# OPHTHALMOLOGY

## for the speciality «Dentistry»

**Minsk BSMU 2016**

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
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КАФЕДРА ГЛАЗНЫХ БОЛЕЗНЕЙ

# ОФТАЛЬМОЛОГИЯ
## по специальности «Стоматология»

# OPHTHALMOLOGY
## for the speciality «Dentistry»

Методические рекомендации

Минск БГМУ 2016

УДК 617.7 (811.111) (072)
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О-91

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Авторы: д-р мед. наук, проф. Л. Н. Марченко; канд. мед. наук, доц. А. Ю. Чекина; канд. мед. наук, доц. Т. В. Качан; канд. мед. наук, доц. А. А. Далидович; канд. мед. наук, доц. Витебского государственного ордена Дружбы народов медицинского университета М. В. Морхат

Рецензенты: д-р мед. наук, проф. каф. офтальмологии Белорусской медицинской академии последипломного образования Г. Ф. Малиновский; д-р мед. наук, проф., лауреат Государственной премии Республики Беларусь, зав. отделом офтальмологической помощи Медицинского центра Минского тракторного завода Н. И. Позняк

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Предназначены для преподавателей кафедры глазных болезней к обучению студентов 4-го курса медицинского факультета иностранных учащихся, изучающих учебную дисциплину «Офтальмология» по специальности «Стоматология» на английском языке.

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Учебное издание
**Марченко** Людмила Николаевна
**Чекина** Анна Юрьевна
**Качан** Татьяна Владимировна и др.

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The purpose of studying the discipline «Ophthalmology» for the specialty «Dentistry» is to acquire competence, based on the student ability to search for educational and informational resources independently and to master the methods allowing to gain and analyze the knowledge in the following aspects:

– ways of studying the eye, conjunctiva, eyelid and lacrimal apparatus;
– ways of studying visual functions;
– diagnosis and clinical manifestations of the most widespread diseases of eye;
– systemic pathology with eye and dental manifestations;
– preventive methods of ocular complications of dental diseases;
– the main eye diseases, causing vision problems and blindness;
– the ways of providing emergency medical aid in case of various injuries and diseases of eyes;

## GENERAL OPHTHALMOLOGY

### OPHTHALMOLOGY, ITS CONTENT AND TASKS, HISTORY, ANATOMY AND DEVELOPMENT OF THE EYE. PHYSIOLOGY OF EYE AND VISION

**Time:** 2 hours.

**Educational Goal.** To introduce the students to Ophthalmology as a subject studying a very small area, that is medical and surgical care of the eye, the adjacent adnexal and periocular area and the visual system. It encompasses the upper and mid face, eyebrows and eyelids, lacrimal system and orbit, as well as the globe and eye muscles, optic nerve and nervous connections all the way back to the visual cortex.

**Students should** be able to define each of these structures and describe their function.

**Topics of seminar**

Ocular Anatomy:

Eyelids. Sclera. Limbus.

Conjunctiva. Cornea. Extraocular muscles.

Anatomy of the extraocular muscles and their fascia.

Origin, course, insertion, innervations, and action of the extraocular muscles:

a) horizontal rectus muscles;
b) vertical rectus muscles;
c) oblique muscles;
d) levator palpebrae superioris muscle;
e) insertion relationships of the rectus muscles.

Blood supply of the extraocular muscles: a) arterial; b) venous.

Facial motor and sensory anatomy:

a) trigeminal nerve;

b) facial nerve.

Iris. Pupil. Anterior chamber.

Posterior chamber. Lens.

Ciliary body. Choroid.

Anatomy of vitreous and retina.

Vitreous.

Macula. Optic discs

Normal retinal blood vessel walls: a) arterioles; b) venules.

Location of rods and cones in retina. Retinal pigment epithelium

Maintenance of clear ocular media:

The main prerequiste for visual function is the maintenance of clear refractive media of the eye.

Physiology of tears:

Tear film plays a vital role in maintaining the transparency of cornea.

Physiology of cornea:

Transparency of cornea;

Nutrition and metabolism of cornea;

Permeability of cornea;

Corneal wound healing.

Physiology of crystalline lens:

Lens transparency;

Metabolic activities of the lens;

Accommodation.

Physiology of aqueous humour and maintenance of intraocular pressure:

In addition to its role in maintaining a proper intraocular pressure it also plays an important metabolic role by providing substrates and removing metabolities from the avascular cornea and the crystalline lens.

Physiology of ocular motility:

- origin and insertion;
- actions;
- types of ocular movements;
- synergists, antagonists and yoke muscles.

Physiology of binocular single vision

Prerequisites for development of binocular single vision:

1. Straight eyes (motor mechanism).
2. Reasonably clear vision in both eyes (sensory mechanism).
3. Ability of visual cortex (mental process).

Grades of binocular single vision:

Grade I — Simultaneous perception;

Grade II — Fusion;

Grade III — Stereopsis.

**Clinical Competencies.** Students should:

– understand basic ocular anatomy;

– describe normal ocular anatomy;

– understand anatomy and function of eyelids, conjunctiva, cornea;

– understand anatomy and function of lens.

– understand definition and function of retina.

**LITERATURE**

***Main***

1. *Khurana, A. K.* Comprehensive Ophthalmology / A. K. Khurana. 4th ed. Published by New Age International (P) Ltd. P. 3–18, 51–54, 89–91, 127–128, 133–135, 167–169, 205–210, 243–244, 249–252, 339–342, 363–364, 377–379.

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2. *Kanski, J. J.* Clinical Ophthalmology / J. J. Kanski. 6th ed. Edinburgh, London, New York, Oxford, Philadelphia, St. Louis, Sydney, Toronto, 2007. P. 1–24, 33–52, 151, 323.

