance illumination chart is switched on and the patient is instructed to look at the distance vision chart.
- ✧ The patient's right eye should be examined with the examiner's right eye and the Retinoscope should be held in right hand and vice versa.
- ✧ In the beginning the Retinoscopy streak with plane mirror shined into the patient's eye and the streak is moved from side to side in primary meridians.

- ✧ The movement of the pupillary reflex is noted whether it is with or against the Retinoscopy reflex.
- ✧ If the movement is width it is neutralized with 'Plus' lenses and in case of against movement the reflex is neutralize with 'Minus' lenses.
- ✧ The reflex is assessed in different meridian by rotating the axis of the streak. If the reflex is having the same brightness and width all around, the patient has spherical power.
- ✧ In case of spherical power the reflex is neutralized with a spherical lens in trial frame and the power is added until bright light fills the pupillary area without any movement.
- ✧ The net spherical power is obtained by subtracting the working distance from the gross spherical value.

In Astigmatism:

- ✧ In presence of astigmatism along the primary meridians, there will be difference in width, brightness and speed of the pupillary reflex. In this case one meridian is neutralized first with a spherical lens in one meridian and the meridian 90^{o} away form it is neutralized with a cylinder.
- ✧ If the axis of the cylinder is other than the primary meridians, a oblique movement of the pupillary reflex is noted while moving the streak side by side. The streak is rotated until the movement of the pupillary reflex is parallel to the motion of the streak. Now the eye is neutralized with the way it is done in presence of astigmatism.
- ✧ The working distance is subtracted form the spherical power to get the final prescription.
- ✧ The procedure is repeated in the other eye.

Results & Observations

RE: Gross value - Working distance in Dioptre

LE: Gross value - Working distance in Dioptre

The Point of neutrality is indicated by

a. Absence of movement in the pupillary area
b. Whole pupillary area is brighter
c. Reversal of the movement after placing 0.25D lens in trial frame

The characteristics of the pupillary reflex

1. **Direction**: With movement needs to be neutralized with plus lens whereas against movement is neutralized with minus lens.

2. **Width**: The reflex is narrower if the power is more and vice versa.

3. **Speed:** Speed of the reflex is slower in higher power and vice versa.

4. **Brightness and Colour**: In case of higher power the reflex is dim where as the reflex is brighter in low power. The colour of the reflex is orange and it varies with the brightness.

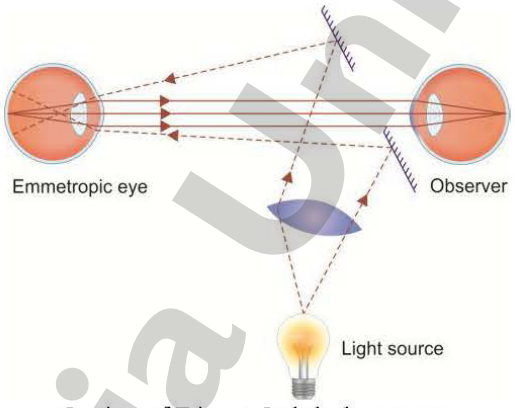
PRACTICAL 2: PRACTICE OF DIRECT OPHTHALMOSCOPY

Introduction

Direct Ophthalmoscopy is a procedure by which the retinal details such as optic disc, macula and individual retinal blood vessels are assessed with the instrument called Direct Ophthalmoscope. The direct ophthalmoscope produces a magnification of 15X by using the power of the eye.

Direct Ophthalmoscopy is a easier and faster technique which does not require dilatation of the eye. This technique has a limitation of reduced depth perception due to absence of Stereopsis as it is a monocular technique.

Principle/ Theory



Optics of Direct Ophthalmoscope

Direct Ophthalmoscopy is based on the principle that if the patient and the examiner both are emmetropic, the light rays emerging out from the patient's eye will be parallel after refraction through the eye optical system and these parallel light rays will be focused on examiner's eye. So the examiner has a clear visibility of the patient's retina.

