

Article/Review

Kalsifikatsiyalangan va murakkab koronar zararlanishlarni endovaskulyar davolashda innovatsion texnologiyalar va LMCA revaskulyarizatsiya strategiyalari: sistematik adabiyotlar sharhi

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Annotatsiya: Ushbu sistematik adabiyotlar sharhida kalsifikatsiyalangan va murakkab koronar zararlanishlarni endovaskulyar davolashda innovatsion texnologiyalar (tomir ichi litotripsiya, rotatsion va orbital aterektomiya, dori qoplamali ballonlar) hamda chap asosiy koronar arteriya (LMCA) revaskulyarizatsiya strategiyalari (TOKA va AKSh qiyosiy tahlili) baholangan. **Maqsad.** Kalsifikatsiyalangan va murakkab koronar zararlanishlarni endovaskulyar davolashda innovatsion texnologiyalarning samaradorligi va xavfsizligini, shuningdek LMCA kasalligida TOKA va AKSh amaliyotlarining qiyosiy natijalarini sistematik ravishda baholash. **Materiallar va usullar.** 2006–2025 yillarda PubMed, Scopus, Web of Science va Google Scholar ma'lumotlar bazalarida chop etilgan 80 ta ilmiy manba, jumladan Disrupt CAD I–IV, ROTAXUS, PREPARE-CALC, ORBIT I–II, BASKET-SMALL 2, PICCOLETO II, AGENT IDE, SYNTAX, EXCEL, NOBLE, PRECOMBAT kabi yirik randomizatsiyalashtirilgan klinik tadqiqotlar, meta-tahlillar va xalqaro konsensus hujjatlari tahlil qilingan. **Natijalar.** Tomir ichi litotripsiyasi (IVL) kalsifikatsiyalangan koronar stenozlarda >90% texnik muvaffaqiyat va past asoratlar darajasini ta'minlagan. LMCA kasalligida SYNTAX bali ≤ 22 bo'lgan bemorlarda TOKA va AKSh natijalari o'xshash; SYNTAX bali ≥ 33 bo'lganda AKSh ustunligi aniqlangan. IPD meta-tahlilga ko'ra, spontan MI xavfi TOKA guruhida 2,35 barobar yuqori ($p < 0,0001$). DCB kichik tomirlar kasalligida DES ga non-inferior ekanligi tasdiqlangan. **Xulosa.** Innovatsion kalsifikatsiya modifikatsiya texnologiyalari murakkab koronar zararlanishlarni davolash imkoniyatlarini sezilarli kengaytirgan. LMCA kasalligida revaskulyarizatsiya usulini tanlashda SYNTAX bali, qandli diabet holati va Kardiologik konsilium yondashuvi hal qiluvchi ahamiyat kasb etadi.

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Kalit so'zlar: tomir ichi litotripsiya, rotatsion aterektomiya, orbital aterektomiya, dori qoplamali ballonlar, chap asosiy koronar arteriya, teri orqali koronar aralashuv, aorto-koronar shuntlash, koronar arteriya kalsifikatsiyasi, stent ichi restenoz.

Innovative technologies in endovascular treatment of calcified and complex coronary lesions and LMCA revascularization strategies: a systematic literature review

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Abstract:

This systematic literature review evaluates innovative technologies for endovascular treatment of calcified and complex coronary lesions (intravascular lithotripsy, rotational and orbital atherectomy,

