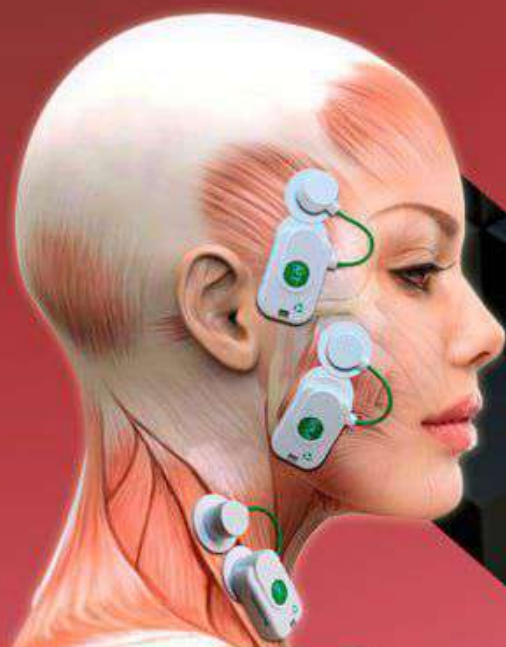


**ЭЛЕКТРОМИОГРАФИЧЕСКОЕ ИССЛЕДОВАНИЕ У ПАЦИЕНТОВ С  
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## MIGREN KASALLIGINI DAVOLASHDA ZAMONAVIY

### TEXNOLOGIYALARNING AHAMIYATI

Saidvaliyev F.S <sup>1,a</sup>, Subxanova A.X <sup>2,b</sup>

<sup>1</sup> Toshkent tibbiyot akademiyasi nevrologiya va tibbiy psixologiya kafedrası

t.f.d, professori.

<sup>2</sup>Toshkent tibbiyot akademiyasi tayanch doktoranti (PhD)

<sup>a</sup>[farruh70saidvaliyev@yandex.ru](mailto:farruh70saidvaliyev@yandex.ru), <sup>b</sup>[dr.aziza88@mail.ru](mailto:dr.aziza88@mail.ru)

### ANNOTATSIYA

Migren kasalligi dunyo bo‘ylab keng tarqalgan, insonlarning kundalik ish faoliyati, mehnat unumdorligiga, kasbiy faoliyatiga bevosita salbiy ta’sir ko‘rsatuvchi

va nogironlikka olib keluvchi nevrologik kasallik. Migren xastaligini davolashda standart davo muolajalari bilan birga zamonaviy texnologiyalardan foydalanish kasallikni profilaktik samaradorligini oshirmoqda. Bugungi kunda zamonaviy texnologiyalarning kundalik turmush tarzimizga kirib kelish va rivojlanishini tibbiyot sohasida ham bir qancha yutuqlarga olib kelganini ko'rishimiz mumkin. Ushbu maqolada zamonaviy texnologiyalarning tibbiyot sohasidagi o'rnini, rivojlanish bosqichlari, migren kasalligida mobil ilovalar va ularning ahamiyati hamda noinvaziv neyromodulyatsiya qurilmalari haqida ma'lumot berilgan.

**Kalit so'zlar:** migren, mobil ilova, davolash, teletibbiyot, tibbiyot provayderlari, tibbiy dastur, TMS.

## АКТУАЛЬНОСТЬ СОВРЕМЕННЫХ ТЕХНОЛОГИЙ В ЛЕЧЕНИИ МИГРЕНИ

Саидвалиев Ф.С.<sup>1,а</sup>, Субханова А.Х.<sup>2,б</sup>

<sup>1</sup>д.м.н., профессор, кафедры неврологии и медицинской психологии  
Ташкентской медицинской академии

<sup>2</sup> базовый докторант (PhD) Ташкентской медицинской академии

<sup>а</sup>[farruh70saidvaliyev@yandex.ru](mailto:farruh70saidvaliyev@yandex.ru), <sup>б</sup>[dr.aziza88@mail.ru](mailto:dr.aziza88@mail.ru)

### АННОТАЦИЯ

Мигрень – это неврологическое заболевание, которое распространено во всем мире, напрямую влияет на повседневную работу людей, производительность труда, профессиональную деятельность, приводит к инвалидности. Использование современных технологий наряду со стандартными методами лечения мигрени повышает профильную эффективность заболевания. Сегодня мы видим, что проникновение и развитие современных технологий в наш повседневный образ жизни также привело к некоторым достижениям в медицине. В данной статье рассматривается роль современных технологий в медицине, этапы развития, мобильные приложения

и их значение при мигрени, а также представлена информация о неинвазивных устройствах нейромодуляции.

