



JSCAI Image

Palliative Balloon Valvuloplasty for Late Stenosis of a Degenerated Transcatheter Heart Valve: Proof of Concept



Manish Vinayak, MD, Gilbert H.L. Tang, MD, MSc, MBA, Malcolm Anastasius, MBBS, PhD, Pedro Moreno, MD, George D. Dargas, MD, PhD, Annapoorna S. Kini, MD, Samin K. Sharma, MD, Sahil Khera, MD, MPH*

Mount Sinai Heart, Mount Sinai Hospital, New York, New York

Case presentation

A 74-year-old male Jehovah's Witness with bicuspid aortic stenosis and advanced underlying cardiomyopathy underwent transcatheter aortic valve replacement (TAVR) with a 34-mm Evolut R CoreValve (Medtronic Inc). He remained well until 5 years later when he was admitted with heart failure. Transesophageal echocardiogram (TEE) demonstrated severe structural valve degeneration (SVD) with stenosis (peak: 58 mm Hg, mean: 34 mm Hg, Vmax 3.8 m/s, effective orifice area of 0.85 cm², and LVOT/AV VTI ratio of 0.16), and ejection fraction of 20%. (Figure 1A, B, and Supplemental Videos 1 and 2).

Computed tomography (CT) showed a reasonably well-expanded valve but with eccentric expansion toward the right sinus (Figure 1C, D). CT indicated high risk of right coronary artery (RCA) obstruction with redo-TAVR due to low height of RCA (around node 5 of the Evolut valve) and risk of the sinus sequestration from "neoskirt" extension above the sino-tubular junction and valve to RCA distance <2 mm. In addition, CT revealed proximity of one of the commissures to the RCA orifice which precluded the use of leaflet modification techniques. (Figure 1E-G). Cardiac catheterization confirmed low height of the RCA and effaced right sinus (Figure 1H, Supplemental Video 3).

As the patient was not a surgical candidate for TAVR explant, our heart team decided on palliative balloon valvuloplasty of the Evolut valve to improve leaflet mobility. The RCA was protected with a coronary wire and balloon during the procedure to avoid debris or pinned Evolut leaflet obstructing the coronary flow. Balloon valvuloplasty with a 26 mm balloon was decided based on preindex TAVR CT analysis of the native anatomy. The Impella left ventricular support system (Abiomed), and balloon expandable SAPIEN 3 Ultra valve (Edwards Lifesciences) with a size of 29 mm were kept as a backup in the event of the development of massive aortic regurgitation (AR) requiring rapid transcatheter heart valve (THV) replacement.

Balloon valvuloplasty with a 26 mm SAPIEN 3 system (Edwards Lifesciences) was performed with cerebral embolic protection (Claret Sentinel Cerebral Protection System, Boston Scientific). Simultaneous aortography revealed complete nonopacification of the right sinus and RCA (Figure 1I, Supplemental Video 4). Following valvuloplasty, the mean/peak transvalvular gradient decreased to 10/17 mm Hg; however, TEE initially showed severe transvalvular AR (Figure 1J, Supplemental Video 5). Given that the prosthetic leaflet might have been stuck in the open position, the RCA guide catheter was used to manipulate the leaflets to a closed position, reducing the AR to trivial. (Figure 1K; Supplemental Video 6). The postprocedural course was uneventful, and the patient was discharged home with a mean gradient of 10 mm Hg, AVA 1.3 cm², Post LVOT/AV VTI ratio of 0.66, and trivial AR (Figure 1L, Supplemental Videos 7, 8). He remained well at the 30-day and 3-month follow-ups with no change in echocardiographic findings.

Discussion

Numerous clinical and bench studies have provided evidence of stable THV hemodynamics and long-term durability, with follow-up durations of up to 8 and 25 years, respectively. Nevertheless, THV can occasionally fail, necessitating either TAVR explant or redo-TAVR as treatment options.^{1,2}

Redo-TAVR can pose challenges due to the risk of coronary obstruction. Implanting a THV inside a failing THV pins the leaflets of the first valve in the open position, creating a "neoskirt." Bench studies have demonstrated that low implantation of a short-stent frame THV in a prior THV provides a shorter neoskirt height, which may facilitate coronary access after redo-TAVR.³ However, this is not feasible if the primary mechanism of failure is stenosis, as in our case, because the leaflet overhang of the failed stenotic THV may impact the hydrodynamic performance of the second THV. In addition, the proximity of one

Keywords: balloon valvuloplasty; degenerative valve; valve restenosis.