drug-coated balloons) and left main coronary artery (LMCA) revascularization strategies (PCI versus CABG comparative analysis). **Aim.** To systematically assess the efficacy and safety of innovative technologies in treating calcified and complex coronary lesions, and to evaluate comparative outcomes of PCI versus CABG in LMCA disease. **Methods.** A systematic search of 80 scientific sources published between 2006 and 2025 was conducted using PubMed, Scopus, Web of Science, and Google Scholar databases, including major RCTs (Disrupt CAD I–IV, ROTAXUS, PREPARE-CALC, ORBIT I–II, BASKET-SMALL 2, PICCOLETO II, AGENT IDE, SYNTAX, EXCEL, NOBLE, PRECOMBAT), meta-analyses, and international consensus documents. **Results.** Intravascular lithotripsy (IVL) demonstrated >90% technical success with low complication rates in calcified coronary stenoses. In LMCA disease, PCI and CABG showed similar outcomes in patients with SYNTAX score ≤ 22 , while CABG demonstrated superiority at SYNTAX score ≥ 33 . Per IPD meta-analysis, spontaneous MI risk was 2.35-fold higher in the PCI group ($p < 0.0001$). DCB was confirmed non-inferior to DES in small vessel disease. **Conclusion.** Innovative calcification modification technologies have significantly expanded treatment options for complex coronary lesions. In LMCA disease, SYNTAX score, diabetes status, and Heart Team approach are critical determinants for revascularization strategy selection.

Keywords: intravascular lithotripsy, rotational atherectomy, orbital atherectomy, drug-coated balloons, left main coronary artery, percutaneous coronary intervention, coronary artery bypass grafting, coronary artery calcification, in-stent restenosis.

Kirish

Yurak-qon tomir kasalliklari bugungi kunda dunyodagi asosiy o'lim sabablari orasida birinchi o'rinni egallaydi. Jahon Sog'liqni Saqlash Tashkiloti ma'lumotlariga ko'ra, har yili 17,9 million kishi yurak-qon tomir kasalliklaridan vafot etadi [1]. Zamonaviy intervension kardiologiyada murakkab teri orqali koronar aralashuv (TOKA) tushunchasi keng qo'llanila boshlagan bo'lib, Giustino va hammualliflarining 2016-yilgi tadqiqotida murakkab TOKAning standartlashtirilgan oltita mezon belgilangan [2]. Kinnaird va hamkasblarining 514 575 ta TOKA amaliyotini qamrab olgan tadqiqoti murakkab TOKAning kengaytirilgan mezonlarini taqdim etdi [3]. Koronar arteriyalar kalsifikatsiyasi murakkab TOKA ning eng muhim komponentlaridan biri hisoblanadi. Madhavan tadqiqotiga ko'ra, kalsifikatsiyasi mavjud bemorlarda yurak-qon tomir asoratlari xavfi 3–4 barobar yuqori ekanligi aniqlangan [4]. Yaqqol kalsifikatsiya stentning to'liq yozilishiga to'sqinlik qilib, stent trombozi va restenoz xavfini oshiradi [5]. Shu bois, kalsifikatsiyalangan zararlanishlarni stentlashga tayyorlashda innovatsion texnologiyalar — tomir ichi litotripsiya (IVL), rotatsion aterektomiya (RA) va orbital aterektomiya (OA) kabi usullar tobora keng joriy etilmoqda. Boshqa tomondan, chap asosiy koronar arteriya (LMCA) stenozi koronar arteriya kasalligining eng og'ir shakllaridan biri bo'lib, koronografiya o'tkazilgan bemorlarning 4–7% ida aniqlanadi [6].

O'zbekiston sharoitida Fozilov va hammualliflarining tadqiqotlari koronar arteriya kasalligining mahalliy epidemiologik xususiyatlarini ta'kidlaydi [7–9]. So'nggi 15 yil davomida SYNTAX, EXCEL, NOBLE va PRECOMBAT kabi yirik tadqiqotlarda LMCA kasalligida TOKA va aorto-koronar shuntlash (AKSh) amaliyotlarining natijalari qiyosiy tahlil qilingan [6,10–13].

Ushbu sistematik adabiyotlar sharhining maqsadi — kalsifikatsiyalangan va murakkab koronar zararlanishlarni endovaskulyar davolashda innovatsion texnologiyalarning samaradorligi va xavfsizligini baholash, shuningdek LMCA kasalligida TOKA va AKSh qiyosiy natijalarini zamonaviy dalillar asosida sistematik ravishda tahlil qilishdir.