## VISUAL FUNCTIONS (VISUAL ACUITY, VISUAL FIELDS, COLOUR VISION, DARK ADAPTATION, BINOCULAR VISION)

### CLINICAL METHODS IN OPHTHALMOLOGY

**Time:** 3 hours.

**Educational goal:** measure and record principles of distance acuity, correction and understanding of near visual acuity in adults, measure visual fields, colour vision, dark adaptation, binocular vision. Recognize abnormal anatomy and the signs and symptoms of conditions associated with important causes of visual loss, such as macular degeneration, diabetic retinopathy, central retinal artery, and central retinal vein occlusion. Students should know when to refer patients to an ophthalmologist for evaluation of suddenly reduced visual acuity, abnormal fundus appearance, and other abnormal findings associated with dental disease pathology.

Medical students should recognize external and internal ocular structures of the normal human eye and know how to perform a basic eye examination.

**Students should:**

– understand the concept of distance visual acuity testing with and without correction and with a pinhole;

– understand the purpose of measuring near visual acuity with and without correction and testing each eye individually, understand the purpose of measuring other visual functions;

– measure and record near visual acuity in an adult with near correction and understand principles of distance acuity measurement in adults and children;

– perform and evaluate visual fields by confrontation;

– evaluate ocular motility;

– use the direct ophthalmoscope for assessment of red reflex, the optic nerve, and posterior fundus examination;

– dilate the pupils;

– understand conditions which require immediate ophthalmic evaluation, such as sudden vision loss.

**Topics of the seminar classes**

OCULAR EXAMINATION

Testing of visual acuity, visual field, colour vision, dark adaptation, binocular vision.

External ocular examination.

Fundus examination.

I. TESTING OF VISUAL ACUITY

Distant and near visual acuity should be tested separately.

The distant visual acuity (Golovin-Sivcev's test types).

Visual acuity for near (near vision chart)

Visual field testing — confrontation

Visual field defects:

a) scotoma;

b) hemianopia;

c) homonymous hemianopia;

d) bitemporal hemianopia.

Physiology of vision:

function of photoreceptors (rods and cones),

function of visual pathway,

function of visual cortex.

Visual perception:

The light sense (visual adaptation):

Dark adaptation

Light adaptation

Colour sense:

Trichromatic theory of colour vision (Young-Helmholtz theory):

Red sensitive cone pigment, also known as erythrolabe or long wave length sensitive (LWS) cone pigment.

Green sensitive cone pigment, also known as chlorolabe or medium wavelength sensitive (MWS) cone pigmen.

Blue sensitive cone pigment, also known as cyanolabe or short ware length sensitivity (SWS) cone pigment. Extraocular motility — appearance of eyes in primary position and normal motility in six cardinal positions of gaze:

a) Strabismus — ocular alignment in primary position;

b) Limitation of eye movement;

c) Limitation of gaze (both eyes affected similarly);

d) Nystagmus (spontaneous jerking eye movements).

Abilities of visual cortex (mental process).

II. EXTERNAL OCULAR EXAMINATION

A. Inspection in diffuse light

B. Focal (oblique) illumination examination

C. Special examination (tonometry, gonioscopy)

External Inspection:

Students should understand the external ocular anatomy, evaluate the position of the lids, and inspect the conjunctiva, sclera, cornea, and iris with a penlight.

Pupillary Reaction Testing:

Students should measure the pupillary size and assess the direct and consensual pupillary reaction.

Ocular Motility Testing:

Students should understand the importance of ocular motility assessment in the six cardinal positions of gaze and ocular alignment in primary position.

Direct Ophthalmoscopy:

Students should understand the basic function of an ophthalmoscope and should know how to adjust focus. Students should know the importance of the fact which examiner's hand is used to examine the patient's right or left eye.

Pupillary Dilatation:

Students should understand how to dilate the pupils pharmacologically for examination of the ocular fundus.

Intraocular Pressure Measurement:

Students should understand the concept of intraocular pressure assessment, but are not expected to measure intraocular pressure with a tonometer.

Anterior Chamber Depth Assessment:

Students should understand how to assess anterior chamber depth with a focal beam or penlight held at an oblique angle to the optical axis.

Upper Lid Eversion:

Students should know how to evert the upper lid and examine it for presence of foreign bodies.

Fluorescein Staining of the Cornea:

Students should know how to apply topical fluorescein and interpret staining of the cornea to detect corneal epithelial defects.

Examination of the normal eye with direct ophthalmoscopy:

1. Red reflex.
2. Optic disc.
3. Retinal arterioles and venules.
4. Posterior retina and choroid.

Fundus features of important ocular diseases:

a) retinoblastoma
b) retinal detachment
c) age-related macular degeneration

When it is necessary to refer patients to an ophthalmologist:

a) abnormal red reflex or fundus;
b) visual loss or symptoms consistent with a vitreoretinal disorder.

Basics of magnetic resonance imaging (MRI) and computerized tomography (CT) scanning.

**Clinical Competencies.** Students should:

– understand important causes of decreased vision, abnormal fundus appearance, and abnormal findings that require referral of the patient to an ophthalmologist for evaluation;

– perform the test of ductions and versions and recognize acute onset cranial nerve palsies III, IV, VI which require immediate referral;

– understand importance of dilated fundus exam;
– understand definition and importance of retinal detachment;
– know physiology of the eye and vision;
– know theories of colour vision.

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## OPTICS AND REFRACTION, ACCOMMODATION

**Time:** 2 hours.

**Educational goal.** Students should understand that the human eye is an optical system and understand the principles of common refractive errors, such as myopia, hyperopia, astigmatism, and presbyopia. Students should understand the normal anatomy of the extraocular muscles and normal ocular alignment. Students should understand the principles of abnormal ocular alignment, such as exotropia and esotropia, and the risk of amblyopia in children.

