

“Balloon Withdrawal Technique” to Correct Prosthesis Malposition and Treat Paravalvular Aortic Regurgitation During TAVI

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ABSTRACT: Transcatheter aortic valve implantation (TAVI) is an emerging technology used to treat high-risk patients with severe aortic stenosis. During TAVI with the CoreValve ReValving System, a balloon is used for the reduction of paravalvular regurgitation. However, in this paper, we describe the “balloon withdrawal” technique through which the positioning of a second valve can be avoided in case of initial malpositioning. The result of the technique was rather encouraging, and minimal paravalvular aortic regurgitation was recorded after echocardiographic assessment.

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Transcatheter aortic valve implantation (TAVI) is an emerging technology used to treat high-risk patients with severe aortic stenosis.^{1,2} Currently, the majority of experience for TAVI is derived from two bioprostheses — one balloon-expandable (SAPIEN; Edwards Lifesciences, Inc) and one self-expandable (CoreValve; Medtronic, Inc). Bioprosthetic devices are mainly introduced through a femoral artery, converting TAVI into a truly percutaneous procedure. During TAVI with the CoreValve ReValving System, the balloon may be used for the reduction of paravalvular leak. However, in this paper, we describe a technique of “balloon withdrawal” through which we can avoid using a second valve in case of initial low positioning of the first valve.

Technique

After native aortic valve predilatation with a 20 x 45 mm balloon (Cristal), a 29 mm CoreValve bioprosthesis deployment was optimally initiated (Figure 1A). Nevertheless, fluoroscopic evaluation revealed a too-low prosthesis implantation and severe paravalvular aortic regurgitation (IV/IV) (Figure 1B). Accordingly, the decision was made to perform the Snare repositioning technique (Figure 1C), which has previously been described in detail.^{3,4}

However, no significant aortic regurgitation improvement was observed. While the option of implanting a second prosthesis within the first was debated among the interventional team, it was decided to perform a “balloon withdrawal” technique prior to this. Under continuous fluoroscopic guidance, a 28 x 50 mm balloon (Cristal) was dilated within the bioprosthesis (Figure 2A). At the peak of balloon inflation, a constant but gentle withdrawal force was applied. As the inflated balloon slipped out of the bioprosthesis, a minimal upward movement of the prosthesis was observed (Figure 2B). Subsequently, final angiographic evaluation showed aortic regurgitation I-II/IV, while prosthesis appositioning was favorably altered by approximately 2-3 mm (Figure 2C). The decision not to proceed immediately with a second valve was due to the fact that data regarding long-term outcomes with valve-in-valve positioning are lacking. The risk of obstruction or compromise of coronary ostium flow by the valve-in-valve was also taken into account. Echocardiographic examination at discharge showed minimal paravalvular regurgitation.

Discussion

TAVI is an innovative technique to treat high-risk patients with degenerative severe aortic valve stenosis.⁵ Therefore, proper valve positioning is rather crucial in order to avoid moderate or severe paravalvular leak. The balloon withdrawal technique arose because TAVI is a laborious procedure that can be accompanied by a variety of complications.^{6,7} Despite all the precautions, malpositioning of the bioprosthesis may occur and has consequences for the patient. Identification of optimal placement and application of repositioning techniques for prostheses with unacceptable functionality have been described.⁴ Implantation of a second valve within the first, application of withdrawal force with a “snare,” or “removal and re-insertion” of a semi-deployed prosthesis have been proposed. To the best of our knowledge, this is the first time that the balloon withdrawal technique has been reported. We believe that improvement of valve functionality was achieved due to (1) modification of the prosthesis orientation; (2) withdrawal of the prosthesis (by a few millimeters); and (3) better expansion of the CoreValve frame by balloon inflation. However, we emphasize the fact that the operator should be cautious during the application of the withdrawal force, which should be constant but gentle. Friction caused by tortuosity and/or calcification of the arterial tree must be

