Retinoscopy

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Retinoscopy is defined as the objective method of assessing the Refractive State of the eye. This still forms the bread and butter of the most of the practicing ophthalmologists. A good manual refraction is more accurate than the autorefraction techniques available in today’s technologically advanced world.

Types

Mainly divided into Static retinoscopy: which is done in eyes after putting cycloplegic drugs and Dynamic retinoscopy: where the test is done in accommodating eyes.

Optics of Retinoscopy

The refractive power of the given eye is assessed by locating the image of the far point of the patient’s eyes by moving the illumination across the fundus and noting the behaviour of the luminous reflex seen in the patient’s pupillary area. If the image is formed between the patient and the observer “opposite movement or against movement” is seen and if the image falls outside this region a “with movement” is seen. When the far point of the patient’s eye corresponds to observer’s nodal point, neutral point is reached.

The detailed optics can be divided into 3 stages

(a) Illumination Stage- Where one patch of patients retina gets illuminated.

(b) Reflex Stage – Image of illuminated area formed by the subject’s diopteric power apparatus at patients far point

(c) Projection stage – Projection of image by the observer.

Retinoscopy in emmetropia

In the illumination stage, light from the retinoscopy mirror illuminates the patch from the patient’s retina i.e P.

In the reflex stage, the illuminated patch forms an image at the far point of the patient’s eye which in emmetropia is at infinity.

In the projection stage, the determining ray is R, which from infinity comes to the observer’s nodal point and reaches the observer’s retina at Po. So as the mirror rotates “a with movement” is observed.

Retinoscopy with hypermetropia

The illumination stage is same as that of emmetropia.

The reflex stage is different as the far point lies behind the patient’s retina and so a virtual image is formed.

The projection stage is same as that of emmetropia and therefore a “a with movement” of reflex is obtained.

Retinoscopy in myopia

In higher degrees of myopia where the image is formed between the patient and the observer “against movement” will be obtained and in weak myopia where the far point lies behind the observer “with movement” is obtained.

The object of retinoscopy is to place lenses in front of the subject’s eye so as to find the point of neutralization at which the direction of movement of the reflex is indeterminate. The greater the degree of ametropia,
Illumination stage in emmetropia

Reflex stage in emmetropia

Projection stage in emmetropia

Reflex and projection stage in hypermetropia

Reflex and Projection stage in myopia less than 1.5 D

Reflex and Projection stage in myopia greater than 1.5 D
the shorter the excursion and slower the speed of movement.

Methods of retinoscopy

(A) Retinoscopes are mainly 2 types

1) Reflecting Retinoscopes : Which can be plane mirror or concave mirror with a perforation of 4 mm size in the cornea. This needs a separate light source.
2) Luminous Retinoscope : In this both light source and mirror are incorporated.

Eg. Streak retinoscope which allows the axis of any astigmatism to be more readily identified.

(B) Trial frames

This helps to keep a standard distance of the lenses from the eye and also for accurate centration of the lens. The lenses should be carried closer to the eye i.e approximately 12 mm in front of the cornea, so they occupy the same position as spectacle lenses. This should also allow angulation of lens when checking for near vision.

(C) Test Lenses

A typical trial set will have spheres every quarter of a dioptre to 4D and every half to 6D and thereafter every dioptre to 14D and every 2 D for 20D and cylinders every quarter to 4D and every half to 6D. In all the cases when a strength of over 5D in any meridian is involved the back vertex power of the combination should be determined and the prescription modified accordingly. Before commencing the retinoscopy the trial frames must be accurately centered so that the optical centre of the lens inserted corresponds to the patient's visual axis.

Practice of Retinoscopy

The room should be long and darkened.

In case of dynamic retinoscopy, patient is asked to fix at a spot of light which is at least 6 m away.
The examiner should use his right eye for patient's right and his left eye for patient's left.
The working distance is usually 2/3 m.
The movement of the reflex obtained is then noted in all meridians.

To start with, vertical and horizontal meridians are assessed and if the same lens neutralises both vertical and horizontal meridian, then no astigmatism is present. If this is not so then examiner has to assess in different meridians and neutralize each meridian to find out the amount of astigmatism.

"With movement" is obtained in any meridian which is hypermetropic, emmetropic or myopic less than -1.5 D. The convex lenses are used for neutralization. If an "against movement" is found, concave lenses are used for neutralization. Spherocylinder combination can be used to assess the correct axis of astigmatism.