* Corresponding author: sahil.khera@mountsinai.org (S. Khera).

<https://doi.org/10.1016/j.jscai.2023.101188>

Received 2 August 2023; Received in revised form 12 September 2023; Accepted 19 September 2023

Available online 10 October 2023

2772-9303/© 2023 The Author(s). Published by Elsevier Inc. on behalf of the Society for Cardiovascular Angiography and Interventions Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

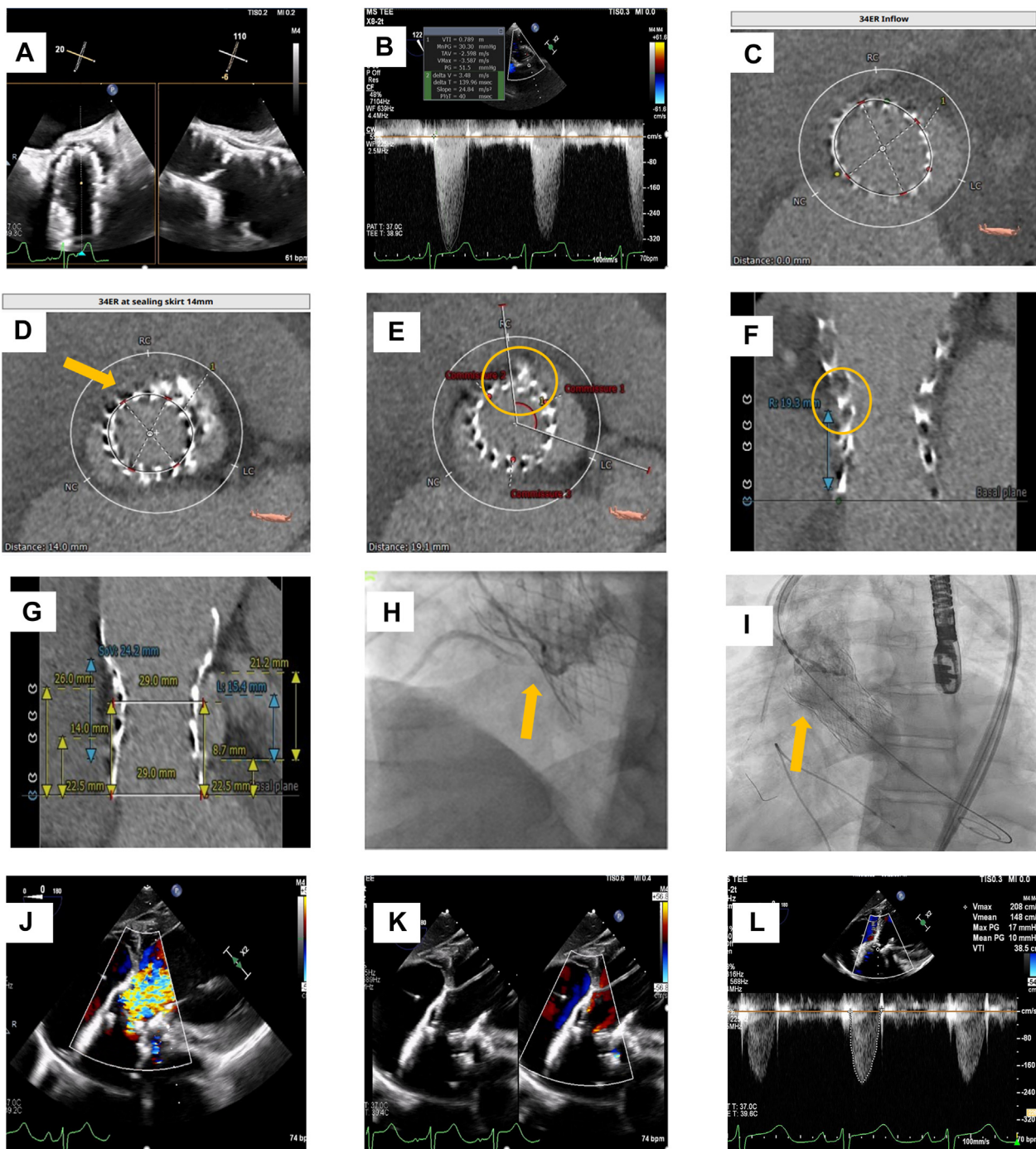


Figure 1.