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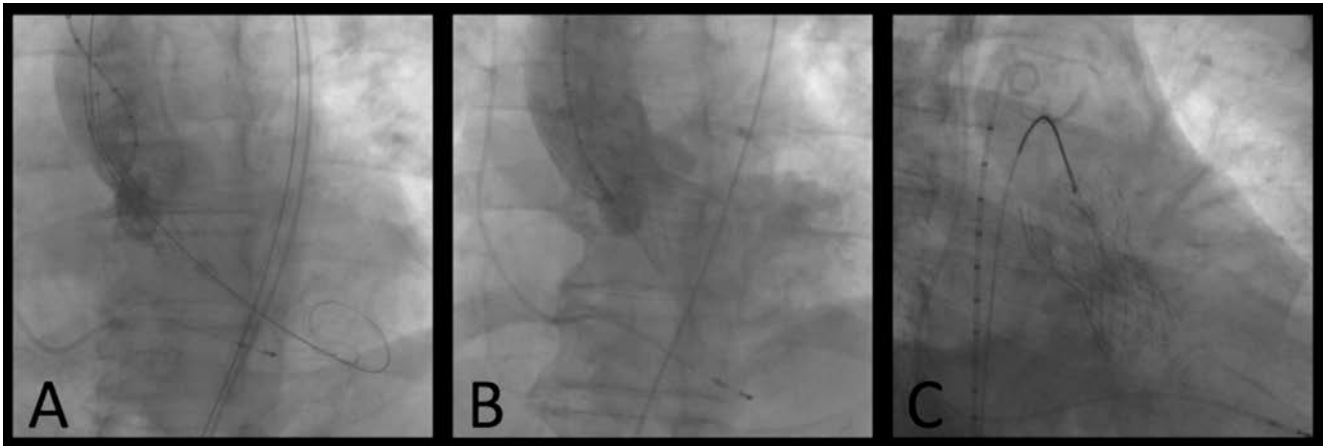


Figure 1. (A) Initial stage of prosthesis deployment. (B) Prosthesis fully deployed; aortic regurgitation. (C) The “snare” technique.

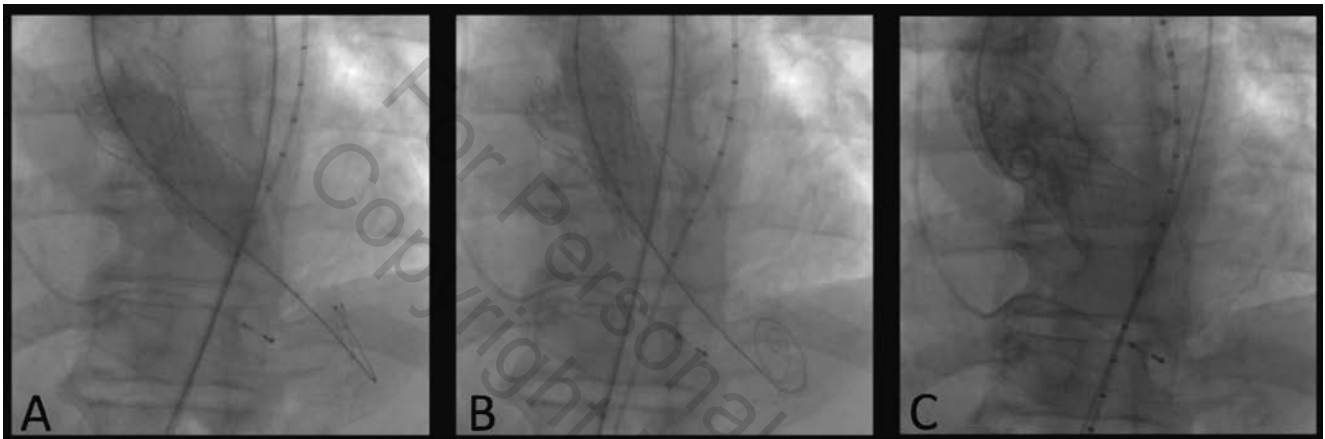


Figure 2. (A, B) The balloon withdrawal technique. (C) Final angiography.

taken into consideration and not mislead the operator. It is clear that an extreme withdrawal force could potentially result in dreadful complications. Moreover, simultaneous fluoroscopy is crucial to ensure the interventionalist has full control of the whole procedure. However, since the devices used for TAVI are not designed to be repositioned, we believe that such manipulations are not always feasible and should only be used as bail-out techniques. Therefore, the balloon withdrawal technique might be a useful alternative to correct prosthesis malposition and treat paravalvular aortic regurgitation during TAVI.

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