

Eye examination

An **eye examination** is a battery of tests performed by an ophthalmologist, optometrist, or orthoptist assessing vision and ability to focus on and discern objects, as well as other tests and examinations pertaining to the eyes. All people should have periodic and thorough eye examinations as part of routine primary care, especially since many eye diseases are silent or asymptomatic.

Eye examinations may detect potentially treatable blinding eye diseases, ocular manifestations of systemic disease, or signs of tumours or other anomalies of the brain.

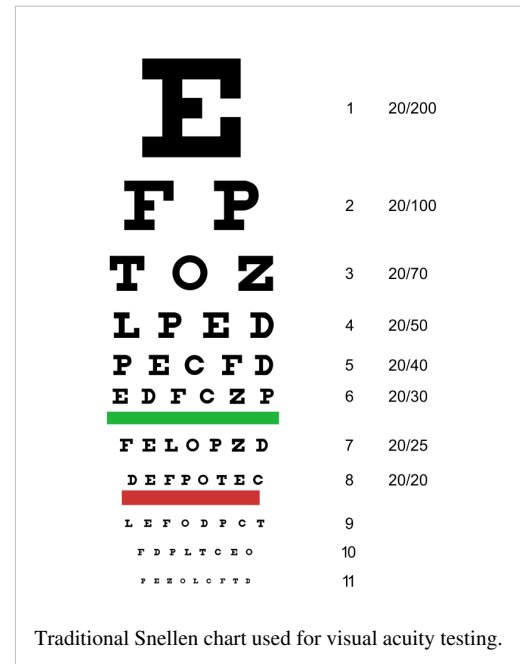
Comprehensive eye examination

Entrance tests

- External examination
- Visual acuity
- Amplitude of accommodation
- Color vision
- Cover test
- Stereopsis
- Near point of convergence
- Extraocular motilities
- Pupils
- Visual field screening
- Interpupillary distance

Refraction

- Lensometry
- Keratometry
- Retinoscopy
- Refraction
 - Monocular
 - Binocular balance
- Cycloplegic refraction



Slit lamp examination of the eyes in an ophthalmology clinic

Functional tests

- Accommodative system
 - Negative relative accommodation
 - Positive relative accommodation
- Vergence system

Health assessment

- Slit lamp biomicroscopy
- Direct ophthalmoscopy
- Binocular indirect ophthalmoscopy
- Tonometry
- Amsler grid
- Visual field assessment
- Gonioscopy

Advanced techniques

- Corneal topography
- Corneal pachymetry
- Scheimpflug ocular imaging
- Retinal tomography
- Ocular computed tomography
- Scanning laser polarimetry

Corneal pachymetry

Corneal pachymetry is a measurement of the thickness of the cornea using ultrasound^[1]

Setting

Ideally, the eye examination consists of an external examination, followed by specific tests for visual acuity, pupil function, extraocular muscle motility, visual fields, intraocular pressure and ophthalmoscopy through a dilated pupil.

A minimal eye examination consists of tests for visual acuity, pupil function, and extraocular muscle motility, as well as direct ophthalmoscopy through an undilated pupil.

Basic examination

External examination

External examination of eyes consists of inspection of the eyelids, surrounding tissues and palpebral fissure. Palpation of the orbital rim may also be desirable, depending on the presenting signs and symptoms. The conjunctiva and sclera can be inspected by having the individual look up, and shining a light while retracting the upper or lower eyelid. The cornea and iris may be similarly inspected.



Determining a prescription for eyeglasses

Visual acuity

Visual acuity is the eye's ability to detect fine details and is the quantitative measure of the eye's ability to see an in-focus image at a certain distance. The standard definition of normal visual acuity (20/20 or 6/6 vision) is the ability to resolve a spatial pattern separated by a visual angle of one minute of arc. The terms 20/20 and 6/6 are derived from standardized sized objects that can be seen by a "person of normal vision" at the specified distance. For example, if one can see at a distance of 20 ft an object that normally can be seen at 20 ft, then one has 20/20 vision. If one can see at 20 ft what a normal person can see at 40 ft, then one has 20/40 vision. Put another way, suppose you have trouble seeing objects at a distance and you can only see out to 20 ft what a person with normal vision can see out to 200 feet, then you have 20/200 vision. The 6/6 terminology is more commonly used in Europe and Australia, and represents the distance in metres.

This is often measured with a Snellen chart.

Pupil function

An examination of pupillary function includes inspecting the pupils for equal size (1 mm or less of difference may be normal), regular shape, reactivity to light, and direct and consensual accommodation. These steps can be easily remembered with the mnemonic *PERRLA (D+C)*: **P**upils **E**qual and **R**ound; **R**eactive to **L**ight and **A**ccommodation (**D**irect and **C**onsensual).

A swinging-flashlight test may also be desirable if neurologic damage is suspected. The swinging-flashlight test is the most useful clinical test available to a general physician for the assessment of optic nerve anomalies. This test detects the afferent pupil defect, also referred to as the Marcus Gunn pupil. In a normal reaction to the swinging-flashlight test, both pupils constrict when one is exposed to light. As the light is being moved from one eye to another, both eyes begin to dilate, but constrict again when light has reached the other eye.