1. Chap asosiy koronar arteriya (LMCA) kasalligida TOKA va AKSh: qiyosiy tahlil

LMCA chap qorincha miokardining 75% dan ortiq qismini qon bilan ta'minlaydi. O'zbekiston sharoitida 2018-yilda o'tkazilgan retrospektiv tahlilda LMCA shikastlanishi bo'lgan 66 nafar bemorning 63,6% ida ko'p tomirli zararlanish, 78,8% ida distal segment zararlanishi aniqlangan. Medina tasnifi bo'yicha eng ko'p uchraydigan kategoriyalar 1,1,0 (46,9%) va 1,1,1 (30,3%) ekanligi tasdiqlangan [14]. 2020-yilda O'zbekiston Kardiologiyasi jurnalida chop etilgan keng qamrovli sharh LMCA zararlanishlarining 70–80% hollarda ko'p tomirli xarakter kasb etishi, distal segmentda joylashishi (40–94%) va kuchli kalsifikatsiya bilan xarakterlanishini ko'rsatdi [15]. SYNTAX tadqiqoti (2009, n=1800) LMCA va ko'p tomirli kasallikda TOKA ni AKSh bilan taqqoslagan birinchi yirik RCT

hisoblanadi. 5 yillik LMCA subgrup tahlilida MACCE darajasi TOKA guruhida 36,9%, AKSh guruhida 31,0% tashkil qildi ($p=0,12$). SYNTAX bali ≤ 22 bo'lganda natijalar o'xshash (MACCE: 30,4% vs 28,6%, $p=0,74$), SYNTAX bali ≥ 33 bo'lganda AKSh ustunligi tasdiqlandi (MACCE: 46,5% vs 29,7%, $p=0,003$) [6,16]. SYNTAX tadqiqotining 10 yillik natijalari 2019-yilda Lancet jurnalida nashr etildi [17].

EXCEL tadqiqoti (2016, $n=1905$) zamonaviy everolimus ajratuvchi stentlar bilan LMCA TOKAsini AKSh bilan taqqosladi. 3 yillik natijalar TOKAning AKShdan qolishmasligini tasdiqladi (HR 1,00; 95% CI 0,79–1,26) [13]. 5 yillik kuzatuvda barcha sabablarga ko'ra o'lim TOKA guruhida statistik jihatdan yuqori bo'ldi (13,0% vs 9,9%; $p=0,04$) [18]. 2020-yilda O'zbekiston Kardiologiyasi jurnalida LMCA ning himoyalangan o'zagiga muvaffaqiyatli stent implantatsiyasi holati tavsiflangan [19].

NOBLE tadqiqoti (2016, $n=1201$) 5 yillik kuzatuvda asosiy yakuniy nuqta TOKA guruhida 28%, AKSh guruhida 19% tashkil qildi (HR 1,58; $p<0,001$). Protseuraga bog'liq bo'lmagan MI (7% vs 2%, $p<0,001$) va takroriy revaskulyarizatsiya (17% vs 10%, $p=0,004$) TOKA guruhida yuqori bo'ldi [20,21].

PRECOMBAT tadqiqoti (2011, $n=600$) 10 yillik kuzatuvda birlamchi yakuniy nuqtada statistik farq aniqlanmadi (TOKA 29,8% vs AKSh 24,7%; HR 1,25; $p=0,15$), biroq takroriy revaskulyarizatsiya TOKA guruhida yuqori bo'ldi (20,9% vs 9,3%; HR 2,43; $p<0,001$) [12,22,23].

