



Extreme negative remodeling of septal left anterior descending branch masquerading as a bifurcation lesion

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Abstract

We report a case of severe negative remodelling at the ostium of septal LAD artery. We deferred stenting to avoid the risk of rupture of the vessel and stent fracture

Keywords Remodeling · Bifurcation · Intravascular ultrasound · External elastic membrane

Abbreviations

IVUS	Intravascular ultrasound
EEM	External elastic membrane
IWMI	Inferior wall myocardial infarction
LAD	Left anterior descending artery
LCX	Left circumflex artery
RCA	Right coronary artery
CAG	Coronary angiography
FFR	Fractional flow reserve

Case report

A 57-year-old male presented with history of inferior wall myocardial infarction (IWMI) in the past. Coronary angiography (CAG) showed RCA total occlusion which was stented. An intravascular ultrasound (IVUS) imaging (Volcano 40 MHz) for a septal LAD ostial lesion (Fig. 1, Panel 1) showed a significant constriction of the external elastic membrane (EEM) at the ostium without any significant plaque burden (Fig. 1, Panels 2 and 3). The remodeling ratio (RR) was 0.26 which was suggestive of significant negative remodeling. Furthermore, we noticed significant amounts of muscle tissue surrounding the vessel like a muscle bridge without any milking effect (Fig. 1, Panel 4). The fractional

flow reserve (FFR) was also non-significant at 0.84. Hence stenting was deferred. Patient was doing well without any symptoms at 12 months follow-up.

Discussion

Negative remodeling indicates shrinkage of the vessel and decrease in EEM area over time [1]. Its role in causing myocardial ischemia in a de novo lesion is unclear. Stable coronary plaques are more likely to undergo negative remodeling [2]. It is a marker of advanced atherosclerosis [3]. The ratio of the EEM area at the lesion site to the EEM area at the proximal reference segment is the 'Remodeling ratio'. Negative remodeling has a remodeling ratio of less than 0.95 [4].

Negative remodeling with minimal or no plaque has been reported in ostial locations [5–9]. Moreover, ostial narrowing, particularly at the left main, can also occur as a normal variant. In an IVUS case series, several cases of angiographic narrowing of the ostial left main have been found to be normal physiological variants in IVUS. These lesions can masquerade as atherosclerotic narrowing and should be interpreted cautiously thus emphasizing the importance of IVUS in studying such lesions [10]. The lesion in our case was not addressed with stenting because of the different clinical presentation, negative FFR and to avoid the risk of rupture of the vessel and possible fracture of the stent in view of muscle tissue around the vessel.

Possibility of negative remodeling should be considered before stenting such constrictive lesions. Negative remodeling can be found without significant plaque burden particularly at the ostium. Stenting such lesions may be difficult and may lead to rupture of the vessel owing to

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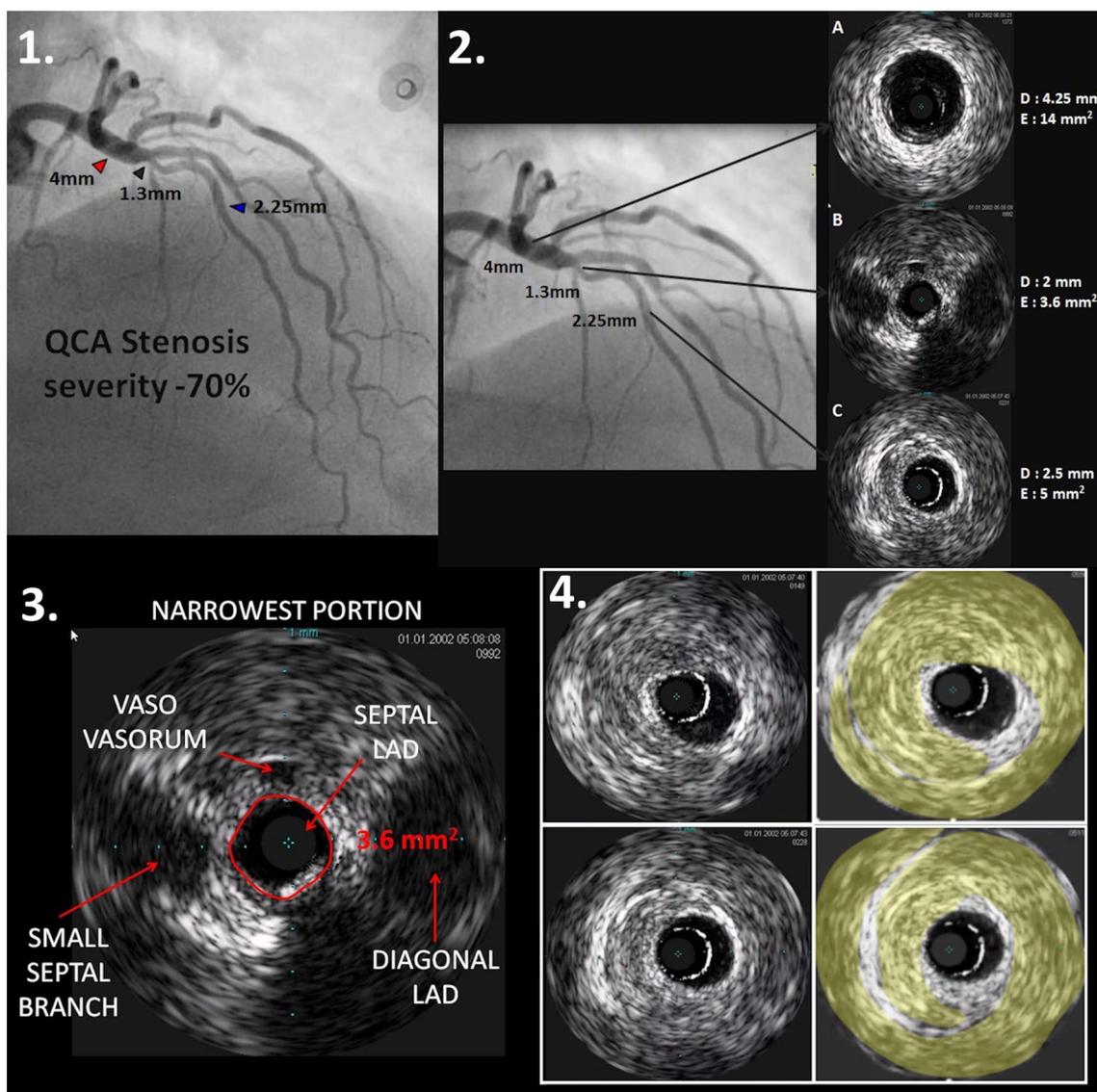