Apparatus required

1. Direct Ophthalmoscope
2. Distance target preferably a spot light

Procedure

- ✧ As a prerequisite illumination of the testing room is made dim.
- ✧ The patient is made to sit comfortably and the examiner has to at the same line with the patient. The examiner also need to adjust the height of the chair so that the patient's eyes and the examiner's eyes are at the same level.
- ✧ The distance illumination chart is switched on and the patient is instructed to look at the target provided to the patient.
- ✧ The patient's right eye should be examined with the examiner's right eye and the ophthalmoscope should be held in right hand and vice versa.

Distance direct ophthalmoscopy:

- ✧ It should be performed as a routine before direct ophthalmoscopy.
- ✧ The instrument is illuminated and the dioptre wheel is set at zero.
- ✧ Then light is thrown into patient's eye from a distance of 20-25cm and the pupillary area is assessed.
- ✧ In absence of any media opacity, a red glow should come out of the pupillary area. Any dark shadow in the red glow is the indication of media opacity.

Direct ophthalmoscopy:

- ✧ Once the red glow is observed, the examiner has to move closer to the patient's eye by directing the light beam into pupil (Red Reflex of the Retina)
- ✧ The retina is focused by rotating the dioptre wheel and the retinal blood vessel is traced.
- ✧ By tracking the blood vessel the optic disc is focused which is slightly nasal aspect of the Fundus. As the blood vessels are approaching to the optic disc, its thickness increases progressively.
- ✧ The macula is assessed by asking the patient to look at the ophthalmoscope directly or by moving ophthalmoscope temporally. Or the patient is asked to look at the light of the ophthalmoscope and as the patient fixes the light, the macula is automatically viewed.
- ✧ While assessing the periphery of the retina, the patient is asked to
  - ◆ Look up to assess superior retina
  - ◆ Look down to assess inferior retina
  - ◆ Look nasally to assess nasal retina
  - ◆ Look temporally to assess temporal retina

Results & Observations

RE		LE
	Optic disc:	
	Shape	
	Clarity of the margin	
	Thickness of the neuro-retinal rim	
	Colour	
	Cup-disc ratio	
	Macula:	
	Foveal reflex	
	Other aspects:	
	Arterio-venous crossings	
	Central and/or Peripheral Retinal Lesions	
	Clarity of the Crystalline Lens	

PRACTICAL 3: PRACTICE OF SLIT LAMP PROCEDURES

Introduction

Slit lamp is a bio-microscope is a self-illuminated instrument which allows the examination of living tissues under magnification.

Slit lamp bio-microscopy uses different illumination techniques by which different parts of the eye can be assessed with or with out accessories in conjunction with it. It is also used for quantitative measurement and photographic documentation of each part of the eye.

Principle/ Theory

A narrow and very bright slit beam is produced by a lamp and the beam is focused on the eye with the help of a condensing lens system. The illuminated area of the eye is now viewed under magnification of a microscope.

Apparatus required

A Slit lamp bio-microscope

Procedure

Practice of Slit lamp bio-microscopy involved with several illumination techniques

1. ***Diffuse illumination***

✧ Angle between the illumination beam and observation system is made as 45°
✧ A diffuse filter is used when the slit is opened fully.
✧ Magnification is varied from low to moderate.

2. ***Direct illumination***

✧ Angle between the illumination beam and observation system is made as 45° to 50°.
✧ Both the illumination system and observation system are focused at the same point.
- *Optic section:* In this a thin knife edge beam with maximum brightness is produced.
- *Parallelepiped section:* The beam is made bit wider with a thickness of 1 to 2 mm.
- *Conical beam:* Very tiny circular or square shaped beam is created by reducing both the height and width of the beam.

3. ***Indirect illumination***

✧ Angle between the illumination beam and observation system is made as 45° to 50°.
✧ The illumination beam is focused to an adjacent area of the ocular tissue to be observed.
✧ Magnification can be varied form low to high.

