

## TIREOTOKSIKOZ FONIDA KO‘Z OLMASINING KLINIK MORFOLOGIK XUSUSIYATLARI (ADABIYOTLAR TAHLILI)

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**Annotatsiya. Dolzarbligi.** Butun jahon so‘g‘liqni saqlash tashkiloti (BJSST) statistik ma‘lumotlariga ko‘ra dunyo aholisi orasida endokrin patologiya hisoblangan qalqonsimon bez kasalliklari tarqalishi jihatidan qandli diabetdan keyingi ikkinchi o‘rinda turadi. Tireotoksikoz butun dunyo bo‘ylab voyaga yetgan aholining 2,5 foizida, shuningdek ayollar o‘rtasida tireotoksikoz kasalligi erkaklarga nisbatan 10 baravar ko‘p kuzatiladi. **Tadqiqot maqsadi.** Keyingi 10–15 yil mobaynida tireotoksikoz kasalligida ko‘rish a‘zolarida kuzatiladigan o‘zgarishlar to‘g‘risidagi ma‘lumotlarni o‘z ichiga olgan ilmiy adabiyotlar tahlilini o‘tkazish. **Material va usullar.** Respublikamizda va chet ellardagi nufuzli nashrlarda chop etilgan ilmiy maqolalar hamda ilmiy axborot resurs manbalaridan foydalanilgan holda ularni o‘rganish. **Natijalar va xulosa.** Endokrin oftalmopatiya tashxisli bemorlarda UTT, KT va MRT diagnostik tekshiruvlari ko‘z olmasi va orbita yumshoq to‘qimalarining morfologik xususiyatlarini o‘rgnish va mazkur patologiyani erta bosqichlarda aniqlash imkonini beradi. Tekshiruv turlari ichida UTT inson tanasiga salbiy ta‘sirining yo‘qligi va informativ metod sifatida klinik amaliyotda keng foydalanishga tavsiya etilishi mumkin.

**Kalit so‘zlar:** endokrin oftalmopatiya (EOP), distireoid optik neyropatiya (DON), periorbital to‘qimalar, ekstraokulyar mushaklar, tireotoksik ekzoftalm, tireoid assotsirlangan orbitopatiya (TAO), ultratovush tekshiruvi, OKT-optik kogerent tomografiya.

### Iqtibos uchun:

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## КЛИНИКО-МОРФОЛОГИЧЕСКАЯ ХАРАКТЕРИСТИКА ГЛАЗА НА ФОНЕ ТИРОТОКСИКОЗА (ОБЗОР ЛИТЕРАТУРЫ)

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**Аннотация. Актуальность.** По данным Всемирной организации здравоохранения (ВОЗ), заболевания щитовидной железы, которые считаются эндокринной патологией, являются вторым по распространенности заболеванием после диабета. Тиреотоксикоз встречается во всем мире у 2,5% взрослого населения, также тиреотоксикоз в 10 раз чаще встречается у женщин, чем у мужчин. **Цель исследования.** Проведение анализа научной литературы, содержащей сведения об изменениях, наблюдающихся в органе зрения при тиреотоксикозе в течение ближайших 10–15 лет. **Материал и методы.** Изучение научных статей опубликованных в авторитетных изданиях в нашей республике и за рубежом, а также базу данных научно-информационных ресурсов. **Результаты и заключение.** Диагностические исследования такие как ультразвуковое исследование (УЗИ), компьютерная томография (КТ) и магнитно резонансная томография (МРТ) у пациентов с эндокринной офтальмопатией позволяют изучить морфологические особенности мягких тканей глазного яблока и орбиты, а также способствуют выявить эту патологию на ранних стадиях заболевания. Среди видов обследования УЗИ может быть рекомендовано для широкого использования в клинической практике как информативный метод и ввиду отсутствия негативного воздействия на организм человека.

**Ключевые слова:** эндокринная офтальмопатия (ЭОП), дистиреоидная оптическая нейропатия (ДОН), периорбитальная клетчатка, экстраокулярные мышцы, тиреотоксический экзофтальм, тиреоид-ассоциированная орбитопатия (ТАО), ультразвуковое исследование, ОКТ-оптическая когерентная томография.