Students should understand the eye as an optical system and should know how refractive surgery corrects common refractive errors of emmetropia, myopia, hyperopia, and astigmatism.

**Topics of seminar**

A. Refraction States (as it affects direct ophthalmoscopy).

Emmetropia

Myopia

Hyperopia

Astigmatism

Presbyopia and accommodation. Average Accommodative Amplitudes for different ages.

B. Spectacle correction.

Spherical lenses.

Bifocals, trifocals, multi-focal lenses (progressive lenses).

C. Special lens material.

Plastic.

Impact resistant high index plastic.

Polycarbonate lens.

D. Contact lenses.

Clinically important features of contact lens:

Optics.

Field of vision.

Image size.

Hard contact lens.

Flexible contact lens.

Therapeutic contact lens.

E. Intraocular lens.

Concept of correcting the refractive error caused by cataract removal.

F. Refractive surgery.

Concept of correcting myopia and hyperopia.

G. Patients with low vision.

Understand that patients may benefit from low vision aids.

Understand that patients may need special rehabilitation with low vision optical devices.

A. Refractive errors.

Myopia — long eye, steep cornea, or both.

Hyperopia — short eye, flat cornea, or both.

Astigmatism — uneven curvature of cornea.

Presbyopia — inability to focus at near due to aging.

B. Types of surgical techniques to correct refractive errors.

Incision — weaken cornea structurally to change curvature.

Lamellar — change cornea shape with addition or removal of tissue.

Thermal — shrink corneal collagen to steepen or flatten the anterior corneal curvatures.

Intraocular lens implantation with or without removal of crystalline lens.

C. Newer procedures — with excimer laser.

Photorefractive keratectomy (PRK).

Laser in situ keratomileusis (LASIK).

D. Effectiveness of refractive surgery.

Continual improvement.

LASIK may be more predictable than radial keratotomy.

Uncorrected visual acuity of 20/40 or better in most patients.

E. Risks associated with refractive surgery.

Infection.

Loss of best-corrected visual acuity.

Overcorrection, under correction, regression to baseline refractive status.

Visual aberrations such as glare and halos.

F. Success in refractive surgery depends on:

Careful preoperative evaluation.

Exclusion of systemic diseases and eye disorders that may be contraindicated.

**Clinical Competencies.** Students should:

– understand emmetropia, myopia, hyperopia, astigmatism, and presbyopia;

– measure near central acuity in adults with a near card and understand measurement of acuity in children with Allen cards or the tumbling E card test;

– understand optical principles of contact lens, intraocular lens, and refractive surgery;

– understand the need for low vision rehabilitation;

– describe refractive surgical theory and practice;

– understand risks and benefits of commonly discussed and performed refractive procedures.

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# SPECIAL OPHTHALMOLOGY

## DISEASES OF THE EYELIDS, CONJUNCTIVA AND LACRIMAL SYSTEM

**Time:** 3 hours.

**Educational goal.** Students should understand the normal anatomy of the adnexal structures and the presenting signs and symptoms of serious conditions associated with ocular and systemic morbidity.

Students should know the signs and symptoms of common causes of diseases of the eyelids, conjunctiva and lacrimal system. Students should also know which corneal and external related conditions require immediate referral to an ophthalmologist.

**Topics of seminar**

A. Eyelid.

1. Examination and Technique:

a) assess the position of the upper eyelid by measuring the distance between the lid margin and the corneal light reflex (margin-reflex distance);

b) visual inspection of eyelids and periocular area.

2. Normal anatomy:

a) anterior and posterior lamellae;

b) lid margin;

c) orbital septum relationship to eyelid/orbit;

d) eyebrow;

e) levator aponeurosis;

f) blood supply — internal and external carotid circulation;

g) sensory supply — V1 and V2;

h) motor supply — cranial nerve III, cranial nerve VII, and upper eye lid sympathetic innervations.

3. Eyelid Diseases:

a) malpositions:

– blepharoptosis;

– dermatochalasis;

– entropion;

– ectropion;

– lagophthalmos;

b) inflammations:

– chalazion;

– blepharitis;

– meibomitis;

c) infections:

– hordeolum;

– preseptal cellulitis;

– orbital cellulitis;
– herpes Zoster ophthalmicus;
d) tumors:
– benign;
– cysts;
– nevi;
– papillomas;
– xanthelasma;
– malignant (basal cell carcinoma, squamous cell carcinoma);
e) eyelid trauma.
4. Position of the eyelids:
a) normal lid position;
b) upper eyelid retraction;
c) upper eyelid ptosis.
B. Lacrimal System.
1. Examination technique. Visual inspection of medial canthal area
2. Anatomy
a) upper lacrimal system — puncta, canaliculi, and lacrimal sac;
b) lower lacrimal system — bony and mucosal nasolacrimal duct.
3. Lacrimal diseases:
a) congenital nasolacrimal duct obstruction;
b) acquired nasolacrimal duct obstruction;
c) dacryocystitis;
d) lacrimal trauma.
C. Inflammation of the conjunctiva (conjunctivitis).
1. Infective conjunctivitis: bacterial, chlamydial, viral, fungal, rickettsial, spirochaetal, protozoal, parasitic etc.
2. Allergic conjunctivitis.
3. Irritative conjunctivitis.
4. Keratoconjunctivitis associated with diseases of skin and mucous membrane.
5. Traumatic conjunctivitis.
6. Keratoconjunctivitis of unknown etiology.
Clinical classification
Differential diagnosis
Complications
Treatment
Trachoma (previously known as Egyptian ophthalmia)
Etiology:
Serotypes A, B, Ba and C are associated with hyperendemic (blinding) trachoma;

Serotypes D-K are associated with paratrachoma (oculogenital chlamydial disease).

