OPHTHALMOLOGIC DIAGNOSIS

F. HERBERT HAESSLER, M.D.

Professor and Director of the Division of Ophthalmology, Marquette University School of Medicine

1953

OPHTHALMOLOGIC DIAGNOSIS

Preface

Celsus called medicine an *ars conıecturalis*. Though diagnosis now rests on a much more solid foundation, it is still based on a degree of conjecture—less elegantly, guesswork—and it is within the looser limits of legitimate conjecture for the benefit of the patient that data are accepted as valid in diagnosis. To limit oneself only to those data the significance of which is understood completely when submitted to a most rigorous skeptical analysis is not in the best interest of the patient. It might be an interesting exercise to write the necessarily brief canon of ophthalmologic diagnosis that excludes everything that is not demonstratable without any reservation whatsoever.

In this book, it has been my modest purpose to select from the literature those ophthalmologic data that are necessary for diagnosis and to present them in an arrangement that makes them useful for the recognition of the nature of ophthalmic disease. The first five chapters are offered as an example of diagnostic procedure that is based on an abbreviated list of manifestations. The remainder of the book is a series of essays in which further comment is elaborated to elucidate the situations in which it seemed to me that help would be welcomed. The text is planned to function as a road map of diagnosis, not an exhaustive account of all of the recorded manifestations of disease. Although I have striven to have the text reflect current thought, the greater emphasis is on the fundamental principles rather than the latest developments. It does not seem as important to me to have the last word as to thoroughly understand the first one. Now, as in the days of Hippocrates, there is nothing that is so important as an alert and agile mind.

Among the illustrations, there is none that might be mistaken for a portrait of a sick eye. The diagnostician does not need a three-dimensional plastic image of structures nearly as much as a more abstract knowledge of relationships which are better displayed by diagram than by realistic drawing.

The references are few because the data are easily accessible in the larger textbooks and handbooks. Those that appear here and there were chosen partly to call attention to unusually helpful material but chiefly to record my indebtedness to the writer of work that has been particularly useful to me.

Contents

1 The General Survey of the Patient

The central figure in the physician's professional life is the patient. He comes for advice because he is disturbed and the advice given must be based on a diagnosis. The purpose of diagnosis is the fullest possible understanding of the disordered function in an individual patient. The enjoyment of the art of diagnosis lies in the elegance of thinking, in the delicate analysis of subtle distinctions made in observation of the patient and not in the crude identification of the patient's disease with one of the few dozen known disease pictures. In what follows, some of the more important units and concepts of ophthalmology will be presented in an arrangement that displays their use in diagnosis. They are conveniently considered in the categories of *anemnesis* or the patient's story, *status presens* or the doctor's observation, and *epicrisis* or the orderly consideration of the significance of the data and their synthesis into an integrated pattern.

§ 1 HISTORY

One begins with the history or anemnesis. There are at least three purposes in taking a history and the most obvious, namely the gathering of data which are directly useful in the technical diagnosis, does not outweigh the other two in importance as much as one might suppose. In the first place, the patient is given a chance to tell his story. Unless he consults the ophthalmologist for the fitting of glasses which he believes he needs, he is worried, and the mere telling of his story to a man in whom he has confidence relieves him tremendously. Moreover, under pressure from worry the patient remembers many details of diagnostic importance which may never occur to him again. When the ophthalmologist listens with sympathy and real interest in the welfare of a fellow man, he is functioning as a physician rather than a medically trained technician. In the second place, it is in listening to the story that the doctor learns to know the patient. He learns to judge him as a human being, who may be genuine or histrionic, brave or timid, or one who exaggerates, minimizes, consciously conceals, or is too nervous or inhibited to completely tell his story. He learns to evaluate pain, which is often impossible to describe precisely even by an excellent observer, and to know whether the patient is seriously ill or not, whether he is getting better or worse. In short, he gets the subtle intuitive understanding of the patient that enables him to treat him as a sick human being and not merely as the carrier of an interesting biologic problem. To the student a refined diagnosis often seems the height of achievement, as indeed it is from the point of view of medicine as applied biology—which, be it remembered, is the recognition of patterns of occurrence, not the description of a mechanism. However, in his role of doctor it is no more than the technical basis of his advice to the patient. The third use of history taking is the obvious gathering of those data which the patient himself has observed. As in other disciplines, we ask for a description of the chief disturbances and elaborate their characteristics. About a headache, for example: we ask its nature, whether it is an acute pain or dull ache, sharp, boring or burning in nature, in what part of the head it occurs, at what time it occurs and in what temporal relationship to other events or circumstances. We strive by appropriate questions to get evidence of the integrity or abnormality of each function and tissue in turn. In time a systematic order becomes so habitual that one no longer has to wonder what to do next or to stop to reassure oneself that nothing has been forgotten.

