

TIBBIYOT SIGNALLARINING TURLARI VA TUZILISHI

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ANNOTATSIYA

Axborot texnologiyalari tibbiyot va sog‘liqni saqlashning barcha sohalarida mavjud. Zamonaviy texnologiyalar rivojlanishi tibbiyot sohasida ham ilgorilab bormoqda. Bugungi kunda mavjud bo‘lgan raqamli signallarga ishlov berish algoritmlari yordamida biosignallarni tahlil qilish orqali fiziologik jarayonlarni va signal parametrlarini tadqiq etish mumkin.

Kalit so‘zlar: *Biosignallar, Tirik organizmlar, fiziologik jarayonlar, Bioelektrik signallar, Biomagnitik signallar, Biokimyoviy signallar, Biomexanik signallar, Bioakustik signallar.*

ANNOTATION

Information technology is present in all areas of Medicine and health care. The development of modern technologies is also advancing in the field of Medicine. By analyzing biosignals using digital signal processing algorithms available today, it is possible to research physiological processes and signal parameters.

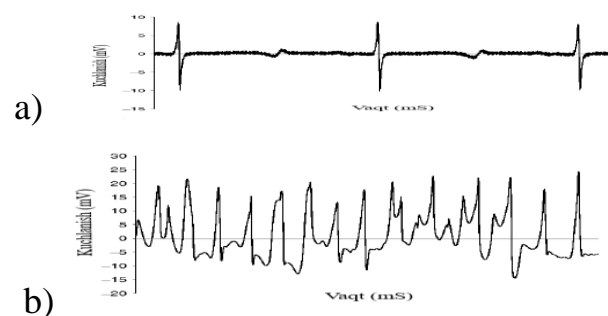
Keywords: *Biosignals, living organisms, physiological processes, bioelectric signals, biomagnetic signals, biochemical signals, biomechanical signals, bioacoustic signals.*

Biosignallar – bu yurakning urishi yoki mushaklarning qisqarib – kengayishi kabi biologik jarayonning vaqt sohasidagi qiymatlarining ifodasi hisoblanadi. Tirik organizmdagi biologik jarayon paytida yuzaga keladigan elektr, kimyoviy va mexanik o‘zgarishlar, o‘lchash va tahlil qilish uchun zarur bo‘lgan signallarni ishlab chiqaradi.

Shuning uchun biosignallarda ma'lum bir biologik jarayon yoki tizimning asosiy fiziologik mexanizmlari va tibbiy diagnostika uchun foydali axborotlar mavjud.

Tirik organizmlar o'zaro bog'liq bo'lgan ko'plab tizimlardan iborat – masalan inson tanasi asab tizimi, yurak – qon tomir tizimi, mushak – skelet va boshqa tizimlardan iborat. Har bir tizim ko'plab fiziologik jarayonlar uchun mas'ul bo'lgan bir nechta quyi tizimlardan iborat.

Bioelektrik signallar. Nerv va mushak hujayralari orasidagi elektrokimyoviy o'zgarishlar natijasida bioelektrik signallar hosil bo'ladi. Nerv yoki mushak hujayrasiga yetarli darajada ta'sir etilsa, hujayralar harakat potentsialini hosil qiladi va ularni elektrodlar yordamida o'lchanadi. Ta'sir etilgan hujayra tomonidan hosil bo'lgan harakat potentsiallari bitta aksondan qo'shni hujayralarga uning aksoni orqali uzatiladi. Hujayralar faollashganda biologik to'qimalar orqali tarqaladigan elektr maydoni hosil bo'adi. Potensialda o'zgarishlarni to'qima yoki organizm yuzasida sirt elektrodleri yordamida o'lchash mumkin. Bularga Elektrokardiogramma (EKG), Elektrogastrogramma (EEG), Elektromiogramma (EMG) kabilar misol bo'ladi(1.1-rasm