Sabatine va hammualliflarining 2021-yilgi IPD meta-tahlili ($n=4612$) 5 yillik kuzatuvda barcha sabablardan o'lim bo'yicha farq aniqlanmadi (TOKA 11,2% vs AKSh 10,2%; HR 1,10; $p=0,33$). Biroq, spontan MI (TOKA 6,2% vs AKSh 2,6%; HR 2,35; $p<0,0001$) va takroriy revaskulyarizatsiya (18,3% vs 10,7%; HR 1,78; $p<0,0001$) TOKA guruhida yuqori bo'ldi [24]. Head va hammualliflarining 2018-yilgi tahlili 30 kunlik insult xavfi AKSh guruhida yuqori (1,7% vs 0,4%; $p<0,001$) ekanligini ko'rsatdi, lekin 5 yillik davrda tenglashdi [25]. Gaba va hammualliflarining 2024-yilgi tahlilida SYNTAX bali yuqori va qandli diabeti bor bemorlarda AKSh afzal natijalarni namoyon etdi [26].

2. Bifurkatsion zararlanishlarni davolash strategiyasi

Bifurkatsion zararlanishlar murakkab TOKAning muhim tarkibiy qismi bo'lib, endovaskulyar koronar amaliyotlarning 15–20% ini tashkil etadi. 2006-yilda Medina tomonidan taklif etilgan tasnif bugungi kunda eng keng qo'llaniladigan tizim hisoblanadi [27]. 2022-yilda e'lon qilingan Bif-ARC konsensus hujjati bifurkatsion zararlanishlar bo'yicha standartlashtirilgan ta'riflar va yakuniy nuqtalarni belgiladi [28]. Yevropa Bifurkatsiya Klubining (EBC) 2024-yilgi 18-konsensus hujjati bifurkatsion TOKA amaliyotining har bir bosqichida angiografik ko'rsatmalardan foydalanish tartibini taqdim etdi [29]. EBC 2021-yilgi 15-konsensusida provizor stentlash aksariyat bifurkatsion zararlanishlar uchun tanlov usuli ekanligi ta'kidlangan [30].

EBC MAIN tadqiqoti (2021, $n=467$) LMCA bifurkatsiyasida provizor va ikki stentlash strategiyalarini taqqosladi. 1 yillik MACE har ikki guruhda o'xshash bo'ldi (14,7% vs 17,7%; $p=0,41$), biroq distal bifurkatsiya burchagi $\geq 70^\circ$ bo'lganda ikki stentlash afzal natijalarni ko'rsatdi [31]. DEFINITION II tadqiqoti (2020, $n=653$) murakkab bifurkatsion zararlanishlarda ikki stentlash ustunligini tasdiqladi (TLF: 6,1% vs 10,3%; $p=0,02$) [32].

3. Tomir ichi litotripsiya (IVL): mexanizm, dalillar va klinik natijalar

Tomir ichi litotripsiyasi — nefrologiyadagi ekstrakorporal litotripsiya tamoyillarini kardiovaskulyar tibbiyotga muvaffaqiyatli tatbiq etish asosida yaratilgan innovatsion texnologiyadir. IVL akustik bosim to'liqlarini yordamida kalsifikatsiyalangan qatlamni selektiv ravishda modifikatsiya qilib, yumshoq to'qimalarga minimal ta'sir ko'rsatadi [33,34]. OKT tekshiruvi IVL ta'sirida ko'p tekislikli va bo'yлама kalsifikatsiya yoriqlari hosil bo'lishini ko'rsatgan [35].

Brinton va hammualliflarining 2019-yilgi dastlabki feasibility tadqiqoti IVLning klinik salohiyatini ko'rsatdi [36]. Disrupt CAD II (2019, $n=120$) IVLning xavfsizligi va samaradorligini baholadi: klinik muvaffaqiyat 93,1%, 30 kunlik MACE 5,8% [37]. Disrupt CAD III (2020, $n=431$) eng yirik prospektiv tadqiqot bo'lib, birlamchi xavfsizlik yakuniy nuqtasi 92,2% ($p<0,0001$), samaradorlik 92,4% ga yetdi. OKT sub-tahlilida zararlanishlarning 67,4% ida multiplanar kalsiy yoriqlari aniqlandi, MSA o'rtacha $6,5 \pm 2,1 \text{ mm}^2$ ni tashkil etdi [38]. 1 yillik kuzatuvda MACE 8,7% ni tashkil qildi [39]. Disrupt CAD IV (Yaponiya, $n=100$) Osiyo populyatsiyasida protsedura muvaffaqiyati 95,0%, 30 kunlik MACE 3,0% ni tashkil qildi [40]. Disrupt CAD I–IV birlashtirilgan tahlili ($n=628$)

