

Stent Deformation in Bifurcation Stenting with Final Kissing Balloon Inflation In Vivo Demonstration Supported by CLEARstent

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Patient History

78-year-old woman with typical chest pain and left anterior descending coronary artery stenoses, with a fractional flow reserve of 0.76.

Treatment

A bioresorbable scaffold (Absorb 2.5/18 mm, Abbott Vascular, Abbott Park, Illinois) was used to treat the midsection-left anterior descending coronary artery. A high-grade bifurcation lesion of the left anterior descending/1st diagonal branch remained (Medina 0/1/0). This lesion was treated with a drug-eluting stent (Xience Prime 3.0/15 mm, Abbott Vascular) which was implanted in the left anterior descending coronary artery, followed by rewiring and balloon angioplasty of the diagonal branch and final kissing balloon inflation. Figures 1–8 illustrate the various steps of the procedure and resulting changes in stent geometry.

Comments

Various techniques for stent deployment in bifurcation lesions have been developed. In general, a single-stent approach is preferable, but balloon dilation of the side branch can lead to deformation of the main branch stent, which is incompletely resolved by “final kissing balloon dilation” [1,2]. In vivo imaging of stent expansion and deformation by fluoroscopy is challenging, given the poor X-ray absorption of modern thin-strut stents. Software tools have become available that permit improved visualization of coronary stents in cine fluoroscopy. They improve contrast-to-noise ratio (and, hence, resolution) by averaging consecutive cine fluoroscopic frames. Balloon markers are used as reference points in order to eliminate motion. The images presented on the right side have been acquired by an Artis zee system with CLEARstent software.

[1] Sgueglia GA, Chevalier B. Kissing balloon inflation in percutaneous coronary interventions. *J Am Coll Cardiol Intv* 2012;5:803–11.

[2] Foin N, Secco GG, Ghilencea L, Krams R, Di Mario C. Final proximal post-dilatation is necessary after kissing balloon in bifurcation stenting. *EuroIntervention* 2011;7:597–604.

Professor Stephan Achenbach, MD



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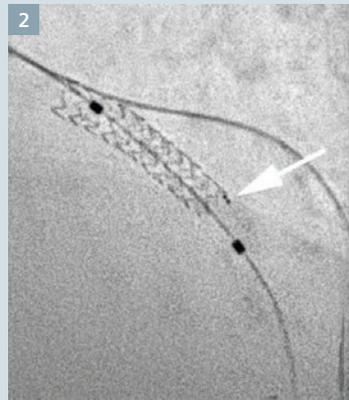


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1 Coronary angiogram showing bifurcation stenosis

Bifurcation stenosis (arrow) of the left anterior descending coronary artery/1st diagonal branch (Medina 0/1/0). Fractional flow reserve in the left anterior descending coronary artery was measured as 0.76.

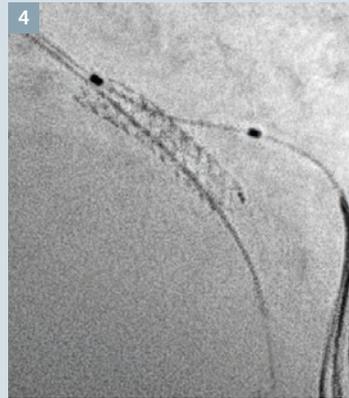


2 Stent placed in main branch

CLEARstent image of a drug-eluting stent (Xience Prime 3.0/15 mm, Abbott Vascular) placed in the left anterior descending coronary artery. The side-branch wire is jailed. Note the two markers of the bioresorbable scaffold (Absorb 2.5/18 mm, Abbott Vascular) placed immediately distal to the drug-eluting stent (arrow).

3 Rewiring of side branch

The side branch has been rewired. Note the passage of the side-branch wire further distal as compared with Figure 2 (arrow).

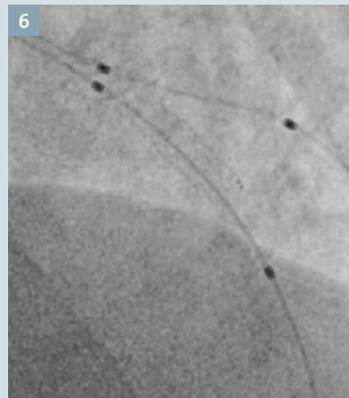
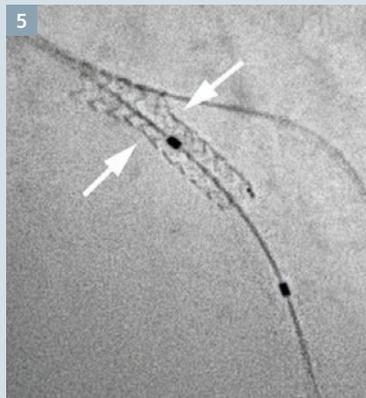


4 Balloon positioned in side branch

A balloon (compliant, 2.5/15 mm) has been introduced into the side branch and will be inflated to 10 atm.

5 Stent deformation following side-branch angioplasty

After side-branch balloon inflation, the stent struts are opened towards the side branch, but the main branch stent shows the typical deformation with an inward displacement of the stent struts distal to the bifurcation (arrows).

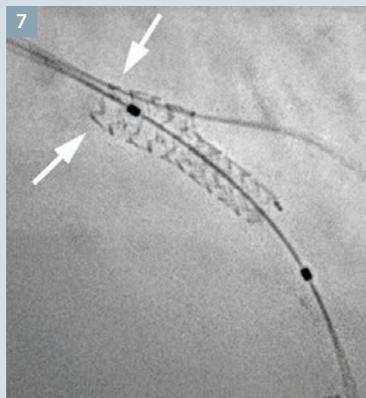


6 Balloon placement for kissing balloon angioplasty

Balloon placement for kissing balloon inflation (2.5/15 mm non-compliant balloons in both the main branch and side branch). This is a nonenhanced original cine fluoroscopic image.

7 Stent configuration following kissing balloon angioplasty

CLEARstent image after kissing balloon inflation. The side-branch struts remain open, the deformation of main branch struts distal to the bifurcation has been corrected. A slight inward displacement of the very proximal stent struts has occurred (arrows).



8 Final contrast-enhanced angiogram

The final contrast-enhanced angiogram shows successful percutaneous coronary intervention of the stenosis and absence of residual stenosis in the main and side branches.