4. ***Retro illumination***

✧ It is set up by reflecting the slit lamp beam from a ocular structure situated posterior to the structure to be observed.
- *Iris retro illumination:* Angle between the illumination beam and observation system is made as 45°. The slit beam is set with moderate width and the magnification is set as moderate to high.

- *Fundus retro illumination:* Angle between the illumination beam and observation system is made as 2^{o} to 4^{o}. Moderate to high magnification is used and slit beam of moderate width and reduced height is used.

5. *Specular reflection*

✧ Angle between the illumination beam and observation system is set up in such a way that the angle of incident is equal to the angle of reflection which can be obtained be making a separation of 50^{o}.
✧ The magnification is set up as moderate to high.
✧ The illumination beam of high intensity and a variable width is used.

6. *Sclerotic scatter*

✧ Angle between the illumination beam and observation system is made as 40^{o} to 60^{o}.
✧ A narrow slit beam of 1 mm is focused on Limbus.
✧ The cornea is assessed with low magnification. In absence of any pathology or foreign body inside the cornea it will appear as dark. However in case of reduced transmission the area of cornea will appear as gray.

7. *Oscillatory illumination*

✧ The observation system is kept focused on the area to be observed and the illumination beam is oscillated back and forth alternately.

Results & Observations

Observation of different structures by different illumination techniques

1. ***Diffuse illumination***
   a) Overall view of ocular structures and the adnexa of the eye.
   b) Assessment of contact lens fit
2. ***Direct illumination***
   a) Optic section is used to assess the layers of cornea and lens
   b) Parallelepiped illumination is used to assess of corneal pathology, foreign body
   c) Conical beam is used to assess cells and flares in the anterior chamber.
3. ***Indirect illumination***
   a) It is used to assess corneal epithelial edema, epithelial vesicles, pigments on cornea, corneal foreign body.
   b) structural components of the iris
4. ***Retro illumination***
   a) Iris retro illumination is used to assess corneal opacity with more prominence.
   b) Fundus retro illumination helps to evaluate lens opacity.
5. ***Specular reflection***
   a) It is used assess the endothelium layer of cornea and the tear film.
6. ***Sclerotic scatter***
   a) It is helpful in assessment of corneal opacity and corneal foreign body.
7. ***Oscillatory illumination***
   a) It is used to assess ocular structures with quick to and fro movement.

PRACTICAL 4: PRACTICE OF SUBJECTIVE REFRACTION

Introduction

Subjective refraction is the technique of determining the refractive status of the eye following the subjective response of the patient.

Aim of the subjective refraction is to provide maximum visual acuity by providing the spherical and cylindrical lenses in front of the eye. Other than proving best corrected visual acuity subjective refraction also helps in assessing amount of vision loss due to an ocular pathology, visual status of a treatment or surgical procedure.

Principle/ Theory

Principle of subjective refraction is to make the light rays focused on retina in both the meridian by providing maximum plus and minimum minus when accommodation is at rest.

Apparatus required

1. Distance and near vision charts
2. Trial lens set
3. Trial case
4. Jackson cross cylinder
5. Duochrome chart

Procedure

I. Monocular subjective refraction

1. Determination of Best Vision Sphere (BVS)

- ✧ The objective refraction value is obtained first and the patient is made to wear trial frame
- ✧ The right eye is first fogged. To get the fogging lens +1.50 is added to the spherical power in objective refraction.
- ✧ Then the eye is defogged by 0.25 steps until the maximum vision with spherical lens is obtained.