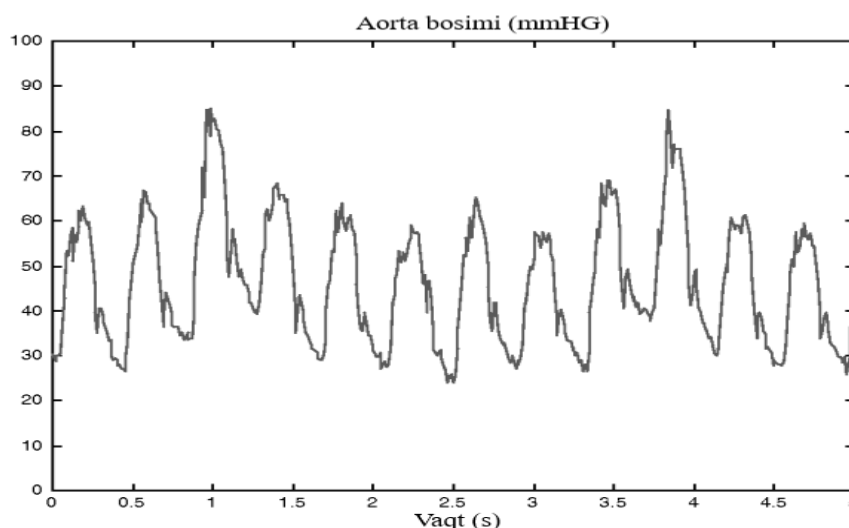
1.1-rasm. (a) normal sinus ritmida elektrokardiogram, (b) yurak sirtining qorincha fibrilatsiyasi(ventricularfibrillation)dan yozib olingan elektrokardiogram (1000 samples/s)

Biomagnitik signallar. Har xil organlar, shu jumladan yurak, miya va o'pka magnit sensorlar bilan o'lchanadigan zaif magnit maydonlarini hosil qiladi. Odatda magnit maydon kuchi unga mos keladigan fiziologik biosignallarga nisbatan kichikroq bo'ladi. Biomagnitizm – bu ma'lum bir fiziologik faollik bilan bog'liq bo'lgan to'qima yoki organdan keladigan elektr maydoniga bog'langan magnit signallarini o'lchashdir.

Juda aniq magnit sensorlari yoki SQUID (supero'tkazuvchi kvant interferansiya qurilmasi) magnometrlari yordamida miyadagi (magnetoensefalogramma, MEG), periferik nervlardagi (magnetoneurografiya, MNG), oshqozon – ichak traktidagi (magnetogastrografiya, MGG), yurakdagi (magnetokardiografiya, MCG) magnit faollikni monitoring qilish mumkin.

Biokimyoviy signallar. Biokimyoviy signallar tanadagi turli xil kimyoviy moddalar konsentratsiyasining o'zgarishi haqidagi ma'lumotlarni ifodalaydi. Kaltsiy va kali kabi turli xil ionlarning hujayralardagi konsentratsiyasini o'lchash va qayd etish mumkin. Nafas olish tizimida yoki qonda kislorod (rO_2) va karnbonat anhidrid (rCO_2)ning qisman bosimidagi o'zgarishlari qonda kislorod konsentratsiyasining normal darajasini baholash uchun ishlatiladi. Bularning barchasi biokimyoviy signallarni tashkil qiladi. Ushbu biokimyoviy signallardan glyukoza, laktak va metabolitlarning miqdorini aniqlash, turli fiziologik tizimlarning faoliyati to'g'risida ma'lumot olish kabi turli maqsadlarda foydalanish mumkin.

Biomexanik signallar. Harakat, siljish, kuch, bosim va oqimni o'z ichiga olgan biologik tizimlarning mexanik funksiyalari ham o'lchanadigan biosignallarni hosil qiladi. Masalan, qon bosimi qonning tomirlar devorlariga ta'sir etadigan kuchini o'lchashdir. Qon bosimining o'zgarishini to'lqin shakli sifatida qayd etish mumkin(1.2-rasm).



1.2-rasm. 4 yoshli bolaning aorta tomiridan qayd etilgan qon bosimining to'lqin shakli (200 samples/s).

To‘lqin shaklidagi yuqori qiymatli qismlari ya’ni maksimal qon bosimiga ko‘tarilishi yurak qorinchalarining qisqarishini anglatadi va bu sistolik bosim deb ataladi. To‘lqin shaklining past qiymatli qismlari ya’ni minimal qon bosimiga tushganda qorinchaning kengayishini anglatadi va bu diastolik bosim deb yuritiladi.

Bioakustik signallar. Bioakustik signallar tebranishlarni(harakatlarni) o‘z ichiga olgan biomexanik signallarning maxsus to‘plamidir. Biologik jarayonlar akustik shovqinni keltirib chiqaradi. Masalan, yurakdagi klapanlar orqali oqadigan qon oqimi o‘ziga hos tovushga ega. Yurak klapaning bioakustik signalini o‘lchash orqali uning to‘g‘ri ishlashini aniqlash mumkin. Nafas olish tizimi, bo‘g‘inlar va mushaklar biologik muhit orqali tarqaladigan bioakustik signallarni hosil qiladi va ularni teri yuzasidagi akustik sensorlar yordamida qayd etiladi.

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