**Ключевые слова:** мигрень, мобильное приложение, лечение, телемедицина, медицинские провайдеры, ТМС.

## THE IMPORTANCE OF MODERN TECHNOLOGIES IN THE TREATMENT OF MIGRAINE DISEASE

Saidvaliyev F.S<sup>1,a</sup>, Subxanova A.X<sup>2,b</sup>

<sup>1</sup>*DSc., professor of the Department of neurology and medical psychology of the Tashkent Medical Academy*

<sup>2</sup>*Basical doctorant (PhD) of the Tashkent Medical Academy*

[farruh70saidvaliyev@yandex.ru](mailto:farruh70saidvaliyev@yandex.ru), [dr.aziza88@mail.ru](mailto:dr.aziza88@mail.ru)

### ABSTRACT

Migraine is a neurological disease that is widespread in the world and directly affects people's work, productivity, and professional performance, leading to disability. Usage of modern technological devices and standard methods of treating migraine increases the profile of the efficiency illness. Today we notice that the penetration and development of modern technologies in our daily lifestyle has also led to some advances in medicine. This article discusses the role of modern technologies in medicine, stages of development, mobile applications and their significance in migraine, as well as non-invasive neuromodulation devices provided information.

**Keywords:** migraine, mobile application, treatment, telemedicine, medical providers, medical application, TMS.

JSS Tning ma'lumotlariga ko'ra (2010y) nevrologik kasalliklar orasida migren xastaligi tarqalishi bo'yicha 2-chi o'rinda turadi va ayollarda erkaklarga qaraganda ko'p uchraydi. Migren nogironlikga olib keluvchi 289 ta kasallik orasidan o'ziga xos sabablari bilan 7-o'rinni egallagan [1]. Migren kasalligi bemorlarda kundalik ish faoliyatini kamaytirish bo'yicha nevrologik kasalliklar orasida yetakchi o'rinda turadi [2].

Migren kasalligini davolash usullari o'tkir va profilaktika dori vositalari hamda bir qator nofarmakologik davolarni o'z ichiga oladi [3]. Standart davolash usullariga va keng qamrovli tashxislash mezonlari ishlab chiqilganiga qaramasdan, migren kasalligini noto'g'ri tashxislash va davolashning yetarli emasligi jiddiy muammo bo'lib qolmoqda [4]. Olingan ma'lumotlarga ko'ra dunyo aholisining 2-14% migren uchun profilaktika davo muolajalaridan foydalanadi [5].

Shu bilan birga migren tashxisini qo'yishdagi xatoliklar sog'liqni saqlash tizimida asosiy muammolardan biri bo'lib qolmoqda [6].

So'nggi yillarda sun'iy intellekt va kompyuter sohasini o'rganish tibbiyotning turli yo'nalishlarida murakkab muammolarni hal qilish uchun kuchli vosita sifatida paydo bo'ldi [7]. Xususan, kompyuterlashtirilgan tibbiy yo'nalishlar tashxis qo'yishda aniqlik va bemor ma'lumotlaridan foydalanish sog'liqni saqlash tizimida ijobiy o'zgarishlarga olib keldi [8,9].

Bugungi kunda zamonaviy texnologiyalar sog'liqni saqlash sohasida muhim rol o'ynamoqda. Sog'liqni saqlash axborot texnologiyalari, vositalari, sog'liqni saqlash informatikasi, shifoxona IT va tibbiyot texnologiyalari - bularning barchasi raqamli salomatlik bilan bog'liq [10,11]. Raqamli salomatlik - bu dasturiy ta'minot va xizmatlarni birlashtirgan holda sog'liqni saqlash tizimida raqamli texnologiyalarni qo'llashdir. Mobil sog'liqni saqlash ilovalari, elektron sog'liqni saqlash yozuvlari, taqiladigan qurilmalar, telesog'liqni saqlash va teletibbiyot va moslashtirilgan tibbiyot barchasi raqamli sog'liqni saqlash tizimiga kiritilgan [12,13].

Sog'liqni saqlash sohasi mutaxassislari hozirda smartfon yoki planshet kompyuterlaridan o'zlariga peyjer, uyali aloqa va PDAlardan kerak bo'lgan vazifalarni bajarish uchun foydalanadilar. Smartfonlar va planshetlar qo'lda saqlanishi mumkin bo'lgan yagona qurilmada hisoblash va aloqa funksiyalarini birlashtirib, bemorlarga yordam berish vaqtida qulay foydalanish imkonini beradi [14]. Ovoz yozish va matndan tashqari, yangi mobil qurilmalar, yuqori sifatli kameralar va ovoz yozish qurilmalari kabi yanada rivojlangan funksiyalarni taklif etadi. Ushbu xususiyatlar, kuchli protsessorlar va operatsion tizimlar, katta xotiralar

va yuqori aniqlikdagi ekranlar bilan mobil qurilmalar asosan qo‘l kompyuterlariga aylandi [15].

Teletibbiyot keng ma‘noda raqamli texnologiyalar yordamida masofadan tibbiy xizmatlarni real vaqt rejimida yetkazib berish sifatida ta‘riflanadi. Bir tomondan telesalomatlik va elektron sog‘liqni saqlash bir-biriga bog‘liq bo‘lib, ikkinchi tomondan smartfonlar ilovalardan foydalanishni o‘z ichiga olgan mobil sog‘liqni saqlash, tibbiy maqsadlar uchun foydalaniladigan provayderlarni o‘z ichiga oladi [16,17].