2. Refinement of axis of the cylinder

- ✧ Once BVS is achieved, the cylindrical lens determined by objective refraction is inserted into trial frame and the patient is directed to a round target.
- ✧ JCC is now placed in such a way that handle of the JCC is aligned with the axis of the cylinder.
- ✧ JCC is now flipped and the patient is asked in which position the round target gets sharper, rounder and clearer? When flipping the JCC in two position, in one position axis of the minus cylinder is at 45^{o} and in another position axis of plus cylinder is at 45^{o} with the axis of the cylinder placed in trial frame.
- ✧ If the axis is clear in one view, the axis of the cylinder in trial frame is rotated by 5^{o} towards which patent has clearer vision.
- ✧ This process is repeated till there is equal clarity of the target in either view or else there is reversal.

3. Refinement of power of the cylinder

- ✧ Once the axis is determined the axis of plus cylinder of the JCC is aligned with the axis of the cylinder placed in trial fame.
- ✧ Now axis of minus cylinder of the JCC is aligned with the axis of cylinder by flipping it and the patient is asked in which position the round target gets sharper, rounder and clearer.
- ✧ If the target is more clear when the plus cylinder axis is aligned with the axis of the cylinder +0.25 is added to the cylinder power and vice versa.
- ✧ This process is repeated till there is equal clarity of the target in either view or else there is reversal.

4. Refinement of sphere

- ✧ It is done by Duochrome with fogging test.
- ✧ The patient is fogged by one line by placing +050D to +0.75D and directed to the Duochrome chart.
- ✧ The patient is asked in which color background the letters are clearer. The red letters will definitely be clearer as the patent is fogged.
- ✧ The eye is then defogged by 0.25 steps and the patient is asked to compare the clarity of the letters in either colour background in each step.
- ✧ The defogging is continued till there is equal clarity in both the background.

II. Binocular subjective refraction

- ✧ Binocular balancing is done to balance the accommodation in both the eye and out of many techniques fogging with alternate occlusion is the conventional one.
- ✧ Both the eyes are fogged with two lines by placing 0.75D.
- ✧ Now alternate occlusion of both the eyes is done for 5 seconds in each eye and the patient is asked to compare the clarity of each eye.
- ✧ +0.25D is added to the eye having more clarity.
- ✧ If there is reversal of clarity after placing +0.25D in better eye, dominating eye testing is performed. The dominating eye should always be the better eye.
- ✧ Now defogging is done binocularly in 0.25 step until the best vision is achieved.

All the steps are repeated in the left eye.

Results & Observations

RE: _____ Dsph _____ Dcyl @ _____

LE: _____ Dsph _____ Dcyl @ _____

Duochrome test:

RE: Balanced/ Red better/ Green better

LE: Balanced/ Red better/ Green better

Binocular balancing:

Balanced: Yes/ No

PRACTICAL 5: JACKSON CROSS CYLINDER TEST

Introduction

The Jackson Cross Cylinder is combination of two cylinders of equal power but with opposite signs is placed in such a way that their axes are kept at 90° to each other. A handle is mounted at 45° to the axes of the cross cylinder.

Jackson Cross Cylinder

Principle/ Theory

JCC is a Sphero-cylindrical lens which is combination of a spherical power and a cylindrical power of double of the sphere and with opposite sign. As the spherical equivalent of JCC is zero, there will be no change in the position of Sturm conoid when it is placed in front of the patient's eye. But there will be increase or decrease in power of astigmatism by equal amount by flipping the JCC.

Apparatus required

1. Lensometer
2. Lose prisms

Procedure

- ✧ Before performing JCC objective refraction is done first.
- ✧ Best vision sphere is determined by fogging and defogging method and then first the axis of the cylinder and then power of the cylinder is determined.

Refinement of axis of the cylinder

- ✧ Once BVS is achieved, the cylindrical lens determined by objective refraction is inserted into trial frame and the patient is directed to a round target.
- ✧ JCC is now placed in such a way that handle of the JCC is aligned with the axis of the cylinder.
- ✧ JCC is now flipped and the patient is asked in which position the round target gets sharper, rounder and clearer? When flipping the JCC in two position, in one position axis of the minus cylinder is at 45° and in another position axis of plus cylinder is at 45° with the axis of the cylinder placed in trial frame.
- ✧ If the axis is clear in one view, the axis of the cylinder in trial frame is rotated by 5° towards which patent has clearer vision.

