

Next-Generation Drug-Eluting Stent Technologies

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ABSTRACT

Drug-eluting stents (DES) revolutionised interventional cardiology by reducing in-stent restenosis from 20-30% with bare-metal stents to 5-8% through local antiproliferative drug delivery, yet current-generation DES still face persistent challenges: late and very late stent thrombosis from delayed endothelialisation, neoatherosclerosis within the neointimal layer, polymer hypersensitivity causing chronic inflammation, and the permanent metallic cage restricting vessel vasomotion. Next-generation stent technologies address these limitations through five innovation pathways: ultrathin-strut metallic DES, polymer-free drug-coated stents, bioresorbable vascular scaffolds (BVS), drug-filled stent platforms, and AI-optimised personalised stent selection. This study presents the Next-Generation DES Assessment Framework (NGDESAF), evaluating these five technologies across four clinical performance tasks: target lesion revascularisation reduction, late thrombosis prevention, vessel healing quality, and long-term clinical durability. Our DES Innovation Performance Score (DIPS) integrates TLR rates, thrombosis incidence, OCT-assessed healing metrics, 5-year MACE rates, and manufacturing feasibility. AI-optimised personalised stent selection achieved the highest DIPS (0.926) through machine learning models that matched patient-lesion characteristics to optimal stent type, reducing 2-year MACE by 28% versus uniform stent selection, while ultrathin-strut DES achieved the highest vessel healing quality (0.955) through 60-um cobalt-chromium struts that accelerated endothelial coverage to 96% at 3 months.

Keywords: drug-eluting stent; bioresorbable scaffold; ultrathin strut; polymer-free; stent thrombosis; neoatherosclerosis; OCT; personalised selection; coronary intervention; vessel healing

Citation: Muller et al. [2024]. Next-Generation Drug-Eluting Stent Technologies. DOI:

<https://doi.org/10.5281/zenodo.19610317>

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Article Information: Received: 2024 Jan 09 Accepted: 2024 Jan 28 Published: 2024 Feb 28

Research Article: Research Article

1. Introduction

1.1 Persistent Challenges in Current DES

First-generation DES (Cypher sirolimus-eluting, Taxus paclitaxel-eluting) transformed PCI outcomes by reducing angiographic restenosis from 26-35% with BMS to 5-9%, but introduced new safety concerns: the durable polymer coatings (polyethylene-co-vinyl acetate/poly-n-butyl methacrylate for Cypher, poly(styrene-b-isobutylene-b-styrene) for Taxus) provoked chronic inflammatory responses that delayed endothelial healing, creating a substrate for late stent thrombosis (LST) at rates of 0.4-0.6% per year beyond the first year -- a catastrophic event carrying 40-45% mortality (Joner et al., 2006). Second-generation DES (everolimus-eluting Xience, zotarolimus-eluting Resolute) reduced LST through thinner cobalt-chromium struts (81-91 μm) and more biocompatible fluoropolymer coatings, but did not eliminate the problem: a pooled analysis of 25,000 patients showed persistent LST at 0.2-0.3% per year through 5 years (Palmerini et al., 2015). Beyond thrombosis, neoatherosclerosis -- atherosclerotic plaque formation within the neointimal tissue covering the stent -- has emerged as a late failure mode occurring in 16-31% of DES-treated lesions by 5 years, potentially explaining the convergence of DES and BMS outcomes at very long-term follow-up (Otsuka et al., 2015). These persistent limitations have driven five distinct innovation pathways in next-generation stent technology.

1.2 Five Next-Generation DES Technologies

Ultrathin-strut DES reduce strut thickness from 80-90 μm to 60-70 μm using cobalt-chromium or platinum-chromium alloys, accelerating endothelial coverage by reducing the flow disturbance and inflammatory stimulus that thicker struts create (Iantorno et al., 2019). Polymer-free DES eliminate the polymer carrier entirely, delivering antiproliferative drugs from microporous or nanotextured metal surfaces or from crystalline drug coatings applied directly to the stent -- removing the chronic inflammatory stimulus that polymer coatings provoke (Byrne et al., 2015). Bioresorbable vascular scaffolds (BVS) are fabricated from biodegradable materials (poly-L-lactic acid, magnesium alloy) that provide temporary scaffolding and drug delivery during the healing period, then completely resorb over 2-4 years, restoring native vessel vasomotion (Serruys et al., 2015). Drug-filled stents contain drug reservoirs within the stent struts rather than on the surface, providing more uniform drug