O‘tkir bo‘lmagan bosh og‘rig‘i bo‘lgan bemorlarga tibbiy maslahatlar videokonferens aloqa yoki videokonferensiya uchrashuvlari bilan ommalashtirilmoqda. Telefon orqali uchrashuvlar o‘ziga xos afzallik va cheklovlarni keltirib chiqaradi [18]. O‘tkazilgan tajribalarga asoslanib olimlar deyarli barcha tibbiy mutaxassisliklarga teletibbiyot xizmatlarining qo‘llanilishi kasallikni tez yaxshilanishiga ta‘sir ko‘rsatishini isbotladilar [19].

Migren xastaligi uchun teletibbiyot alternativ usul hisoblanadi, chunki kasallik xaqidagi ta‘lim, migren xurujiga sabab bo‘luvchi omillar, davolanishni to‘liq davom ettirish kabi klinik vazifalar teletibbiyot yondashuvlari orqali osonlik bilan bajariladi [20,21].

Bosh og‘rig‘i bo‘lgan bemorlar tomonidan qo‘llaniladigan elektron kundaliklar orasida eng ko‘zga ko‘ringan mHealth dasturi hisoblanadi. Ular aniq tashxis qo‘yish, dori-darmonlarni to‘g‘ri tanlashga, hurujlarning qo‘zg‘atuvchisini va vaqtini aniqlashga yordam beradi. Bemor o‘z turmush tarzi haqida to‘g‘ri hisobot berganida, ular bosh og‘rig‘ining kuchayish bosqichlarida hususan, dori-darmonlarni haddan tashqari ko‘p iste‘mol qilish, stress holatlarida xulq-atvor xatti-harakatlarni aniqlashlari mumkin bo‘ladi [22].

Mobil qurilmalar va ilovalar shifokor va bemorlar uchun juda ko‘p afzalliklarga ega bo‘lib, klinik qarorlar qabul qilish, bemorlarning natijalarini yaxshilanishini qo‘llab-quvvatlovchi va tibbiy yordam ko‘rsatishga bo‘lgan samaradorlikni sezilarli darajada oshiradi [23,24].



Ilovalar - bu muayyan maqsadni amalga oshirish uchun kompyuter yoki mobil qurilmadan foydalanish uchun ishlab chiqilgan dasturdir [25].

Hozirda sogʻliqni saqlash sohasida koʻplab muhim vazifalarni bajarishda yordam beradigan ilovalar mavjud, ular:

- maʼlumot va vaqtni boshqarish;
- tibbiy maʼlumotlarni saqlash va ulardan foydalanish;
- toʻgʻridan-toʻgʻri muloqot;
- bemorni boshqarish va monitoring qilish;
- klinik qarorlar qabul qilish;
- tibbiy taʼlim [26].

Mobil qurilmalarda tibbiy ilovalarni yuklab olish imkoniyati koʻplab mobil klinik resurslarni taqdim etdi [27]. Bir qancha tibbiy ilova turlari mavjud, jumladan elektron retseptlar, dori vositalariga oid qoʻllanmalar, tibbiy hisoblagichlar, klinik koʻrsatmalar, tashxislash va davolash, kasallikni nazorat qilish, hisob-kitoblar [28,29], bundan tashqari tibbiy koʻriklarni oʻtkazishi mumkin boʻlgan mobil ilovalar ham mavjud [30,31].

Dalillarga asoslangan tibbiyot ilovalari klinik qaror qabul qilish uchun foydali vositalar boʻlib xizmat qilmoqda. Kasallikni tashxislashda foydalaniladigan tibbiy maʼlumotnomalar, tashxislash, davolash, tashxisni taqqoslash, yuqumli kasalliklar, patogenlar va boshqa mavzular haqida maʼlumot beruvchi mobil ilovalar ham mavjud. Bunday ilovalarga quyidagilar kiradi: Johns Hopkins Antibiotic Guide (JHABx), Dynamed, UpToDate, 5-minute Clinical Consult (5MCC), 5-minute Infectious Diseases Consult (5MIDC), Sanford Guide to Antimicrobial Therapy (SG), ePocrates ID, Infectious Disease. Eslatmalar (ID eslatmalari), Pocket Medicine yuqumli kasalliklar (PMID) va IDdx [32,33].

**Ilova yordamida bemor monitoringi.** Surunkali kasalligi bor bemorlarning sogʻligʻini masofadan turib kuzatish uchun mobil qurilmalar shifokorlar tomonidan maʼqullangan usullardan biriga aylangan [14]. Mobil qurilma ilovalari kasallik kechishini nazorat qilish, jamiyat maʼlumotlarini toʻplashi yoki nogironlarga mustaqil hayot kechirishlarida yordam beradi. Mobil qurilmalar bilan aloqa qiladigan

datchiklar surunkali kasalligi bor keksa bemorlarga tibbiy ma'lumotlarni masofadan turib kuzatish va nazorat qilishda ham foydalaniladi [23].