birlamchi xavfsizlik va samaradorlik ko'rsatkichlari mos ravishda 92,7% va 92,4% ekanligini tasdiqladi. E'tiborli jihati, IVL bilan bog'liq perforatsiya, abrupt closure yoki no-reflow hodisalari kuzatilmadi [41]. 2024-yilgi ko'p markazli meta-tahlil IVLning >90% texnik muvaffaqiyat va past asoratlar darajasini tasdiqladi [42]. REPLIC-EPIC18 registri (n=1175) real klinik sharoitda ham IVLning yuqori samaradorligini ko'rsatdi [43]. ROLLER COASTER-EPIC22 (2025) tadqiqotida IVL rotatsion aterektomiyaga nisbatan kamroq asoratlar bilan ishonchli natijalarni ta'minlashi aniqlandi [44]. BMC2 registri IVL foydalanishining yildan-yilga ortib borayotganini tasdiqladi [45].

4. Rotatsion aterektomiya: ROTAXUS va PREPARE-CALC tadqiqotlari

Rotatsion aterektomiya (RA) qattiq kalsifikatsiyalangan koronar zararlanishlarni «differensial kesish» mexanizmi asosida davolaydi. ROTAXUS tadqiqoti (n=240) 9 oylik LLL ko'rsatkichida RA guruhida biroz yuqori natija aniqladi ($0,40 \pm 0,61$ vs $0,31 \pm 0,44$ mm; $p=0,03$) [46]. PREPARE-CALC tadqiqoti (2018) RA va modifikatsiyalangan ballonlarni taqqosladi. 9 oylik LLL RA guruhida $0,39 \pm 0,49$ mm, nazorat guruhida $0,45 \pm 0,62$ mm tashkil qildi (non-inferiority $p=0,47$). Bu tadqiqotda ilk bor RA ortiqcha neointimal giperplaziya bilan bog'liq emasligi aniqlandi [47]. 2 yillik kuzatuvda MACE har ikki guruhda o'xshash bo'ldi (16,8% vs 19,9%; $p=0,52$) [48]. ROTAXUS va PREPARE-CALC qiyosiy tahlili PREPARE-CALC bemorlarining kattaroq yoshi va murakkab zararlanishlari (LMCA 10,6% vs 2,1%) borligini ko'rsatdi [49]. 5 yillik kuzatuvda RA guruhida revaskulyarizatsiya kamayish tendensiyasi kuzatildi (18,2% vs 26,4%; $p=0,08$) [50]. OKT sub-tahlili RA chuqurroq kalsifikatsiya modifikatsiyasini ta'minlashini, lekin yakuniy MSA ko'rsatkichi bir xil ekanligini tasdiqladi [51].

ROTATE registri (n=659) RA amaliyotining yuqori muvaffaqiyati (95,3%) va maqbul xavfsizlik profilini tasdiqladi [52]. Yevropa [53] va Shimoliy Amerika [54] ekspert konsensus hujjatlari RAning zamonaviy qo'llanilishi bo'yicha batafsil ko'rsatmalar taqdim etdi. Bail-out RA prediktorlari: zararlanish uzunligi (OR 1,02; $p=0,04$), bifurkatsiya (OR 2,60; $p=0,009$) va tomirning $>45^\circ$ egilishi (OR 3,49; $p<0,001$) [55]. CVIT 2023-yilgi konsensus hujjati RAning optimal qo'llanilishi standartlarini yangiladi [56].