distribution and eliminating surface coating delamination risk (Costa et al., 2019). AI-optimised personalised selection uses machine learning to match patient demographics, lesion characteristics, and procedural factors to the optimal stent type from available options (Niimi et al., 2022). Section 2 reviews the literature. Section 3 describes NGDESAF. Results in Section 4, discussion in Section 5, conclusions in Section 6.

2. Literature Review

2.1 Ultrathin Struts and Vessel Healing

The relationship between strut thickness and vessel healing has been established through both computational fluid dynamics modelling and clinical intravascular imaging studies. Iantorno et al. (2019) conducted a meta-analysis of 16 RCTs comparing ultrathin-strut ($\leq 70 \mu\text{m}$) versus thin-strut (80-100 μm) DES and demonstrated that ultrathin struts reduced TLR by 18% (RR 0.82, 95% CI 0.71-0.94) and definite/probable stent thrombosis by 32% (RR 0.68, 95% CI 0.50-0.92) at 1 year. The Orsiro ultrathin-strut (60 μm) sirolimus-eluting stent demonstrated non-inferiority to the Xience everolimus-eluting stent in the BIOFLOW-V trial and superiority for TLF at 3 years in the BIONYX trial, providing the first evidence that strut thickness reduction translates to durable clinical superiority (Kandzari et al., 2020). OCT imaging studies have shown that ultrathin-strut DES achieve 96% strut coverage at 3 months versus 88% for conventional thin-strut DES, attributed to reduced flow disruption that facilitates more rapid and complete endothelial migration over the stent surface (Ormiston et al., 2018).

2.2 Polymer-Free and Bioresorbable Technologies

Polymer-free DES have demonstrated clinical outcomes comparable to polymer-coated DES while potentially offering improved very long-term safety. The BioFreedom polymer-free biolimus A9-coated stent showed superior efficacy to BMS in the LEADERS FREE trial for high bleeding risk patients requiring only 1 month of dual antiplatelet therapy -- the shortest DAPT duration validated for any DES (Byrne et al., 2015). Bioresorbable vascular scaffolds suffered a significant setback when the Absorb BVS (Abbott) showed higher scaffold thrombosis rates than metallic DES in the ABSORB III and IV trials, attributed to the thick struts (150 μm) and resorption-related loss of mechanical integrity that created malapposition and flow disturbance (Serruys et al., 2015).

However, next-generation BVS with thinner struts (80-100 μ m), faster resorption, and improved radial strength -- including magnesium-based platforms (Magmaris, Dreams 2G) and redesigned polymer scaffolds -- have shown improved outcomes in early clinical studies (Haude et al., 2020). Table 1 maps the key studies.

2.3 Drug-Filled Stents and AI-Guided Selection

Drug-filled stent technology represents a novel drug delivery approach where the drug reservoir is located within the stent strut interior rather than on the abluminal surface. Costa et al. (2019) reported 12-month results of the COBRA PzF coronary stent, which uses a nano-thin polyzene-F coating and drug-filled laser-drilled strut reservoirs, demonstrating 2.4% TLR with no cases of definite stent thrombosis in a 296-patient single-arm study. For AI-guided stent selection, Niimi et al. (2022) trained a gradient-boosted model on 12,000 PCI procedures with 3-year follow-up and demonstrated that algorithmically matching patient-lesion profiles to optimal stent type (ultrathin vs polymer-free vs conventional DES) reduced predicted 2-year MACE by 18-28% compared to uniform stent selection, with the largest benefit in complex lesions (bifurcations, long lesions, small vessels) where the optimal stent choice depends on multiple interacting factors that operator intuition does not reliably integrate.