Bundan tashqari smartfon orqali reanimatsion holatdagi bemorni kuzatish uchun klinik monitoring tizimi ishlab chiqildi; u bemorning zarur hayotiy belgilar darajasini rangli kodlangan signallar yordamida nazorat qilib turadi [15]. Android uchun iWander ilovasi GPS mobil qurilmasi yordamida Altsgeymer kasalligiga chalingan bemorlarni kuzatish va nazorat qilish uchun ishlab chiqilgan ilovalar ham mavjud. Mobil qurilmalarda HanDBase, HIPAA ma'lumotlar bazasidan kasalxonaga yotqizilgan bemorlarni joylashuvi, tashxisi, davo rejalari va hisob-kitob ma'lumotlariga ko'ra nazorat qilish uchun foydalanilgan [34].

Reabilitatsiya davrida bemorlarni nazorat qilish uchun foydalaniladigan mobil ilovalar bluetooth orqali bitta o'tkazgichli EKG qurilmasiga ulangan smartfon bemorlarni kasalxonadan tashqari sharoitda kuzatish imkonini berdi [34].

Bosh og'rig'i bo'lgan bemorlar tomonidan qo'llaniladigan elektron kundaliklar orasida eng ko'zga ko'ringan mHealth dasturi hisoblanadi. Ular aniq tashxis qo'yish, dori-darmonlarni to'g'ri tanlashga, hurujlarning qo'zg'atuvchisini va vaqtini aniqlashga yordam beradi. Bemor o'z turmush tarzi haqida to'g'ri hisobot berganida, ular bosh og'rig'ining kuchayish bosqichlarida hususan, dori-darmonlarni haddan tashqari iste'mol qilish, stress holatlarida xulq-atvor xatti-harakatlarni aniqlashlari mumkin bo'ladi [22].

To'g'ri tibbiy yordam ko'rsatuvchi provayder va bemor bilan muloqot qilish to'g'ri tashxis qo'yish va turli xil jismoniy kasalliklarga optimal yordam berish uchun juda muhimdir. Bu, ayniqsa, migrenni boshqarishda muhim ahamiyatga ega, chunki bosh og'rig'i soni, nogironlikka sabab bo'luvchi omillarni erta aniqlash klinik qaror qabul qilishda katta ma'lumot olish imkonini beradi. Muloqotni yaxshilovchi provayderlar bemorlarga har bir epizod uchun simptomlar, hurujlarning soni, chastotasi kabi funksional buzilishlar va dori-darmonlarni qo'llash kabi muhim ma'lumotlarni yozib olish uchun kundalik nazoratni tavsiya qiladi va davolash samaradorligini yaxshilaydi [35,36]. Ba'zi bemorlar migren tafsilotlarini yozib olish uchun qog'oz kundalik yoki kalendar usullardan foydalanishni afzal ko'rsalar,

boshqalari migren bilan bog'liq ma'lumotlarni hujjatlashtirish uchun elektron kundalik yoki smartfonga asoslangan dastur (ilova) dan foydalanishni afzal ko'radilar. Ularni qog'oz kundaliklarga qaraganda qulay, ishonchli, ehtiyotkor va samarali ekanligini aniqlangan [37].

Hozirgi kunda 120 000 dan ortiq mobil tibbiy ilovalar mavjud, biroq ularning 80% dan ortig'i tibbiyot mutaxassisleri ishtirokisiz yaratilgan [22]. Bosh og'rig'i uchun kundalik ilovalarning 18% ilmiy yoki klinik tajribaga ega ekanligi aniqlangan [24]. Barcha tibbiyot yo'nalishlari orasida migren uchun qo'llaniladigan dasturlar keng tarqalgan va dunyo bo'yicha 3-o'rinda bo'lsa-da, eng kam o'rganilgan ilmiy ishlardan biri hisoblanadi. Bu shuni anglatadiki, migren uchun mobil ilovalarni ishlab chiqish ilmiy ishdan ko'ra ko'proq tijorat va iqtisodiy maqsadlarda foydalanilgan [38].

Migren kechishini boshqarish uchun tasdiqlangan bir qancha ilovalar mavjud. Huguet va boshqa olimlar 2015 yilda myWHI deb nomlangan dasturni ishlab chiqdilar, bu foydalanuvchilarga og'riq boshlanish vaqti, intensivligi, joylashuvi, qo'zg'atuvchi omillar, simptomlar, bundan tashqari bosh og'rig'ining boshlanish vaqti, huruj davri, og'riq darajasini tasvirlash imkonini berdi. 14 yoshdan 28 yoshgacha bo'lgan 65 nafar ishtirokchi kundalikni 14 kun davomida sinab ko'rdilar va uni foydali, o'rganish oson va davolanishda samarali deb topdilar [39].

