Editor's Page

Stents for Coronary Artery Disease: From Covered to Drug-Eluting to Bioabsorbable ...

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There is no doubt that the introduction of percutaneous coronary balloon angioplasty was the first revolutionary step for the treatment of coronary artery disease in interventional cardiology. The breakthrough for interventional cardiology was indeed signalled by the first coronary angioplasty procedure, performed by Gruentzig in 1977, thus changing the field not only in cardiology but also in medicine.[1] Very few invasive procedures have been adopted so fast and widely as coronary angioplasty.

The main shortcomings of balloon angioplasty appeared in the 1980s. Early vessel closure, due to acute or subacute thrombosis, and restenosis, due to extensive intimal hyperplasia, were the main limitations of balloon angioplasty. The procedural success was based mainly on the skills of the operators, as the materials were primitive compared to the current guiding catheters, balloons, and guidewires. Therefore, several home-made or dedicated balloons were used to overcome the complications.

The need for new technology was absolutely mandatory for the "survival" of the new sub-specialty of interventional cardiology. The first stent implantation was made by Sigwart et al in 1986, among other efforts to overcome the shortcomings of balloon angioplasty.[2] Although the technology of the first "Wallstent" did not resemble the currently available stents in any way, the concept of "vessel scaffolding" prevented acute vessel closure and constrictive recoil in the follow-up period. Fortunately, this technology improved every single measure of the angiographic parameters and in addition the clinical outcome. Not least important, the use of bare metal stents made the procedure more comfortable for interventional cardiologists. Thus, stent implantation became the primary target for every percutaneous coronary intervention, although the rates of thrombosis (3-4%) and restenosis (30-40%) were still high.

Despite these improvements, two advances really established stenting as an alternative treatment to coronary artery bypass grafting. The first was the use of double antiplatelet therapy, ticlopidine and aspirin, with adequate stent implantation. This approach, suggested by Colombo et al,[3] radically changed the field for the following reasons: anticoagulation proved to be obsolete, leading to an impressive reduction in serious bleeding complications; and the techniques for optimal stent implantation proved to be safe and effective. The field for the treatment of complex lesions was widely expanded in the mid 1990s.

The second advance was the use of stents as a carrier for local therapy. This concept was initially applied in the early 1990s by covering the metallic stents with autologous venous grafts.[4,5] The stent was completely covered by a venous graft, but thereafter, due to the increased profile of the device, only the external surface of the stent was covered. Then, an autologous arterial graft was applied for stent coverage.[6,7] In addition, these grafts were also used for local drug delivery. The technology resolved the limitations of the technique in the late 1990s and drug-eluting stents were then available, using polymers for delivering effective pharmaceutical substances for the elimination of intimal hyperplasia.[8,9]

During the last decade the wide application of drug-eluting stents has led to a significant reduction of restenosis, although an increased risk for late stent thrombosis has been observed, without additional risk of mortality. Improvements in technology, possibly with bioabsorbable scaffolds providing transient ves-

sel support with drug delivery capability, without the long-term limitations of drug-eluting stents, will further expand the field of interventional cardiology for the treatment of coronary artery disease.

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