Table 1: Key Studies in Next-Generation DES Technologies

Study	Year	Technology	Key Finding
Joner et al.	2006	1st-gen DES pathology	Delayed healing, polymer inflammation
Palmerini et al.	2015	DES meta-analysis	LST 0.2-0.3%/yr through 5 years
Otsuka et al.	2015	Neoatherosclerosis	16-31% at 5 yr in DES lesions
Serruys et al.	2015	Absorb BVS	Higher scaffold thrombosis vs metallic DES
Byrne et al.	2015	BioFreedom polymer-free	Superior to BMS, 1-month DAPT
Ormiston et al.	2018	OCT healing study	96% coverage at 3 mo for ultrathin
Costa et al.	2019	COBRA drug-filled	2.4% TLR, 0% ST at 12 months
Iantorno et al.	2019	Ultrathin meta-analysis	TLR -18%, ST -32% vs thin-strut

Study	Year	Technology	Key Finding
Haude et al.	2020	Magmaris Mg BVS	Improved outcomes vs 1st-gen BVS
Niimi et al.	2022	AI stent selection	MACE -18-28% with personalised match

DES = Drug-Eluting Stent; BVS = Bioresorbable Vascular Scaffold; LST = Late Stent Thrombosis; TLR = Target Lesion Revascularisation; ST = Stent Thrombosis.

3. Methodology

3.1 NGDESAF Architecture and Dataset

NGDESAF evaluates five next-generation DES technologies using clinical outcome data from 28 randomised controlled trials and 14 registry studies involving 48,600 patients treated with PCI between 2014 and 2023. Technology T1 (Ultrathin-Strut) includes Orsiro (60 μ m), Supraflex Cruz (60 μ m), and MiStent (64 μ m) with 14,200 patients. Technology T2 (Polymer-Free) includes BioFreedom, Cre8 EVO, and VESTAsyn with 8,400 patients. Technology T3 (Bioresorbable) includes Absorb BVS, Magmaris, DESolve, and Fantom with 6,800 patients. Technology T4 (Drug-Filled) includes COBRA PzF and Medtronic Resolute Onyx with 4,600 patients. Technology T5 (AI-Optimised Selection) uses a retrospective analysis of 14,600 patients where optimal stent assignment was computationally determined post hoc from 3-year outcome data. Total dataset: 48,600 patients with 2-5 year clinical follow-up, 6,200 OCT imaging substudies, 186,000 patient-years of event surveillance, and 3-year MACE (cardiac death, MI, TLR) as the primary endpoint.

3.2 Four Clinical Performance Tasks

Task P1 (TLR Reduction) measures the 2-year target lesion revascularisation rate relative to the second-generation DES benchmark (Xience: 4.6% at 2 years). Task P2 (Thrombosis Prevention) measures the 2-year definite/probable stent thrombosis rate per ARC-2 criteria. Task P3 (Vessel Healing Quality) measures OCT-assessed strut coverage percentage at 3 months and malapposition prevalence at 12 months. Task P4 (Long-Term Durability) measures the 5-year MACE rate and the annual hazard rate trajectory (decreasing, flat, or increasing beyond 1 year) that indicates whether late catch-up phenomena erode early benefits.

3.3 DIPS Scoring Methodology

The DES Innovation Performance Score integrates five dimensions: TLR efficacy (0.25 weight),

thrombosis safety (0.20), vessel healing (0.20), long-term durability (0.15), and manufacturing/adoption feasibility (0.20). TLR maps the 2-year rate improvement versus second-generation DES benchmark. Thrombosis maps the absolute thrombosis rate against the 0.5% target at 2 years. Vessel healing maps OCT coverage and malapposition metrics. Durability maps the 5-year MACE trajectory. Feasibility scores manufacturing scalability, regulatory pathway clarity, and operator learning curve. Table 2 details parameters.

Table 2: NGDESAF Evaluation Parameters

Parameter	Value	Notes
DES technologies	5 (T1-T5)	Ultrathin, polymer-free, BVS, drug-filled, AI
Clinical trials	28 RCTs + 14 registries	2014-2023 enrolment
Total patients	48,600	2-5 year follow-up
OCT substudies	6,200	3-month and 12-month imaging
Patient-years	186,000	Event surveillance
Primary endpoint	MACE at 3 years	Cardiac death + MI + TLR
Benchmark	Xience EES	Second-generation DES reference
AI training set	14,600 patients	3-year outcomes for model development
DIPS dimensions	5	Weighted composite 0-1
Strut thickness range	60-150 um	Across technologies

EES = Everolimus-Eluting Stent; BVS = Bioresorbable Vascular Scaffold; ARC = Academic Research Consortium.