Yana bir iHeadache mobil ilovasidan bemorlar bosh og'rig'i bilan bog'liq belgilar bo'yicha xabar berish maqsadida foydalanishlari mumkin. Olimlar ilovadan foydalangan 106 ta bemorlarning 71%da xurujlar sonini kamayganligini aniqladilar, 90% bemorlar ilovani qog'ozga asoslangan kundaliklardan ko'ra samarador deb topdilar. AppStore va Google Playdan yuklab olish mumkin bo'lgan bosh og'rig'iga qarshi ilovalarni baholash o'tkazilinganda, ularni yuklab olish, klinik aniqligi, samaradorligi, foydalanuvchi ishtiroki solishtirildi va eng yaxshi uchta dastur Migraine Buddy, Migraine Coach va Migren Monitor deb aniqladilar [40].

**Migren Buddy** mobil ilovasi migren qo'zg'atuvchilarini, sabablarini, dori-darmonlarini, chastotasini, davomiyligini, og'riq intensivligini va joylashishini qayd qiladi va aniqlaydi. Shuningdek, u shifokorlarga ma'lumotlarni yuborish va bemorga

bosh og‘rig‘ini yaxshiroq tushunishga yordam berish uchun xulosa hisobotini taqdim etadi. Bundan tashqari bemorning bosh og‘rig‘i va uyqu rejimi o‘rtasida bog‘liqlikni aniqlash uchun uyqu kundaligi ham mavjud. Olimlar ushbu ilovani bemorlar uchun juda ko‘p ma‘lumotni taqdim etishi mumkinligini aniqladilar [41].

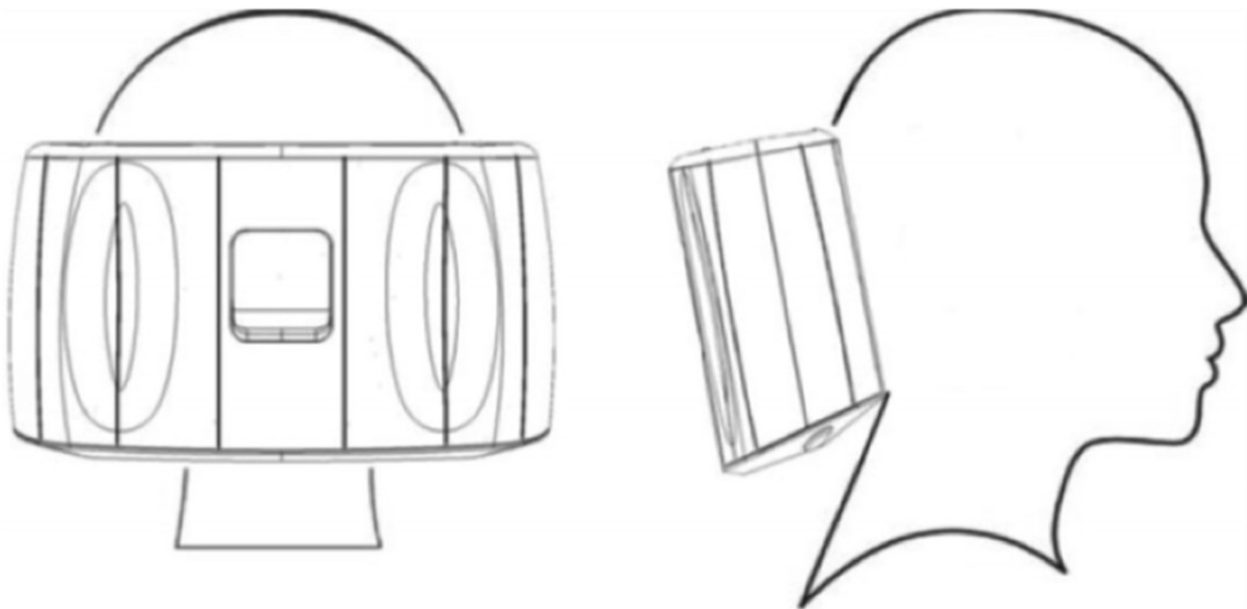
**Migrene Coach** dasturi- kasallikni nazorat qilish uchun mo‘ljallangan mobil ilova. Foydalanish uchun oddiy bo‘lgan dastur bemorlarga migren epizodini kuzatish imkonini beradi. Foydalanuvchilar MIDAS shkalasi natijalariga va moslashtirilgan grafik va diagrammalar yordamida ma‘lumotlarga ega bo‘ladilar. Ular kasallik haqidagi ma‘lumotlarni PDF-fayllarda shifokorga osongina elektron shaklda yuborishlari mumkin [42].