If there is an efferent defect in the left eye, the left pupil will remain dilated regardless of where the light is shining, while the right pupil will respond normally. If there is an afferent defect in the left eye, both pupils will dilate when the light is shining on the left eye, but both will constrict when it is shining on the right eye.

If there is a unilateral small pupil with normal reactivity to light, it is unlikely that a neuropathy is present. However, if accompanied by ptosis of the upper eyelid, this may indicate Horner's syndrome.

If there is a small, irregular pupil that constricts poorly to light, but normally to accommodation, this is an Argyll Robertson pupil.

Ocular motility

Ocular motility should always be tested, especially when patients complain of double vision or physicians suspect neurologic disease. First, the doctor should visually assess the eyes for deviations that could result from strabismus, extraocular muscle dysfunction, or palsy of the cranial nerves innervating the extraocular muscles. Saccades are assessed by having the patient move his or her eye quickly to a target at the far right, left, top and bottom. This tests for saccadic dysfunction whereupon poor ability of the eyes to "jump" from one place to another may impinge on reading ability and other skills.

Slow tracking, or "pursuits" are assessed by the 'follow my finger' test, in which the examiner's finger traces an imaginary "double-H", which touches upon the eight fields of gaze. These test the inferior, superior, lateral and medial rectus muscles of the eye, as well as the superior and inferior oblique muscles.

Visual field (confrontation) testing

Evaluation of the visual fields should never be omitted from the basic eye examination. Testing the visual fields consists of confrontation field testing in which each eye is tested separately to assess the extent of the peripheral field. To perform the test, the individual occludes one eye while fixated on the examiner's eye with the non-occluded eye. The patient is then asked to count the number of fingers that are briefly flashed in each of the four quadrants. This method is preferred to the *wiggly finger test* that was historically used because it represents a rapid and efficient way of answering the same question: is the peripheral visual field affected?

Common problems of the visual field include scotoma (area of reduced vision), hemianopia (half of visual field lost), homonymous quadrantanopia (involving *both* eyes) and bitemporal hemianopia.

Intraocular pressure

Intraocular pressure (IOP) can be measured by Tonometry devices designed to measure the outflow (and resistance to outflow) of the aqueous humour from the eye. Diaton Tonometry can measure IOP through the Eyelid

Ophthalmoscopy

Ophthalmoscopic examination may include visually magnified inspection of the internal eye structures and also assessment of the quality of the eye's red reflex.

Ophthalmoscopy allows the one to look directly at the retina and other tissue at the back of the eye. This is best done after the pupil has been dilated with eye drops. A limited view can be obtained through an undilated pupil, in which case best results are obtained with the room darkened and the patient looking towards the far corner.

The appearance of the optic disc and retinal vasculature are the main focus of examination during ophthalmoscopy. Anomalies in the appearance of these internal ocular structures may indicate eye disease or condition.

A red reflex can be seen when looking at a patient's pupil through a direct ophthalmoscope. This part of the examination is done from a distance of about 50 cm and is usually symmetrical between the two eyes. An opacity may indicate a cataract.

Slit-lamp

Close inspection of the anterior eye structures and ocular adnexa are often done with a slit lamp machine. A small beam of light that can be varied in width, height, incident angle, orientation and colour, is passed over the eye. Often, this light beam is narrowed into a vertical "slit", during slit-lamp examination. The examiner views the illuminated ocular structures, through an optical system that magnifies the image of the eye.

This allows inspection of all the ocular media, from cornea to vitreous, plus magnified view of eyelids, and other external ocular related structures. Fluorescein staining before slit lamp examination may reveal corneal abrasions or herpes simplex infection.

The binocular slit-lamp examination provides stereoscopic magnified view of the eye structures in striking detail, enabling exact anatomical diagnoses to be made for a variety of eye conditions.

Also ophthalmoscopy and gonioscopy examinations can also be performed through the slit lamp when combined with special lenses. These lenses include the Goldmann 3-mirror lens, gonioscopy single-mirror/ Zeiss 4-mirror lens for (ocular) anterior chamber angle structures and +90D lens, +78D lens, +66D lens & Hruby (-56D) lens, the examination of retinal structures is accomplished.

School vision screening

See pediatric ophthalmology

See also

Conditions diagnosed during eye examinations

- Amblyopia
- Diplopia
- Myopia
- Hyperopia
- Presbyopia
- Strabismus

Other tests that may be performed during eye examinations

- Electrooculography
- Electroretinography
- Ultrasound biomicroscopy

Miscellaneous

- Binocular vision
- Eyeglass prescription
- Orthoptics
- Stereopsis
- Vergence

References

Others

- eMedicine article on Neuro-ophthalmic examination ^[2]

External links

- Eye examination equipment in the market ^[3]
 - Hollands of London Eye test information ^[4]
 - What A Vision Test Involves? ^[5]
 - A simulator for eye movements and pupil function tests ^[6]
 - Having an eye test (RNIB) ^[7]
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References

- [1] EyeMDLink (<http://www.eyemlink.com/Test.asp?TestID=25>)
 - [2] <http://www.emedicine.com/oph/topic643.htm>
 - [3] <http://www.optivision2020.com>
 - [4] http://www.hollandsoflondon.com/index_files/eye_test_info.htm
 - [5] http://www.opticsplace.com/article_29/what_a_vision_test_involves.htm
 - [6] <http://cim.ucdavis.edu/EyeRelease/Interface/TopFrame.htm>
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