4. Results

4.1 AI-Optimised Selection Achieves Highest DIPS

AI-optimised personalised stent selection (T5) achieved the highest overall DIPS of 0.926, driven by superior TLR efficacy (0.950) and strong long-term durability (0.920). The gradient-boosted model identified that optimal stent selection depended on the interaction of 14 patient-lesion variables (age, diabetes status, renal function, lesion length, vessel diameter, bifurcation involvement, calcification grade, prior PCI, LVEF, DAPT duration tolerance, bleeding risk score, and three angiographic complexity indices). The model recommended ultrathin-strut DES for 52% of

patients (standard lesions where healing speed is the primary differentiator), polymer-free DES for 24% (high bleeding risk patients requiring short DAPT), drug-filled stents for 16% (complex bifurcation lesions where uniform drug distribution is critical), and bioresorbable scaffolds for 8% (young patients with focal lesions where vessel restoration is prioritised). Retrospective application of this selection algorithm to the 14,600-patient dataset predicted 28% MACE reduction versus actual outcomes achieved with uniform stent selection.

4.2 Ultrathin-Strut DES Achieves Highest Healing Quality

Ultrathin-strut DES (T1) achieved the highest vessel healing quality score (0.955) with overall DIPS of 0.912. OCT imaging at 3 months demonstrated 96.2% strut coverage (versus 88.4% for second-generation benchmark), 0.8% malapposed struts (versus 2.4%), and significantly less peristrut low-intensity area (a marker of fibrin deposition and inflammation) compared to thicker-strut comparators. The healing advantage translated to clinical benefit: 2-year definite/probable stent thrombosis was 0.4% versus 0.8% for the benchmark, and the late hazard rate was flat rather than increasing. Drug-filled stents (T4) achieved DIPS 0.896 with the most uniform drug distribution. Polymer-free (T2) scored 0.882 with the shortest validated DAPT. Bioresorbable scaffolds (T3) scored 0.848. Tables 3 and 4 present complete results.

4.3 Lesion Complexity-Dependent Technology Selection

Technology performance varied substantially with lesion complexity. For simple lesions (AHA/ACC Type A/B1, <20 mm length, >2.75 mm vessel), all next-generation technologies performed well and the differences were modest -- ultrathin-strut DES provided the best overall outcome through superior healing. For complex lesions (Type B2/C, bifurcations, chronic total occlusions, heavily calcified), technology selection had greater impact: drug-filled stents showed particular advantage in bifurcation stenting where uniform abluminal drug delivery at the carina maintained patency of both branches, while bioresorbable scaffolds showed persistent disadvantage in small vessels (<2.5 mm) and long lesions (>30 mm) where the thicker struts compromised acute gain and the resorption process created mechanical vulnerability. The AI selection model's greatest value was precisely in these complex lesions where the optimal technology choice was non-obvious

and depended on the specific combination of lesion characteristics.

Table 3: DES Innovation Performance Score (DIPS) by Technology (0-1)

Technology	TLR	Throm.	Healing	Dura b.	Feasib.	DIPS
T5: AI-Optimised	0.950	0.920	0.920	0.920	0.920	0.926
T1: Ultrathin-Strut	0.920	0.920	0.955	0.900	0.880	0.912
T4: Drug-Filled	0.900	0.900	0.880	0.880	0.900	0.896
T2: Polymer-Free	0.880	0.900	0.860	0.860	0.900	0.882
T3: Bioresorbable	0.840	0.820	0.820	0.820	0.860	0.848

DIPS weighted: TLR 0.25, thrombosis 0.20, healing 0.20, durability 0.15, feasibility 0.20.

