

CORONARY, PERIPHERAL, AND STRUCTURAL INTERVENTIONS

CLINICAL CASE SERIES

Management of Single Leaflet Device Attachment in the Tricuspid Position



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ABSTRACT

BACKGROUND Single leaflet device attachment (SLDA) during transcatheter edge-to-edge repair (TEER) of the tricuspid valve is an uncommon but recognized complication. This case series presents 2 older adult patients with symptomatic severe tricuspid regurgitation who underwent tricuspid TEER and experienced SLDA during the procedure.

CASE SERIES The first patient was an 85-year-old man with liver cirrhosis and right-sided heart failure. Transthoracic echocardiography (TTE) revealed severe tricuspid regurgitation secondary to annular dilation, with a coaptation gap of 5 mm between the anterior and septal leaflets. He was deemed a high operative risk and underwent tricuspid TEER (tTEER) using 2 MitraClip XTW devices (Abbott). During the procedure, 1 clip detached from the septal leaflet and was retrieved using EN Snare (Merit Medical) and ÖNÖ (ÖNÖ COR) devices, with placement of another clip. The procedure ultimately reduced tricuspid regurgitation from massive to moderate. The second patient was a 70-year-old woman with a history of atrial fibrillation and rheumatoid arthritis. She presented with symptomatic severe secondary tricuspid regurgitation on both TTE and transesophageal echocardiography. The tTEER procedure was performed using a XTW TriClip (Abbott). Following SLDA, the clip was retrieved using the EN Snare and ÖNÖ devices, and 2 subsequent clips were placed successfully, thus reducing regurgitation to mild.

CONCLUSIONS SLDA during tTEER presents a significant procedural challenge but can be managed effectively with clip retrieval using the EN Snare and ÖNÖ devices. Both cases demonstrated successful clip retrieval without injury to the valve leaflets and successful TEER. (JACC Case Rep. 2025;30:103864) © 2025 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

PATIENT 1

The patient was an 85-year-old man with cirrhosis of the liver in the setting of right-sided heart failure and symptomatic severe tricuspid regurgitation. Transthoracic echocardiography (TTE) showed a severely enlarged right ventricular chamber size, moderately reduced systolic function, severe tricuspid valve

regurgitation secondary to annular dilatation with incomplete leaflet coaptation, an effective regurgitant orifice (ERO) by proximal isovelocity surface area (PISA) of 0.89 cm², a regurgitant volume by PISA of 47 mL, preserved left ventricular function, and mild mitral valve regurgitation (**Figure 1**). Transesophageal echocardiography (TEE) confirmed severe secondary tricuspid valve regurgitation with a coaptation gap of

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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ABBREVIATIONS AND ACRONYMS

ERO = effective regurgitant orifice

PISA = proximal isovelocity surface area

SLDA = single leaflet device attachment

TEE = transesophageal echocardiography

TTE = transthoracic echocardiography

tTEER = tricuspid transcatheter edge-to-edge repair

5 mm between the anteroseptal and anteroposterior leaflets (**Figure 2**, **Video 13**).

He was evaluated by the multidisciplinary heart team and was believed to be at high operative risk because of his comorbidities and an appropriate candidate for tricuspid transcatheter edge-to-edge repair (tTEER). The patient was admitted for diuresis before the planned tTEER to reduce the leaflet coaptation gap. During the procedure, a MitraClip XTW (Abbott) was positioned in the midpoint of the commissure between the anterior and septal leaflets, with substantial improvement in regurgitation, but residual regurgitation in the center of the valve was noted (**Figure 3**).

A second XTW MitraClip was brought into position toward the center of the valve and appeared to have adequate leaflet insertion; however, after release, the clip detached from the septal leaflet (**Video 1**) (single leaflet device attachment [SLDA]). An attempt was made to place a stabilizing clip toward the center of the valve; however, the clip appeared unstable and at risk for embolization, so it was removed. The Abbott steerable guide sheath and clip delivery system were removed, and a 26-F DrySeal sheath (Gore Medical) was inserted, followed by a Destino 13.8-F steerable guide sheath (Baylis Medical). The mobile clip was captured using an EN Snare device (Merit Medical) through the ÖNÖ device (ÖNÖCOR) central port and drawn into the sheath without any injury to the leaflet or blood vessel (**Figures 4 to 6**, **Videos 2 to 5** and **10** and **12**).