Final refraction is obtained by deducting a dioptric value corresponding to the working distance as well as the cycloplegic drug used. The recording of retinoscopic results is usually done in the form of a cross which indicates the neutralization point of the two main meridia and also their orientation.

Streak retinoscopy

Linear light source is used instead of a circular image which will give more idea about the axis of astigmatism. The first meridian is neutralized at the point at which the streak disappears and the pupil becomes completely filled with light or completely dark. If all meridia are similarly neutralized, there is no astigmatism and if a band shaped reflex appears in any meridian then astigmatism is present. If there is a break in the alignment between the reflex in the pupil and the band outside which means the axis of astigmatism is different and you have to rotate the streak until the reflex in the pupil and the band outside will align.

Special situations in retinoscopy

- The reflex may be too faint in case of media opacities and high refractive errors.
- In case of high ametropia repeat the retinoscopy with ± 7D lens.
- Spherical aberrations cause different parts of the image with varying brightness which can be negative or positive.
- Scissor shadows are seen when one part of the aperture is myopic and one part is hypermetropic.
Usually seen in irregular astigmatism associated with corneal scar and subluxaion of lens etc.

- Children under the age of 7 years cycloplegia is mandatory and in children with squinting eye, retinoscopy is done after occluding the fixing eye.
- In immature cataractvery confusing reflexes are obtained.

- In conical cornea, a triangular or swirling reflex with its apex at the centre of the cone is seen.

**Conclusion**

Retinoscopy is an art which requires much painstaking practices and every ophthalmologist has to lean and make it a daily practice.

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In 1867 he became Assistant Professor at the Royal Infirmary in Edinburgh. The peculiar pupils of tabes and general paralysis were first described by Argyll Robertson in two articles he published in 1869.

That the pupils of patients with lues (the older name for syphilis) were small, irregular and did not react to light was already known. However it was Argyll Robertson who described the fact that these same pupils did contract on accommodation.

Argyll Robertson taught ophthalmology at the University of Edinburgh until 1897, when he retired from active hospital service. He was chairman of the Ophthalmologic Society of England and of the Royal College of Surgeons in Edinburgh, besides being honorary eye physician to Queen Victoria and King Edward VII.

Argyll Robertson was a man of broad medical interests and emphasised the role of ophthalmology in a wider medical context. He published observations on the albuminuric retinopathy and at his invitation as president of the Ophthalmological Society, lectured on “The therapeutical contributions of ophthalmology to general medicine.”

Argyll Robertson left no large number of medical publications; according to his obituary he “preferred the tongue to the pen as a medium”. In 1863 he described the clinical effects on the eye from phystostigm - The calabar beam as a new ophthalmic agent, a major contribution to the treatment of glaucoma. He was also the first to describe a trephining method of operation for certain cases of glaucoma.

Besides his professional standing, Argyll Robertson seems to have impressed his contemporaries by his social appearance and party talents. This side of his personality was thus summarized in a biographical note: “His handsome features and his tall, athletic frame made him the cynosure of all female eyes in his youth and in his later years, clad in a grey frock-coat and top hat, his dignified manner combined with his genial old-world courtesy made him conspicuous in any assembly and a magnificent ambassador of Scotland, firmly establishing that country in the social world of ophthalmology. He attributed his good health to golf and considered it the finest recreation in the world. Even though it was recreation, however, he brought to it the same skill he had as a surgical operator, winning the gold medal of the Royal and Ancient Club of St. Andrews five times”.

In 1894 the Calabar connection recurred in that a patient who had lived in Old Calabar for the previous eight years consulted him. She complained of a tickling, irritating sensation under the skin of the eyelids, which she had noticed, was worse in warm surroundings. He observed a worm “moving in a tortuous wriggling manner under the conjunctiva, the surface of which became slightly elevated as it moved along”. He anaesthetized the conjunctiva, incised it and removed the worm intact. It was found to be a filarial loa, which he presumed had got there through bathing in contaminated water. We know now that the vectors are flies and that the adult worms migrate through the subcutaneous tissue causing fugitive “Calabar swellings” and sometimes beneath the conjunctiva — hence the popular name “eye worm”.

Argyll Robertson in 1883 began teaching ophthalmology at the University of Edinburgh, remaining in this office until 1897, when he retired from active hospital service. From 1893 to 1895 he was chairman of the ophthalmologic society of England, 1886 chairman of the Royal College of Surgeons in Edinburgh, honorary eye physician to Queen Victoria and King Edward VII. In 1904, for health reasons, he moved to the Island of Jersey, and in 1908 made a journey to India. He caught a cold in Gondal near Bombay, and died there.