- ✧ This process is repeated till there is equal clarity of the target in either view or else there is reversal.

Refinement of power of the cylinder

- ✧ Once the axis is determined the axis of plus cylinder of the JCC is aligned with the axis of the cylinder placed in trial fame.
- ✧ Now axis of minus cylinder of the JCC is aligned with the axis of cylinder by flipping it and the patient is asked in which position the round target gets sharper, rounder and clearer.
- ✧ If the target is more clear when the plus cylinder axis is aligned with the axis of the cylinder +0.25 is added to the cylinder power and vice versa.
- ✧ This process is repeated till there is equal clarity of the target in either view or else there is reversal.

Results & Observations

If axis and power is determined with a JCC of ±0.25D,

During determination of axis when JCC is flipped in two position. The power added in front of the eye is

1. -0.25D @ 45^{o} / +0.25D @ 135^{o}
2. -0.25D @ 135^{o} / +0.25D @ 45^{o}

During determination of axis when JCC is flipped in two position. The power added in front of the eye is

1. -0.25D @ 180^{o} / +0.25D @ 90^{o}
2. -0.25D @ 90^{o} / +0.25D @ 180^{o}

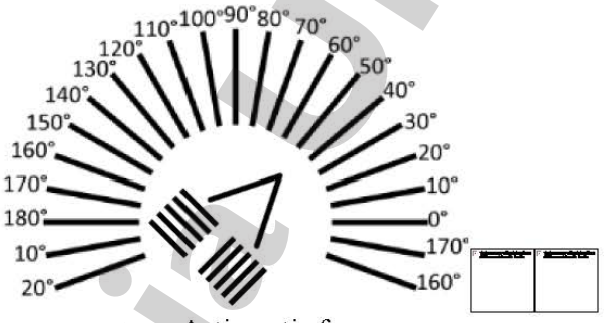
PRACTICAL 6: ASTIGMATIC FAN & DIAL TEST

Introduction

Determining axis and power of astigmatism is the important steps of subjective refraction. It is important to determine axis and then power of the astigmatism before refining the power of spherical power. There are different way of determining the axis and power of astigmatism. Astigmatic fan and dial technique is one of them. Though Jackson Cross Cylinder test is the most conventional method of determining axis and power of cylinder, astigmatic fan and dial test is still an effective method in absence of Jackson Cross Cylinder.

Principle/ Theory

The astigmatic fan and dial consists of radial lines spaced at an interval of 10 degrees interval. The central panel of it has a Maddox V which indicates the axis of the cylinder and block containing series of horizontal and vertical lines which determines power of the cylinder. The outer radial lines are fixed where as the central panel can be rotated trough 180 degrees.



Astigmatic fan

The meridian parallel or perpendicular to the sharpest line in Astigmatic fan or dial is the axis of the cylinder.

Apparatus required

1. Astigmatic fan & dial
2. Trial lens set
3. Trial fame

Procedure

- ✧ One eye is occluded and the best vision sphere is obtained.
- ✧ The fogging lens is placed in the trial frame. To get the proper fogging lens astigmatic correction is approximated based on visual acuity. Now approximate astigmatic power is divided by 2. Then 0.50 is added to get the fogging power.
- ✧ After fogging the patient is directed to astigmatic fan & dial chart and the patient is asked to note down if any of the line or lines appear sharper than the others.
- ✧ The arrowhead of the Maddox V is made pointed to the sharpest line by rotating the central panel.

- ✧ It is central panel is further rotated until the barbs on both sides of the Maddox V are equally clear. Now the arrowhead is pointed to the principle meridian of astigmatism and the meridian perpendicular to it is the axis of minus cylindrical power.
- ✧ Now the patient is asked to look at the blocks and the minus cylinder is added in 0.25 steps at the predetermined axis until both the blocks of lines are equally clear. This is the power of correcting cylinder.

