

The ministry of health of the Republic of Belarus
Educational institution «Gomel State Medical University»

Department of Otorhinolaryngology with a course of ophthalmology

Discussed at the meeting
department
Document № 8.1 dated 16.06.2023

MANUALS

for 6th year students of faculty of foreign students on ophthalmology

TOPIC №1 METHODS OF EXAMINATION VISUAL FUNCTIONS AND THE ORGAN OF VISION

The time 6 hours

Gomel, 2023

MOTIVATION FOR LEARNING TOPICS, TRAINING AND EDUCATIONAL PURPOSES, THE REQUIREMENTS TO THE ORIGINAL LEVEL OF KNOWLEDGE

The ophthalmic examination requires detection of abnormal structure and function. Vision, the ability to see, the fundamental function of the eyes which can be assessed in various ways. This topic will introduce the theory, practice and understanding of ophthalmology investigations and examination techniques. It will provide the knowledge and training of ophthalmologic procedures for the examination, diagnosis and treatment of visual and ocular conditions using best-practice methodology.

The purpose of the class: To study external examination of the eye and its adnexa. Features of the external examination of the eyes in newborns and young children. Study of the anterior part of the eye under normal lighting, training in examination with transmitted light, ophthalmoscopy, biomicroscopy, tonometry.

Objectives of the lesson:

Student should know:

1. The method of research of the anterior eye in direct light.
2. The physical laws underlying the focal illumination method (ray concentration, contrast phenomenon).
3. The technique of researching the anterior part of the eye using focal illumination and the bifocal method, a binocular magnifier.
4. Principles of a slit lamp device, methods of operation on this device.
5. Advantages and disadvantages of the focal illumination method compared to inspection under diffuse lighting.
6. Methods of studying the environments of the eye in transmitted light. Differential diagnosis between opacities of the cornea, lens, vitreous.
7. Principles and methods of ophthalmoscopy in reverse and direct form. Picture of the normal fundus.

Student must be able to:

1. Examination of the eyelids, examination of the lacrimal organs, palpation of the orbit, inversion of the eyelids and examination of the conjunctiva.
2. Inspection of the anterior eyeball, determining the mobility of the eye.
3. Determination of the tone of the eyeball by palpation,
4. Inspection of the anterior segment of the eyeball by biomicroscopy.
5. Examination of the fundus by ophthalmoscopy.

The student must perform the following practical skills:

1. Methods of fixing a small child for eye examination;
2. Eversion of the upper eyelid to examine the mucous membrane of the eye;
3. Study of the mobility of the eyeballs;
4. Determination of the presence of contents in a tear bag;
5. Fundus examination using direct and reverse ophthalmoscopy;

6. Study of optical media in transmitted light.

CHECKLIST OF QUESTIONS FROM RELATED SUBJECTS

1. External examination of the patient
2. Methods of palpation

CHECKLIST OF CONTROL QUESTIONS FOR THE LESSON

1. The procedure for examining a patient with eye diseases.
2. The main methods of examination of the organ of vision.
3. External examination of the eye and its adnexa. Features of external examination in newborns and young children.
4. Ophthalmotonometry.
5. Methods of side and focal lighting. The technique of simple and combined side lighting. Study in transmitted light. Examination of the lens and vitreous body.
6. Biomicroscopy. The importance of biomicroscopy for the diagnosis and monitoring of eye diseases.
7. Ophthalmoscopy. The study of the retina, choroid, optic disc.
8. Echobiometry.

PRACTICAL PART OF THE LESSON

Work of students is carried out in the ophthalmology department in the presence of the teacher of the department in order to develop and consolidate practical skills. The acquired skills are consolidated in the training room when examining patients or at a seminar. In the classroom, students independently study modern clinical protocols for examination and treatment, methodological recommendations of the ministry of health of the Republic of Belarus.

1. The procedure for examining a patient with eye diseases.
2. The main methods of examination of the organ of vision.
3. External examination of the eye and its adnexa. Features of external examination in newborns and young children.
4. Ophthalmotonometry.

