Two zotarolimus-eluting stent generations: a meta-analysis of 12 randomized trials versus other limus-eluting stents and an adjusted indirect comparison.

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Background: The performance of zotarolimus-eluting stents (Medtronic Inc., Santa Clara, CA, USA) versus other limus-eluting stents (LES) and the possible improvements of Resolute zotarolimus-eluting stents (R-ZES) versus Endeavor zotarolimus-eluting stents (E-ZES) still remain to be defined. We sought to evaluate efficacy and safety of two zotarolimus-eluting stent generations versus other LES and to compare R-ZES versus E-ZES.

Methods: We undertook a meta-analysis of trials in which patients were randomly assigned to percutaneous coronary interventions (PCI) with R-ZES versus LES or with E-ZES versus LES as well as an indirect comparison of R-ZES versus E-ZES, with LES as common comparator. The primary efficacy endpoint was ischemia-driven target vessel revascularization (ID-TVR), the primary safety endpoints were cardiac death and cumulative definite/probable stent thrombosis (ST).

Results: Overall, 13,709 patients were assigned to PCI with R-ZES versus LES (n = 7,185) or with E-ZES versus LES (n = 6,524). The risk of ID-TVR (odds ratio [95% confidence interval] = 1.08 [0.90-1.25], p = 0.47) was slightly lower in R-ZES versus LES patients, with no difference between R-ZES and E-ZES patients (p = 0.96) and ST (1.18 [0.98-1.40], p = 0.36) did not differ between R-ZES and LES patients. Patients receiving E-ZES were more likely to undergo ID-TVR as compared to those receiving LES (1.95 [1.40-2.73], p < 0.001). Cardiac death (0.12 [0.74-1.91], p = 0.86) and ST (1.07 [0.70-1.62], p = 0.88) were similar between E-ZES and LES. At indirect comparison, PCI with R-ZES versus E-ZES reduced the risk of ID-TVR (0.54 [0.37-0.78], p < 0.001), without increasing cardiac death (0.97 [0.46-2.00], p = 0.93) and ST (1.07 [0.66-1.74], p = 0.80).

Conclusions: The antirestenotic efficacy of Resolute zotarolimus-eluting stents is superior to Endeavor zotarolimus-eluting stents and similar to other limus-eluting stents. Endeavor zotarolimus-eluting stents increase the risk of reinterventions as compared to other limus-eluting stents. First and second zotarolimus-eluting stent generations have similar thrombogenicity compared to other limus-eluting stents.

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Abiluminal-Only Coating Everolimus Eluting Coronary Stent: An In-Vivo Study in Small Coronary Target Vessels and Long Lesions

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Background: Vascular inflammation plays a fundamental role in the process of neointimal formation following coronary stent implantation. Drug-eluting stents (DES) improve the efficacy of percutaneous coronary intervention by modulating vascular inflammation. We aimed to evaluate the vascular inflammation profile following coronary stent implantation of a novel stent comprising an abluminal biodegradable Everolimus-eluting coating on the Element stent platform (SYNERGY) compared to an identical bare metal stent control (BMS = Element stent).

Methods: BMS (Element, n = 6) and SYNERGY (n = 6) stents were implanted in nine 8-month-old FH swine. Each coronary target site was predilated with an angioplasty balloon prior to stent placement. At 30 days stents were analyzed with optical coherence tomography (OCT) and histology (neointimal area). Para strut leukocyte (PSL), Foamy macrophage infiltration (FMI) and adventitial inflammation (AI) were evaluated in a semi-quantitative score.

Results: Both OCT (neointimal area; SYNERGY, 3.68 ± 0.82 mm² vs BMS, 5.72 ± 0.8 mm², 35% reduction) and histology (neointimal area; SYNERGY = 3.18 ± 0.73 mm² vs. BMS = 5.95 ± 0.78 mm², 46% reduction) demonstrated a significant reduction in neointimal proliferation in the SYNERGY group. The SYNERGY stent exhibited a significant reduction in PSL (0.33 ± 0.69) compared to BMS (2.39 ± 0.7, p < 0.001). The neointimal area occupied by foamy cells was significantly greater in BMS (0.57 ± 0.53 mm²) compared to SYNERGY group (0.28 ± 0.35 mm²). Consistently, FMI value was also decreased in SYNERGY (0.83 ± 0.79) compared to BMS (2.44 ± 2.06, p < 0.001). The AI score did not show significant differences between the studied groups (SYNERGY = 1.33 ± 1.46, BMS = 1.94 ± 1.55; p = 0.15).