5. Orbital aterektomiya: ORBIT tadqiqotlari va klinik tajriba

Orbital aterektomiya (OA) eksentrik aylanuvchi toj yordamida kalsifikatsiyani modifikatsiya qiladi. ORBIT I (2013, n=50) OAning texnik imkoniyatlarini (92%) va maqbul xavfsizlik profilini ko'rsatdi [57]. 3 yillik kuzatuvda MACE 20,0%, TLR 12,0% tashkil qildi [58].

ORBIT II (2014, n=443) protsedura muvaffaqiyati 89,6%, 30 kunlik MACE 10,4%, perforatsiya 0,9%, slow-flow/no-flow 1,4% ni tashkil qildi [59]. 1 yillik natijalarda MACE 16,4% [60], 2 yillik kuzatuvda 23,9% ga yetdi [61]. Goel va hammualliflarining meta-tahlilida orbital va rotatsion aterektomiya o'rtasida jiddiy farqlar aniqlanmadi, biroq slow-flow/no-flow OA guruhida kamroq uchrash ehtimoli qayd etildi [62].

6. Dori qoplamali ballonlar (DCB): kichik tomirlar kasalligi va stent ichi restenoz

BASKET-SMALL 2 (2018, n=758) kichik koronar arteriyalarda DCB va DES ni taqqosladi. 3 yillik birlamchi yakuniy nuqta DCB guruhida 15,1%, DES guruhida 14,1% tashkil qildi (non-inferiority $p=0,004$) [63]. 3 yillik kuzatuv natijalari DCBning uzoq muddatli non-inferiority ni tasdiqladi (14,6% vs 12,7%; non-inferiority $p=0,0002$) [64].

PICCOLETO II (2020, n=232) 6 oylik LLL DCB guruhida $0,18 \pm 0,45$ mm, DES guruhida $0,12 \pm 0,41$ mm tashkil qildi (non-inferiority $p=0,03$) [65]. 3 yillik natijalari TLF bo'yicha farq aniqlanmadi (13,8% vs 16,4%; $p=0,57$) [66]. BELLO tadqiqoti (n=182) DCBning qoniqarli angiografik natijalarini tasdiqladi [67]. AGENT IDE (2024, n=440) DCBning stent ichi restenozida TLFni sezilarli kamaytirganini ko'rsatdi [68]. Xalqaro DCB Konsensus Guruhining uchinchi hisoboti optimal qo'llanish bo'yicha tavsiyalar taqdim etdi [69].

DAEDALUS meta-tahlili (2020, n=2850) DCBning stent ichi restenozida DESga muqobil va samarali ekanligini tasdiqladi [70]. Wang va hammualliflarining meta-tahlili DCBning de novo kichik tomirlar kasalligida samarali vosita ekanligini ko'rsatdi [71]. 2024-yilgi meta-tahlilda paklitaksel va sirolimus qoplamali ballonlar o'rtasida jiddiy farq aniqlanmadi [72].

7. Multimodal yondashuv va zamonaviy algoritmlar

2023-yilgi EAPCI/EURO4C-PCR klinik konsensus bayonoti kalsifikatsiyalangan koronar stenozlarni boshqarishda multimodal yondashuvni tavsiya etdi. Konsensusga ko'ra, tomir ichi vizualizatsiyasi kalsifikatsiya morfologiyasini aniqlash va modifikatsiya strategiyasini tanlashda hal qiluvchi

ahamiyat kasb etadi. Zararlanish xususiyatlaridan kelib chiqib, IVL, RA, OA yoki ularning kombi-natsiyasidan foydalanish tavsiya etiladi [73].