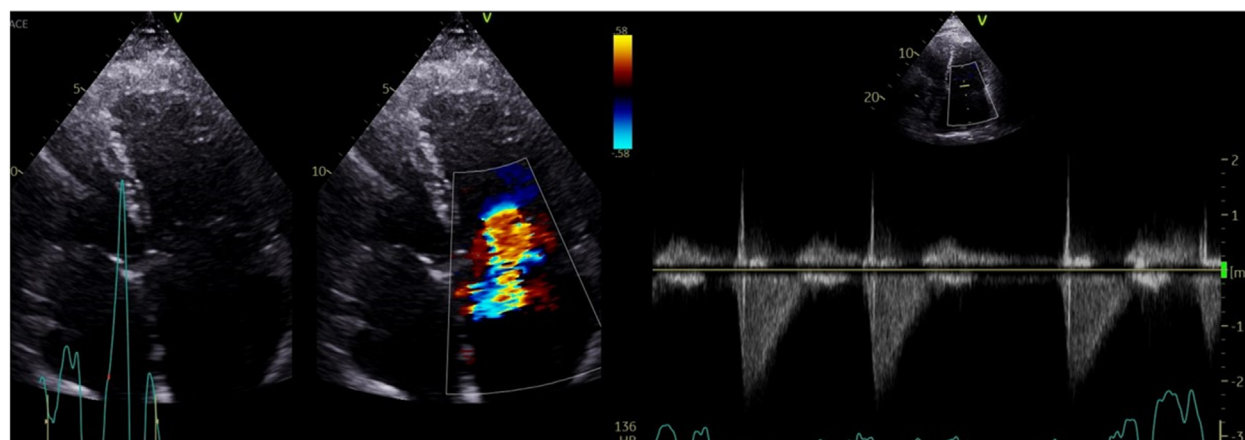
TAKE-HOME MESSAGES

- A larger annulus resulting in a larger coaptation gap, thinner leaflets, and technically challenging imaging increases the risk for SLDA in tTEER compared with mitral valve interventions.
- The optimal management of SLDA in tTEER remains uncertain, and clip retrieval and removal can be challenging and associated with vascular injury, leaflet injury, or both.
- We describe the first repeated use of a strategy of successful retrieval of tricuspid clips after SLDA by using the ÖNÖ device (ÖNÖCORE) without leaflet or vascular injury and allowing for successful procedural completion.

Subsequently, the Abbott steerable guide sheath was reintroduced, and another MitraClip XTW was positioned with adequate leaflet insertion toward the center of the commissure between the anterior and septal leaflets. Following release, both clips remained stable with reduction in tricuspid regurgitation from massive to moderate with a transtricuspid gradient of <2 mm Hg (**Figure 7**, **Video 14**).

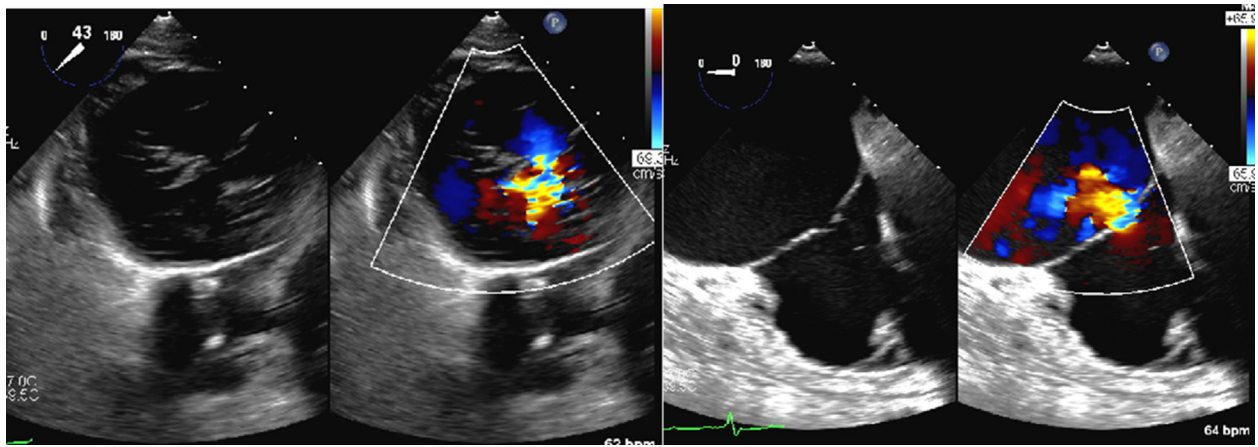
PATIENT 2. The second patient was a 70-year-old woman with a past medical history of long-standing atrial fibrillation and rheumatoid arthritis who also presented with symptomatic severe tricuspid regurgitation. After sinus rhythm was restored and maintained, TTE showed moderately enlarged right ventricular size with mildly reduced function and severe secondary tricuspid regurgitation secondary to