Fig. 1 1 Still angiogram image of the left coronary artery showing a dual LAD system with ostial stenosis of the septal LAD (Grey arrowhead) with a QCA stenosis severity of 70%. The angiographic dimensions of the proximal (Red arrowhead) and distal (Blue arrowhead) reference segments are also mentioned. 2 Still coronary angiogram (left panel) and the representative IVUS images (right panel) of the proximal reference segment (a), narrowest portion (b) and the distal

reference segment (c). The diameter (d) and the EEM area (e) of the segments are also mentioned alongside the images. 3 IVUS image of the narrowest portion (ostium of septal LAD) showing the EEM area. The diagonal LAD, a small septal branch and the vaso vasorum are also seen in the picture. 4 IVUS image with yellow shaded area representing myocardial tissue akin to bridge

the size disparity between the lesion site and the reference site. More over because of muscle tissue around the vessel, there is a risk of stent fracture as well.

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Compliance with ethical standards

Conflict of interest The author declares that they have no conflicts of interest.

References

1. Mintz GS, Nissen SE, Anderson WD, Bailey SR, Erbel R, Fitzgerald PJ et al (2001) American College of Cardiology clinical expert consensus document on standards for acquisition, measurement and reporting of intravascular ultrasound studies (IVUS). A report of the American College of Cardiology task force on clinical expert consensus documents. *J Am Coll Cardiol* 37:1478–1492
2. Schoenhagen P, Ziada KM, Vince DG, Nissen SE, Tuzcu EM (2001) Arterial remodeling and coronary artery disease: the concept of “dilated” versus “obstructive” coronary atherosclerosis. *J Am Coll Cardiol* 38:297–306
3. Inaba S, Mintz GS, Farhat NZ, Fajadet J, Dudek D, Marzocchi A et al (2014) Impact of positive and negative lesion site remodeling on clinical outcomes: insights from PROSPECT. *JACC Cardiovasc Imaging* 7:70–78
4. Pasterkamp G, Borst C, Gussenhoven EJ et al (1995) Remodeling of de novo atherosclerotic lesions in femoral arteries: impact on mechanism of balloon angioplasty. *J Am Coll Cardiol* 26:422–428
5. Kobayashi Y, Mehran R, Moussa I et al (2001) Negative remodeling at the ostium of the left circumflex artery. *J Invasive Cardiol* 13:805–807
6. Mintz GS, Kent KM, Pichard AD et al (1997) Contribution of inadequate arterial remodeling to the development of focal coronary artery stenoses: an intravascular ultrasound study. *Circulation* 95:1791–1798
7. Hong MK, Mintz GS, Lee CW et al (2003) Intravascular ultrasound assessment of patterns of arterial remodeling in the absence of significant reference segment plaque burden in patients with coronary artery disease. *J Am Coll Cardiol* 42:806–810
8. Sadamatsu K, Maehira N, Tashiro H (2007) Negative remodeling at the ostium of the left anterior descending artery induced myocardial ischemia. *J Invasive Cardiol* 19:E328–E330
9. Chang KY, Park KS, Choi YA, Kim JH, Jeon BS, Her S-H (2012) Severe negative remodeling at the middle right coronary artery without atheroma plaque. *Ewha Med J.* <https://doi.org/10.12771/emj.2012.35.1.65>
10. Iyisoy A, Ziada K, Schoenhagen P, Tsutsui H, Kapadia S, Popovich J, et al (2002) Intravascular ultrasound evidence of ostial narrowing in non-atherosclerotic left main coronary arteries. *Am J Cardiol* 90:773–775.