A. Conjunctival signs:

1. Congestion.
2. Conjunctival follicles.
3. Papillary hyperplasia.
4. Conjunctival scarring.
5. Concretions (glands of Henle).

B. Corneal signs:

1. Superficial keratitis.
2. Herbert follicles.
3. Pannus (progressive pannus, regressive pannus).
4. Corneal ulcer.
5. Herbert pits.
6. Corneal opacity.

Degenerative conditions of conjunctive

Pinguecula

Pterygium (surgical technique of pterygium excision)

Concretions

Symptomatic conditions of conjunctive

Hyperaemia of conjunctiva

Chemosis of conjunctiva

Ecchymosis of conjunctiva

Xerosis of conjunctiva

Discoloration of conjunctiva

**Clinical Competencies.** Students should:

– understand structure and function of eyelids, commonly associated malpositions, and acquired disorders;

– determine if ptosis is present;

– understand tear production and drainage;

– determine if redness is associated with conjunctive hyperemia;

– assess conjunctival discharge;

– understand findings that are associated with serious ocular conditions that require immediate ophthalmic care.

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## DISEASES OF THE CORNEA, SCLERA

**Time:** 4 hours.

**Educational goal.** Students should know anatomy and physiology: applied anatomy, applied physiology, applied histology of the cornea and sclera; clinical signs inflammations of the cornea: ulcerative keratitis, non-ulcerative keratitis, superficial, deep; which corneal conditions require immediate referral to an ophthalmologist.

**Topics of seminar**

Inflammations of the cornea

1. Infective keratitis
    a) Bacterial
    b) Viral
    c) Fungal
    d) Chlamydial
    e) Protozoal
    f) Spirochaetal
2. Allergic keratitis
    a) Phlyctenular keratitis
    b) Vernal keratitis
    c) Atopic keratitis
3. Trophic keratitis
    a) Exposure keratitis
    b) Neuroparalytic keratitis
    c) Keratomalacia
    d) Atheromatous ulcer
4. Keratitis associated with diseases of skin and mucous membrane.
5. Corneal ulcer associated with systemic collagen vascular diseases.
6. Traumatic keratitis, which may be due to mechanical trauma, chemical trauma, thermal burns, radiations.
7. Idiopathic keratitis e.g.,
    a) Mooren's corneal ulcer
    b) Superior limbic keratoconjunctivitis
    c) Superficial punctate keratitis of Thygeson

Hypopyon corneal ulcer:

Treatment:

1. The specific treatment
    a) Topical antibiotics
    b) Systemic antibiotics

2. Non-specific treatment

a) Cycloplegic drugs;

b) Systemic analgesics and anti-inflammatory drugs;

c) Vitamins (A, B-complex and C).

3. Physical and general measures

a) Hot fomentation;

b) Dark goggles;

c) Rest, good diet and fresh air.

Viral corneal ulcers

Herpes simplex keratitis (Primary herpes, Recurrent herpes)

1. Epithelial herpetic keratitis

a) Punctate epithelial keratitis

b) Dendritic ulcer

c) Geographical ulcer

Treatment of epithelial keratitis

I. Specific treatment

a) Antiviral drugs (Aciclovir)

b) Mechanical debridement

II. Non-specific supportive therapy.

2. Stromal keratitis

a) Disciform keratitis

b) Diffuse stromal necrotic keratitis

Treatment (steroid eye drops, aciclovir 3 % ointment).

Keratoplasty.

3. Metaherpetic keratitis (Epithelial sterile trophic ulceration)

Treatment

a) Lubricants (artificial tears)

b) Lid closure (tarsorrhaphy).

Protozoal keratitis (Acanthamoeba keratitis).

Etiology

1. Contact lens wearers using home-made saline.

2. Other situations include mild trauma associated with contaminated vegetable matter, salt water diving.

3. Opportunistic infection in patients with herpetic keratitis, bacterial keratitis, bullous keratopathy and neuroparalytic keratitis.

Keratitis associated with diseases of skin and mucous membrane (Rosacea keratitis).

Superficial punctate keratitis (SPC).

Causes

1. Viral infections are the chief cause.

2. Chlamydial infections include trachoma.

3. Toxic lesions e.g., due to staphylococcal toxin.

4. Trophic lesions e.g., exposure keratitis and neuroparalytic keratitis.
5. Allergic lesions e.g., vernal keratoconjunctivitis.
6. Irritative lesions e.g., effect of some drugs.
7. Disorders of skin and mucous membrane (acne rosacea, pemphigoid).
8. Dry eye syndrome, i.e., keratoconjunctivitis sicca.
9. Specific type of idiopathic SPK e.g., Thygeson's punctate keratitis.
10. Photo-ophthalmitis.

Filamentary keratitis

Interstitial keratitis:

Syphilitic interstitial keratitis:

1. Initial progressive stage;
2. Florid stage;
3. Stage of regression.

Corneal dystrophies:

I. Anterior dystrophies (superficial dystrophies);
II. Stromal dystrophies;
III. Posterior dystrophies.

Ectatic conditions of cornea:

Keratoconus (conical cornea);
Keratoglobus;

Keratoconus posterior.

Keratoplasty (corneal grafting or corneal transplantation).

DISEASES OF THE SCLERA

Episcleritis.

Scleritis: I. Anterior scleritis (98 %)

1. Non-necrotizing scleritis (85 %)
2. Necrotizing scleritis (13 %)
   a) with inflammation
   b) without inflammation (scleromalacia perforans)

II. Posterior scleritis (2 %)

Blue sclera.

Staphyloma of the sclera.

