Journal of Clinical & Experimental Cardiology

Feig, et al., J Clin Exp Cardiolog 2015, 6:3
DOI: 10.4172/2155-9880.1000364

Case Report Open Access

Sirolimus Stents, Positive Remodeling, Late Incomplete Stent Apposition, Oh My!

Jonathan E Feig[1*], Jessica L Feig[2], Annapoorna S Kini[1], Samin K Sharma[1], Rony Shimony[1], and Daniel E Soffer[1]

[1]Dr. Samin K Sharma Family Foundation Cardiac Catheterization Laboratory, Icahn School of Medicine at Mount Sinai, Mount Sinai Medical Center, Department of Medicine/Cardiology, NY, USA

[2]New York University School of Medicine, NYU Langone Medical Center, Department of Medicine, NY, USA

[*]**Corresponding author**: Feig JE, Dr. Samin K Sharma Family Foundation Cardiac Catheterization Laboratory, Icahn School of Medicine at Mount Sinai, Mount Sinai Medical Center, Department of Medicine/Cardiology, NY, 10029, USA, Tel: 9177155841; E-mail: jonathan.feig@gmail.com

Received date: December 12, 2014; **Accepted date:** March 16, 2015; **Published date:** March 23, 2015

Case Report

A 52 year old female with a history of hyperlipidemia and hypothyroidism presented to the emergency department with intermittent diffuse chest discomfort and throat tightness after walking approximately one block. Her past medical history is significant for two mid left anterior descending artery (mLAD) Cypher sirolimus stents (2.5 mm × 23 mm, 2.5 mm × 8 mm) placed in 2008 when she presented with similar symptoms. She has no allergies or past surgical history. Family history is notable for a mother with hypertension and a father with diabetes. She drinks socially and has never smoked or uses other substances. Her medications were aspirin, amlodipine, pitavastatin, synthroid and a multivitamin. Of note, plavix was discontinued one year after stent placement. Electrocardiogram demonstrated normal sinus rhythm without any significant ST changes. Physical exam was unremarkable. Cardiac enzymes were negative. During stress echocardiogram, the patient was able to complete 11 METS without any symptoms. There was no inducible ischemia or wall motion abnormalities at >85% MPHR (mean peak heart rate) with a rest ejection fraction of 60%. CT angiography (CTA) revealed two sequential stents in which in stent restenosis (ISR) was unable to be excluded.

Furthermore, it appeared that the proximal end of the first stent was outside the vessel lumen (Figure 1). Coronary angiography was performed which revealed a 70-80% stenosis in the mLAD with ISR and careful review of the angiogram, however, revealed that there was contrast outside the proximal stent (Figure 2). In order to further dissect the mechanism, optical coherence tomography (OCT) was used which interestingly demonstrated positive remodelling, late incomplete stent apposition (ISA) and ISR in the proximal and distal stents (Figures 3-5). In addition, multiple interstrut hollows (MIH), cavities between and outside the stent struts at the site of stent implantation, were identified which another finding is shown to be associated with ISA [1]. Interestingly, OCT revealed that the proximal edge of the proximal stent was essentially occluded and therefore the guide wire travelled outside the stent due to positive remodelling. The wire subsequently dove into the distal stent and finally exited (Figure 6). Since studies have shown that the staining outside the sirolimus stent (peri-stent contrast staining) within 12 months after implantation and late incomplete stent apposition were associated with increased target lesion revascularization as well as very late stent thrombosis [1-5], we decided that percutaneous coronary intervention may not be the ideal treatment. Instead, we opted for minimally invasive coronary artery bypass graft (CABG) surgery.