ESC 2024-yilgi yo'riqnomasi murakkab zararlanishlarda TOKA ni IVUS yoki OKT nazorati ostida o'tkazish (I sinf, A dalillar) va LMCA kasalligida Kardiologik konsilium yondashuvini tavsiya etadi [10]. ACC/AHA/SCAI 2021-yilgi qo'shma yo'riqnomasi intravascular imaging (Class IIa) va fiziologik baholashni (Class I) tavsiya etadi [74]. ESC/EACTS 2018-yilgi yo'riqnomasi ham qo'shma yondashuvni ta'kidlaydi [75]. 2024-yilgi SCAI ekspert konsensus bayonoti kalsifikatsiyalangan zararlanishlar uchun lesion preparation strategiyalarini batafsil yoritdi [76]. SYNTAX Score II tizimi (2020-yilgi yangilangan versiya) TOKA va AKSh o'rtasidagi tanlovni shaxsiylashtirishga xizmat qiladi [77,78]. Young va hammualliflarining tadqiqoti Kardiologik konsilium yondashuvining optimal davolash strategiyasini tanlashdagi hal qiluvchi rolini tasdiqladi [79]. EuroSTO klubining 2019-yilgi konsensusida STO endovaskulyar rekanalizatsiyasi bo'yicha zamonaviy yondashuvlar taqdim etildi [80].

Munozara

Ushbu sistematik adabiyotlar sharhida tahlil qilingan dalillar kalsifikatsiyalangan va murakkab koronar zararlanishlarni davolashda innovatsion texnologiyalarning sezilarli yutuqlarni ta'minlaganligini ko'rsatadi. IVL texnologiyasi Disrupt CAD tadqiqotlari seriyasida izchil ravishda >90% texnik muvaffaqiyat va past asoratlar darajasini namoyon etdi [38,41]. Ayniqsa, IVL bilan bog'liq perforatsiya va no-reflow hodisalarining kuzatilmasligi klinik ahamiyatga ega.

RA sohasida PREPARE-CALC tadqiqotining 5 yillik natijalari RA guruhida revaskulyarizatsiya ehtiyojining kamayish tendensiyasini ko'rsatdi (18,2% vs 26,4%; p=0,08) [50]. Bu yangi avlod DES bilan birgalikda qo'llanilganda RAning yaxshilangan klinik natijalarini aks ettiradi.

LMCA kasalligida IPD meta-tahlil (n=4612) o'lim bo'yicha farq aniqlanmasa-da, spontan MI va takroriy revaskulyarizatsiya TOKA guruhida statistik jihatdan yuqori ekanligi aniqlandi [24]. SYNTAX bali va qandli diabet holati revaskulyarizatsiya usulini tanlashda muhim omillar sifatida tasdiqlandi [16,26]. DCB sohasida BASKET-SMALL 2 va PICCOLETO II tadqiqotlari kichik tomirlar kasalligida DCBning DESga non-inferior ekanligini tasdiqladi [63,65]. DAEDALUS meta-tahlili esa stent ichi restenozida DCBning samarali alternativa ekanligini isbotlaydi [70].

O'zbekiston sharoitida Fozilov va hammualliflarining tadqiqotlari koronar arteriya kasalligining mahalliy xususiyatlarini o'rganish va zamonaviy davolash usullarini joriy etish zarurligini ta'kidlaydi [7-9,14,15,19]. Bu ma'lumotlar O'zbekistonda innovatsion endovaskulyar texnologiyalarni keng joriy etishning dolzarbligini yana bir bor tasdiqlaydi.

Xulosa

Ushbu sistematik adabiyotlar sharhi natijalariga asoslanib, quyidagi xulosalarni chiqarish mumkin:

Birinchidan, tomir ichi litotripsiyasi kalsifikatsiyalangan koronar stenozlarda >90% texnik muvaffaqiyat va past asoratlar darajasi bilan eng xavfsiz innovatsion usul sifatida o'zini namoyon etdi. Rotatsion aterektomiya yangi avlod DES bilan birgalikda qo'llanilganda yaxshilangan uzoq muddatli natijalarni ta'minlaydi. Orbital aterektomiya RAg muqobil samarali texnologiya sifatida tasdiqlangan.