Abnormalities of cornea: transparency, corneal oedema, corneal opacity, corneal vascularization.

**Clinical Competencies.** Students should:

- know the characteristic features of bacterial corneal ulcer;
- know the complications of corneal ulcer;
- know the clinical features of perforation of corneal ulcer;
- understand the predisposing stress stimuli which trigger an attack of herpetic keratitis;
- know which antiviral drug is effective for viral keratitis;

- treatment methods of a corneal opacity;
- examination for corneal epithelial defect with fluorescein;
- know the characteristic features of episcleritis.

**LITERATURE**

***Main***

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***Additional***

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## LENS AND CATARACT. DISEASES OF THE LENS

**Time:** 2 hours.

**Educational goal.** Students should recognize the symptoms and ophthalmic signs of cataract as a cause of decreased central visual acuity. They should understand the general principles of cataract surgery and correction of aphakia with intraocular lenses, contact lenses, or aphasic spectacles.

**Topics of seminar**

Anatomy of lens.

Intraocular location of lens behind the iris plane.

Optical clarity of normal lens.

Suspension of normal lens in retroiridic position by zonules.

Suspensory ligaments of lens (Zonules of Zinn).

Applied physiology and biochemistry crystalline lens:

- Lens transparency.
- Metabolic activities of the lens.
- Accommodation.

Development of an opacity in the lens is known as cataract.

Etiological classification

I. Congenital and developmental cataract

II. Acquired cataract

1. Senile cataract
2. Traumatic cataract
3. Complicated cataract
4. Metabolic cataract
5. Electric cataract
6. Radiational cataract

7. Toxic cataract:
   a) Corticosteroid-induced cataract
   b) Miotics-induced cataract
   c) Copper (in chalcosis) and iron (in siderosis) induced cataract.
8. Cataract associated with skin diseases (Dermatogenic cataract).
9. Cataract associated with osseous diseases.
10. Cataract with miscellaneous syndromes (Down's syndrome).

Capsular cataract.
Subcapsular cataract.
Cortical cataract.
Supranuclear cataract.
Nuclear cataract.
Symptoms attributable to cataract:
   Slowly progressive blurring of vision;
   Painless progressive loss of vision.
Senile cataract («age-related cataract»)
Etiology of senile cataract.
Stages of maturation of the cortical type of senile cataract:
1. Stage of lamellar separation.
2. Stage of incipient cataract.
3. Immature senile cataract (ISC).
4. Mature senile cataract (MSC).
5. Hypermature senile cataract (HMSC):
   a) Morgagnian hypermature cataract;
   b) Sclerotic type of hypermature cataract (iridodonesis).

Clinical features senile cataract – symptoms:
1. Glare.
2. Uniocular polyopia (i.e., doubling or trebling of objects).
3. Coloured halos.
4. Black spots in front of eyes.
5. Image blur, distortion of images and misty vision.
6. Loss of vision.

Examination of the lens by direct ophthalmoscopy.
Evaluation of red reflex.
Abnormal lens features by direct ophthalmoscopy.
Complications of senile cataract
1. Phacoanaphylactic uveitis.
2. Lens-induced glaucoma.
3. Subluxation or dislocation of lens.

Treatment of cataract.
- Surgical removal of lens (cataract extraction).
- Implantation of artificial lens in eye.

When to refer patient to an ophthalmologist.

1. Examination reveals abnormal red reflex, lens clouding, or opacity.
2. Patient reports progressive visual loss or blurring.

**Clinical Competencies.** Students should:

– diagnose cataract (definition and symptoms, red reflex, slit lamp findings);

– describe management of cataract: surgery; intraocular lens;

– know complications of cataract.

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## DISEASES OF THE UVEAL TRACT

**Time:** 5 hours.

**Educational goal.** Students should recognize the symptoms and ophthalmic signs of inflammations (uveitis): general considerations, anterior uveitis, posterior uveitis, endophthalmitis and panophthalmitis.

Perform examination of anterior segment for acute or chronic uveitis (slit lamp, magnifying lens); identification of ciliary injection, keratic precipitates, inflammatory cells, flare, fibrin, hypopyon, iris nodules, and anterior or posterior synechiae.

**Topics of seminar**

Congenital anomalies of uveal tract
Heterochromia of iris
Albinism
Corectopia
Polycoria
Congenital aniridia
Persistent pupillary membrane
Coloboma of the iris, coloboma of the choroid
Uveitis

Anatomical classification

1. Anterior uveitis.
2. Intermediate uveitis.
3. Posterior uveitis.
4. Panuveitis.

Clinical classification

1. Acute uveitis (Iritis and Iridocyclitis)
2. Chronic uveitis (Iritis and Iridocyclitis).

Pathological classification

1. Suppurative or purulent uveitis.
2. Non-suppurative uveitis.

Etiological (Duke Elder□S) classification

1. Infective uveitis
2. Allergic uveitis
3. Toxic uveitis
4. Traumatic uveitis
5. Uveitis associated with non-infective systemic diseases
6. Idiopathic uveitis

Iris, Ciliary Body, Choroid.

Choroiditis.

Sympathetic Ophthalmia.

Signs and symptoms of anterior, intermediate, and posterior uveitis.

Infective uveitis:

a) exogenous infection (following penetrating injuries, perforation of corneal ulcer and postoperatively (after intraocular operations);

b) secondary infection (from neighbouring structures: conjunctivitis, keratitis, scleritis, retinitis, orbital cellulitis and orbital thrombophlebitis);

c) endogenous infections (caused by the entrance of organisms from some source situated elsewhere in the body, by way of the bloodstream) – play important role in the inflammations of uvea.

Allergic (hypersensitivity linked) uveitis:

a) Microbial allergy.

b) Anaphylactic uveitis.

c) Atopic uveitis.