FIGURE 1 Preprocedural Transthoracic Echocardiogram of Patient 1



Transthoracic echocardiogram demonstrates severe functional tricuspid regurgitation with a large coaptation gap, confirmed via Doppler signal.

FIGURE 2 Preprocedural Transesophageal Echocardiogram of Patient 1



Preprocedural transesophageal echocardiogram showing severe tricuspid regurgitation with a 5 mm coaptation gap.

annular dilatation (vena contracta, 7 mm; ERO, 0.28 cm², and regurgitant volume, 30 mL by PISA). TEE confirmed tricuspid annulus dilatation with reduced leaflet coaptation and a coaptation gap (Figure 8).

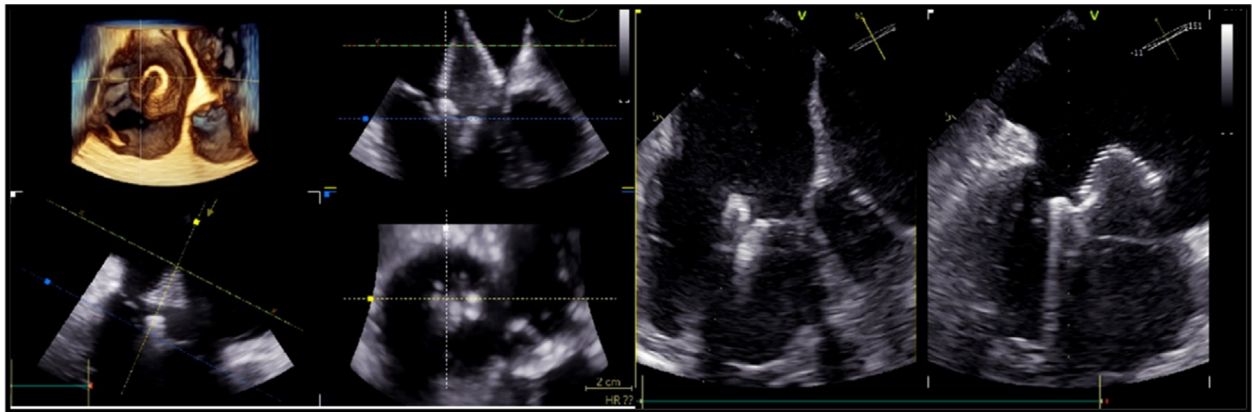
The patient did not tolerate high-dose diuretic agents as a result of hyponatremia. She was evaluated

by the multidisciplinary heart team for tricuspid valve intervention and was believed to be appropriate for tTEER. Initially, an XTW TriClip (Abbott) was brought into position over the antero-septal commissure, and a grasp was made. The clip appeared to have adequate leaflet insertion on TEE and intracardiac echocardiography (Figure 9), but it had an SLDA

FIGURE 3 Intraprocedural Transesophageal Echocardiogram of Patient 1 After Deployment of First MitraClip