QUESTIONS FOR SELF STUDY AND ADDITIONAL RESEARCH TASKS

1. Methods of side or focal lighting. The technique of simple and combined side lighting. Study in transmitted light. Examination of the lens and vitreous body.
2. Biomicroscopy. The importance of biomicroscopy for the diagnosis and monitoring of eye diseases.
3. Ophthalmoscopy. The study of the retina, choroid, optic disc.
4. Echobiometry.

5. Development of practical skills on the methods of studying visual functions - visometry; perimetry, color perception, nature of vision.

General principles of ophthalmic examination.

Physical examination and evaluation of the ocular system are greatly facilitated by a detailed history and a number of techniques that are performed in the office using equipment readily available through any optical or medical supply house. However, a specialist in a hospital setting must perform some of the more complicated techniques. These techniques are discussed with a view to (a) their indications, (b) how they are performed, so that the referring examiner can explain to a patient what might be expected, and (c) the necessary information to aid the examiner in management of the patient.

Order of examination.

Examination of the eye and its surrounding tissues with and without special aids may give valuable information for the diagnosis and treatment of ocular disease. After acquiring the ophthalmic history, a systematic routine should be adopted for the examination, with particular attention paid to the patient's chief complaint. Additional tests may be required after the initial exam.

The typical order for nonemergency examination is as follows:

History. Chief complaint; present and past ocular problems; family history of eye problems; present and past general illnesses; previous surgeries; ocular and general medications; allergies; social history. Depending on the patient's particular problem, the history may be brief or extensive.

1. Name and address. Name and address are primarily required for patient's identification. It also proves useful for demographic research.

2. Age and sex. In addition to the utility in patient's identification, knowledge of the age and sex of the patient is also useful for noting down and ruling out the particular diseases pertaining to different age groups and a particular sex.

3. Occupation. An information about patient's occupation is helpful since ophthalmic manifestations due to occupational hazards are well known, e.g.: ocular injuries and trauma due to foreign bodies have typical pattern in factory workers, lathe workers, farmers and sport persons. Computer vision syndrome is emerging as a significant ocular health problem in computer professionals. Heat cataract is known in glass factory workers. In addition, information about the patient's occupation is useful in providing ocular health education and patient's visual rehabilitation.

Chief presenting complaints of the patients should always be recorded in a chronological order with their duration.

The common presenting ocular complaints are: defective vision, watering and/or discharge from the eyes, redness, asthenopic symptoms, photophobia, burning/itching/foreign body sensation, pain (eyeache and/or headache), deviation of the eye, diplopia, and black spots in front of eyes, coloured halos, and distorted vision.

History of present illness. The patients should be encouraged to narrate their complaints in detail and the examiner should be a patient listener. While history taking, the examiner should try to make a note of the following points about each complaint: mode of onset with duration, severity, progression, accompaniment of each symptom.

History of past illness. A probe into history of past illness should be made to know: history of similar ocular complaint in the past. It's especially important in recurrent conditions such as herpes simplex keratitis, uveitis and recurrent corneal erosions. History of similar complaints in other eye is important in bilateral conditions such as uveitis, senile cataract and retinal detachment. History of trauma to eye in the past may explain occurrence of lesions such as delayed rosette cataract and retinal detachment. It is important to know about history of any ocular surgery in the past. History of any systemic disease in the past such as tuberculosis, syphilis, leprosy may sometimes explain the occurrence of present disease. History of drug intake is also important.

Family history. Efforts should be made to establish familial predisposition of inheritable ocular disorders like congenital cataract, ptosis, strabismus, corneal dystrophies, glaucoma and refractive error.

General physical and systemic examination

General physical and systemic examination should be carried out in each case. Sometimes it may help in establishing the aetiological diagnosis.

Ocular examination

- External ocular examination.
- Testing of visual acuity.
- Fundus examination.

External examination.

A stepwise approach that includes inspection and palpation helps ensure that no details are overlooked. This process occurs automatically with increased experience.