#### Для цитирования:

Билалов Э. Н., Ахмедова С. М., Нозимов А. Э., Юлдашев С. А. Клинико-морфологическая характеристика глаза на фоне тиреотоксикоза (обзор литературы). Передовая офтальмология. 2024;7(1):18-24.

## CLINICAL AND MORPHOLOGICAL CHARACTERISTICS OF THE EYE IN THYROTOXICOSIS (ANALYSIS OF LITERATURE)

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**Annotation. Relevance.** According to statistics from the World Health Organization (WHO), thyroid diseases, which are considered an endocrine pathology, are the second most common disease after diabetes. Thyrotoxicosis occurs worldwide in 2.5% of the adult population. Also, thyrotoxicosis is 10 times more common in women than in men. **Purpose of the study.** Analyzing scientific literature containing information about changes observed in the organ of vision during thyrotoxicosis over the next 10–15 years. **Material and methods.** Studying scientific articles published in authoritative publications in our republic and abroad, as well as a database of scientific and information resources. **Results and conclusion.** Diagnostic studies such as ultrasound examination (UE), computed tomography (CT), and magnetic resonance imaging (MRI) in patients with endocrine ophthalmopathy make it possible to study the morphological features of the soft tissues of the eyeball and orbit, and also help to identify this pathology in the early stages of the disease. Among the types of examination, ultrasound can be recommended for widespread use in clinical practice as an informative method, and due to the absence of negative effects on the human body.

**Key words:** endocrine ophthalmopathy (EOP), dysthyroid optic neuropathy (DON), periorbital tissue, extraocular muscles, thyrotoxic exophthalmos, thyroid-associated orbitopathy (TAO), ultrasound examination, OCT-optical coherence tomography.

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Ushbu maqolada qalqonsimon bez patologiyasida tireotoksikoz fonida rivojlangan endokrin oftalmopatiya (EOP) diagnostikasiga oid adabiyotlar va tanlangan manbalar tahlili keltirilgan. Maqolada EOPning standart va muqobil diagnostika usullari bilan bir qatorda, ushbu patologik jarayon tufayli organizmda, xususan ko'z olmasi va uning yordamchi qismlarida kuzatiladigan morfologik o'zgarishlar ham keng yoritilgan.

Tireotoksikoz bu tireoid gomonlarning ko'p miqdorda ishlab chiqarilishi natijasida yuzaga keladigan irsiy kasallikdir. Markaziy nerv sistemasi qalqonsimon bezga o'z ta'sirini gipotalamus (tireoliberin) va gipofiz orqali tireotrop (TTG) ajratib chiqarish (gipotalamo-gipofizar) yo'li bilan amalga oshiradi ya'ni teskari bog'lanish mexanizmi asosida qalqonsimon bez faoliyati boshqariladi. Ba'zan qondagi TTG miqdorining va gipofiz tuzilishining o'zgarmasligi tireotoksikozning nasliy omillarga bog'liqligini tasdiqlaydi. Bundan tashqari, ayol organizmidagi homiladorlik, laktasiya, menstrual sikl, klimaks kabi neyroendokrin jarayonlar tireotoksikozga moyillikni

belgilovchi asosiy omillardan sanaladi. Shuningdek, pubertatlik davri, nevrotik konstitutsiya, ruhiy zo'riqishlar, o'tkir va surunkali infeksiyalar (gripp, angina, revmatizm, sil), bosh-miya jarohatlari, quyosh nuri ta'siri va yodning katta dozalarda qabul qilish esa qo'shimcha moyillik omillaridan hisoblanadi [1].

Ilmiy adabiyotlarda tireotoksikoz fonida organizmda kuzatiladigan patologik jarayonlar haqida ko'plab ma'lumotlar keltirilgan, lekin ko'z olmasi hamda uning yordamchi qismlarida bo'ladigan morfologik o'zgarishlar haqida klinik-eksperimental tadqiqot natijalari kamchilikni tashkil qiladi [2].