It is sometimes difficult, even with the most adroit questioning, to obtain a history from the patient who has decided that he needs glasses and that all he wants the ophthalmologist to do is to take appropriate measurements. Apparently he feels that although the ophthalmologist functions as a healer of sick eyes and as a fitter of glasses, the two functions are completely unrelated.

For further guidance in history taking a few comments on the nature of the symptoms in ophthalmology will be helpful. The diagnostic significance of each of these symptoms will be discussed in an appropriate chapter. The symptoms that are commonly mentioned by patients are: asthenopia, headache, loss of vision, pain, dizziness, diplopia, muscae volitantes, halos or rainbows about lights, scintillating scotoma.

Asthenopia is discomfort associated with the eye. The patient often calls it eye strain and usually is unable to describe his discomfort precisely. It may be the vaguest of manifestations or it may be definitely a feeling of pain or at least uneasiness in or about the eyes. On the other hand, it may not be precisely localized but be definitely associated with use of the eyes. It is well for the ophthalmologist to record as precisely as possible the information he is able to get from the patient so that he may later evaluate the importance of the symptom after the physical examination has been completed. It is particularly important to avoid giving inadequate consideration to this vague symptom. One quite naturally is apt to slight it because one feels that to the majority of patients it is just a word they have repeatedly heard rather than the exact description of their own observation of discomfort.

Headache. The remarks on asthenopia apply equally to the vague headache that a majority of patients mention, though not, of course, to the headache that has definite, clearly-described characteristics of onset, duration, severity, location, and quality.

Loss of vision, however slight it may be, must always be meticulously investigated. Most often it results from a need for a change of glasses but in a not inconsiderable number of patients it is a first and only sign of multiple sclerosis, brain tumor, or other neurologic lesion. Rapid and great loss of vision almost always accompanies disease of the optic nerve and sudden blindness in a patient in his seventh decade suggests a search for evidence of temporal arteritis. In the elderly diminution of visual acuity is often the result of senile degeneration of the retina in the region of the macula, which escapes all but the most thorough ophthalmoscopic observation. A wise rule for the ophthalmologist is to give every patient a visual acuity of 20/20 or to know the reason for his failure to do so.

Pain. When the patient speaks of pain rather than headache his observations are usually objective and precise. It is important to record in detail the nature of onset, duration, and severity of such pain and their relation to other phenomena. Even the beginner in ophthalmology should be aware of the extreme importance of the excruciating, prostrating pain of an attack of acute glaucoma.

Another cause of extreme ocular pain is panophthalmitis, a severe pyogenic inflammation of all the tissues of the eye which almost always destroys the eye. It probably would be recognized at almost any point in the course of a methodical physical examination were it not so striking a disease that it can hardly be overlooked at first sight. The patient has severe ocular pain and almost always feels definitely ill, and is drowsy. He has a fever, usually a headache, and often vomits. The lids are swollen with edema, the veins are enlarged, and the impression of swelling may be increased by marked proptosis of the globe. Chemosis is usually extreme, the conjunctival vessels are swollen, and there is marked circumcorneal ciliary hyperemia. The cornea is steamy and lusterless; if the iris is still visible, its trabecula are swollen and their pattern is obscured by exudate. The vitreous chamber may be filled with pus which is manifest as a yellow reflex in the pupil. Movement of the eyeball is painful if indeed the eyeball is not fixed by intense infiltration of the orbital tissue with fluid and cells. When the pressure is released through a surgical or spontaneous opening, the pain subsides and the patient gradually gets well. The infection may be traumatic or metastatic; if it is primary in the eyeball, it does not lead to general infection or death. Even gas gangrene, which is recognized because the discharge is a thin coffee-colored fluid with gas bubbles, remains a local infection.