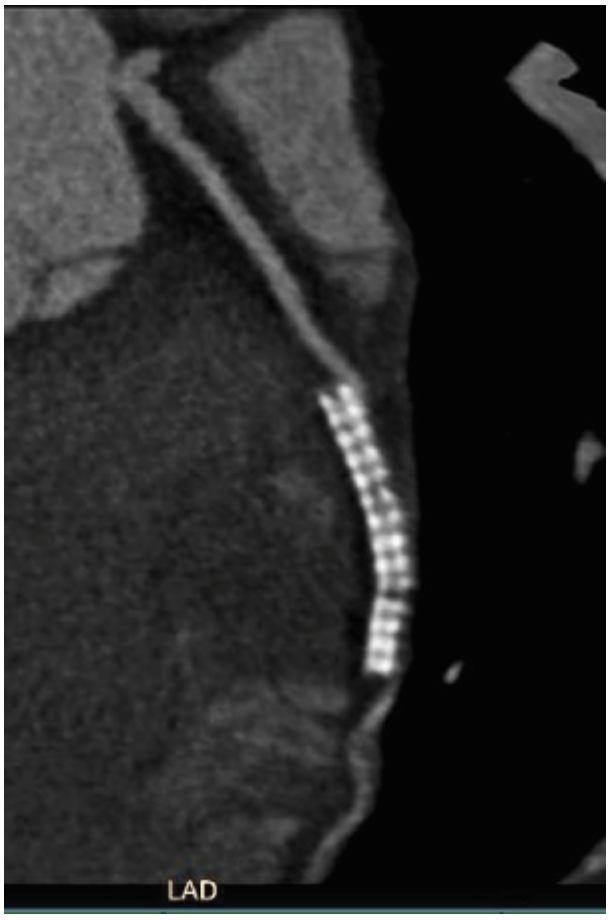

Figure 1: CT angiography was performed which demonstrated two sequential stents in the LAD (left anterior descending artery) in which in stent restenosis (ISR) was unable to be excluded. Furthermore, it appeared that the proximal end of the first stent was outside the vessel lumen.

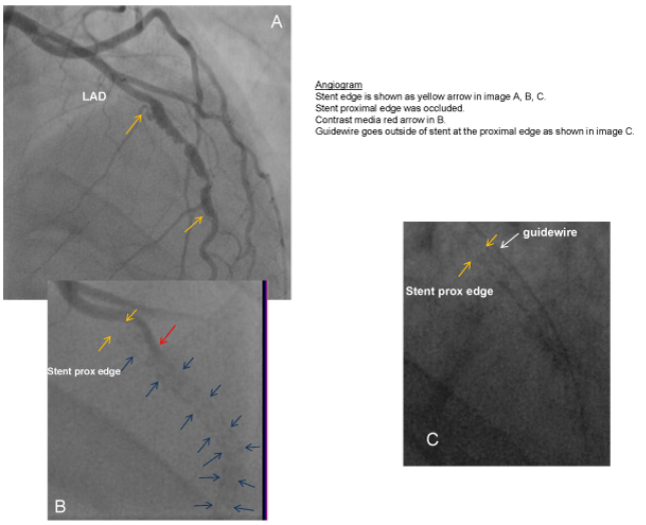

Figure 2: A) An angiogram was performed and the two yellow arrows demonstrate the stent edges with in stent restenosis being evident. B) Closer analyses reveal that the proximal stent edge was occluded (yellow arrow) as contrast seems to be outside the stent (red arrow). The blue arrows outline the stent location throughout the vessel. C) In this close-up of the vessel, it is demonstrated that the guide-wire travels outside the proximal edge of the stent.