Palliative balloon valvuloplasty in an extreme-risk patient with transcatheter valve stenosis where redo-TAVR was not feasible. Thickened Evolut leaflets on transesophageal echocardiography (TEE) (A). Echo-derived mean/peak gradients = 34/58 mm Hg (B). CT analysis showed reasonably well-expanded valve (C) and eccentric expansion of the Evolut frame toward the right sinus (orange arrow) (D). CT axial cut showed proximity of 1 of the commissures to the right coronary artery (RCA) ostium which is around node 5 of the Evolut frame (orange circle) (E) and narrow valve to the RCA distance (orange circle) (F). CT measurements of the left sinus and effaced right sinus (G). Coronary angiogram confirmed low RCA ostium (orange arrow) (H). Simultaneous aortogram during balloon valvuloplasty showing nonopacification of right sinus and coronary balloon in proximal RCA (orange arrow) (I). Severe aortic regurgitation (AR) following valvuloplasty likely from Evolut leaflet pinned in an open position (J). Trivial AR following leaflet manipulation (K). Final TEE mean/peak gradients = 10/17 mm Hg (L). All images in the paper are original images.

of the commissures to the RCA orifice on CT precluded us from using leaflet modification (BASILICA) or leaflet removal techniques.

Due to the above factors associated with a high risk of RCA obstruction associated with redo-TAVR and high surgical risk for TAVR explant, the patient was considered for palliative late balloon valvuloplasty, which was safely and effectively performed.

Conclusion

Balloon valvuloplasty in non-SVD after TAVR is a recognized treatment option.⁴ We describe a successful case of late balloon valvuloplasty of a failed stenotic THV. However, long-term results and risks associated with this procedure are unknown. Therefore, it can be

considered as an option in a patient where redo-TAVR or TAVR explant is not feasible. Further investigations are needed to determine if this bailout option can be applied to all stenotic transcatheter valves.

Declaration of competing interest

Gilbert H. L. Tang is a physician proctor, physician advisory board member and consultant for Medtronic, physician advisory board member and consultant for Abbott Structural Heart, physician advisory board member for JenaValve, consultant for NeoChord, and has received speakers' honoraria for Siemens Healthineers. George D. Dangas reports institutional research grants from Abbott Laboratories, AstraZeneca, Bayer, Boston Scientific, Medtronic, and Daiichi-Sankyo, consultant fees from Biosensors and Boston Scientific, and speaker honoraria from Chiesi. Sahil Khera is a physician proctor and consultant for Medtronic, and a consultant for Abbott Structural Heart, Terumo, Eastend Medical, and W. L. Gore. He also serves on the speaker's board for Zoll Medical. The remaining authors have nothing relevant to disclose.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethics statement and patient consent

Informed consent was obtained, and this case report adheres to the relevant ethical guidelines.

Supplementary material

To access the supplementary material accompanying this article, visit the online version of the Journal of the Society for Cardiovascular Angiography & Interventions at [10.1016/j.jscai.2023.101188](https://doi.org/10.1016/j.jscai.2023.101188).

References

1. Jørgensen TH, Thyregod HGH, Ihlemann N, et al. Eight-year outcomes for patients with aortic valve stenosis at low surgical risk randomized to transcatheter vs. surgical aortic valve replacement. *Eur Heart J*. 2021;42(30):2912–2919. <https://doi.org/10.1093/eurheartj/ehab375>
2. Sathananthan J, Hensey M, Landes U, et al. Long-term durability of transcatheter heart valves: insights from bench testing to 25 years. *JACC Cardiovasc Interv*. 2020;13(2):235–249. <https://doi.org/10.1016/j.jcin.2019.07.049>
3. Akodad M, Sellers S, Landes U, et al. Balloon-expandable valve for treatment of Evolut valve failure: implications on neoskirt height and leaflet overhang. *JACC Cardiovasc Interv*. 2022;15(4):368–377. <https://doi.org/10.1016/j.jcin.2021.12.021>
4. Akodad M, Blanke P, Chuang MA, et al. Late balloon valvuloplasty for transcatheter heart valve dysfunction. *J Am Coll Cardiol*. 2022;79(14):1340–1351. <https://doi.org/10.1016/j.jacc.2022.01.041>