Dizziness is a word frequently used by patients when they in their own minds are unable to differentiate vertigo from eye strain or even a vague headache. It is important to distinguish this from real vertigo and sometimes from diplopia.

Diplopia is the seeing of double images. It usually arises from a disturbance of binocular coordination which makes it impossible to bring the pair of eyes into such a position that the two images of an object, one from each eye, may be mentally fused. When the disturbance of motility is great and the images are far apart the patient has no difficulty in recognizing diplopia but when the disturbance is slight the images all but overlap and the patient is aware only of blurred vision or slight confusion. Monocular diplopia is encountered but rarely.

Muscae volitantes, when first noted, are mistaken for a flying insect and are a common manifestation of middle age. They are an expression of a shadow cast by an opacity in the vitreous and have no serious significance. Their existence must be recorded so that the finding may be correlated with ophthalmoscopic findings later.

Halos or **rainbows** around lights are easily recognized by the patient. I comment on them here only to emphasize their extreme importance because in the overwhelming majority of cases they are signs of glaucoma.

Scintillating scotoma calls attention to migraine, and is an ophthalmologist's problem only because the visual disturbance leads the patient to attribute his discomfort to his eyes.

§ 2 PHYSICAL EXAMINATION

The physical examination should be so planned that the data give evidence that every important structure and function of the organ that is examined is normal or that certain deviations from normal are manifest. The remainder of this chapter is an account of the kind of data that must be gathered, and the method of making the observations, but not of the significance of the data.

The importance of a careful and complete methodical examination of the patient can hardly be overemphasized, particularly when early in the course of the examination a lesion has been found that may adequately account for the loss of vision or other difficulty that has brought the patient for consultation. For example: if a granular pigmentation of the macula is found it may be assumed that it is the cause of a loss of vision which in reality is due to incipient syphilitic optic neuritis; a moderately advanced senile cataract may be thought to account for a loss of vision which is actually due to chronic simple glaucoma; or temporal pallor of the disc may be ascribed erroneously to an innocuous pigment disturbance in a patient with pituitary tumor. In all these examples the second and essential disease could have been as easily discovered as the first if it had not been unjustifiably assumed that the first defect discovered adequately accounted for the patient's difficulty. The second disease would not be missed by an examiner who is persuaded that it is of utmost importance to assemble evidence of the integrity of every accessible function and structure in every patient. By methodical complete study of every patient regardless of early findings one avoids what Meisner has called the pitfall of the second disease.

The physical examination is conveniently divided into four parts in which pertinent facts are gathered relating to the functions, the adnexa, the anterior segment, the fundus.

At some time in the course of the examination of every patient who is 40 years of age or more it is essential to measure the ocular tension. The tension is usually measured after the anterior segment has been examined and the optic disc has been studied ophthalmoscopically but before the pupil has been dilated for the complete inspection of the fundus. If the tension is measured it is unlikely that chronic simple glaucoma will escape detection even in an early stage. If measurement of tension is neglected it is certain the disease will not be discovered in some patients before grave and irreparable damage has occurred.

The Functions

The essential functions that must be examined in each patient are visual acuity, accommodation, pupillary reactions, corneal sensitivity, ocular movements.