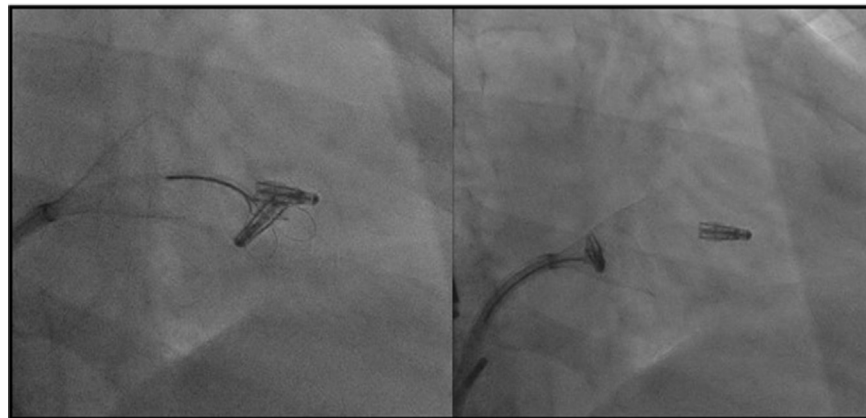
Transesophageal echocardiogram images after deployment of the first MitraClip between the anterior and septal leaflets with substantial improvement in regurgitation, but residual regurgitation in the center of the valve was noted.

FIGURE 4 Intraprocedural Transesophageal Echocardiogram of Patient 1 During Retrieval of Second MitraClip

Transesophageal echocardiogram images during retrieval of the second MitraClip using the Ensnare device and ONO basket.

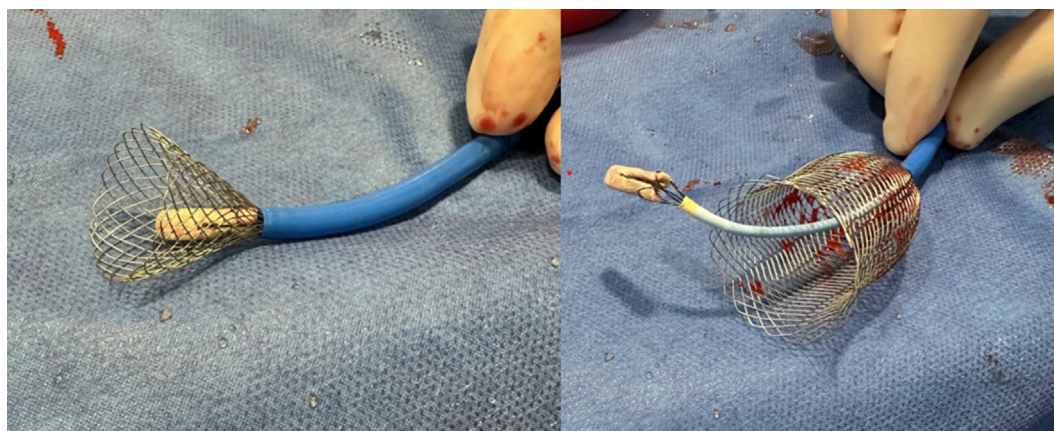
after release and appeared unstable (**Figure 10**, **Video 6**). The Abbott steerable guide sheath and clip delivery system were removed, a 26-F Gore DrySeal sheath was inserted, and the clip was retrieved using an ONO device with an EN Snare device through a Destino sheath (**Figures 11 and 12**, **Videos 8, 9, and 11**).

The clip delivery steerable guide sheath was reinserted, and 2 additional XTW clips were placed at the antero-septal commissure. Both clips remained stable after release, with mild residual tricuspid regurgitation and a transvalvular gradient of 1 mm Hg (**Figure 13**).