- Autoimmune uveitis (Still's disease, rheumatoid arthritis, Wegener's granulomatosis, systemic lupus erythematosus, Reiter's disease)
- HLA-associated uveitis (HLA-B27: ankylosing spondylitis, Reiter's syndrome; HLA-B5: Uveitis in Behcet's disease; HLA-DR4 and DW15: Vogt Koyanagi Harada's disease).

Anterior uveitis (Iridocyclitis)

Clinical features

Symptoms:

1. Pain
2. Redness.
3. Photophobia and blepharospasm.
4. Lacrimation.
5. Defective vision.

Signs of uveitis (slit lamp biomicroscopic examination):

- Lid oedema;
- Circumcorneal congestion;
- Corneal signs: corneal oedema, keratic precipitates (KPs) and posterior corneal opacities.
- Anterior chamber signs: aqueous cells; aqueous flare; hypopyon (sterile pus in the anterior chamber); hyphaema (blood in the anterior chamber); changes in depth and shape of anterior chamber; changes in the angle of anterior chamber.
- Iris signs: loss of normal pattern; changes in iris colour; iris nodules (Busacca nodule; Koeppe nodule); posterior synechiae; neovascularsation of iris (rubeosis iridis).
- Pupillary signs: narrow pupil; irregular pupil shape; ectropion pupillae (evertion of pupillary margin); pupillary reaction; occlusion pupillae; seclusio pupillae.
- Changes in the lens: pigment dispersal; exudates; complicated cataract.
- Change in the vitreous.

Complications and sequelae of uveitis:

1. Complicated cataract.
2. Secondary glaucoma.
3. Cyclitic membrane (fibrosis of exudates present behind the lens).
4. Choroiditis.
5. Retinal complications.
6. Papillitis.
7. Band-shaped keratopathy.
8. Phthisis bulbi.

Differential diagnosis:

1. Acute red eye.
2. Granulomatous versus non-granulomatous uveitis: non-granulomatous associated systemic diseases (juvenile rheumatoid arthritis, Reiter's syndrome, Behcet's disease); granulomatous (associated diseases – sarcoidosis, tuberculosis, fungal).
3. Etiological differential diagnosis.

Treatment of iridocyclitis:

I. Non-specific treatment:

a) Local therapy:

1. Mydriatic-cycloplegic drugs.
2. Corticosteroids.
3. Broad spectrum antibiotic drops.

b) Systemic therapy:

1. Corticosteroids.

2. Non-steroidal anti-inflammatory drugs (NSAIDS).
3. Immunosuppressive drugs.

c) Physical measures:

1. Hot fomentation.
2. Dark goggles.

II. Specific treatment of the cause.

III. Treatment of complications:

1. Inflammatory glaucoma (hypertensive uveitis).
2. Post-inflammatory glaucoma.
3. Complicated cataract.
4. Retinal detachment.
5. Phthisis bulbi

Uveal melanoma.

1. Most common primary intraocular malignancy.
2. Variants: a) iris; b) ciliary body; c) choroidal.
3. Clinical presentation: a) asymptomatic vs. symptomatic;
b) pigmented vs. amelanotic.
4. Prognosis: a) size; b) cell type.
5. Treatment: a) non-surgical; b) surgical (enucleation).
6. Differential diagnosis: a) choroidal nevus; b) metastasis to eye;
c) retinal detachment.

**Clinical Competencies.** Students should:

– know the common causes of acute anterior uveitis;
– know the differential diagnosis of acute iridocyclitis;
– define keratic precipitates;
– define synechiae; describe their types;
– define seclusio pupillae, occlusio pupillae and iris bombe;
– know the causes of diminution of vision in a patient with iridocyclitis;
– know complications of iridocyclitis;
– know treatment of iridocyclitis;
– know the most common cause of central choroiditis;
– have an idea at what stage vitrectomy operation should be performed in a patient with endophthalmitis.

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## GLAUCOMA

**Time:** 4 hours.

**Educational goal.** Students should understand the anterior segment anatomy and understand the circulation of aqueous humor in the normal human eye and in primary open angle glaucoma and primary angle closure glaucoma. Students should recognize the risk factors, signs, and symptoms of primary open angle glaucoma and angle closure glaucoma.

**Topics of seminar**

A. Anatomy.

1. Aqueous humor:

a) production: ciliary body;

b) circulation: movement from posterior chamber through pupil into anterior chamber;

c) outflow pathway:

– trabecular meshwork in anterior chamber angle;

– uveoscleral outflow tract.

2. Optic Nerve.

«Glaucoma may be defined as an optic neuropathy usually with characteristic optic nerve head and visual field changes».

Injury to axons from retinal ganglion cells at lamina cribrosa.

Signs of optic nerve injury.

Increased size of the central cup.

Asymmetric cupping.

3. Organization of axons and associated visual field defects.

B. Examination.

1. Central visual acuity measurement.

2. Visual field testing:

a) confrontation testing with finger counting in four quadrants of each eye;

b) central color testing — red top bottle.

3. Pupillary reaction.

Relative afferent pupillary defect (RAPD) as a sign of unilateral optic nerve injury.

4. Penlight examination.

Anterior chamber depth estimation:

a) normal;

b) narrow.

5. Intraocular pressure:

a) applanation tonometry;

b) normal value range. Direct ophthalmoscopy to reveal the signs of glaucomatous optic neuropathy.

C. How to interpret history and risk factors.

1. Primary open angle glaucoma:

a) risk factors:

– increased intraocular pressure;

– African and Caribbean ancestry;

– age greater than 60 years;

– primary family member with glaucoma;

b) genetic influence: GLC1A (myocilin gene) juvenile open angle glaucoma;

c) symptoms: lack of symptoms until late in disease.