Results & Observations

Astigmatism in

RE: _____ @ _____

LE: _____ @ _____

PRACTICAL 7: PRACTICE OF NPA

Introduction

Near point of Accommodation is the near most point in front of the eye any object situated at which is seen clearly with maximum accommodation. Measurement of NPA actually gives a hints of maximum amount of accommodation a person can exert. NPA has significance in diagnosing different anomalies of Accommodation.

In clinic it is measured with the help of an instrument called Royal Air Force (RAF) ruler.

Principle/ Theory

RAF ruler consists of a 50 cm in long rule with a slider. A rotating four sided cube is attached to the slider and it can be moved back and forth with the slider. On the one side of the cube has a vertical line with a central dot and the other sides have different targets for reading. There are different scales featured on the four sides of the rule. One side of the rule has centimeter scale. One side has dioptre measurement. One side is marked with age and the other side measures convergence with normal reduced and defective.

RAF ruler

One end of the ruler has a foot rest to be placed on the cheek and the other end has got a handle.

Apparatus required

1. RAF ruler
2. Occluder

Procedure

- ✧ The patient is made to sit comfortably wearing full correction.
- ✧ The foot rest of the RAF ruler is placed on the chick in such a way that the rule is perpendicular to the tip of the nose and the ruler is slightly slanted downward.
- ✧ One eye of the patient, conventionally the left eye first is occluded by the occluder.
- ✧ A reading target is fixed on the cube and the patient is directed to the smallest line on chart the patient can appreciate.
- ✧ The target is now moved forward slowly towards the patient and the patient is asked to mention when the line becomes blur.

- ✧ Once the line becomes blur the patient is asked to make it clear again. If the patient can't make the line clear again this the point of sustainable blur.
- ✧ If the line gets clear after trying, the target is further push up until a point of sustainable blur is achieved.
- ✧ The point of sustainable blur is noted down as the point of break.
- ✧ The target is then pushed back till the line gets just clear again and the point is noted from the scale as point of recovery.
- ✧ The same procedure is repeated on other eye and then binocularly.

Results & Observations

Near point of Accommodation

RE -	Break: ____ cm	Recovery: ____ cm	Average: ____ cm
LE -	Break: ____ cm	Recovery: ____ cm	Average: ____ cm
BE -	Break: ____ cm	Recovery: ____ cm	Average: ____ cm

PRATICAL 8: PRACTICE OF NPC

Introduction

Near point of Convergence is the near most point infront of the eye any object situated at which is seen single with maximum effort of positive fusional vergence. Measurement of NPA actually gives a hints of maximum amount of convergence a person can exert. NPC has a significance in diagnosing different anomalies of fusional vergence.
In clinic it is measured with the help of an instrument called Royal Air Force (RAF) ruler.

Principle/ Theory

RAF ruler consists of a 50 cm in long rule with a slider. A rotating four sided cube is attached to the slider and it can be moved back and forth with the slider. On the one side of the cube has a vertical line with a central dot and the other sides have different targets for reading. There are different scales featured on the four sides of the rule. One side of the rule has centimeter scale. One side has dioptre measurement. One side is marked with age and the other side measures convergence with normal reduced and defective.

RAF ruler

One end of the ruler has a foot rest to be placed on the cheek and the other end has got a handle.

Apparatus required

3. RAF ruler
4. Occluder

Procedure

- ✧ The patient is made to sit comfortably wearing full correction.
- ✧ The foot rest of the RAF ruler is placed on the chick in such a way that the rule is perpendicular to the tip of the nose and the ruler is slightly slanted downward.
- ✧ A target consisting of a vertical line with a central dot is fixed on the cube and the patient is directed to the target.
- ✧ The target is now moved forward slowly towards the patient and the patient is asked to mention when the line just becomes double.
- ✧ Once the line becomes double the patient is asked to make it single again. If the patient can't make the line single again this the breaking point.