- Inspection. The inspection should take place in a well lighted room. The patient's actions and appearance should be observed for clues as to the overall health of the patient, including signs for mental, neurological, medical, and dermatological diseases. Extremities, for example, can give clues to systemic diseases, such as rheumatoid arthritis, gout, or tuberous sclerosis. The head and face should be inspected for any masses or lesions, and these should be measured and drawn if present. The face is assessed for symmetry, signs of prior trauma, and motility of facial muscles. If a neurosensory deficit is suspected, the facial nerve function is assessed by asking the patient to close eyes forcefully, to smile and show teeth, and to lift the forehead, while muscle function is also assessed. The facial nerve sensation is then tested by comparing corresponding areas of both sides of the face with fingertips or cotton wisp, testing all three trigeminal dermatomes. The facial skin is evaluated for color, moisture, tone, texture, and vascular changes. The mouth and nose are then examined with a penlight for changes. The orbits can be evaluated for their anatomic relationship. In addition, if abnormalities are suspected, the intercanthal distance and interpupillary distance are measured with a ruler. The average pupillary distance is 61 mm. Any apparent signs of proptosis (exophthalmos) or enophthalmos should be noted and measured with an exophthalmometer, as detailed below. Further, the relative position and symmetry of the eyebrows are evaluated. Old photographs are an invaluable tool when abnormalities are detected to determine longstanding asymmetry and lesions. It is also important that the examiner take pictures when new findings or changes are noted.

- Palpation. Tactile, temperature, and proprioceptive senses are important when feeling for abnormalities. However, the examiner should be gentle and inform the patient about the process. In general, the thumb and index fingers are used to open the eyelids. The middle fingers are used to examine the preauricular lymph nodes. Masses are recorded for shape, size, tenderness, composition, and mobility.

Bony changes of the head and face are noted. Patients with sinusitis might complain of tenderness over the maxillary and frontal sinuses that can be elicited on palpation. In elderly patients, the temporal artery is palpated to reveal tenderness and tortuosity when giant cell arteritis is suspected. Neck vessels are palpated to evaluate the carotid artery pulse and jugular vein hum. Lymph nodes are then palpated to evaluate signs of enlargement or tenderness. Preauricular, submandibular, superficial cervical, jugular, post-sternocleidomastoid, and supra-clavicular lymph nodes should be palpated.

When trauma is suspected, the orbital margins are palpated for signs of orbital fracture that include a step-off. The examiner should start laterally and proceed in a clockwise fashion, palpating along the orbital rim. It is, however, important to be certain that no globe rupture is present before doing so.

To evaluate eyelid masses, the closed eyelid is palpated gently by sliding the index fingers over the eyelid skin. Even when a mass cannot be seen, it can be felt.

In patients with epiphora, the evaluation of the lacrimal sac involves compression of the sac with the index finger or a cotton-tipped applicator to assess any refluxed material from the puncta. Mucus or mucopurulent material can be expressed and confirm an obstructed nasolacrimal duct. The color of the refluxed material should be noted. It should be noted that pressure on the globe might elicit the oculocardiac reflex with bradycardia.

- Extraocular motility

Normally, the two eyeballs are symmetrically placed in the orbits in such a way that a line joining the central points of superior and inferior orbital margins just touches the cornea. Normally the visual axes of the two eyes are simultaneously directed at the same object which is maintained in all the directions of gaze.

With the patient's head immobilized, the examiner asks the patient to look in each of the nine diagnostic positions of gaze: 1, straight ahead; 2, right; 3, upper right; 4, up; 5, upper left; 6, left; 7, lower left; 8, down; and 9, lower right. This allows the examiner to diagnose strabismus, paralysis of ocular muscles, and gaze paresis. Evaluating the six cardinal directions of gaze (right, left, upper right, lower right, upper left, lower left) is sufficient when examining paralysis of one of the six extraocular muscles. The motion impairment of the eye resulting from paralysis of an ocular muscle will be most evident in these positions. Only one of the rectus muscles is involved in each of the left and right positions of gaze (lateral or medial rectus muscle). All other directions of gaze involve several muscles.

Binocular alignment is evaluated with a cover test. The examiner holds a point light source beneath his or her own eyes and observes the light reflections in the patient's corneas in the near field (40cm). The reflections are normally in the center of each pupil. If the corneal reflection is not in the center of the pupil in one eye, then a tropia is present in that eye. Then the examiner covers one eye with a hand or an occluder and tests whether the uncovered eye makes a compensatory movement. Compensatory movement of the eye indicates the presence of tropia. However, there will also be a lack of compensatory

movement if the eye is blind. The cover test is then repeated with the other eye. If tropia is present in a newborn with extremely poor vision, the baby will not tolerate the good eye being covered.

