TERI REGENERATSIYASI VA TRANSPLANTATSIYASI: ZAMONAVIY BIOTEXNOLOGIK YONDASHUVLARNING SAMARADORLIGI

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Annotatsiya: Maqolada teri anatomiyasi, fiziologik va regeneratsion imkoniyatlari, zamonaviy transplantatsiya turlari (avto-, allo-, kseno-, biotexnologik qoplamalar) hamda ularning klinik samaradorligi tahlil etilgan. Staminal hujayralar, 3D-bioprinting va growth-factor texnologiyalarining kelajakdagi istiqbollari ko‘rsatilgan.

Kalit so‘zlar: teri regeneratsiyasi, transplantatsiya, 3D-bioprinting, staminal hujayra, growth factor, yonib-ketish, xronik yara, Integra, qoplamalar, estetik natija.

SKIN REGENERATION AND TRANSPLANTATION: THE EFFECTIVENESS OF MODERN BIOTECHNOLOGICAL APPROACHES

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Abstract: Skin anatomy, physiological and regenerative diseases, modern types of transplantation (auto-, allo-, xeno-, biotechnological diseases) and indicators of future prospects of stem cells, 3D-bioprinting and growth factor technology are analyzed for each study.

Keywords: skin regeneration, transplantation, 3D bioprinting, stem cells, growth factor, burn, chronic wound, Integra, coatings, aesthetic result.

Kirish:

Teri – inson tanasining eng katta va universal organi (1,5–2 m², ≈ 4 kg) bo‘lib, baryer, immunologik, sensor, termoregulyatsion va estetik vazifalarni bajaradi. So‘nggi yillarda terining katta qismi kuyishi, shuningdek, diabetik va venoz etiologiyali, travmalar, xronik yaralarda donor teri tanqisligi klinik onkologik va reabilitatsion jarayonlarni sezilarli murakkablashtirmoqda. Maqolada klassik avtolog split-thickness graft (STSG) bilan qo‘shimcha derma analogi (Integra®) va 3D-bioprinting usulida o‘stirilgan staminal- boyitilgan teri ekvivalentining solishtirma samaradorligi baholandi.

Materiallar va usullar

Tadqiqot 2020–2024 yillar oralig‘ida yirik yonib-ketish markazida o‘tkazildi. Retrospektiv-komparativ sxemaga ko‘ra 15–45 % TBSA yonib-ketishli 18–65 yoshdagi 120 bemor va 60 diabetik-venoz yara bemorlari qamrab olindi. Bemorlar uch ta guruhga ajratildi: avtolog STSG (50), Integra+STSG (40) va 3D-bioprinting teri ekvivalenti (30). Kuzatuv muddati 12 hafta asosiy, 6 oy uzoq muddatli bo‘ldi. To‘liq yopilish vaqti, graft qabul qilinish foizi, Vancouver Scar Scale (VSS), infektsiya chastotasi va SF-36 hayot sifati shakli asosiy baholash mezonlari etib olindi. Statistik tahlil SPSS 26.0 dasturida t-test, χ^2 va Kaplan-Meyer usullari bilan amalga oshirildi ($p<0,05$).

Natijalar

O‘rtacha to‘liq yopilish vaqti avtolog guruhda 21 kun, Integra guruhida 17 kun, 3D-bioprinting guruhida 14 kunni tashkil etdi. O’n ikki haftalik yopilish darajasi mos ravishda 82 %, 93 % va 97 % bo‘ldi. Graft qabul qilinish foizi har uch guruhda yuqori (96–98 %) va statistik farqlanmadi. VSS bo‘yicha 6-oy ko‘rsatkichlari 7,8 balldan 4,1 ballgacha kamaydi; eng yaxshi natija 3D-bioprinting guruhida aniqlangani bilan, bu guruhda infektsiya chastotasi ham eng past (3 %) edi. Hayot sifati indekslari o‘z navbatida fizik funksiya va umumiy sog‘liq bo‘yicha 3D-bioprinting guruhida aniq yaxshilanish bilan tugadi.

Muhokama

Olingan ma’lumotlar 3D-bioprinting teri ekvivalentining proliferatsiya fazasini 4–6 kunga qisqartirish, VEGF va bFGF ortiqcha sekretsiya orqali angiogenezni kuchaytirish, shuningdek staminal hujayralarning immunomodulyator ta’siri tufayli infektsiyani 3 % gacha kamaytirish imkonini ko‘rsatdi. Integra® derma analogi ham yopilish tezligi va estetik natijada avtomatik graftga nisbatan afzallikka ega bo‘ldi, biroq printer-boyitilgan qoplamalar ko‘rsatkichlari yuzasidan yana ham

yuqori natija berdi. Cheklovlar jihatidan 3D-bioprinting usuli jihoz va operator malakasini talab qiladi, kuzatuv vaqti cheklangan; kelgusida ko‘p markazli randomizlangan tadqiqotlar bilan kost-efektivlik bahosi olib borilishi lozim.

Xulosa

Zamonaviy 3D-bioprinting bilan boyitilgan teri ekvivalenti klassik avtolog graftga nisbatan yara yopilishini 32 % tezlashitiradi, VSS bo‘yicha xiralik hajmini 2 baravarga kamaytiradi va eng past infektsiya darajasini ta’minlaydi. Ushbu texnologiyani keng ko‘lamli ko‘p markazli va iqtisodiy baholash orqali milliy klinik protokollarga joriy etish maqsadga muvofiq hisoblanadi.

Foydalanilgan adabiyotlar

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