VISUAL ACUITY

Visual acuity is measured by asking the patient to read with each eye separately the letters on a chart. It is desirable to have the patient sit 20 feet from the chart. In one of the smaller rows of letters on the chart each letter subtends an angle of 5 minutes and the lines of which it is composed are 1 minute wide. In the other rows the letters are proportionately larger so that they subtend similar angles at 15, 30, 40, 50, 70, 100, and 200 feet. If the patient, sitting 20 feet from the chart, reads the letters in the line that subtends the standard angles at 50 feet his visual acuity is recorded as 20/50. Note that this expression is not a fraction. It is merely a method, universally adopted, for recording that the patient sat 20 feet from the chart (numerator of the pseudo-fraction) and read all or most of the letters of a size that could be read at 50 feet by a subject whose visual acuity is 20/20. Doctors who harbor the quaint notion that the metric system is more "scientific" rather than more convenient for certain purposes use 6/6 (meters) and 6/15 for the notations in this example. The test gives a fair estimate of the patient's visual acuity. It has great practical usefulness though it is not by any means precise. It rarely happens that a patient can read every letter in one line on the chart and not a single letter in the line below, nor will two patients who miss three letters in the 20/20 line miss the same three letters. Furthermore, the number of letters in any given line is not chosen because that number has a relationship to the visual acuity which that line represents. Instead it is the number of letters of that particular size that can be placed conveniently on a card of usable size. One usually decides that a patient is 20/30, for example, if he reads most of the letters in the 20/30 line.

ACCOMODATION

The near point of accommodation is more precisely measured than visual acuity, though it, too, has hazards of interpretation. When the eye is relaxed it is in sharp focus for the most distant point that lies within its range. Through the action of the ciliary muscle on the lens the dioptric power can be increased and when this increase is to its maximum the eye is in focus for the nearest point within its range. This process is called accommodation. It can be measured with adequate precision by asking the patient to look steadily at a fine line or a small printed character on a card. The card is moved slowly nearer to the eye and the patient is asked to indicate the nearest position in which the line is seen without the slightest blur. The number of centimeters between the point of blurring and the eye is an adequate measure of accommodation—adequate, that is, for clinical use when it is important to know that the ciliary muscle and its innervation are intact. It is important to measure the distance at least approximately because the range of accommodation differs with age. One can decide whether the accommodation is normal or not only by comparing the patient's range with a table of normal data.

When the range of accommodation is measured for dealing with an optical problem, the measurement is made more precisely and the near point of accommodation is then expressed as a reciprocal of the distance in meters between the point of blurring and a point 13 mm. anterior to the cornea. The figure expresses in diopters the strength of a lens which, when placed 13 mm. in front of the eye, brings the optical system of the relaxed eye into sharp focus at that distance. The accommodation varies with age as is shown by the table of normal data.

PUPILLARY REACTIONS

The observation of pupillary reactions is essentially a study of the nervous control of the iris and not of the tissue of the iris. The pupils are changed in size, in response to light, in accommodation and convergence and in response to other sensory stimuli and even mental states. It is important to conduct a test of pupillary responses in such a manner that only one stimulus to pupillary contraction or dilation is changed, if possible. When all nervous pathways from and to the muscle that control the diameter of the pupil are intact the reaction of the pupil to any stimulus is bilaterally equal.

In testing the pupillary reaction to light, have the patient face a window or uniformly illuminated surface and observe carefully that the pupils are round and equal. Then shade both eyes for a few seconds and uncover one and again shade both eyes for a few seconds and uncover the other. Or you may shade neither and expose each eye separately to the brighter light of a flash-light or ophthalmoscope. Next ask the patient to look at a small object near at hand—a dot on a card or a pencil point, for example—and observe that with the adjustment of the position of the eyes for near vision both pupils contract, and do so equally. It is important to understand that in this instance the part that accommodation plays in the adjustment of the pair of eyes for near vision is used as a stimulus for pupillary contraction, whereas in the preceding section we were interested in accommodation itself and were measuring its magnitude. Also note that observation of the change in diameter of the pupil during accommodation is not an index of the range of accommodation.