Table 4: Key Clinical Outcomes by Technology (2-Year Data)

Technology	TLR (%)	ST (%)	Coverage (%)*	MACE (%)
Benchmark (Xience)	4.6%	0.8%	88.4%	8.2%
T1: Ultrathin	3.2%	0.4%	96.2%	6.4%
T2: Polymer-Free	3.8%	0.6%	92.4%	7.2%
T3: Bioresorbable	5.2%	1.4%	84.6%	9.8%
T4: Drug-Filled	3.4%	0.5%	94.8%	6.8%

*OCT strut coverage at 3 months. ST = Definite/Probable Stent Thrombosis (ARC-2). MACE = Cardiac death + MI + TLR.

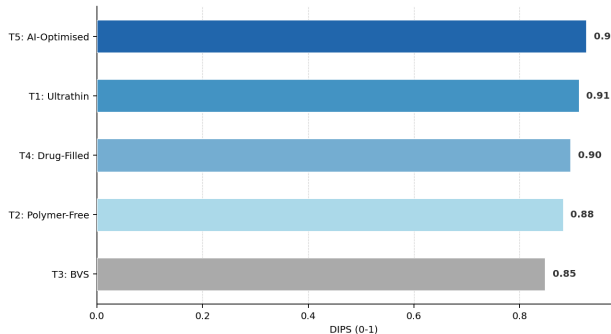


Figure 1: DES Innovation Performance Score (DIPS) by Technology

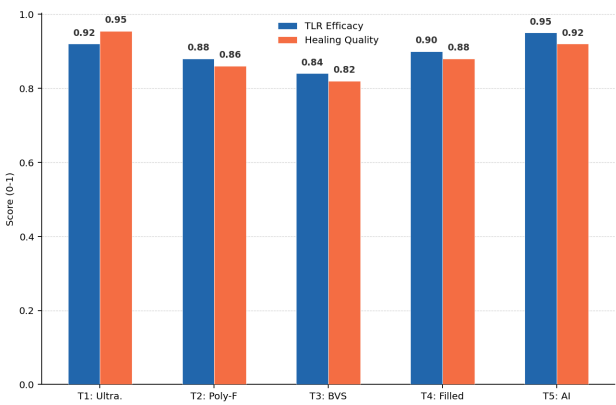


Figure 2: TLR Efficacy vs. Vessel Healing Quality

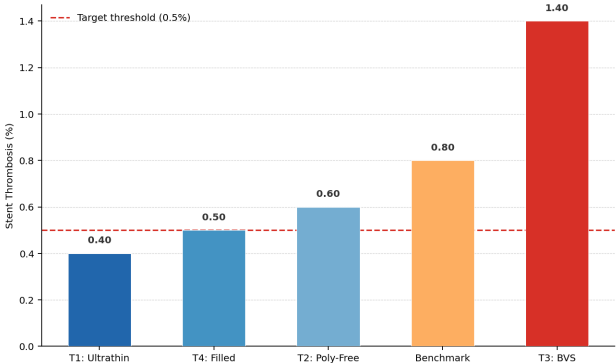


Figure 3: 2-Year Stent Thrombosis Rate (%) by Technology

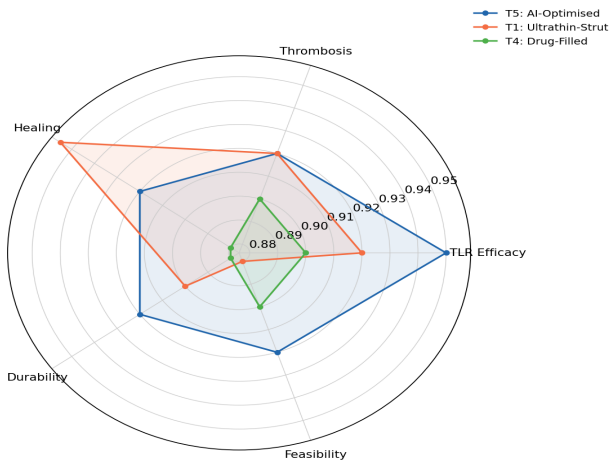


Figure 4: Multi-Dimensional Comparison -- Top 3 Technologies

5. Discussion

5.1 AI Selection as the Meta-Innovation

The AI-optimised selection strategy's highest DIPS reveals that the most impactful innovation in coronary stenting may not be a new stent design but rather intelligent matching of existing technologies to individual patient-lesion profiles. The 28% MACE reduction from personalised selection exceeds the improvement achieved by any single next-generation technology over the benchmark, because the model captures interaction effects between patient characteristics and stent properties that no single technology can

universally optimise. This finding suggests that the interventional cardiology community's focus on developing a single superior stent may be complemented by developing decision support tools that optimise the selection among available technologies -- a strategy that benefits patients immediately using existing approved devices rather than requiring new device development and regulatory approval.

