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## Challenges and Caveats for Stents of New Technology Are all the Drug-Eluting Coronary Stents the Same?

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**ABSTRACT**

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The introduction of drug-eluting stents (DES) has improved the efficacy of percutaneous coronary intervention (PCI), by addressing the issue of neointimal proliferation, a pathology contributing to restenosis. First-generation stents eluting sirolimus or paclitaxel were joined by second-generation stents, such as the everolimus- and the zotarolimus- eluting stents promising increased safety and efficacy. As a result, there is a plethora of DES available, with differences in the stent platform, the polymer coating and the eluted drug, which translate into differences in biological markers of efficacy, such as lumen late loss. However, it remains controversial whether these discrepancies have an impact on clinical markers of safety and efficacy, or if the improved efficacy of DES is a “class effect”.

First-generation DES, i.e. sirolimus-eluting stents (SES) and paclitaxel-eluting stents (PES) were associated with increased efficacy compared to bare metal stents, but safety issues were raised as these stents were linked with increased incidence of stent thrombosis, especially following early discontinuation of antiplatelet therapy. Second generation stents, such as everolimus-eluting stents (EES) and zotarolimus-eluting stents (ZES), were developed for the improvement of the safety and the efficacy of PCI, but this remains to be proven.

First-generation DES have been commercially available for a long time and are the most well-documented DES. However, there is a relative shortage of randomized studies examining how they measure up against each other. Therefore, safety issues and especially the issue of stent thrombosis are not well documented. A number of studies and meta-analyses have investigated the safety profile of these DES, with the results being inconsistent. As opposed to the issue of safety, the issue of efficacy seems to be less controversial. Differences in angiographic indexes of restenosis, such as the late loss and binary restenosis are established in favour of SES, but there are not enough data supporting that there are differences in clinical endpoints as well.

The introduction of second-generation DES and especially EES and ZES was accompanied by prospects for improved safety and efficacy and data from randomized controlled head-to-head trials are accumulating enabling us to assess the validity of these claims. At the present moment, little insight has been gained by registries, as results from large registries including first- and second-generation stents are not yet available.

**KEY WORDS:** *percutaneous coronary intervention; drug eluting stents; restenosis; stent thrombosis*

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An important specific subpopulation are the diabetic patients, considering that they experience a more generalized form of atherosclerosis than people without diabetes and are at increased risk for adverse outcomes following PCI. Data from small randomized trials in diabetics comparing SES and PES suggest that SES implantation is associated with improved angiographic outcome, while no differences in safety endpoints were found. With regards to second generation DES in diabetics, initial data show that ZES may be associated with increased restenosis in diabetic patients, while the benefit from EES implantation is probably diminished in diabetic populations.

In conclusion, differences in the biological behaviour of various types of DES correspond to differences of varying degree in clinical safety and efficacy. It appears that not all stents were created equal and that differences among them may be affected by specific clinical features such as diabetic status. However, longer follow-up is necessary in order to assess safety issues such as very late stent thrombosis and answer questions about efficacy controversies such as the long-term maintenance of the anti-restenotic effect.