This qualitative examination suffices for the preliminary examination and when the pupillary reactions are found normal. For the analysis of abnormal pupillary reactions it is helpful to record the pupillary diameter before and after application of the appropriate stimulus. No elaborate equipment is necessary for this. It is very easy to estimate the pupillary diameter to ½ mm. by comparing the pupil with a series of black circular areas printed on a card varying from 1 to 8 mm. in diameter in steps of ½ mm. (fig. 1). The analysis of pupillary disturbances is based on a diagrammatic representation of the principal nervous pathways that are involved (see fig. 25, p. 39).

CORNEAL SENSITIVITY

Corneal sensitivity is tested by touching the cornea with a thread or wisp of cotton twisted to a thin filament. The normal eye blinks. The loss of sensitivity of the cornea suggests a herpetic infection and is sometimes the only evidence of a disturbance of conduction in the fifth cranial nerve.

OCULAR MOVEMENTS

The observation of ocular motility is important in three kinds of movement—the command movements, the movements of following, the cover test.

Command movements

In the command movements the patient is asked to move his eyes up, down, to the right and to the left without moving his head. The examiner watches the eyes to see that both eyes move fully in the directions indicated.

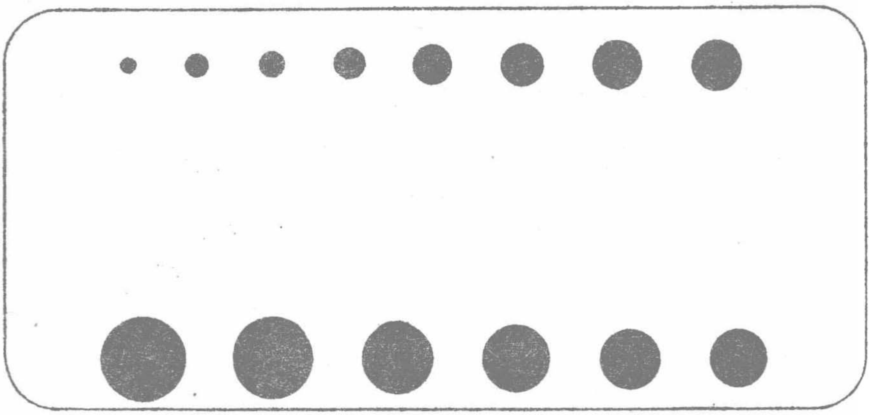


FIG. 1. Haab-type pupillometer

Movements of following

In the movements of following the patient is asked to follow with his gaze an object, say a pen point, which is carried out in the six cardinal directions. The cardinal directions of gaze are up and right, right, down and right, up and left, left, down and left. These six directions are not chosen arbitrarily but because each is the direction in which one of the six extraocular muscles is the functionally predominant one.

Cover test

With the cover test one can measure the position of one eye in relation to the other in any desired position of gaze.

The equipment for performing the test is the simplest—two 3- by 5-inch filing cards. On one, make a dot in ink or pencil for the patient to fixate. With the other, cover one eye. To learn the performance of the test follow these directions. Sit so that you face the seated subject and can look over the card and see his eyes (fig. 2). Ask him to look fixedly at the dot on the card and while he is doing so cover his left eye and watch his right eye. If the right eye does not move, you have evidence that it has been looking at the dot. Remove the card and remind the subject to continue looking at the card. Then cover the right eye. If the left eye does not have to move to fixate the dot you have evidence that both eyes can simultaneously look at the same point. The condition is normal binocular single vision and is called orthotropia.

If you had performed the test on a crosseyed patient whose left eye was fixating the dot when you asked him to look at it with both eyes open and whose right eye deviated inward, it would have been necessary for him to

