

CLEARstent – A Useful Tool Not Only to Document Stent Expansion

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Patient History

An 84-year-old patient was hospitalized with chest tightness involving retrosternal pressure upon exertion. 10 years before, the same symptoms had occurred with a coronary angiogram. This showed tight ostial stenosis of the anterior interventricular artery (LAD) and the proximal part of the circumflex artery (LCX). Back then, two stents were implanted, a Cordis Cypher Sirolimus-eluting stent on the proximal LAD, and an ACS Multilink bare metal stent in the proximal part of the LCX.

Diagnosis

The patient underwent a coronary angiogram (Fig. 1) which showed a tight distal stenosis of the left main coronary artery extending into the ostium of the anterior interventricular artery. The circumflex seemed to be unaffected. An angioplasty for the distal lesion of the left main artery was the suggested course of treatment due to the patient's age.



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1 Left coronary artery seen from RAO 1° / CAU 27° (A) and LAO 58° / CAU 31° (B) showing tight stenosis reaching from left main artery across LCX into LAD

Treatment

The procedure was carried out on an Artis zee floor-mounted angiography system. The therapeutic strategy for this patient mainly depended on good knowledge of the positions of the stents that were implanted around ten years prior. Given that traditional angiographic images make it difficult to accurately view the edges of the implanted stents, it was decided to use the CLEARstent software in order to precisely assess the positions of the old stents in relation to the left main artery.

CLEARstent requires balloon or similar markers to align the individual images of a coronary angiogram for enhancement. As the coronary flow could be compromised by a thick balloon crossing the stenosis, we decided to use a special, thinner ATW guide wire featuring CLEARstent detectable markers at 10 mm intervals and with a diameter of 0.0076 inch.

In addition, the wire would also enable a conventional angioplasty to be carried out (Fig. 2). With the guide wire placed in the anterior interventricular artery (Fig. 3), the CLEARstent images with and without contrast injections first confirm the positioning of the old Cypher stent in the proximal part of the LAD. It protruded about 1 millimeter into the left main artery covering the ostium of the Multilink stent, which was positioned in the circumflex artery. The contrast injection made it possible to assess the extent of calcification which obscured the previously implanted stent in the angiography images (Fig. 3). We then positioned the ATW guide within the LCX so we could see more accurately the Multilink stent and confirm that it was indeed aligned with the ostium of the circumflex artery and not protruding into the left main artery (Fig. 4).

Guided by this information, we predilated the anterior interventricular artery ostium with a high-pressure 3 mm balloon and also predilated the circumflex artery ostium with a very high-pressure balloon (Fig. 5). A 16x3.5 mm Boston Scientific Taxus Element stent was placed in a cross-over position starting in the left main artery and towards the LAD, with a 3 to 4 mm overlap with the old Cypher stent. Positioning was reconfirmed using CLEARstent without contrast injection (Fig. 6). Then the Taxus stent was implanted at 16 atmospheres.

Full deployment of the stent was achieved by post-dilation using a 8x4 mm non-compliant high-pressure balloon (20 atm), reaching from the left main artery into the LAD. The result was assessed with CLEARstent using the markers of the non-compliant balloon. The resulting image confirmed full deployment of the stent. We also obtained a clear visualization of the two stent layers within the first few millimetres of the anterior interventricular artery (Fig. 7). At the same time, a contrast injection confirmed excellent flow in the circumflex artery, which allowed us to avoid crushing the new stent in order to open it towards the circumflex artery.

The perfect end result was confirmed using conventional angiography (Fig. 8). Six months later, the patient was completely free of angina symptoms.

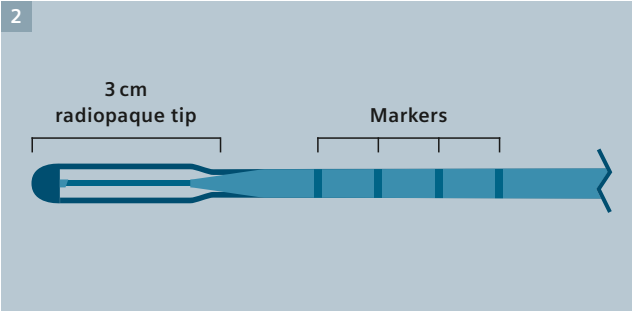
Comments

CLEARstent was developed in particular to assess the proper deployment of endocoronary prostheses along with their relation to the vessel wall. As demonstrated in this case, the software can furthermore be used to improve visualization of the artery and its wall or other applications, as in our case:

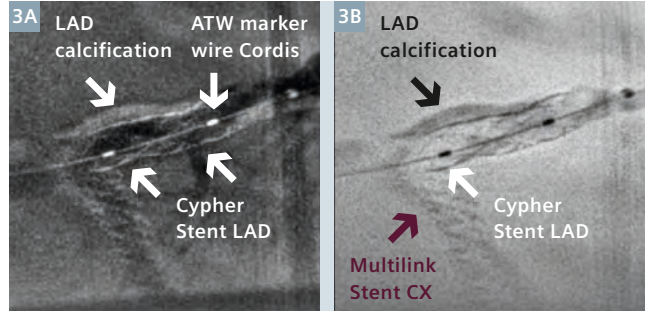
- Viewing the position of stents implanted years earlier, particularly in order to assess the location of any restenosis,
- Assessing the extent of calcification of an artery which may be difficult to see in conventional angiography images,
- Assisting while positioning an undeployed stent, particularly across ostia of the coronary arteries, or into secondary branches for treatment of bifurcations,
- Confirming the position of stents in adjacent to others with a minimum overlap.

Particular dilation guide wire, the Cordis ATW Marker Wire was used. This enabled the treatment with CLEARstent without insertion of a balloon. We can envisage also using this wire with a small-diameter catheter at the time of a diagnostic coronary angiogram procedure.

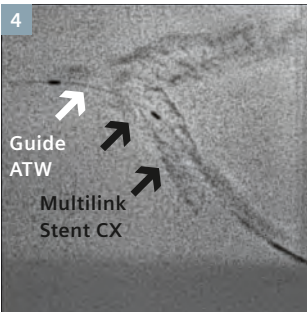
Compared to other systems (e.g. StentBoost), CLEARstent enables improved viewing of the stents with concurrent contrast opacification. This provides better assessment of the flow through stents, particularly collateral ones, and also facilitates fitting endoprotheses in the most difficult cases (left main artery, bifurcational or ostial lesions), thereby avoiding use of costly endovascular imaging instruments (IVUS and OCT) in the majority of cases.



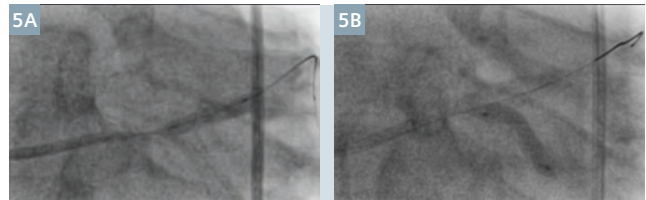
2 ATW Marker Wire.



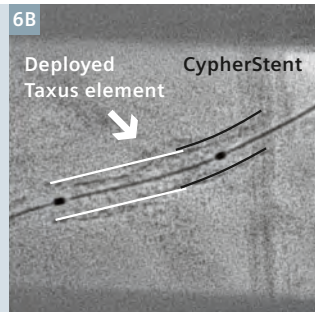
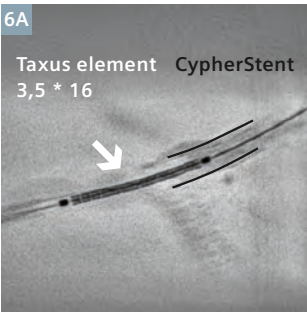
3 CLEARstent Dynamic (A) and CLEARstent (B) enhanced images used for diagnostic overview showing the Cordis ATW marker wire and previously implanted stents in LAD and LCX.



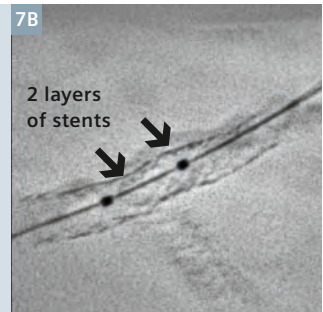
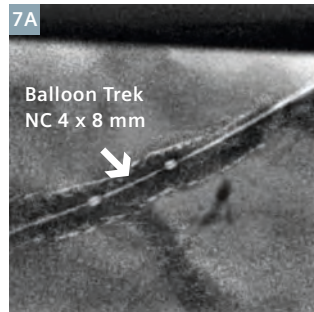
4 Second CLEARstent image shows exact alignment of implanted stent with ostium of circumflex branch.



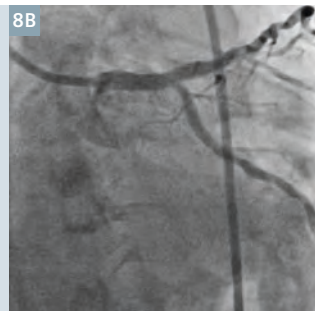
5 Pre-dilatation of LAD (A) and LCX (B).



6 CLEARstent used for assessment of stent positioning (A) and stent expansion (B) before and after balloon inflation.



7 After post-dilatation, CLEARstent Dynamic (A) and CLEARstent (B) views confirm the new stent being well apposed to the vessel wall and also show clearly the two layers of stents where overlapping.



8 Final angiography shows satisfying result and confirm good procedure success.

Contact

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