**Migren monitor** - bu bosh og‘rig‘i milliy jamg‘armasi tavsiya qilgan migrenni nazorat qilish ilovasi. Ushbu dastur “Migren tadqiqot jamg‘armasi” va “Migren kasalliklar assotsiatsiyasi” va boshqa tashkilotlar tomonidan yuqori baholangan. Ilova bemorlarga migrenning davomiyligi, og‘irlik darajasi, belgilarini kuzatish imkonini beradi. Ilova bemorlarga o‘z shifokorlari bilan ma‘lumotlarni osongina almashish shuningdek, shifokorlar bilan o‘z tajriba va maslahatlari bilan bog‘lanish imkonini yaratadi. Ilovada bosh og‘rig‘i haqidagi eng keng tarqalgan savollarga javob berish uchun suniy intellektdan foydalanadigan muloqot ham mavjud. Biroq, u Migren Buddy kabi hisobotlarni taqdim etmaydi, bu esa bemorlarga ularning bosh og‘rig‘ini tushunishini qiyinlashtiradi. Bu shifokorlarga to‘g‘ridan-to‘g‘ri bemorning ma‘lumotlarga ega bo‘lish imkonini beradi. Biroq, u boshqa ilovalarga qaraganda kamroq foydalanuvchi uchun qulay ekanligi aniqlandi, chunki ilovadagi yozuvlarni osongina o‘chirib tashlash imkoniyati foydalanuvchi hurujni yozib olish vaqtida yorliqni o‘zgartirishi kerak bo‘lsa, uni qayta kiritishga to‘g‘ri keladi [43].

Raqamli texnologiyalardan tashqari neyromodulyatsiya qurilmalari mavjud bo‘lib, ular nerv tizimini elektr toki yoki magnit maydon bilan rag‘batlantirish uchun mo‘ljallangan, migrenni davolash va oldini olish maqsadida tasdiqlangan noinvaziv usullardan biridir. Bularga migrenni o‘tkir yoki profilaktik davolash uchun tasdiqlangan uchta turdagi qurilmalar kiradi: impulsli transkraniyal magnit stimulyatori (sTMS) [44], transkutan supraorbital stimulyator (tSNS) [45] va

noinvaziv nervus vagus stimulyatori (nVNS) [46]. Ushbu qurilmalar og‘riq yo‘llariga elektr yoki magnit stimulyatsiya yordamida ta’sir qiladi, bu esa neurotransmitterlarni o‘zgartirishi, og‘riq uzatilishini modulyatsiya qilishi mumkin [47].

Noinvaziv neyromodulyatsiya qurilmalari bosh og‘rig‘i va boshqa neyropatik og‘riqlarda farmakologik davo muolajalariga qo‘shimcha yondashuvlar sifatida paydo bo‘ldi [48,49]. Ushbu muolajalarning patofiziologik ahamiyati neyron to‘qimalarining faolligini invaziv bo‘lmagan tarzda o‘zgartirish orqali bosh og‘rig‘i va unga bog‘liq simptomlarni yaxshilashdan iboratdir. Bunday muolajalarning eng keng tarqalgan turlaridan biri impulsi transkraniyal magnit stimulyatsiyadir (sTMS) [50].



1-

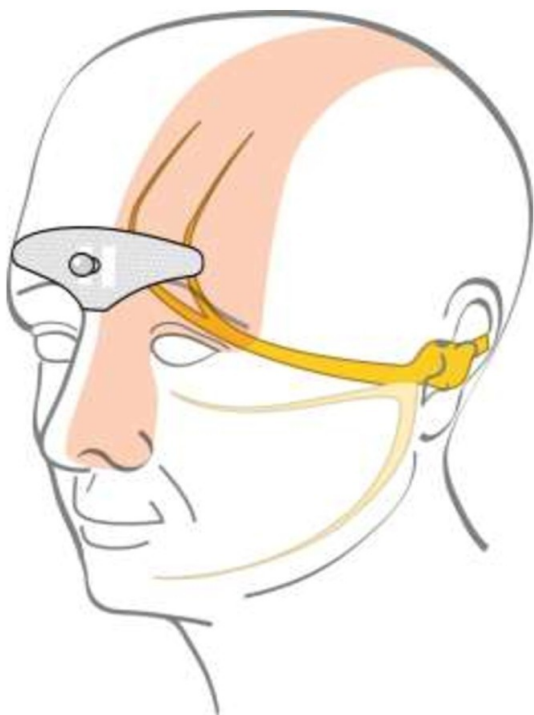
**rasm. sTMS qurilmasi.**

**Impulsi transkraniyal magnit stimulyatsiyasi (sTMS)** bir necha yillardan beri migrenni o‘tkir va profilaktik davolashda qo‘llanilgan [51]. sTMS noinvaziv, xavfsiz va samarali diagnostika va davolash usuli hisoblanadi. sTMS elektromagnit to‘lqinlarni bosh terisi, bosh suyagi, bosh miya membranalariga va neyronlarning elektr muhitini po‘stloq qismiga yetkazib beradi [52]. Qurilmani bosh suyagining pastki qismiga joylashtiriladi, ikki chetida joylashgan tugmani bosish orqali 2 soniya mobaynida impuls o‘tgaziladi (1-rasm). Profilaktik davo maqsadida ushbu

qurilmadan kuniga 2-3 maxal foydalanish mumkin. sTMS aurali migrenda qo'llanilganda 48 soatgacha og'riqni kamaytirgan [53,54].