Conclusions: The abluminal-only Everolimus eluting SYNERGY stent demonstrated suppression of neointimal formation and vascular inflammatory response compared to an identical bare metal stent platform. The absence of polymer beyond the drug delivery period creates the potential to reduce DAPT duration while maintaining best-in-class DES efficacy.

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Drug eluting stents in the elderly: very long-term clinical outcomes (up to 10 years) of octogenarians in the DESIRE Registry.

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Background: Elderly patients (P) after bare metal stents (BMS) traditionally experience higher rates of procedural complication and worse long-term outcomes compared to younger P. This study sought to evaluate the long-term clinical follow-up (FU) after drug elution stents (DES) in octogenarians compared to P < 60 y old and P ≥ 60 y old.

Methods: 4229 P were included in the DESIRE (Drug Elution Stents In The Real World) Registry for an elective DES implantation between 05/2002 and 02/2012. They were divided into 3 groups (g) according to their age: GI: < 60 y (n = 1,516 pts); GI: 60 y (n = 2,397 pts); GI: >80 y (n = 316 pts). The baseline and procedural characteristics as well as the outcomes are in the table.

Results: see table * indicates significance for the comparison

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Comparison of Angiographic and Clinical Outcomes Among Patients with Sirolimus-, Paclitaxel-, Zotarolimus-, and Everolimus-Eluting Stent Implantation in Small Coronary Target Vessels and Long Lesions

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Background: Stenting in small coronary artery and long lesions has been known for high rates of clinical events. There has been no study comparing angiographic and long-term clinical outcomes among stable angina patients with sirolimus-(SES, n = 52), paclitaxel-(PES, n = 52), zotarolimus-(ZES, n = 93) and everolimus-eluting stent (EES, n = 170) implantation in small coronary target vessels and long lesions.

Methods: Propensity matching was performed among 4 cohort groups, and coronary lesions with reference diameter ≥ 2.75 mm and lesion length ≥ 28 mm were included. Late loss and rates of in-stent restenosis at 9-month follow-up were compared, and major adverse cardiovascular events(MACEs) such as all-cause death, non-fatal myocardial infarction, stroke, and target lesion revascularization(TLR) were compared during the 3-year follow-up.

Results: Late loss was significantly lower in the EES group when compared with the PES and ZES groups (0.34 ± 0.41 mm, 0.60 ± 0.15 mm, 0.65 ± 0.16 mm, respectively, p < 0.05). Rate of TLR was significantly lower in the EES group when compared with the SES, PES and ZES groups (2.1%, 9.8%, 11.8%, 8.4%, respectively). Rates of MACE during the 3-year follow-up were significantly lower in the EES. (Figure)
Conclusions: Rate of MACEs was significantly lower in the EES group when compared with the SES, FES, and ZES groups, mainly due to the lower rate of TLR during the 3-year follow-up.

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Primary Results Following Percutaneous Coronary Intervention with the 38 mm Resolute Zotarolimus-eluting Stent
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Background: Implantation of drug-eluting stents in long coronary artery lesions is associated with a higher risk for restenosis and stent thrombosis related to the need for multiple and overlapping stents. The Resolute zotarolimus-eluting stent (R-ZES) is manufactured in a 38 mm length to accommodate longer lesions but clinical data to demonstrate efficacy and safety of the longer stent has not been reported.

Methods: A substudy of 2 prospective, multicenter clinical trials; RESOLUTE–US and RESOLUTE–Asia enrolled patients with de novo coronary artery lesions amenable to treatment with the 38-mm-length R-ZES. The target lesion had to be > 35 mm long and the primary endpoint was target lesion failure (TLF) defined as the composite of cardiac death, target vessel myocardial infarction (TVMI), or clinically-driven target lesion recanalization (TLR) by percutaneous or surgical methods. The rate of TLF at 1 year was compared to a performance goal of 19.0% based on literature suggesting an expected TLF rate of 15.1%.

All patients were prescribed dual antiplatelet therapy for a minimum of 6 months.

Results: There were 223 patients treated with a 38 mm R-ZES; mean age was 61 years, 78.9% were men, 44.6% were white, 3.6% were black, and 50.9% were Asian. Prior PCI was noted in 27.4% of patients, 37.7% had diabetes mellitus and 53.8% had multivessel disease. Lesions were located in the LAD (52.0%), LCX (20.2%) and RCA (44.4%) and 38.9% were left main. The primary endpoint was met with a 12-month TLF rate of 4.5% (upper one-sided 95% confidence interval 7.5%). Rates of cardiac death, TVMI, and TLR at 12 months were 0.9%, 3.6%, and 1.4%, respectively. Early stent thrombosis (≤30 days) was 0.9% and there were no stent thrombosis events after 30 days.