- ✧ If the line gets single after trying, the target is further push up until a point of breaking is obtained.
- ✧ The point of breaking is noted down.
- ✧ The target is then pushed back till the line gets just double again and the point is noted from the scale as point of recovery.

Results & Observations

Near point of Convergence

Break: ____ cm

Recovery: ____ cm

Average: ____ cm

PRACTICAL 9: COVER TESTS

Introduction

Cover tests are the objective methods of qualitative assessment of angle of deviation of the eye. As the cover test is one of the important component of comprehensive eye examination it should be practiced routinely before refraction. Cover test gives some important informations about the type of deviation, direction of deviation, speed of recovery of the deviated eye, whether the deviation is monocular or alternative, if any incomitancy is present. It is also instrumental in latent nystagmus.

Principle/ Theory

The cover tests are based on disassociation by occlusion which is helpful in measurement of latent deviation.

There are two parts in cover tests; cover-uncover test and alternate cover test. Again the cover-uncover test is done in two steps. One is covering one eye, which determines the presence of manifest deviation in contra lateral eye and then uncovering of the eye which determines presence of latent deviation in ipsilateral eye. The alternate cover test can be done as a screening tool to assess presence total amount of deviation. It also provides information about the speed and smoothness of recovery of the deviated eye.

The tests should be performed at distance and near, with and without glasses.

Apparatus required

1. Distance and near visual acuity charts
2. Occluder

Procedure

Cover-uncover test

- ✧ The patient is made to seat comfortably and directed to the distance vision chart. The patient is instructed to maintain fixation by looking at a single letter.
- ✧ Now an Occluder is placed in front of one eye and the contra lateral eye is observed. If there is an instant movement in the contra lateral eye there is presence of manifest deviation.
- ✧ The movement of the deviated eye is noted. Deviation will be opposite to the movement of the eye. If the movement is outward, there is presence of Esotropia and in case of inward movement, the eye is having Exotropia. Hypo and Hypertropia will be diagnosed if the movement of the eye is upward and downward respectively.
- ✧ Now the eye is uncovered by removing the Occluder and the ipsilateral eye is assessed. In presence of a deviation in that eye will be diagnosed as latent deviation. Depending on the movement of the eye there will Exophoria, Esophoria, Hyperphoria and Hypophoria as discussed before.
- ✧ Now a near target as letter, symbol or picture is provided at 33cm and the patient is instructed to fix to the target. The same procedure of cover-uncover test is performed at 33 cm.
- ✧ The whole procedure is repeated on the other eye.

Alternate Cover test

- ✧ It is performed first at distance by directing the patient at a distance target.
- ✧ An Occluder is placed for 2-3 seconds in front of one eye and in a quick succession to the other eye.
- ✧ The movement of the eye noted and speed of recovery of the deviating eye is also noted.

Results & Observations

While recording the result following aspects are considered.

- ◆ Type of deviation present: Latent or Manifest
- ◆ The direction of the deviation: Eso, Exo, Hypo or Hyper
- ◆ The testing distance: Distance or near
- ◆ The test was performed with or without spectacles
- ◆ In presence of manifest deviation, which eye has got the deviation: Right, Left or Alternate