FIGURE 5 Intraprocedural Fluoroscopic Images of Patient 1 During Clip Retrieval

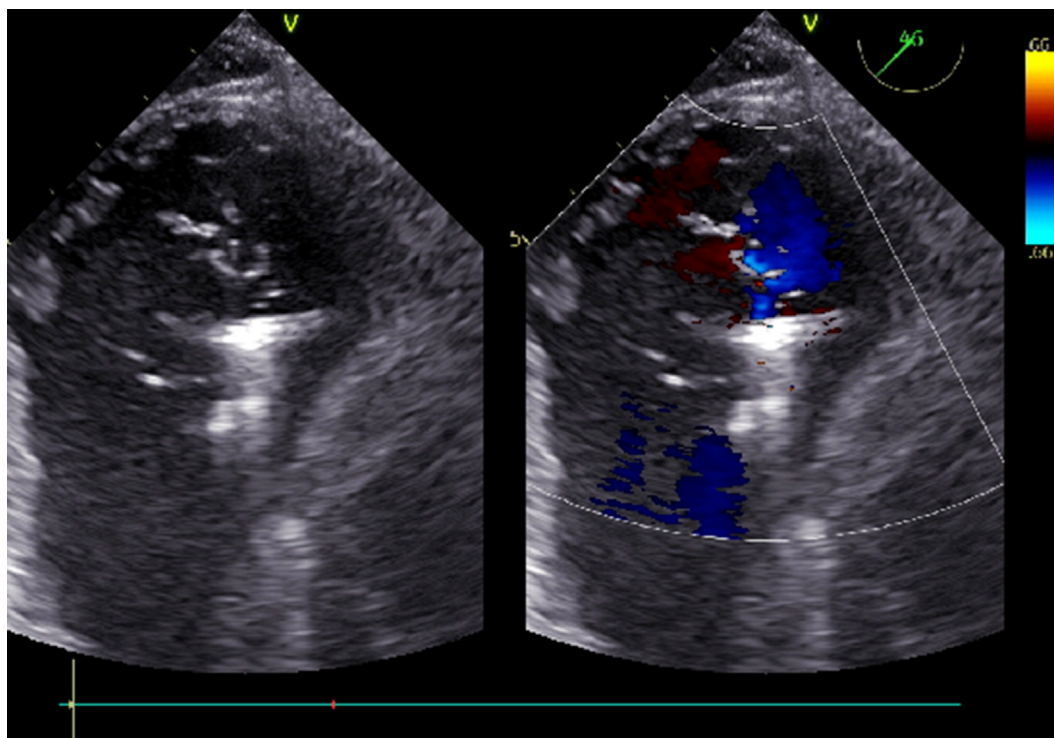
Fluoroscopic images showing the clip retrieval using the ENsnare device and ONO basket. The mobile clip was captured using an EN Snare device through the ONO central port and drawn into the Dryseal sheath and removed from the body.

FIGURE 6 Successful Clip Removal (Patient 1)

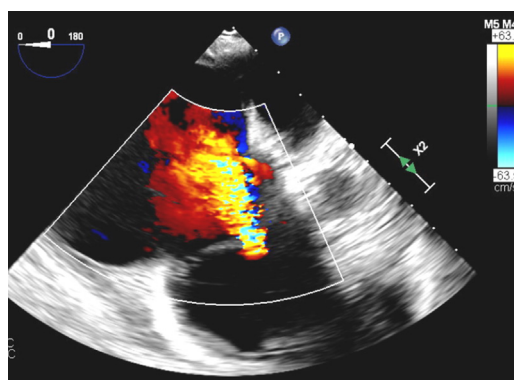


Snared MitraClip extruding from the ONO basket.

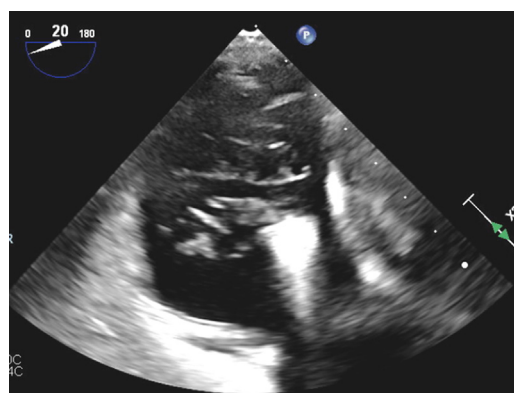
FIGURE 7 Postprocedural Transesophageal Echocardiogram of Patient 1