Conclusions: At 12 months the rate of TLF was significantly less than the performance goal of 19% and clinical events rates were low with no late stent thrombosis. The 38 mm length R-ZES was safe and effective in this selected population of long lesion patients.

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Value Of High-Density Lipoprotein Cholesterol In Predicting Future Cardiovascular Events Of Patients With Low-Density Lipoprotein Cholesterol At The Time Of Percutaneous Coronary Intervention
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Background: Higher levels of high-density lipoprotein cholesterol (HDL-C) have been associated with decreased cardiovascular risk in epidemiologic studies, although a causal role is in question. Dysfunctional HDL has been identified in humans with metabolic syndrome (MSx) or coronary artery disease (CAD). Additionally, current determinations of HDL-C may not correlate with the true anti-atherosclerotic properties, casting doubts on its prognostic value. Therefore, the significance of HDL-C on the outcome of patients with CAD requiring percutaneous coronary intervention (PCI) is unclear.

Methods: Patients treated with PCI from 01/2004 to 12/2011 were prospectively enrolled. The lipid panel of those on statin therapy prior to PCI and who had attained low-density lipoprotein cholesterol (LDL-C) <100 mg/dl was analyzed. Major adverse cardiac events (MACE), including all-cause death, Q-wave myocardial infarction, and target vessel revascularization at 1 year were evaluated in relation to the lipid profile at the time of index PCI. Multivariable Cox proportional hazards regression was employed for the entire cohort and for the subgroup of patients with diabetes mellitus (DM) or MSx.

Results: 2789 patients were included. The population’s mean age was 66 years and 68% was male. 53% had a history of CAD, 39.8% had DM and 42.5% had MSx. At 1-year follow-up, a total of 279 patients (10.1%) experienced MACE. Death occurred in 5.2% of the population. HDL-C after adjustment for baseline characteristics did not demonstrate an independent association with MACE in either the main population or the subgroup with MSx (HR 1.00, 95% CI 0.99-1.01, p=0.98) and HDL-C < 100 mg/dl was achieved at the time of PCI, HDL-C did not independently correlate with MACE at 1 year. These data suggest that HDL-C for patients on statin therapy and controlled LDL may not be an effective biomarker for future clinical events.

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Impact of Stent Structural Design and Deployment Pressure on Strut Apposition and Recoil
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Background: There are major differences in the structural design of currently available coronary stents. Differences in radial forces have been reported between the different stent platforms, but it is still unclear how stent material and strut design may affect stent mechanical performances in clinical settings.

Methods: To evaluate coronary stent designs in a reproducible environment, we created a compliant model of a focal coronary lesion, representing a 50% reduction in lumen diameter. The stents evaluated were the Cobalt Chromium (CoCr) XIENCE V (Abbott Vascular) and Integrity (Medtronic), 316L Stainless Steel (316L SS) Taxus Liberte (Boston Scientific) and BioMatrix Flex (Biosensors Int.), and the Platinum Chromium (PtCr) Promus Element (Boston Scientific). The 3.0 stents (n=14) were deployed across the model lesion at their Nominal Pressure (NP). Minimal Lumen Area (MLA), residual area stenosis and strut apposition were assessed at NP from micro-CT. After NP assessment, the same 3.0 delivery balloon was then inflated at 18 ATM to evaluate impact of deployment pressure on plaque recoil and residual stenosis. A total of 28 experiments were performed.

Results: MLA was significantly increased with pressure deployment: from 5.0 ± 0.5 mm² at NP to 6.8 ± 0.1 mm² with 18 ATM dilatation (p<0.001). Higher pressure also eliminated the risk of malapposed strut from a maximal cross-sectional rate of malapposed strut observed of 25.6 % at NP compared to virtually zero malapposition at 18 ATM pressure. At NP, CoCr stents resulted in overall higher MLA and lower residual stenosis than 316L SS and PtCr stents. MLA was respectively 5.4 mm² for CoCr, 4.9 mm² for 316L SS and 5.0 mm² for PtCr (p<0.001). Such differences were markedly eliminated with higher pressure inflation: at 18 ATM, MLA was respectively 6.7 mm² for CoCr, 6.6 mm² for 316L SS and 6.8 mm² for PtCr.

Conclusions: Initial results with 5 different DES designs underline the importance of deployment pressure in the overall ability of a stent to scaffold a lesion and restore lumen area.