2. Normal tension glaucoma:

a) optic nerve injury and visual field loss similar to primary open angle glaucoma;

b) not associated with elevated intraocular pressure.

3. Primary angle closure glaucoma:

a) risk factors:

– anatomically narrow anterior chamber angle;

– hyperopia;

– dilating drops in eyes with narrow angles;

– anti-cholinergic medications;

– older age;

– some Asian populations;

b) symptoms:

– ocular pain (may be severe);

– ocular redness;

– blurred vision, colored halos, nausea;

c) signs:

– dilated fixed pupil;

– narrow anterior chamber angle;

– pupillary block;

– corneal edema.

D. Pharmacological treatment for open angle glaucoma.

1. Topical medications that increase aqueous humor outflow:

a) parasympathomimetics;

b) prostaglandin analogues.

2. Medications that decrease aqueous production:

a) topical beta blockers;

b) oral carbonic anhydrase inhibitors;

c) alpha-2-agonists;

d) adrenergic agonists.

E. Surgical treatment.

1. Primary acute angle closure glaucoma. Peripheral iridectomy.

2. Primary open angle glaucoma:
   a) laser trabeculoplasty;
   b) filtering surgery.

**Clinical Competencies.** Students should:

– obtain history to determine risk factors for primary open angle glaucoma;

– perform confrontation visual field testing in four quadrants for each eye;

– diagnose primary acute angle closure glaucoma by history and penlight examination;

– recognize signs of optic nerve injury: increased and asymmetric cupping.

– know normal values of intraocular pressure;
– know glaucomatous field defects;
– prescribe treatment for primary open-angle glaucoma.

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## OCULAR TRAUMA. MECHANICAL INJURIES

**Time:** 3 hour.

**Educational goal.** Students should know the effects of the eye and ocular adnexae trauma; recognize the symptoms and ophthalmic signs of mechanical injuries: extraocular foreign bodies, blunt trauma, perforating injuries, perforating injuries with retained intraocular foreign bodies, sympathetic ophthalmitis.

Students should understand the signs and symptoms of ocular conditions that are associated with traumatic conditions, management of penetrating eye trauma and chemical injury to the eye. Take a history in a case of eye trauma. Examination Methods. Classification of Ocular Injuries by the Mechanism of Injury.

**Topics of seminar:**

Mechanical ocular injuries:

– Retained extraocular foreign bodies;
– Blunt trauma (contusional injuries);
– Penetrating and perforating injuries;
– Penetrating injuries with retained intraocular foreign bodies.

1. Closed-globe injury — contusion; lamellar laceration.
2. Open-globe injury — rupture; laceration:

Extraocular foreign bodies

Complications after extraocular foreign body.

Treatment of extraocular foreign bodies:

- removal of conjunctival foreign body;
- removal of corneal foreign body;

Blunt trauma

A. Closed-globe injury

I. Cornea:
1. Simple abrasions.
2. Recurrent corneal erosions (recurrent keractalgia).
3. Partial corneal tears (lamellar corneal laceration).
4. Blood staining of cornea.
5. Deep corneal opacity.

II. Sclera.

III. Anterior chamber:
1. Traumatic hyphaema (blood in the anterior chamber).
2. Exudates.

IV. Iris, pupil and ciliary body:
1. Traumatic miosis.
2. Traumatic mydriasis (Iridoplegia).
3. Rupture of the pupillary margin.
4. Radiating tears in the iris stroma.
5. Iridodialysis.
6. Traumatic aniridia.
7. Angle recession.
8. Inflammatory changes.

V. Lens:
1. Vossius ring.
2. Concussion cataract
3. Traumatic absorption of the lens.
4. Subluxation of the lens.
5. Dislocation of the lens.

VI. Vitreous
1. Liquefaction and appearance of clouds.
2. Detachment.
3. Vitreous haemorrhage.
4. Vitreous herniation in the anterior chamber.

VII. Choroid
1. Rupture of the choroid.
2. Choroidal haemorrhage.

3. Choroidal detachment.
4. Traumatic choroiditis.

VIII. Retina

1. Commotio retinae (Berlin's oedema)
2. Retinal haemorrhages.
3. Traumatic proliferative retinopathy (Retinitis proliferans).
4. Retinal detachment.
5. Concussion changes at macula.
6. Purtscher's Retinopathy.

IX. Intraocular pressure changes in closed-globe injury

1. Traumatic glaucoma.
2. Traumatic hypotony.

X. Traumatic changes in the refraction

1. Myopia may follow ciliary spasm or rupture of zonules or anterior shift of the lens.

2. Hypermetropia and loss of accommodation may result from damage to the ciliary body (cycloplegia).

Penetrating and perforationg injuries

Intraocular foreign bodies (IOFB)

Siderosis bulbi.

Chalcosis.

Localization of IOFB

- Radiographic localization
- Limbal ring method
- Ultrasonographic localization
- CT scan

Treatment of IOFB - removal of IOFB

- Magnetic foreign body
- Non-magnetic foreign body

Sympathetic ophthalmitis

Etiology

Pathogenesis (allergic theory).

Treatment

**Clinical Competencies.** Students should:

- know common sites for retention of an extraocular foreign body;
- know how to remove a corneal foreign body;
- effects of a perforating ocular injury;
- clinical manifestations of siderosis and chalcosis bulbi;
- methods of localizing an intraocular foreign body (IOFB);
- know what is sympathetic ophthalmitis.

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## NON-MECHANICAL INJURIES. CHEMICAL, THERMAL, ELECTRICAL, RADIATIONAL INJURIES

**Time:** 2 hours.

**Educational goal.** Students should recognize the symptoms and ophthalmic signs of non-mechanical injuries: chemical injuries (acid burns, alkali burns); thermal injuries; electrical injuries; radiation injuries: ultraviolet radiations, infrared radiations, ionizing radiation injuries.

