FUNDAMENTALS OF OPHTHALMOSCOPY FOR MEDICAL STUDENTS

Ophthalmoscopy is an essential skill for all clinicians. Like other clinical skills, mastery is conditional on proper technique and practice, practice, practice. If you learn the proper techniques early in your education, you can become a skilled examiner of the ocular fundus by the time you earn your MD.

I. Instruments

The standard instrument for clinical examination of the ocular fundus has been the "direct" ophthalmoscope for many years. In this country, the most common model has been the standard head made by Welch-Allyn. This is a monocular viewer with various settings that allow focusing and adjustment of the light source to accommodate the viewer and to evaluate various features of the fundus.

Standard Head PanOptic

Recently, Welch Allyn introduced the Panoptic ophthalmoscope, a radically different instrument that provides a much larger view of the fundus, and facilitates viewing even through an undilated pupil. It is also a monocular instrument that provides "direct" visualization of the fundus with a variety of settings and attachments for ocular examinations.

Field of View Courtesy of Welch Allyn

II. Preparation

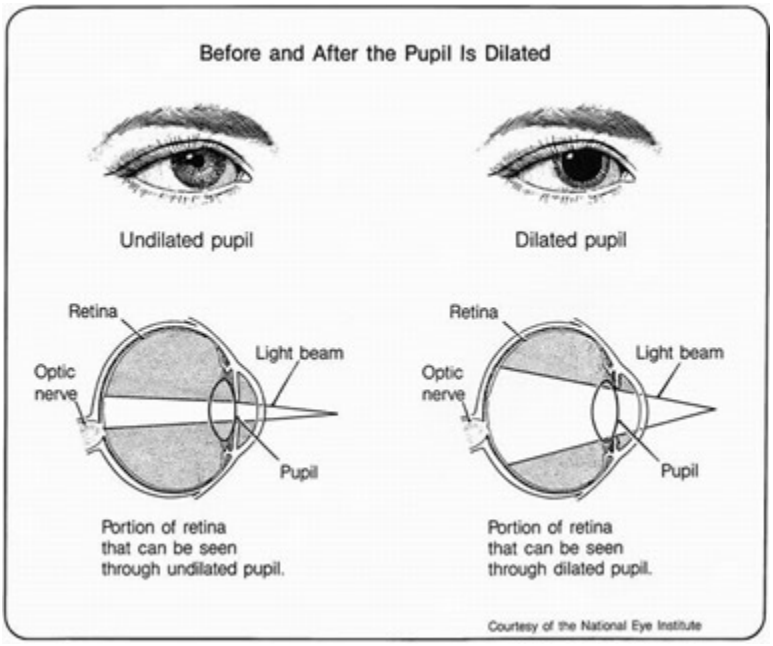
Paying attention to several details before you begin can greatly enhance the success of your viewing efforts. If possible, dim the room lights to avoid light distractions and maintain your attention to details. The patient should be seated comfortably (or lying supine in bed) to minimize head movement. Ask the patient to fixate on a target

directly ahead or above the face at a distant target. It is helpful to warn patients that your head may block their fixation but not to move their eyes or head if you do.

The observer also should be stabilized in order to maintain the correct viewing angle and distance from the eye. You may wish to place your free hand on the patient's shoulder or brow, but it is preferable to use the edge of the bed or the back of the chair.

III. To Dilate or Not To Dilate

It is obvious that the best view of the fundus is obtained through a dilated pupil. This is especially true of older patients. Miosis occurs as part of the normal aging process, and additional difficulties often result from deterioration of the media due to cataracts, etc.



Note, however, that even with dilation, only approximately one-third of the fundus is visible with a direct ophthalmoscope. Fortunately, the area most visible is the posterior pole where the ocular findings of many systemic diseases, such as hypertension and diabetes are located. This includes the disk and the macula, but if peripheral disease such as retinal tears or detachments is suspected, other techniques like indirect ophthalmoscopy must be used.

IV. Instrument Settings

The ophthalmoscope should be prepared for the specific viewer and patient. Using the standard head, set the diopter power to "0", and follow the directions for the Panoptic to make it compatible with your refraction, if any. Both patient and observer should remove their glasses, but contact lenses do not need to be removed.

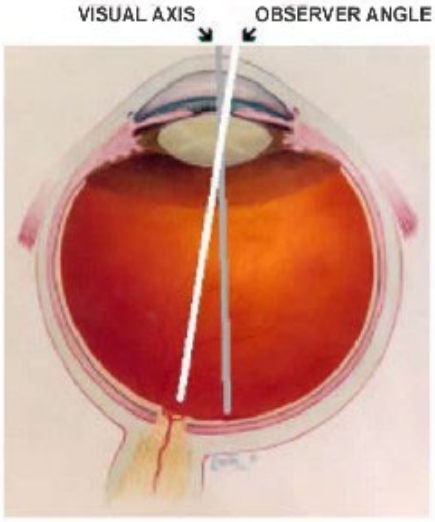
Adjust the size of the incident light beam to approximate the size of the patient's pupils. If the size of the light source is much larger than the pupil, reflected rays may cause glare and dazzle that interferes with detailed examination.