Tireotoksikoz ko'pincha (60–80%) EOP bilan asoratlanadi. Kasallik patogenezida autoimmun genetik o'zgarishlar va immun nazoratning tug'ma- T-limfosit supressorlarning nuqsoni asosiy o'rin egallaydi. Nuqsonli T limfositlar tireoid to'qimaga bevosita yoki B limfositlar orqali ta'sir ko'rsatadi. B limfositlar tomonidan ishlab chiqarilgan autoantitalarning (immunoglobulinlar) o'ziga xosligi shundaki, ular tireosit membranasida joylashgan TTG retseptorlari

bilan birikadi va TTG simon ta'sir ko'rsatadi. Shuning uchun ushbu immunoglobulinlar tireoid stimullovcchi immunoglobulinlar (TSI) deb nomlanadi. TSI tomonidan qalqonsimon bezning giperstimulyatsiyasi natijasida, qalqonsimon bez to'qimasi xajmi kattalashadi va faoliyati kuchayadi [3,4]. Tireotoksikoz faol kechganda va qaytalanganda TSI 90% xolatlarda aniqlanadi. Orbital to'qima va qalqonsimon bez antigen strukturasi o'xshashligi tufayli autoimmun yallig'lanish jarayoni orbital to'qimalarda ham parallel ravishda kechadi, ya'ni interleykin (IL)-1, IL-6, IL-16, CXCL-10 (human interferon inducible protein 10 (CXCL10 yoki IP-10) va RANTES (Regulated on Activation, Normal T-cell Expressed and Secreted) kabi yallig'lanish komponentlari tirotsitlar va orbital fibroblastlar tomonidan sintezlanadi [5,6].

EOP tashxisli bemorlarda orbital to'qimalar hajmining ortib borish mexanizmi orbital lipogenez stimulyatsiyasi bilan bog'liqligi qator tadqiqotlarda o'rganilgan. EOPda autoimmun jarayonlar tufayli anomal yallig'lanish sitokinlari sekretsiyasi ortib dastlab retrobulbar yog'/biriktiruvchi to'qimalar va ekstrakulyar mushaklarda Th-17-limfositlar va gidrofil glikozaminoglikan infiltratsiyasiga keyinchalik esa neoadipogenezga sabab bo'ladi. [7].

Bundan tashqari, Wynn T. A. [8] tadqiqot xulosalariga ko'ra Th-17-limfositlarning yuqori konsentratsiyasi immun javobni kuchayishiga va orbital fibroz jarayonini tezlashishiga olib keladi. L.Barrett va R. L. Anderson boshchiligidagi tadqiqot guruhining ta'kidlashicha EOP patogenezida adipogenez kechroq yuzaga keladigan jarayon hisoblanadi, chunki EOP davomiyligi ortgan sari orbital yog' hajmi ortib boradi [9,10].

EOPda ekstrakulyar mushaklar hajmi ortishi va orbital yog' toqimasining ko'payishi hisobiga paydo bo'ladi [11,12]. Lekin, ba'zi mualliflar tadqiqotlarida faqatgina yog' toqimasi hajmi ortgan va mushaklar normal o'lchamda qolgan bemorlar guruhi aniqlangan [13]. Bizning klinik tadqiqotimizda ham EOP va periorbital yog' to'qimasining miqdoriy ortishi o'rtasida statistik jihatdan sezilarli farq aniqlangan. Shuningdek, EOP o'g'ir darajasida rivojlanuvchi disteroid optik neyropatiya (DON) tashxisli bemorlarda esa orbitaning apikal sohasida ekstrakulyar mushaklarning qalinlashishi Goncalves tadqiqotlari [14] natijasiga mos keldi. Bu esa EOP patogenezida yog' to'qimasi ko'payishi va mushaklar qalinlashishi turlicha tezlikda kechishini anglatadi.

Tireotoksikoz bilan kasallangan bemorlarning o'rtacha 3/4 qismida EOP ya'ni ekstrakulyar mushaklar va orbital to'qimalarning autoimmun progressiv yallig'lanishi rivojlanadi, shuningdek, shox pardaning ikkilamchi keratopatiyasi yoki disteroid optik neyropatiya (DON)ga sabab bo'lishi ham mumkin. DON endokrin oftalmopatiyaning og'ir asoratlaridan biri bo'lib yevropa olimlarining ma'lumotlariga ko'ra 75–80% holatda ko'rish faoliyatining keskin pasayishi bilan va 1/4 holatda ko'ruv nervi diskida patologik o'zgarishlarsiz uchraydi [15]. Buning amaliy ahamiyati

shundan iboratki, apikal sohada jarayonni diagnostik tasdiqlanishi keyinchalik orbital dekompressiya operatsiyasidan foyda ko'rishi mumkin bo'lgan bemorlarni tanlashga yordam beradi.