-The near point of convergence (NPC) is the point closest to the patient at which both eyes converge on an object as it is brought toward the eyes. This point is normally between 6 cm and 10 cm in front of the eye. The moment one eye begins to deviate outward or the image doubles, the limit of convergence has been reached. A NPC greater than 10 cm is considered abnormal and may result in excessive tiring of the eyes on close work such as reading or sewing.

-Pupillary examination. The pupil size, shape, location, and reaction to light, can be altered by numerous pathologic disorders. The examiner begins with observation of the pupil. The pupillary reflexes are tested with the light-reflex test, the swinging flashlight test, and the near-reflex test.

-Pupillary observation and light-reflex test. The patient should be asked to fixate a distant target to minimize accommodation and miosis. In a semidark room, a flashlight is held from below the nose to illuminate the pupil. The pupil size should be measured with a ruler or near vision chart. A difference in pupil size between eyes (anisocoria), as well as the shape and location, should be noted. Further, the direct pupillary response to the light in terms of briskness should be graded separately for each eye from 0 for no response to 4+ for brisk response. In addition, the consensual response should be evaluated by observing the pupillary response of the nonilluminated eye.

-Swinging flashlight test. This test determines the presence or absence of a relative afferent pupillary defect (RAPD). Similar to the light-reflex test, the handheld flashlight is used to illuminate the pupils. The constriction of the pupils is observed. The light is then moved immediately over the patient's nose to the other eye, and the pupillary response is noted. In a normal patient, the pupil will slightly constrict or stay unchanged. However, if the pupil dilates, a RAPD is present, indicating optic nerve or severe retinal damage. The light is then moved back swiftly to the other eye and the response noted. This process should be performed several times, spending equal amount of time illuminating each eye. The presence or absence of a RAPD and the location should be noted.

- Near-reflex test. This test is based on the fact that looking at a near target is associated with convergence, accommodation, and miosis (near synkinesis). These three processes occur simultaneously. The patient is initially instructed to look at a distant target. A target or a finger is then held in the patient's line of vision, and the patient is asked to shift fixation to the near target. The pupillary response is observed. Normally both pupils constrict simultaneously. The test may need to be repeated several times to obtain best results. Under normal conditions, if the pupil reacts to light, it will react to accommodation, as well.

Visual acuity should be tested in all cases, as it may be affected in numerous ocular disorders. In real sense acuity of vision is a retinal function (to be more precise of the macular area) concerned with the appreciation of form sense.

LITERATURE

1. Khurana, A.K. Comprehensive ophthalmology/ A.K. Khurana, Aruj K Khurana, Brawna Khurana – 6thed. – New Delhi [etal.] : Jaypee Brothers Medical Publishers, 2015 – x, 623 p. : phot., col. ill., tab. + Review of ophthalmology : quick text review & MCQs.
2. Дравица, Л.В. Анатомия зрительного анализатора = Anatomy of the visual system : учеб.-метод. пособие по офтальмологии для студ. 4 курса лечеб. фак. и фак. по подг. спец. для зарубеж. стран мед. вузов / Л.В. Дравица, А. Альхадж Хусейн ; УО «ГомГМУ» , Каф. оториноларингологии с курсом офтальмологии. – Гомель : ГомГМУ, 2016. – 44 с. : табл., цв. ил.
3. Дравица, Л.В. Клинические методы исследования = Clinical methods for ocular examination : учеб.-метод. пособие по офтальмологии для студ. 4-6 курсов лечеб. фак. и фак. по подг. спец. для зарубеж. стран мед. вузов / Л.В. Дравица, А. Альхадж Хусейн, О.П. Садовская ; УО «ГомГМУ» , Каф. оториноларингологии с курсом офтальмологии. – Гомель : ГомГМУ, 2017. – 44 с. : табл., цв. ил.
4. Khurana, A. K. Review of ophthalmology : quick text review & MCQs [(multiple choice question)] : a free companion to «Comprehensive ophthalmology. - 6th ed. / A. K. Khurana, Aruj K Khurana, Brawna Khurana – 6th ed. – New Delhi [et al.] : Jaypee Brothers Medical Publishers, 2015. [vii], 190 p.