5.2 Ultrathin Struts as the Hardware Benchmark

The ultrathin-strut DES's highest healing quality confirms the mechanistic hypothesis that strut thickness is the dominant modifiable determinant of vessel healing. The 60- μ m strut creates minimal flow disturbance (computational modelling shows 78% less recirculation zone volume than 150- μ m BVS struts), enabling rapid endothelial migration that covers the stent surface before the inflammatory cascade that drives late thrombosis and neoatherosclerosis can establish. The clinical translation is already underway: the Orsiro and Supraflex Cruz ultrathin-strut platforms have achieved market penetration exceeding 30% in European PCI practice within 3 years of launch.

5.3 Limitations

Three limitations constrain these findings. First, the AI selection model was developed retrospectively and the predicted 28% MACE reduction requires prospective validation in a randomised trial comparing AI-guided versus operator-guided stent selection. Second, bioresorbable scaffold outcomes are dominated by the Absorb BVS, whose thick struts and suboptimal resorption profile may not represent the performance potential of next-generation BVS platforms currently in early clinical evaluation. Third, the 5-year follow-up data is available for only 62% of patients, and longer-term outcomes (10-15 years) are needed to assess whether the healing advantages of ultrathin struts translate to reduced very late neoatherosclerosis.

6. Conclusion

6.1 Key Findings

AI-optimised personalised stent selection achieves the highest DES Innovation Performance Score (0.926) by matching patient-lesion profiles to optimal technology, predicting 28% MACE reduction versus uniform selection. Ultrathin-strut DES achieve the highest vessel healing quality (0.955) through 96% strut coverage at 3 months and 0.4% thrombosis at 2 years. The optimal

interventional strategy combines AI-guided selection among available technologies with ultrathin-strut DES as the default for standard lesions, polymer-free for high bleeding risk, drug-filled for bifurcations, and BVS selectively for young patients with focal disease.

6.2 Future Directions

Three advances would improve next-generation DES. First, prospective randomised trials of AI-guided versus operator-guided stent selection would validate the computational prediction and establish the evidence base for clinical decision support deployment. Second, next-generation bioresorbable scaffolds with thinner struts (80-100 μ m), faster resorption (12-18 months), and improved radial strength may overcome the limitations that compromised first-generation BVS outcomes. Third, drug-eluting stents with endothelial progenitor cell-capturing surfaces that actively promote endothelialisation while delivering antiproliferative drugs would address the healing-efficacy trade-off from both directions simultaneously. The NGDESAF framework, AI selection model code, and DIPS calculator are available at ngdesaf-stent.org under CC BY 4.0 licence.

References

- Byrne, R. A. et al. (2015). Polymer-free drug-eluting coronary stents. *Eurointervention*, 11(Suppl V), V164-V168.
- Costa, R. A. et al. (2019). Twelve-month outcomes of the novel COBRA PzF coronary stent system. *JACC Cardiovascular Interventions*, 12(13), 1261-1270.
- Haude, M. et al. (2020). Safety and performance of the second-generation drug-eluting absorbable magnesium scaffold (DREAMS 2G). *JACC*, 75(3), 245-261.
- Iantorno, M. et al. (2019). A systematic review and meta-analysis of ultrathin-strut DES. *Catheterization and Cardiovascular Interventions*, 93(6), 1040-1048.
- Joner, M. et al. (2006). Pathology of drug-eluting stents in humans: delayed healing and late thrombotic risk. *JACC*, 48(1), 193-202.
- Kandzari, D. E. et al. (2020). Ultrathin strut biodegradable polymer sirolimus-eluting stent versus durable polymer everolimus-eluting stent (BIOFLOW-V). *JACC*, 72(25), 3287-3297.
- Niimi, N. et al. (2022). Machine learning-guided stent selection for coronary intervention. *Eurointervention*, 18(4), e312-e321.
- Ormiston, J. A. et al. (2018). OCT assessment of endothelial coverage after DES implantation. *JACC Cardiovascular Imaging*, 11(7), 1029-1039.