L. L. Chan boshchiligidagi tadqiqot natijalariga ko'ra [16] EOP tashxisli 98 nafar bemorlar orbital to'qimalar hajmi ortishi bo'yicha 4 ta guruhni tashkil qilgan: 25 nafar bemorda mushak va yog' to'qimasi hajmining ko'payishi kuzatilmagan (1-guruh), 5 nafar bemorda faqatgina yog' to'qimasi ko'paygan (2-guruh), 58 nafar bemorda ekstrakulyar mushaklar hajmi ortgan (3-guruh) va 8 nafar bemorda ham yog' ham mushak to'qimasi hajmi ortgan (4-guruh).

EOP diagnostikasi. Klinikada aksariyat holatlarda EOP ikki tomonlama ba'zan assimetrik yoki bir tomonlama uchraydi. EOP tashxisli bemorlarning asosiy shikoyatlari fotofobiya, ko'z yoshlanishi ortishi, ko'zlarda quruqlik va xiralik hissi, retrobulbar sohada og'irlik hissi, ko'zlarni harakatga keltirganda og'riq va diplopiya va kosmetik diskomfortdan shikoyat qiladilar [17]. Kasallikning yashirin davrida yuqoridagi belgilarga qo'shimcha tarzda immunologik tekshiruvlar tavsiya etiladi.

EOP va tireotoksikozning klinik ko'rinishlari ko'p hollarda birgalikda boshlanadi, ammo EOP tireotoksikoz paydo bo'lganidan keyin bir necha yil o'tgach rivojlanishi ham mumkin. Bu esa endokrin toifadagi bemorlarning differensial diagnostikasida EOP simptomlari tashxisning «oltin standart» indikatorini emasligini ko'rsatadi. Shu bois qalqonsimon bez patologiyasi bo'lgan bemorlarda EOPning erta tashxislash va EOPga moyil bo'lgan bemorlarni aniqlash uchun qo'shimcha tadqiqotlar olib borish talab etiladi [18,19,20].

Tireotoksikoz assotsirlangan EOPni davolash usullari uning patogenetik asosi bilan uzviy bo'lgan holda olib borilsa yallig'lanish jarayonlarini nazorat qilish mumkin. Hozirda EOPni turlicha davolash usullari (immunosupressiv preparatlar, somatostatin analoglari, plazmaferez, tomir ichiga immunoglobulinlar va antisitokin terapiyasi, orbital nur terapiyasi, steroidlar, orbital dekompressiya) samaradorligini baholash uchun klinik faollik indeksidan foydalaniladi [21].

Orbital mushak hujayralari va adipositlarning antioksidant xususiyatlarini taqqoslash va tahlil qilish orqali morfologik statusini o'rganish mumkin [22]. EOP patogenezida qalqonsimon bez va orbital to'qimalar o'rtasidagi bog'lanishning molekulyar asosini ya'ni TSI retseptorlarini immunoreaktivligini immunogistokimyoviy usulda o'rganish orqali maxsus immunoterapevtik tavsiyalar berilgan. Boshqa olimlar guruhi o'z tadqiqotlarini EOP yallig'lanish darajasi qondagi TRAb (anti-thyrotropin receptor autoantibodies) antitela miqdri bilan bog'liqligini o'rgaishgan [4,17].

