



Efficacy of TAV-in-TAV using SAPIEN3 Ultra RESILIA for supra-skirtal-leakage with intravascular hemolysis

Ryo Otake¹ · Daisuke Hachinohe¹ · Ryo Horita¹ · Juan Armando Diaz¹ · Hidemasa Shitan¹ · Tsutomu Fujita¹

Received: 4 December 2023 / Accepted: 18 April 2024
© The Author(s) 2024

A 79-year-old female presented with congestive heart failure secondary to severe aortic stenosis, regurgitation. Preoperative computed tomography (CT) showed a tortuous descending aorta, a horizontal aorta (Fig. 1A, B). She had a history of minimally invasive coronary artery bypass grafting. Therefore, we planned to perform transcatheter aortic valve (TAV) implantation using a 23 mm SAPIEN3 Ultra RESILIA (S3UR, Edwards Life sciences, Irvine, CA, USA), with +6% oversizing by area

Unexpectedly, it was implanted too low (Fig. 1C and Online Video 1), and moderate aortic regurgitation persisted from the left coronary cusp side despite post-dilatation. Due to strong resistance, post-dilatation was performed at the same pressure, and the final transthoracic echocardiogram (TTE) showed a mean pressure gradient of 5.5 mmHg and circumferential dilatation of the valve.

Postoperatively, the patient became anemic and jaundiced. Blood tests revealed elevated indirect bilirubin levels along with decreased hemoglobin and haptoglobin findings consistent with intravascular hemolysis. Transesophageal echocardiography (TEE) revealed leakage above the prosthesis skirt, known as supra-skirtal leakage

(SSL) [1] (Fig. 1D and Online Video 2). The SSL was resulted in a portion of the frame above the skirt of the initial prosthesis being positioned below the annular level; due to the progression of anemia requiring blood transfusion, a secondary procedure was required to address the SSL.

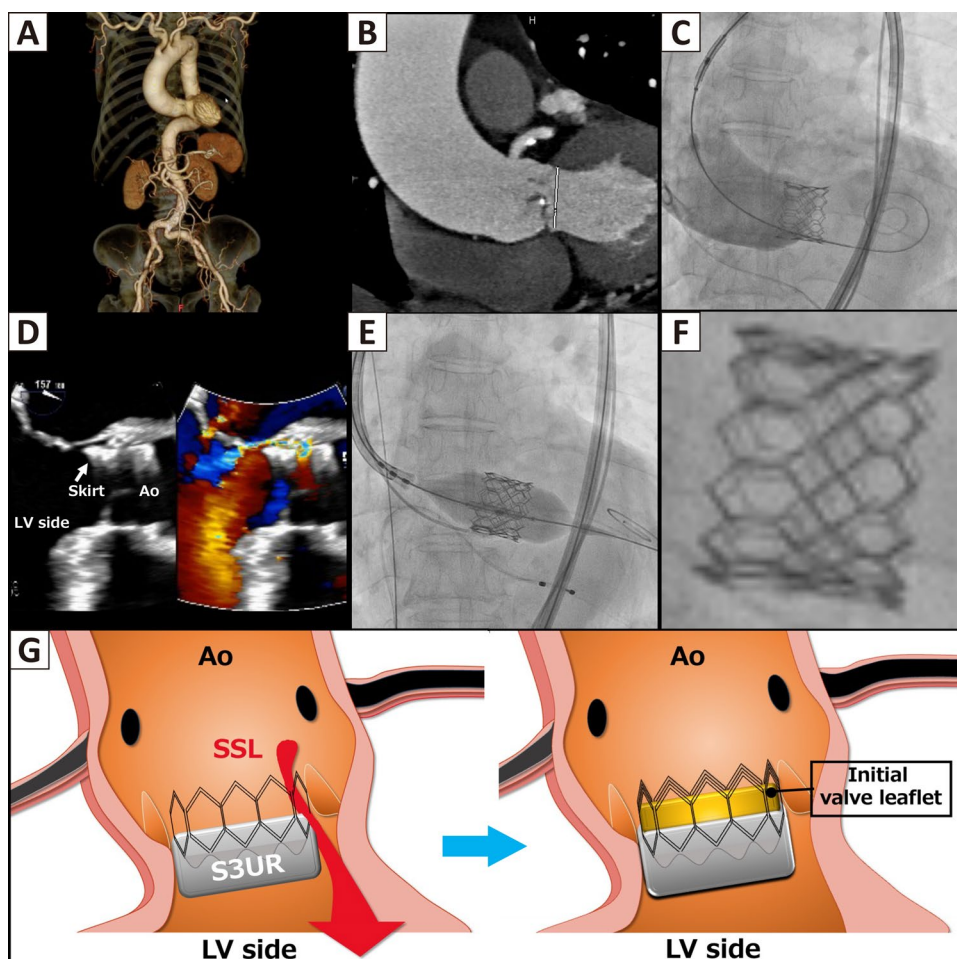
Ten days after the initial procedure, a TAV-in-TAV was performed with a second 23 mm S3UR implanted approximately 1mm above the initial valve (Fig. 1E and F). After the TAV-in-TAV procedure, the prosthesis leaflet of the first valve was raised up to the commissural level, effectively acting as a neo-inner skirt (Fig. 1G). This procedure successfully resolved the SSL and improved the hemolytic status as demonstrated by the follow-up TTE (Online Video 3) and blood test.

This case illustrates the effective use of the TAV-in-TAV procedure with the S3UR valve to address SSL. The innovative approach of using the prosthesis leaflet of the initial valve as a sealing mechanism was instrumental in resolving the SSL and associated intravascular hemolysis. This approach highlights the importance of precise-valve position and offers a potential management strategy for similar clinical cases.

✉ Ryo Otake
a11f130073@gmail.com

¹ Department of Cardiology, Sapporo Cardiovascular Clinic,
8-1, Kita-49 Higashi-16, Higashiku, Sapporo 007-0849,
Japan

Fig. 1 Diagnosis and Management of Supra-Skirtal-Leakage. **A, B** Preoperative CT. **C** Final aortography showed mild-to-moderate aortic regurgitation. **D** TEE mid-esophageal long-axis view, diastolic still-frame. **E** Procedure of TAV-in-TAV for the SSL. **F** Close-up view showing the second valve implanted slightly higher than the initial valve. **G** Schematic depiction of SSL following deep implantation of the S3UR (left) and subsequent effective sealing by the initial valve leaflet after TAV-in-TAV (right)



Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12928-024-01007-3>.

Data availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

Reference

1. Stähli BE, Maier W, et al. Aortic regurgitation after transcatheter aortic valve implantation: mechanisms and implications. *Cardiovasc Diagn Ther.* 2013;3(1):15–22.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.