Turn on the light to approximately one-half the maximum intensity to begin, and then adjust for optimum viewing when the fundus is in view. Do not use maximum intensity especially when using instruments with halogen bulbs as the brightness can be uncomfortable for patients, especially when viewing the macula.

V. Orientation and Landmarks

The optic disk is in the same location in everyone, and is easy to identify. Therefore, if you can find the disk right away, it is usually easier to maintain your orientation and to adjust your viewing angle to see other structures. Use your right eye to view the patient's right eye, and your left for the patient's left. (With the PanOptic, it is possible to use the same eye to view both patient eyes if necessary but it is not recommended).

The observer directs the light from the ophthalmoscope at the pupil at an angle of 15-20 degrees temporally from the patient's line of sight (visual axis), at a distance of approximately 10-12 inches from the patient's eye. Aiming your ophthalmoscope at the pupil along the axis of the white line in the above illustration, you should be able to see a red reflex in the pupil (if you cannot find a red reflex, it may mean that a cataract or other obstruction precludes fundus examination). Keeping the red reflex in your view, move closer until the field of view fills your viewer (about 1" from the eye with the standard ophthalmoscope). Maintain this position as you slightly change the angle of the ophthalmoscope head to examine other areas of the posterior pole.



This is the right eye illustrating the relationship of the macula to the optic nerve. Note that to find the disk, the observer must aim 15-20 degrees temporally from the patient's line of sight. For the left eye the observer moves to the patient's left side.

If you do not see the outline of the disk with this technique, stop, move back 10 inches, and try again, perhaps using a slightly different angle. While in the proper position, you may do a brief search for the disk, but prolonged searching by following vessels, for example, is usually unproductive. More importantly, patients become fatigued rather quickly from the bright light and effort required for cooperation.

The most important skill to learn while practicing is to find the viewing angle necessary to locate the optic disk with a minimum of effort. This ensures that that you will have a cooperative, relaxed patient while you are visualizing the fundus, and your examination will be spent on a productive evaluation.

VI. What Am I Seeing?

To ensure that a thorough examination of all pertinent areas is performed, it is useful to develop a technique of examination that includes all areas to be examined and the specific findings to note.

Beginning with the optic nerve head, since that should be the first target seen, adjust the focus on your ophthalmoscope to sharpen the view as much as possible. Note the color and size of the disk, the size of the cup relative to the total disk size, the presence of hemorrhages, the location and caliber of the central retinal vessels, the sharpness of the disk margins, and whether there is any edema or elevation.

Move the light temporally one and one-half disk diameters and you should be in the central macula. Note the presence or absence of hemorrhages and exudates, pigmentary clumping or absence, and any scars that may be present. Move back to the optic disk, and from there follow each of the main arterial and venous branches into each of the four quadrants as far as you can, again noting the caliber and color of the vessels, the appearance of any pigmentary changes, and search for hemorrhages and exudates in each area.

It is also helpful to note for future reference the clarity of your view and any observation difficulties.

VII. Precautions and Comfort Considerations

A good examination of both fundi is an intensive task for both patient and observer. In particular, the need to minimize movement while a bright light is shining into your eye can cause considerable discomfort and it is considerate to allow the patient to occasionally rest for 10-15 seconds or so during a prolonged examination. The need for close face-to-face positioning is also discomfiting for some people. Usually about 10 seconds of observation is about the maximum tolerated before a 10 second break is necessary. Using frequent breaks during difficult examination allows a more detailed and thorough examination than attempting to do everything with one viewing.

VIII. Practical Applications and Limitations

Examination of the ocular fundus is an important component of the clinical evaluation in many diseases. It is essential in patients with diabetes mellitus, increased intracranial pressure, and glaucoma, for example. However, it is important to understand its limitations as well. Firstly, no stereopsis is possible since one can only obtain a monocular view. Secondly, only the posterior, central fundus can be visualized, and the majority of the peripheral fundus cannot be seen. Therefore, if a retinal tear or detachment is suspected, or if there is a significant risk of retinoblastoma, or histoplasmosis, other techniques must be used.

Direct ophthalmoscopy is therefore a useful clinical tool which should be part of every clinician's examination routine. If utilized with skill, the practitioner can apply an important diagnostic procedure to many of the diseases encountered in everyday practice. Knowing its limitations can lead to appropriate referrals and more detailed evaluations.