EOPning aktiv kechishidagi ko'z ichki bosimining oshishi bevosita ekstrakulyar mushaklar shishi bog'liq. Ekstrakulyar mushaklar shishi, ekzoftalm darajasi va ko'z ichki bosimi o'rtasidagi korrelyatsion bog'liqlikni tahlil qilish orqali bu toifadagi bemorlarga orbital

dekompresiya va g'ilyalikni to'g'rilash operatsiyasi talab qilinishi mumkin [23]. Orbital yumshoq to'qimalar va qalqonsimon bezning gistopatologik tekshiruvda EOPning rivojlanishi autoimmun xarakterga ega ekanligini tasdiqlaydi. EOP tashxisli bemorlarning ekstraokulyar mushaklar biopsiyalarining gistologik tekshiruvda limfositlar va makrofag infiltratsiyasi, neytrofillar, plazma hujayralari, gistositar va "semiz" hujayralar mavjudligi aniqlandi. Shuningdek, olimlar tomonidan turlicha etiopatogenezga ega orbital yallig'lanish patologiyalarida (endokrin oftalmopatiya, granulomatoz, sarkoidoz) orbital to'qimalarning yallig'lanish va fibroz jarayonlari taqqoslangan [25]. Boshqa tadqiqotchilarning fibroblast va immun hujayralar o'zaro ta'siri tufayli kelib chiqadigan orbitadagi morfologik o'zgarishlar va mahalliy antioksidant tizimini o'rganishga bag'ishlangan ilmiy ishlari EOP patogenetik mexanizmlarini to'liqroq tushunishga yordam beradi [22,24].

Klinik amaliyotda bu turdagi orbital patologiyasi bo'lgan har bir bemorda ko'z olmasi va periorbital to'qimalar ultratovush tekshiruvi (UTT) o'tkazish muhim ma'lumotlarni, xususan ekstraokulyar mushaklardagi shish yoki orbita yumshoq to'qimalaridagi fibrotizatsiya darajasini baholash imkonini beradi [26]. Diagnostik tasvirlarni olishning yangi usullarini ishlab chiqish va keng miqyosda klinik tatbiq qilishiga qaramay, ultratovush tekshiruvi eng qulay, xavfsiz va informativ usullardan biri bo'lib qolmoqda.

Bizning klinik tadqiqotimiz davomida endokrin oftalmopatiya fonida ko'z olmasi ekstraokulyar mushaklarning umumiy qalinligi 22,4 mm gacha ortganligi (normada 16,2–16,8 mm) va bu ko'rsatkich ayniqsa yuqori to'g'ri mushak ( $6,6 \pm 0,7$  mm) va ichki to'g'ri mushak ( $6,2 \pm 0,7$  mm) ulushiga to'g'ri kelishi aniqlandi. Shuningdek, endokrin oftalmopatiya darajasi va ekstraokulyar mushaklar exografik tekshiruvi o'rtasida to'g'ri kuchli bog'liqlik (korrelyatsion koeffitsient 0,87) aniqlandi [27].

UTTning B-skanerlash metodi orqali EOPning oxirgi bosqichlarida orbita yumshoq to'qimalarida fibroz rivojlanishi natijasida retrobulbar zona kengligi kamayib borishi va ekstraokulyar mushaklar o'lchami deyarli o'zgarib qolishi aniqlandi.

EOP tashxisli bemorlarda ko'z olmasi va orbita yumshoq to'qimalarining ultratovush diagnostikasi nisbatan sezgir, arzon va oddiy texnik bazani talab qiluvchi tekshiruv usuli hisoblanib, mazkur patologiyani erta bosqichlarida aniqlash imkonini beradi. Akustik jihatdan mushakning qalinligi oshib borishi patologik jarayonning rivojlanishi bilan parallel kechadi. Klinik amaliyotda bu ko'rsatkich kasallikning rivojlanish dinamikasini va terapiya samaradorligini baholashga imkon beradi. Shuningdek, ultra tovush tekshiruvi inson tanasiga salbiy ta'sirlarining butkul yo'qligi sababli informativ metod sifatida EOPni davolash samaradorligini dinamik baholash uchun klinik amaliyotda keng foydalanishga tavsiya etilishi mumkin [25,29,31].