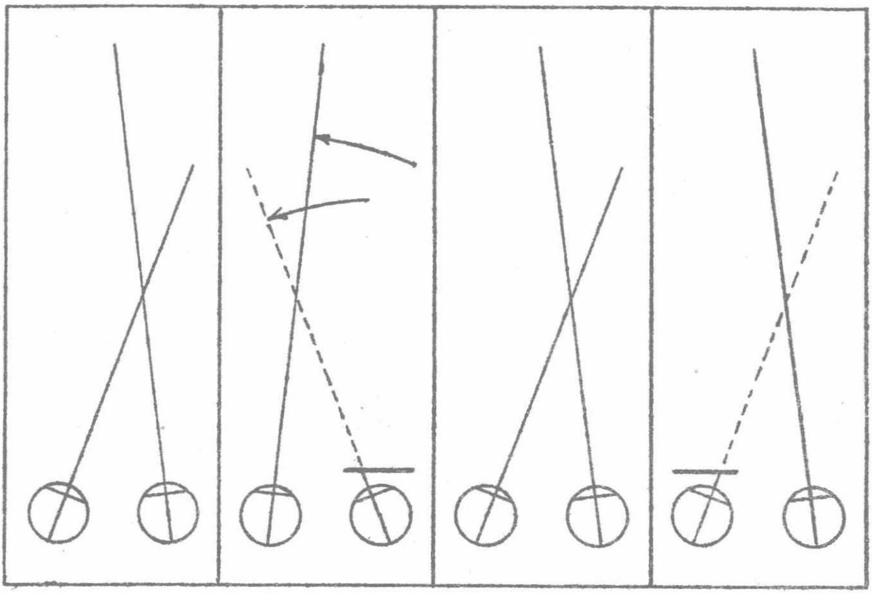


FIG. 2. Cover test in esotropia

rotate his right eye outward in order to see the dot when you covered his left eye. It is obvious that an eye that has been deviating inward must move outward when its fellow eye is covered, one that has been deviating downward must move upward and so on (figs. 2 and 3). For convenience of recording the data, the positions have been given names. A patient whose eye is rotated inward in relation to its fellow eye is said to have esotropia; outward, exotropia; when the right eye is higher than the left, right hypertropia; the left higher than the right, a left hypertropia. The interpretation of the data is discussed on page 40.

For following the recovery of a paralyzed muscle the test can be made quantitative by superimposing suitable prisms of different strength before the uncovered eye until one is found that makes eye movements unnecessary. The test must be performed precisely as outlined. The slight difference of method about to be described measures potential deviation or "phoria" instead of actual deviation or "tropia", and though the phenomenon known as phoria is not of great importance in the scope of this exposition, a description of the method will aid in understanding the principle involved.

If instead of letting the subject look at the dot with both eyes, you cover the left eye for several seconds while the right eye fixates the dot and then quickly shift the card so that it covers the right eye, there will be an ap-