Homiladorlik davrda migrenni farmokologik usulda davolashga bir qancha qarshi ko'rsatmalar mavjudligi tufayli olimlar homilador bemorlarda qo'shimcha davolash usuli sifatida sTMS dan foydalanib xavfsizlik va davolash samaradorligiga erishish mumkinligini aniqladilar [55,56].

**Transkutan supraorbital stimulyator (tSNS)** bosh og'rig'ini nazorat qilishda yangi davrni ochdi. tSNS farmokologik davo muolajalari qoniqarsiz bo'lganda foydalaniladigan muolaja usuli bo'lib, [57] migrenni epizodik turida samarali ekanligi aniqlangan.



## **2-rasm. tSNS qurilmasi.**

tSNS qurilmasi 30 mm × 94 mm o'lchamdagi o'z-o'zidan yopishtirib turuvchi xususiyatiga ega bo'lgan elektrod bilan peshonaga supraorbital nerv soxasiga joylashtiriladi (2-rasm) [58]. tSNS ikki fazali 60 Gts, puls kengligi 250 mks va intensivligi 16 mA ega bo'lgan elektr impulsini hosil qiladi. tSNS bilan kuniga 20 daqiqa foydalanish mumkin [59].

Olimlar o'tkazgan tajribalarda, 40 kun mobaynida muntazam tSNS usulidan foydalanish migren xurujlar sonini 25%ga, triptanlar bilan tSNSni birgalikda qo'llash esa 48%ga kamayishini aniqladilar [60].

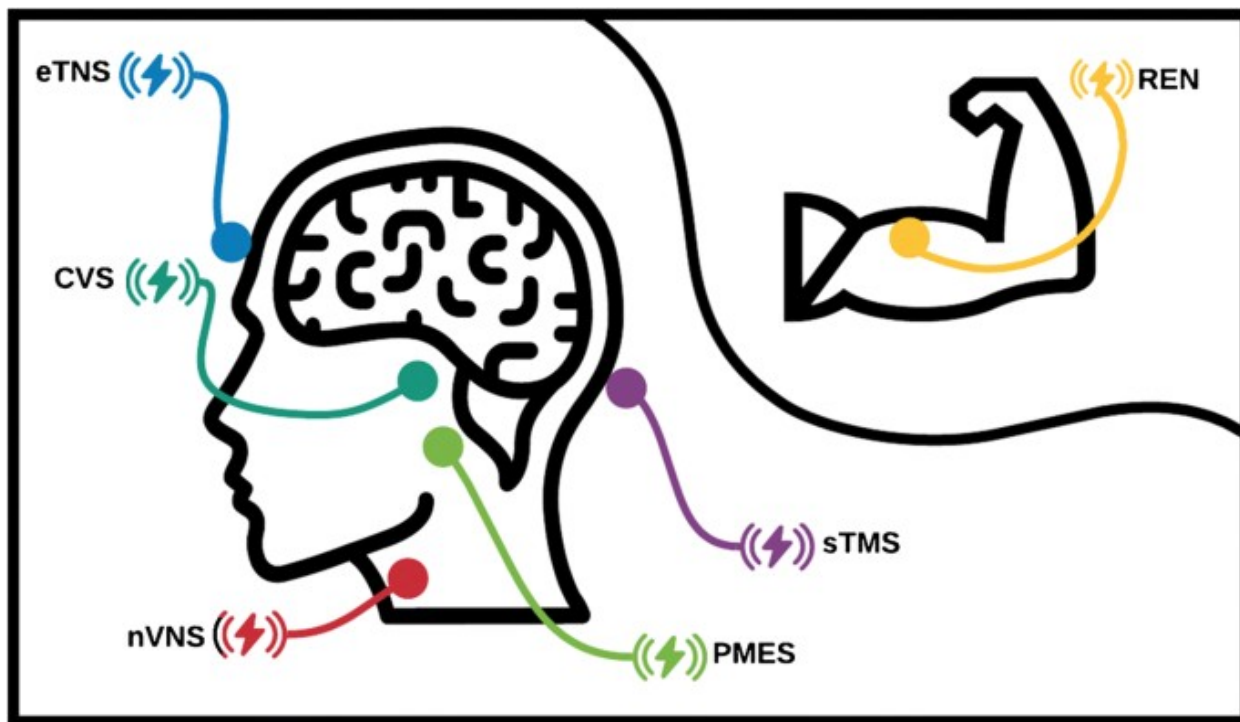
**Noinvaziv nervus vagus stimulyatori (nVNS)** vagus nervini invaziv yoki noinvaziv tarzda qo'zg'atadigan texnik qurilma bo'lib, yillar davomida epilepsiya, depressiya va yurak etishmovchiligi kabi turli xil kasalliklarni davolashda foydalanilgan. Xozirgi kunda bosh og'rig'ini davolashda noinvaziv nVNS "GammaCore" qurilmasi mavjud. O'lchami jihatidan kichik, qulay bo'lgan qurilma bo'yin sohasiga qo'yilib, 25 grts (60mA) chastotali ikkita elektrod yordamida vagus nerviga 90 soniya mobaynida qo'zg'atuvchi ta'sir ko'rsatadi (3-rasm). Vagus nervi avtonom nerv sistemasiga parasimpatik ta'sir ko'rsatib, turli vegetativ funksiyalarni; nafas olish, yurak-qon tomir tizimlari faoliyatiga ta'sir ko'rsatadi [61].