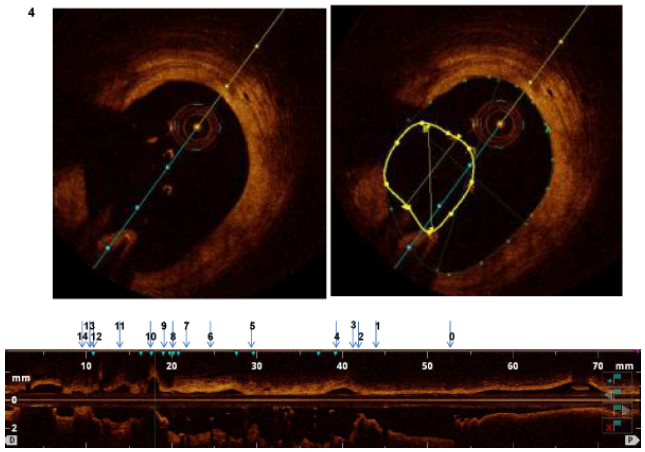

Figure 3: The top panel demonstrates the cross-section of the vessel and the bottom panel is a longitudinal representation of the entire length of the vessel being scanned. The arrows demonstrate the location in terms of the vessel. In this case, position #4 in the vessel reveals a positively remodelled vessel with stent malapposition. (The yellow circle encompasses the circumference of the stent which is much smaller that the circumference of the entire vessel).

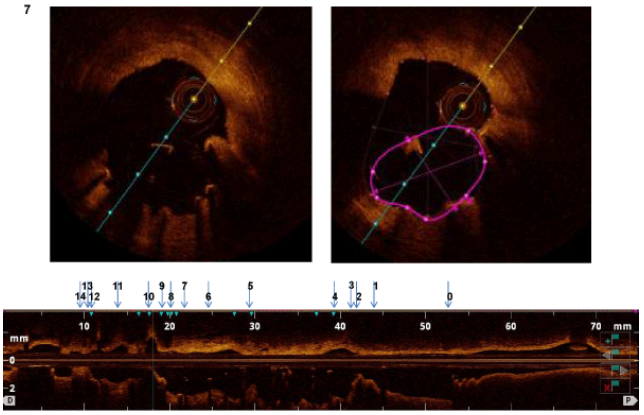

Figure 4: The top panel demonstrates the cross-section of the vessel and the bottom panel is a longitudinal representation of the entire length of the vessel being scanned. The arrows demonstrate location in terms of the vessel. In this case, position #7 in the vessel reveals a positively remodelled vessel with stent malapposition. (The purple circle encompasses the circumference of the stent which is much smaller that the circumference of the entire vessel). In addition, multiple interstrut hollows (MIH), cavities between and outside the stent struts at the site of stent implantation, were identified which is another finding shown to be associated with ISA.

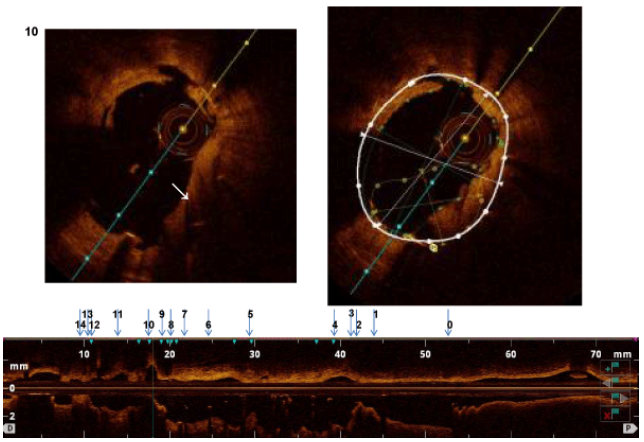

Figure 5: The top panel demonstrates the cross-section of the vessel and the bottom panel is a longitudinal representation of the entire length of the vessel being scanned. The arrows demonstrate location in terms of the vessel. In this case, position #10 in the vessel reveals a positively remodelled vessel with stent malapposition. (The yellow circle encompasses the circumference of the stent which is much smaller that the circumference of the entire vessel (white circle)). In stent restenosis is also evident (white arrow).