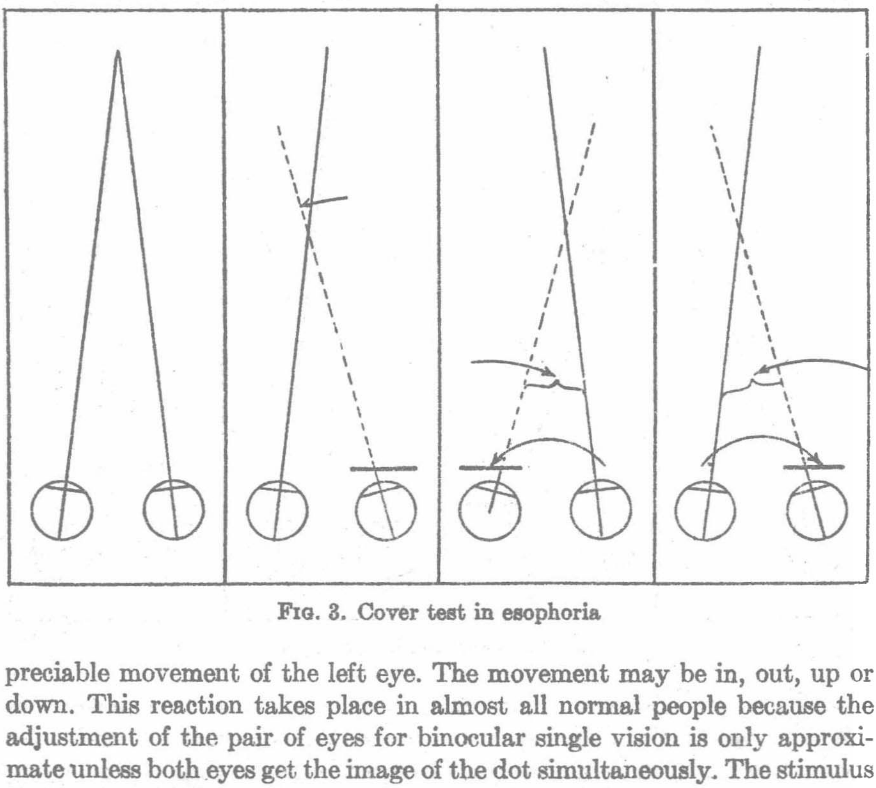


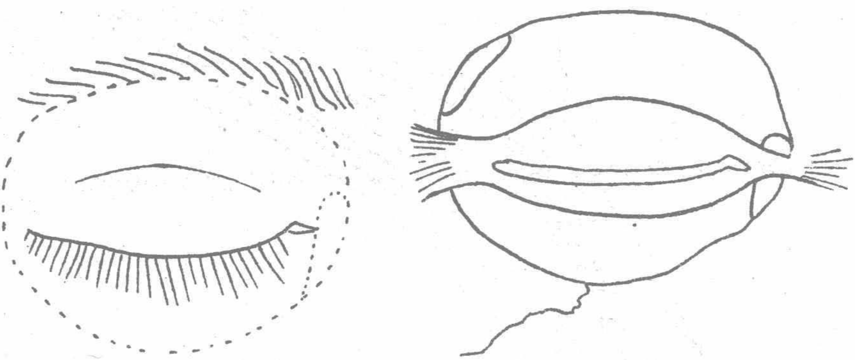
FIG. 3. Cover test in esophoria

preciable movement of the left eye. The movement may be in, out, up or down. This reaction takes place in almost all normal people because the adjustment of the pair of eyes for binocular single vision is only approximate unless both eyes get the image of the dot simultaneously. The stimulus that makes the final adjustment in the position of the eyes is known as the fusion faculty. The position of approximate adjustment for binocular vision in the absence of the fusion reflex is known as heterophoria. The important point of difference between the two methods of doing the cover test is that in the first, the test for heterotropia, ample time is allowed for both eyes of the pair to see the object of fixation binocularly if the state of muscular control is such that simultaneous binocular fixation is possible; whereas in the second, one eye never knows where the other is looking.

The examination of the adnexa

The adnexa which are studied are the lids, the orbital rim, the lacrimal gland and the lacrimal sac. The position of the eye in the orbit is an important finding. The lids are inspected with respect to form, position and other characteristics of the lashes, and the presence or absence of abnormalities of the skin. The latter are essentially a dermatologic problem with which the ophthalmologist, however, must be competent to deal. A comparison of the width of one palpebral fissure with that of the other is often a most fruitful diagnostic lead (figs. 4 to 6).

Visible protuberance in the area over the lacrimal gland and sac suggests



FIGS. 4 and 5

FIG. 4. Left: Adnexa. Lid in relation to orbital rim and lacrimal sac
FIG. 5. Right: Adnexa. Palpebral ligament, lacrimal gland, and lacrimal sac in relation to orbital rim.

enlargement and induration of these structures, a fact which can be confirmed by palpation. Palpation of the orbital margin may reveal irregularities that require interpretation. It is well to observe the relative anteroposterior position of the eyeball in the orbit and if it seems abnormal the exophthalmos or enophthalmos should be measured by the method described on page 61.

The anterior segment

The anterior segment includes all the structures of the globe that are accessible to direct inspection and it is convenient to describe the entire conjunctiva in this part of the examination even though the transitional fold or fornix is hardly a part of the globe and the palpebral portion of the conjunctiva is an integral part of the lid (fig. 7).

In inspection of the tissues of the anterior segment of the eye one ar-