### **3-rasm. nVNS qurilmasi.**

Ushbu stimulyatsiyadan foydalanish og'riq intensivligini 120 daqiqagacha kamaytirib, vizual aura belgilarini sezilarli darajada kamaytirib beradi [62,63]. Migrenni o'tkir va profilaktik davolash maqsadida nVNS qurilmasi sinovdan o'tkazilganda jami 131 ta engil va o'rta darajadagi bemorlarda migren xuruji davrida og'riqni yo'qotish darajasi 1 soatda 38,2% va 2 soatda 51,1%, og'riqsizlanish darajasi esa 1 soatda 17,6% ni va 2 soatda esa 22,9% ni tashkil etgan [64,65].

Bundan tashqari, migrenni o‘tkir davolash uchun **masofaviy elektr trigeminal nerv stimulyatsiya (REN)** qurilmasi ishlab chiqilgan. REN qurilmasining o‘ziga xosligi shundaki, u tananing uzoq joylashgan nuqtalaridagi og‘riqni kamaytirish hususiyatiga ega [66].



#### 4-rasm. REN qurilmasi.

2019 yilda REN qurilmasi yordamida 296 ta bemorda sinov o‘tkazildi. Tadqiqot natijalari shuni ko‘rsatdiki, bemorlarning 3/2 qismida og‘riq yengillashdi. Qurilma qo‘lning yuqori qismiga kiyiladi va har bir davolanish uchun 45 daqiqa vaqt sarflanadi. Bemorlar smartfon ilovasi yordamida REN qurilmasini boshqaradilar, ya‘ni bemor og‘riqning intensivlik darajasini nazorat qilishi mumkin (4-rasm). Bemorga intensivlikni og‘riq chegarasi ostida eng kuchli stimulyatsiya darajasiga moslashtirish buyuriladi [67].

REN bilan bog‘liq quyidagi noxush hodisalar kuzatilinishi mumkin; issiqlik hissi, qo‘l sohasida uvishish, qichishish, og‘riq va mushaklar spazmi. REN qurilmasini yurak yetishmovchiligi, tutqanoq xurujlari va faol implantatsiya qilinadigan tibbiy asboblardan (kardiostimulyatorlar, eshitish apparati implantlari va boshqalar) mavjud bo‘lgan hollarda qo‘llash tavsiya etilmaydi [68]. REN qurilmasini nafaqat kattalarda



balki bolalar va o'smirlarda ham qo'llash mumkin bo'lib, yuqori davolash samaradorligiga erishilgan [69].

**Xulosa.** Tibbiyot sohasida zamonaviy texnologiyalardan foydalanish sog'liqni saqlash mutaxassislariga va bemorlarga bir qancha qulayliklarni keltirib chiqarmoqda. Xususan mobil ilovalar foydalanish jihatidan qulay, kasallikni kechishini nazorat qilish, dori vositalaridan to'g'ri foydalanish, davolanishda yuqori samaradorlikka erishish kabi imkoniyatlarini ochmoqda. Ilovalar sog'liqni saqlash mutaxassislariga har doim mavjud tibbiy formula asosida hisoblash va kasallikga tashxis qo'yishdagi qo'llanmalar, shuningdek dalillarga asoslangan tibbiy resurslardan foydalanish imkonini beradi. Mobil ilovadan foydalanish bemorlarda davolash samaradorligini oshiradi.

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## **ОСОБЕННОСТИ СТРУКТУРЫ И СТЕПЕНИ ЗАБОЛЕВАНИЙ, ПРИВОДЯЩИХ К ПОТЕРЕ ТРУДОСПОСОБНОСТИ РАБОТНИКОВ К ВРЕМЕННОМУ ТРУДУ**

Маматкулов Б.М., Абдурахимов А.Б. Сафаров Х.Х.

### **АННОТАЦИЯ**

**Цель.** Предприятие по обогащению и выплавке меди были изучены специфические особенности состояния здоровья работников, структура и уровень заболеваний, приводящих к временной потере трудоспособности. Материалы исследования. Включены данные о медицинских обращениях и