

Nano-Culotte Stenting for Coronary Bifurcation Lesions: Pros and Cons of a Novel Strategy

To the Editor,

In clinical practice, the management of coronary bifurcation lesions still poses a significant challenge in terms of procedural outcomes, including stent malapposition, geographic miss, redundant stent layers, and carina shift.^{1,2} Therefore, single-stent strategy has been the preferred option in the overwhelming majority of cases with coronary bifurcation lesions.¹ In certain patients, even strategies without stenting including exclusive use of drug-coated balloons have conferred promising results.²⁻⁴ On the other hand, certain 2-stent strategies with favorable outcomes including double-kissing crush, double-kissing mini-culotte, and nano-crush techniques have made a significant breakthrough in the management of coronary bifurcation lesions.^{1,5} In this context, the recent report by Kahraman et al¹ has introduced a novel technique namely double-kissing nano-culotte. Accordingly, I would like to make a few comments on this novel technique and its practical implications.

Technically, double-kissing nano-culotte technique might have a variety of advantages over other novel strategies. In particular, it has a significant analogy with another novel techniques namely nano-crush stenting.^{1,5} In this regard, both techniques enable minimal side branch (SB) stent protrusion in the main vessel (MV) lumen, potentially leading to minimal amount of stent layers at the neocarina and its vicinity.^{1,5} This may also be associated with similar long-term outcomes in both techniques. However, nano-crush technique has certain technical pitfalls, including over-protrusion of SB stent during its pull-back toward the inflated MV balloon in the presence of relatively narrow bifurcation angles ($\leq 70^\circ$).⁵ Conversely, nano-culotte technique¹ seems to be devoid of this potential technical challenge and might be safely performed even in very narrow bifurcation angles.

This novel technique might also have some advantages over its predecessor namely double-kissing mini-culotte. As expected, double-kissing mini-culotte is inherently associated with a higher amount of stent layers at the neocarina and the neighboring proximal MV just before the SB origin.⁶ Moreover, double-kissing mini-culotte is mostly discouraged in the presence of relatively high bifurcation angles and/or substantial differences between proximal MV and SB diameters.⁶ Conversely, double-kissing nano-culotte as introduced by Kahraman et al¹ seems to be technically feasible even in the presence of these anatomical challenges and might also be used as a bail-out technique (as reverse nano-culotte stenting) in the setting of provisional 2-stent strategies characterized by the initial MV stenting. In particular, I also hold the opinion that single-kissing balloon inflation may be sufficient in this novel technique introduced by Kahraman et al.¹ In this context, initial kissing balloon inflation (before MV stenting) may not be performed due to the trivial amount of double-layer stent segments and very low risk of stent malapposition provided that the single final kissing balloon inflation and proximal MV stent optimization (POT) is performed optimally (with prolonged and relatively high-pressure balloon inflation). I also wonder whether they used a balloon with a smaller diameter to predilate the protruded single strut before the initial kissing balloon inflation.¹

LETTER TO THE EDITOR

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Double kissing nano-culotte technique might also be associated with a variety of technical challenges, including geographic miss in the SB ostium particularly at the opposite site of the protruded single-stent cell. This kind of geographic miss is well known to occur mostly in cases who have a relatively large distal MV (similar to or even larger than the proximal MV) possibly as a consequence of positive vascular remodeling and/or poststenotic dilatation and particularly in the presence of narrow bifurcation angles. Therefore, this novel technique might be more feasible in coronary bifurcation morphologies conforming or nearly conforming to the Finet's formula.^{6,7} It is well known that the Finet's formula signifies the presence of fractal branching pattern in the coronary arterial tree.^{6,7} According to this formula, proximal MV diameter equals $0.678 \times (\text{distal MV diameter} + \text{SB diameter})$, suggesting that the distal MV diameter should be relatively smaller compared with the proximal MV diameter under normal conditions for the maintenance of proper coronary flow patterns.^{6,7} Alternatively, wiring through the second cell (as a modified Szabo technique during SB stent preparation) may also be considered to prevent potential geographic miss in the SB ostium in patients with an excessively large distal MV diameter and narrow bifurcation angle.

A variety of complications might specifically be associated with the technical aspects of the Szabo technique that serves as the initial part of this novel strategy¹ In this context, entanglement of guidewires and SB stent dislodgement (mostly upon sudden retrieval of the undeployed SB stent) have been encountered in the setting of the Szabo technique.⁸ Therefore, operators should initially gain experience with the Szabo technique before performing double-kissing nano-culotte stenting. Taken together, this novel technique seems to have a relatively steep learning curve due to its procedural details, including SB stent preparation and the potential need for intravascular imaging. Finally, it seems noteworthy that other less well-known strategies, including Szabo-2 stent strategy (T-stenting of the MV after SB stenting with the Szabo technique optimized with final POT and kissing balloon inflation),⁹ seem to be quite similar to the nano-culotte stenting in terms of its technical advantages and pitfalls.

In conclusion, double-kissing nano-culotte technique seems to be a promising option for the management of coronary bifurcation lesions, particularly in the hands of expert interventionalists who are familiar with the technical pros and cons of this novel strategy. However, clinical studies (particularly aiming to make head-to-head comparisons with other 2-stent strategies) are still warranted to uncover further technical tips and clinical outcomes of this novel technique.

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