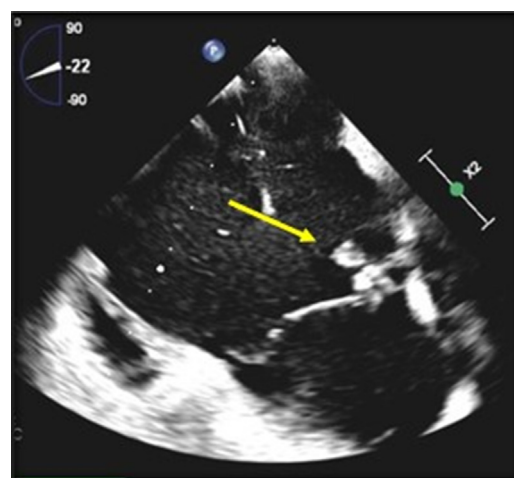
Postprocedural transesophageal echocardiogram shows two stable clips in place with significantly reduced tricuspid regurgitation.

FIGURE 8 Preprocedural Transesophageal Echocardiogram of Patient 2

Preprocedural transesophageal echocardiogram shows severe tricuspid regurgitation with a sizeable central jet.

FIGURE 9 Intraprocedural Transesophageal Echocardiogram of Patient 2 During Triclip Positioning

Leaflet insertion was assessed using a transgastric transesophageal echocardiogram image with an apparent tissue bridge between the anterior and septal leaflets.

FIGURE 10 Intraprocedural Transesophageal Echocardiogram of Patient 2 Showing SLDA

After the clip's release, a single leaflet detachment was noted, and the clip was highly mobile (arrow).

FUNDING SUPPORT AND AUTHOR DISCLOSURES

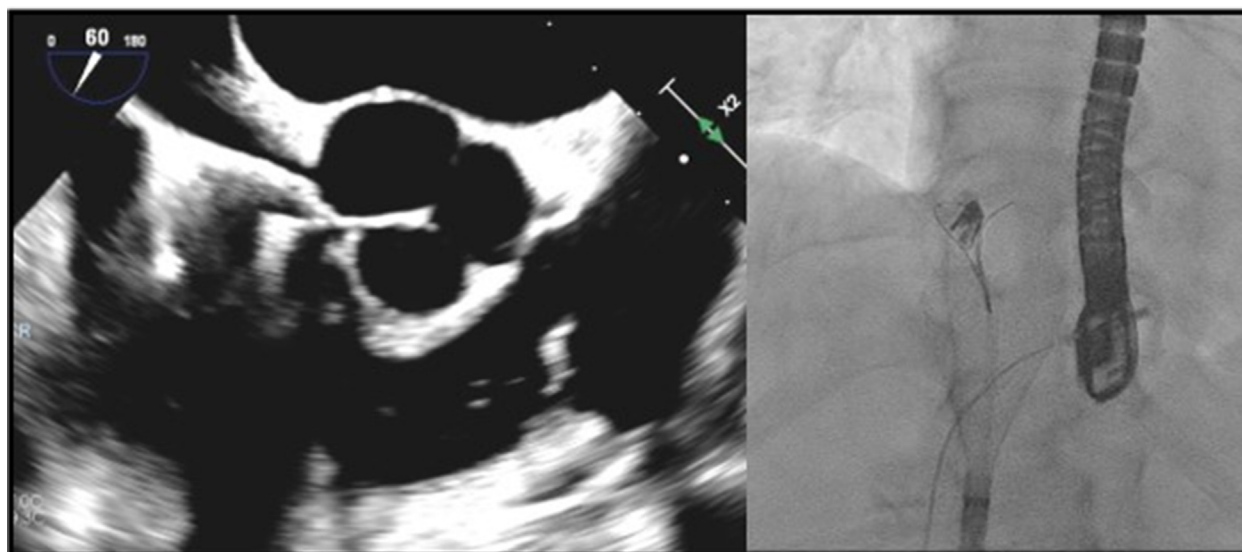
The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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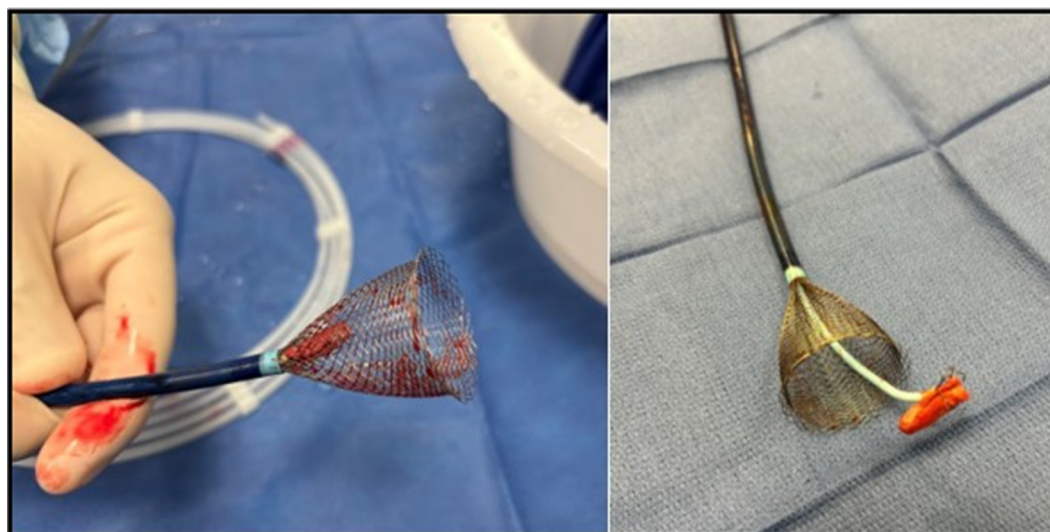
APPENDIX For supplemental videos, please see the online version of this paper.