PRACTICAL 10: PRACTICE OF AUTOREFRACTOMETRY

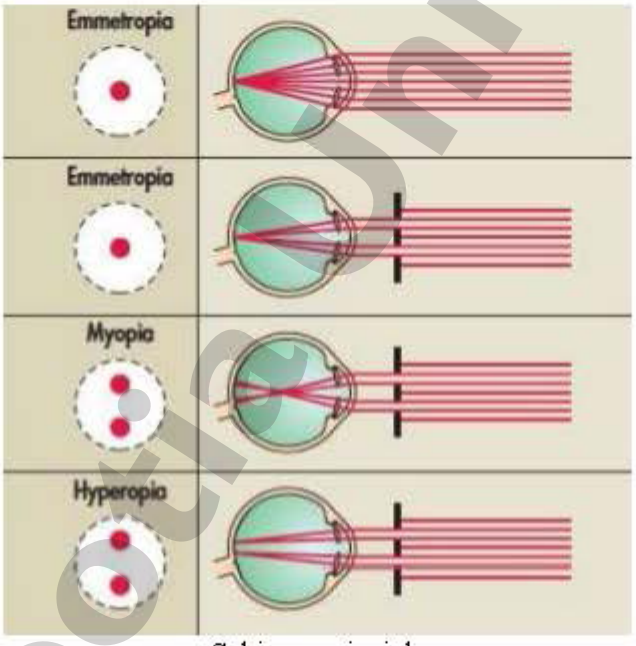
Introduction

Autorefractometry is an objective method of determining the refractive error of eye by an instrument called autorefractometer or optometer. It is an computerised instrument and alternative to the retinoscope. Autorefractometer is a quick procedure and unlike retinoscpy it does not require expertise of the practitioner. It very much helpful in busy practice and mass screening as it is less time consuming.

Principle/ Theory

All Autorefractometer are based on two basic optical principles

1. *Schiener principle*



Schiener principle

The Schiener principle states that refractive error of an eye can be determined by using a disc containing dual pinhole aperture before pupil. Thus parallel rays of light coming from infinity are limited to two small beams of light by the Schiener discs.

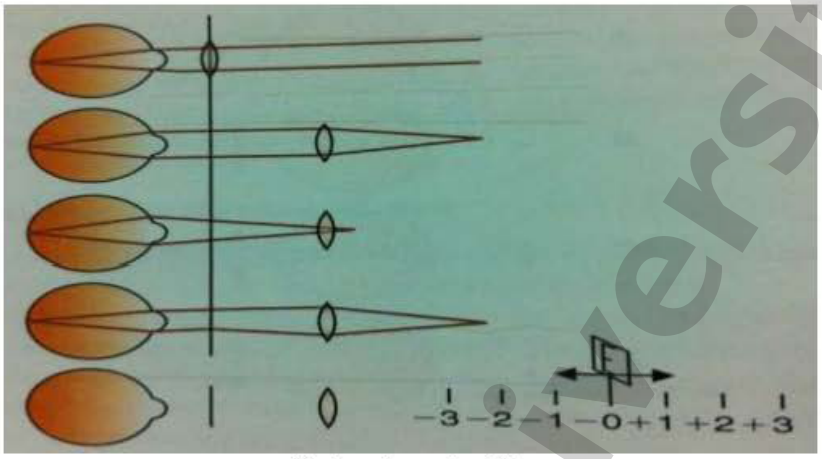
In case of Emmetropia both the beams will be focused on retina hence a single spot on the retinal is formed.

In presence of myopia the beams are focused before retina and there will be formation of two spots on the retina.

In case of Hyperopia the two light beams meet the retina on before they focus. So again there will be two spots on the retina.

By adjusting the position of the object both the light rays can be focused on retina. By measuring the distance of the object far point and the refractive power of the eye can be calculated.

2. *Optometer principle*



Optometer principle

The Optometer uses a convex lens placed at its focal length from the eye and a movable target viewed through the lens.

Light rays form the target on far side enter into the eye with different vergences depending on the position of the target.

If the target is situated at the focal point of the the lens, the light rays from the target will become parallel at the spectacle plane and hence in an emmetropic eye the light rays will be focused on retina.

The light rays from the target situated with in the focal length will become divergent at the spectacle plane where as light rays from the target situated out side the focal length will become convergent at the spectacle plane.

The vergence of the light in the focal plane of the convex lens is linerly related to the displacement of the target from the focal point of the lens.

A scale with equal spacing is formed which shows the number of dioptre according to position of the target.

Apparatus required

Procedure

Results & Observations