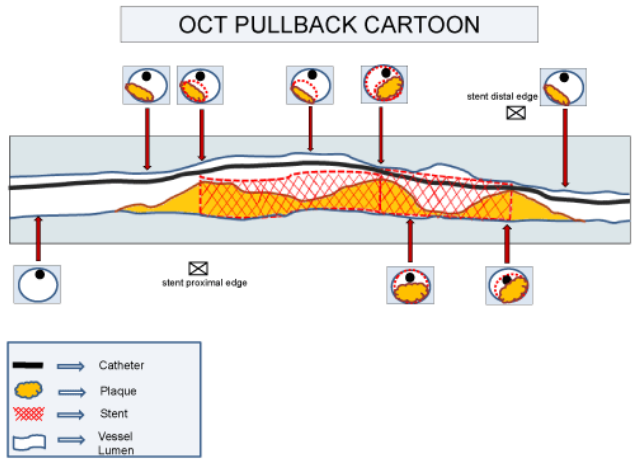

Figure 6: Summary- Two stents were implanted in LAD. Over time, positive remodelling occurred. Proximal edge of the proximal stent was occluded, and the guide-wire goes through the outside of the proximal stent. It then travels into the distal stent. Distal edge of the distal stent was almost occluded. Small space inside stent and enlarged vessel is evident.

CABG X 1 (LIMA-LAD) was performed successfully and the patient was discharged five days later. Intriguingly, there was macroscopic inflammation observed in the mLAD area where the sirolimus stents were deployed which is in agreement with previous reports linking these types of stents with ISA and inflammation [6-7]. Autopsy studies have shown that inflammatory cells diffusely infiltrate in the media causing medial disruption and destruction which likely results in loss of elastic integrity of the vessel wall leading to positive remodeling [6-8].

This case highlights the value of multi-modality imaging which revealed a cypher related process (inflammation, positive remodelling and late incomplete stent apposition) despite a negative stress test. Since ISA is associated with an increased risk of very late stent thrombosis, this finding has significant clinical consequences. In fact, it was this observation that led us to reason that we need a more permanent solution for treatment and therefore we referred the patient for CABG. It also raises important issues such as how long dual anti-platelet therapy should be continued in patients who have these types of stents. In conclusion, this case illustrates the limitations of angiography which is simply luminography, the complementary roles of CTA and OCT and how multi-modality imaging can play a crucial role in helping direct clinical-decision making.

References

1. Tada T, Kadota K, Hosogi S, Kubo S, and Ozaki M, et al. (2012) Optical coherence tomography findings in lesions after sirolimus-eluting stent implantation with peri-stent contrast staining. Circ Cardiovasc Interv 5: 649-656.
2. Ako J, Morino Y, Honda Y, Hassan A, and Sonoda S, et al. (2005) Late incomplete stent apposition after sirolimus-eluting stent implantation: a serial intravascular ultrasound analysis. J Am Coll Cardiol 46: 1002-1005.
3. Sawada T, Shite J, Shinke T, Tanino Y, and Ogasawara D, et al. (2008) Very late thrombosis of sirolimus-eluting stent due to late malapposition: serial observations with optical coherence tomography. J Cardiol 52: 290-295.
4. Imai M, Kadota K, Goto T, Fujii S, and Yamamoto H, et al. (2011) Incidence, risk factors, and clinical sequelae of angiographic peri-stent contrast staining after sirolimus-eluting stent implantation. Circulation 123: 2382-2391.
5. Imai M, Kimura T, Morimoto T, Saito N, and Shiomi H, et al. (2014) Impact of angiographic peri-stent contrast staining (PSS) on late adverse events after sirolimus-eluting stent implantation: an observation from the multicenter j-Cypher registry PSS substudy. Cardiovasc Interv Ther 29: 226-236.
6. Virmani R, Guagliumi G, Farb A, Musumeci G, and Grieco N, et al. (2004) Localized hypersensitivity and late coronary thrombosis secondary to a sirolimus-eluting stent: should we be cautious? Circulation 109: 701-705.
7. Guagliumi G, Sirbu V, Musumeci G, Gerber R, and Biondi-Zoccai G, et al. (2012) Examination of the in vivo mechanisms of late drug-eluting stent thrombosis: findings from optical coherence tomography and intravascular ultrasound imaging. JACC Cardiovasc Interv 5: 12-20.
8. Kon H, Sakai H, Otsubo M, Takano H, and Okamoto K, et al. (2011) Contrast staining outside the sirolimus-eluting stent leading to coronary aneurysm formation: a case of very late stent thrombosis associated with hypersensitivity reaction. Circ Cardiovasc Interv 4: e1-3.