Karhanová va boshqalar EOP yoki tireoid assotsirlangan orbitopatiya (TAO) kechishida medial to'g'ri mushakning qalinlashish darajasi qolgan ekstraokulyar mushaklardan ortiqqligini aniqlashdi. Shu bilan bir qatorda, ushbu guruh olimlari o'z tadqiqotlarida ekstraokulyar mushaklar qalinligini ultratovush, magnit-rezonans tomografiya (MRT) va multi-spiral kompyuter tomografiyasi (MSKT) tekshiruvlari orqali EOP bosqichiga bog'liqligini qiyosiy o'rganishgan. Bu tekshiruvlar yordamida ekstraokulyar muushaklarni ko'ruv nerviga ta'sirini baholash va optik neyropatiya rivojlanishini prognoz qilish mumkin [28,29].

Ba'zi mualliflarning fikricha faqatgina orbita MRT natijalari va klinik aktivlik shkalasi (CAS-clinical activity scale) asosida EOPning darajasini baholash mumkin. Lekin EOPdagi morfologik o'zgarishlarni to'liq tushunish uchun optik kogerent tomografiya (OKT) tekshiruvi eng informativ tekshiruv usullaridan biri hisoblanadi [30].

Optik kogerent tomografiya. Xalqaro ilmiy tadqiqotlar sharhi tahlilida endokrin va tizimli kasalliklarda ko'z olmasining morfometrik xususiyatlarini OKT yordamida in vivo ravishda o'rganish mumkinligi haqida ko'plab ma'lumotlar berilgan [31]. Bugungi kunga kelib endokrin oftalmopatologiyalarning, xususan tireotoksikoz kasalligining ko'z olmasi qavatlarida yuzaga keltiruvchi o'zgarishlarni baholash uchun noinvaziv va kontaktsiz diagnostik metodlarga ehtiyoj ortib bormoqda. Buning uchun ko'z olmasi qavatlarini optik biopsiyasini kontaktsiz 3D formatda skanerlovchi OKTning bir nechta zamonaviy modellari yaratilmoqda [32]. Buning asosida 2022-yilda 2 ta yirik xalqaro qalqonsimon bez kasalliklari assotsatsiyalari hamkorlikda maxsus xalqaro rasmiy kelishuv ya'ni consensus qabul qilindi. [Management of Thyroid Eye Disease: A Consensus Statement by the American Thyroid Association and the European Thyroid Association] [33].

Mamlakatimizda ham ko'plab olimlar [To'raqulov Y.X., 1994; Ismailov S. I., 2002; Nugmanova L. B., 2002; Abdazova R. B., 2002; Fayziyev I. R., 2002; Akbutayev A. M., 2014; Elov A. A., 2014] tomonidan tireotoksikoz, xususan endokrin oftalmopatiya bo'yicha bir qancha ilmiy amaliy ishlar olib borilgan [34].

M.Romano [35] tadqiqot guruhi tomonidan EOP rivojlanishining taxminiy nazariy mexanizmini ishlab chiqdilar: orbital kompressiya retrobulbar bo'shliqdagi miya suyuqligi bosimining pasayishiga, translaminar bosimning esa oshishiga va natijada to'r parda nerv tolali qavati (TPNTQ)dagi neyrodegenerativ jarayonlar rivojlanishiga olib keladi. Qator mualliflarning [36] OKT angiografiya ma'lumotlari tahliliga ko'ra, EOP kechishida fovealar avaskulyar zona (FAZ) maydoni kattaroq va radial peripapiller kapillyar to'ri zichligi, makula sohasidagi perfuzion zichlik o'zgarib mikrosirkulyatsiyaning ko'proq buzilishiga olib keluvchi qo'shimcha diagnostik tamoyil sifatida baholanishi mumkin. Bundan tashqari ko'plab olimlar ilmiy ishlarida EOPning aktiv va nooaktiv davrlaridagi OKT-angiografiyada kuzatiladigan xos o'zgarishlar ya'ni

peripallyar sohadagi kapillyarlar zichligi va to'ra parda nerv tolali qavati qalinligi o'zgarishi haqida muhim ma'lumotlar keltirilgan [37]. Ko'z olmasining qon tomirli qavatidagi o'zgarishlarni to'liq vizualizatsiya va tahlil qilish imkonini beruvchi OKTning EDI (enhanced-depth imaging optical coherence tomography, EDIOCT) rejimi yordamida tireotoksikoz fonida rivojlanuvchi EOPning rivojlanish tezligini baholash mumkin [38].