FIGURE 11 Intraprocedural Images of Patient 2



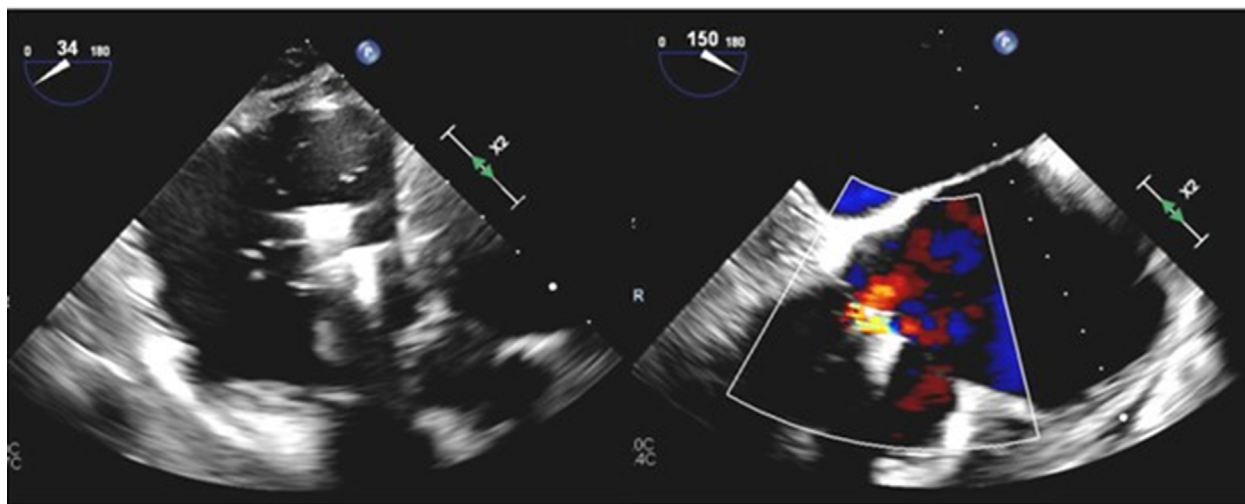
Intraprocedural transesophageal echocardiogram (left) and fluoroscopy (right) during removal of the failed clip using the Ensnares device and ONO basket.

FIGURE 12 Successful Clip Removal (Patient 2)



Removed clip in the ONO basket.

FIGURE 13 Postprocedural Transesophageal Echocardiogram of Patient 2



Postprocedural transesophageal echocardiogram showing the final result with reduction of tricuspid regurgitation to mild.