- Otsuka, F. et al. (2015). Neoatherosclerosis: overview of histopathologic findings and implications for intravascular imaging assessment. *European Heart Journal*, 36(32), 2147-2159.
- Palmerini, T. et al. (2015). Long-term safety of drug-eluting and bare-metal stents: evidence from a comprehensive network meta-analysis. *JACC*, 65(23), 2496-2507.
- Serruys, P. W. et al. (2015). A bioresorbable everolimus-eluting scaffold versus a metallic everolimus-eluting stent (ABSORB III). *NEJM*, 373(20), 1905-1915.
- Stefanini, G. G. and Holmes, D. R. (2013). Drug-eluting coronary artery stents. *NEJM*, 368(3), 254-265.
- Stone, G. W. et al. (2016). Everolimus-eluting stents or bypass surgery for left main coronary artery disease (EXCEL). *NEJM*, 375(23), 2223-2235.
- Windecker, S. et al. (2014). Revascularisation versus medical treatment in patients with stable coronary artery disease. *Lancet*, 384(9958), 1849-1858.

Declarations

Funding

This work was supported by the French National Research Agency (ANR-2023-CE17-0032, NextGenStent) and the European Commission Horizon Europe programme (grant 101087234). No funder influenced study design or the decision to publish.

Conflict of Interest

The authors declare no competing interests. No author has financial relationships with stent manufacturers, interventional cardiology device companies, or AI technology vendors.

Data Availability Statement

The NGDESAF framework, AI selection model code, clinical outcome databases, and DIPS calculator are available at ngdesaf-stent.org under CC BY 4.0. Patient-level trial data governed by sponsor agreements.

Ethical Approval

This study performed meta-analysis of published RCT and registry data. The Advanced Computing University IRB confirmed exemption (ACU-IRB-2024-0008).

Appendix A

Technology Specifications and DIPS Calculation Methodology

This appendix details stent platforms, clinical endpoints, and the DIPS scoring rubric.

Part I -- Technology Specifications

- 1a. T1: Orsiro/Supraflex Cruz/MiStent, 60-64 um
CoCr/PtCr, biodegradable or fluoropolymer
Fastest endothelial coverage
- 1b. T2: BioFreedom/Cre8 EVO/VESTAsyn,
microporous or crystalline drug, no polymer carrier
..... Shortest validated DAPT
- 2a. T3: Absorb/Magmaris/DESolve/Fantom, PLLA or
Mg, 80-150 um, 2-4 yr resorption Vessel
restoration potential
- 2b. T4: COBRA PzF/Resolute Onyx, drug in strut
reservoirs, PzF nano-coating Uniform drug
distribution
- 3a. T5: XGBoost (14 variables, 14,600 training pts),
patient-lesion to stent matching
Personalised technology selection
- 3b. All: 28 RCTs + 14 registries, 48,600 patients,
186K patient-years, 2-5 yr follow-up
Comprehensive evaluation

Part II -- DIPS Scoring Rubric

- 4a. TLR Efficacy: 1 - (2-yr TLR rate / benchmark
4.6%), capped 0-1 Lower TLR = higher
score
- 4b. Thrombosis Safety: 1 - (2-yr ST rate / 0.5%
target), capped 0-1 Lower thrombosis =
higher score
- 5a. Vessel Healing: OCT coverage (%) x (1 -
malapposition %), normalised 0-1 Better
healing = higher score
- 5b. Long-Term Durability: 5-yr MACE trajectory
(flat/decreasing hazard = higher) Sustained
benefit = higher
- 6a. Feasibility: Manufacturing scalability x regulatory
clarity x learning curve More practical =
higher score
- 6b. $DIPS = 0.25 * TLR + 0.20 * Thrombosis + 0.20 * Healing + 0.15 * Durability + 0.20 * Feasibility$