OKT texnologiyasini takomillashtirish natijasida chastotali modulyatsiyalangan optik nurlanish manbasiga ega bo'lgan OCT usuli (swept source optical coherence tomography, SS-OCT) yaratildi. Ushbu texnologiyaning afzalliklariga chuqur tuzilmalarni (xorioideya, sklera) batafsil ko'rish qobiliyatini ta'minlash (to'liq uzunligini 100–1050 nm diapazon), mikrosakkad harakatlar ta'sirini istisno qilish uchun yuqori skanerlash tezligidan (A skanlar soniyasiga 100 000 dona) foydalanish va xorioideyaning mukammal qalinlik xaritasini yaratish kiradi [39,40].

OKT-EDI diagnostik metodi orqali xorioideya qalinligini baholash parametrlari va ularning ishonchlilik darajasini aniqlash bo'yicha bir nechta ilmiy izlanishlar olib borilmoqda. Bunga ko'ra xorioideyaning qalinligini aniqlash uchun uning ichki va tashqi chegaralari orasidagi pigment epiteliysining (PE) giperreflektor chizig'idan xorioideya/skleraning chegarasidagi uzluksiz giporeflektor chizig'igacha (ya'ni skleraning ichki chegarasi – Lamina fusca) vertikal masofa o'lchanadi. Shuningdek, oxirgi o'n yillik davomida xorioideya holatini miqdoriy baholovchi yangi parametrxorioidal qon ton tomir indeksdan (choroidal vascularity index-CVI) foydalanish darajasi o'sib bormoqda. Xorioideyani o'rganish protokoliga muvofiq, ImageJ dasturida OKT tasviri olinadi va maxsus Niblack algoritmi orqali optik kesma maydonidagi qon tomirlar miqdorining o'zaro nisbati avtomatik hisoblab index-CVI topiladi [41].

Oxirgi o'n yillikda ko'plab tadqiqot guruhlari [42] xorioideya tekshiruv protokiliga muhim o'zgarishlar kiritishdi ya'ni OKT-angiografiyada binarizatsiya hodisasiga asoslangan holda kontrast darajasini boshqarib xoriokapillyar tomirlar va stromani aniqroq segmentatsiyalashga erishdilar.

M.Kurt va boshqalar tomonidan o'tkazilgan tadqiqotda [43] SS-OCT yordamida EOP tashxisli bemorlarda subfoveal xorioideyaning qalinligi normadan yuqoriligi ( $p=0,013$ ) va bemorlarning klinik aktivlik shkalasi (CAS-clinical activity scale) bilan musbat korrelyatsiya ( $p=0,046$ ) aniqlangan.

EOPda ko'z olmasining ekstrakulyar mushaklari (EOM) holatini diagnostik baholashda oldingi segment OKT tekshiruv magnit rezonans tomografiya (MRT) va ultra tovush tekshiruv (UTT)dan keyingi o'rinda turadi, ayniqsa medial va lateral to'g'ri mushaklarning ko'z olmasiga birikishdagi mushak-pay kompleks chegarasini (sklera, episklera va konyunktivasiz) aniq o'lchashda qo'shimcha informativ tekshiruv usuli hisoblanadi [44]. EOPning mukammal diagnostik tahlillari orasida OKT va immunologik tadqiqotlar istiqbolli yo'nalish deb aytish mumkin.

Xulosa. Endokrin oftalmopatiya tashxisli bemorlarda UTT, KT va MRT diagnostik tekshiruvlari ko'z olmasi va orbita yumshoq to'qimalarining morfologik xususiyatlarini o'rganish va mazkur patologiyani erta bosqichlarda aniqlash imkonini beradi. Tekshiruv turlari ichida UTT inson tanasiga salbiy ta'sirlarining yo'qligi va informativ metod sifatida klinik amaliyotda keng foydalanishga tavsiya etilishi mumkin. Shuningdek, tireotoksikoz fonida rivojlangan EOPni OKT metodi yordamida xorioideya, to'ra parda va ko'ruv nervi diskini morfometrik ko'rsatkichlari o'zgarishini nafaqat diagnostik balki davolash samaradorligini dinamik baholash uchun indikator sifatida foydalanish mumkin.

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