Ikkinchidan, LMCA kasalligida SYNTAX bali ≤ 22 bo'lgan bemorlarda TOKA va AKSh natijalari o'xshash, SYNTAX bali ≥ 33 bo'lganda AKSh ustunligi aniqlangan. Qandli diabeti bor bemorlarda AKSh amaliyotini qo'llash afzalroq natijalarni ta'minlaydi. Kardiologik konsilium yondashuvi optimal qaror qabul qilishning garovi hisoblanadi.

Uchinchidan, DCB kichik tomirlar kasalligi va stent ichi restenozida DESga muqobil samarali davolash usuli sifatida tasdiqlangan. Kalsifikatsiyalangan zararlanishlarni davolashda multimodal yondashuv va tomir ichi vizualizatsiyasi nazorati optimal natijalar erishishda muhim ahamiyat kasb etadi.

Mualliflarning hissalari

Kontseptualizatsiya: X.F.; Metodologiya: B.Y.; Tadqiqot: B.Y.; Dastlabki yozuv: B.Y.; Tahrirlash: X.F., B.Y.; Nazorat: X.F. Barcha mualliflar maqolaning yakuniy variantini o'qigan va tasdiqlagan.

Authors' contribution

Conceptualization: Kh.F.; Methodology: B.Y.; Investigation: B.Y.; Writing – Original Draft: B.Y.; Writing – Review & Editing: Kh.F., B.Y.; Supervision: Kh.F. All authors have read and agreed to the published version of the manuscript.

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Qo'llanilmaydi. Tadqiqot aralashuvlar yoki bemor ma'lumotlarini o'z ichiga olmaganligi sababli etik ruxsat talab qilinmadi.

Ethics approval

Not applicable. The study did not require ethical approval as no interventions or human data were involved.

Nashrga xabardor qilingan rozilik

Qo'llanilmaydi. Ushbu sistematik adabiyotlar sharhi doirasida yangi tadqiqot ishtirokchilari jalb qilinmagan.

Consent for publication

Not applicable. No new study participants were enrolled in this systematic literature review.

Ma'lumotlar mavjudligi to'g'risidagi bayonot

Tadqiqot natijalarini qo'llab-quvvatlovchi ma'lumotlar asosli so'rov bo'yicha mualliflardan olinishi mumkin. Sharhda muhokama qilingan asosiy dalillar keltirilgan adabiyot manbalarida mavjud.

Data Availability Statement

The data supporting the results of this study are available from the authors upon reasonable request. The principal evidence discussed in the review is available in the cited literature.

Rahmatnomalar

Mualliflar Respublika ixtisoslashtirilgan kardiologiya ilmiy-amaliy tibbiyot markaziga tadqiqot o'tkazish uchun yordam va qo'llab-quvvatlash uchun, shuningdek qimmatli sharhlar va takliflar bilan ishning sifatini yaxshilashga yordam bergan hamkasblarga o'z minnatdorchilarini bildiradilar.

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Manfaatlar to'qnashuvi

Mualliflar manfaatlar to'qnashuvining yo'qligini e'lon qiladilar.

Conflict of interest

The authors declare no conflicts of interest.

Qisqartmalar

IVL	Tomir ichi litotripsiya (Intravascular Lithotripsy)
RA	Rotatsion aterektomiya (Rotational Atherectomy)
OA	Orbital aterektomiya (Orbital Atherectomy)
DCB	Dori qoplamali ballonlar (Drug-Coated Balloons)
DES	Dori qoplamali stentlar (Drug-Eluting Stents)
LMCA	Chap asosiy koronar arteriya (Left Main Coronary Artery)
TOKA	Teri orqali koronar aralashuv
AKSh	Aorto-koronar shuntlash

Adabiyot

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