**Topics of seminar:**

Chemical injuries (modes of injury):

A. Alkali burns:

Clinical picture:

1. Stage of acute ischemic necrosis.
2. Stage of reparation.
3. Stage of complications.

B. Acid burns

1. Conjunctiva.
2. Cornea.

Grading of chemical burns:

I. Epithelial damage only.

II. Hazy but iris details visible.

III. Total epithelial loss, stromal haze and iris details not visible.

IV. Opaque, no view of the iris and pupil.

Treatment of chemical burns:

1. Immediate and thorough wash.
2. Chemical neutralization.
3. Mechanical removal of contaminant.
4. Removal of contaminated and necrotic tissue.
5. Maintenance of favourable conditions – topical atropine.
6. Prevention of symblepharon.
7. Treatment of complications (secondary glaucoma, corneal opacity and symblepharon).

Thermal injuries

Electrical injuries

Radiation injuries

1. Ultraviolet radiations.
   a) photo-ophthalmia.
   b) senile cataract.
2. Infrared radiations.
   Photoretinitis (solar retinopathy or eclipse retinopathy)
   Causes of photic retinopathy (welding arc exposure, lightening retinopathy, retinal phototoxicity cased by ophthalmic instruments, such as operating microscope).
   Pathogenesis solar radiations
   Photochemical effects produced by UV and visible blue light
   Thermal effects
   Clinical features (symptoms, signs).
   Treatment
   Prognosis
3. Ionizing radiation injuries.
   1) radiation keratoconjunctivitis;
   2) radiation dermatitis of lids;
   3) radiation cataract.

**Clinical Competencies.** Students should know:

- mechanisms of damage produced by alkalies burn;
- clinical picture of alkalies burns;
- grading of chemical burns;
- why alkali burns are more serious than the acid burns;
- treatment of chemical burns;
- effects of ultraviolet radiations on the eye;
- clinical picture of ultraviolet keratoconjunctivitis;
- effects of infra-red radiations on the eye.

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## OPHTHALMO-DENTAL SYNDROMES

**Time:** 2 hours.

**Educational goal.** Students should recognize the symptoms and ophthalmic signs of ophthalmo-dental syndromes; ganglionitis (ciliary ganglionitis; naso-ciliary ophthalmia); neurofibromatosis; Mikulicz syndrome; Behcet's disease;

Stevens-Johnson syndrome; Sjogren's disease. Rare ophthalmo-dental syndromes: Weill-Marchesani Syndrome, Oral-palpebrale synkinesia of Zoldan.

**Topics of seminar:**

Ganglionitis (ciliary ganglionitis; naso-ciliary ophthalmia):

It is one of four parasympathetic ganglia of the head and neck. (The others are the submandibular ganglion, pterygopalatine ganglion, and otic ganglion).

Diseases of the ciliary ganglion produce a tonic pupil. This is a pupil that does not react to light (it is «fixed») and has an abnormally slow and prolonged response to attempted near vision (accommodation).

Sjogren's syndrome:

- autoimmune chronic inflammatory disease.
- occurs in women between 40 and 50 years of age.
- main feature keratoconjunctivitis sicca (KCS).

Primary Sjogren's syndrome - sicca complex:

1. combination of KCS and;
2. xerostomia (dryness of mouth).

Secondary Sjogren's syndrome:

1. dry eye and/or dry mouth;
2. autoimmune disease, commonly rheumatoid arthritis.

Pathological features Sjogren's syndrome:

- focal accumulation and infiltration by lymphocytes and plasma cells;
- destruction of lacrimal and salivary glandular tissue.

Mikulicz's syndrome:

- bilaterally symmetrical
- enlargement of the lacrimal and salivary glands
- associated with a variety of systemic diseases:
    a) leukaemias
    b) lymphosarcomas
    c) benign lymphoid hyperplasia
    d) Hodgkin's disease
    e) sarcoidosis
    f) tuberculosis.

Stevens-Johnson syndrome:

- acute illness often caused by hypersensitivity to drugs, particularly
- sulphonamides;
- acute ulceration of the conjunctiva and other mucous membranes (mouth and vagina);
- conjunctival ulceration (cicatrizing conjunctivitis);
- idiopathic multisystem disease clinical picture is similar to that of ocular pemphigoid.

Neurofibromatosis (Neurofibroma):

– lids and orbits are commonly affected in neurofibromatosis (von Recklinghausen's disease);

– the tumour is usually of plexiform type.

Behcet's disease - idiopathic multisystem disease:

– recurrent, non-granulomatous acute iritis with hypopyon;

– aphthous stomatitis (canker like mouth ulcers);

– genital ulcerations;

Etiology — it is still unknown; affects the young men; positive for HLA-B51.

Treatment — corticosteroids; chlorambucil.

Rare ophthalmo-dental syndromes:

Weill-Marchesani Syndrome: spherophakia-brachymorphia syndrome, congenital mesodermal dystrophy.

Oral-palpebrale synkinesia of Zoldan: lifting upper eyelid with ptosis when opening the mouth and lowering of the eyelid when closing the mouth. **Cause:** lesion of the brain stem with dysfunction of the oculomotor, trigeminal and facial nerves.

**Clinical Competencies.** Students should:

– recognize the ophthalmic manifestations of the Mikulich syndrome;

– identify the changes of the visual organs and determine the ophthalmic manifestations of the Stevens-Johnson syndrome;

– describe the ophthalmic manifestations of the disease Sjogren;

– establish the clinical manifestations of the ciliary ganglionitis;

– identify the signs of a naso-ciliary ophthalmia.

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