ARCHIVES OF THE TURKISH SOCIETY OF CARDIOLOGY

Official journal of the TURKISH SOCIETY OF CARDIOLOGY

When Everything Else Fails: TricValve® in a Dialysis-Dependent Patient with Advanced Right Heart Failure

Diğer Her Şey Başarısız Olduğunda: İleri Derecede Sağ Kalp Yetmezliği Olan Diyalize Bağımlı Hastada TricValve®

ABSTRACT

We report the case of a 72-year-old man with end-stage renal disease on maintenance dialysis and advanced right heart failure with severe tricuspid regurgitation, chronic atrial fibrillation, and cardiac cachexia. The patient presented with profound hypotension and cardiogenic shock, leading to recurrent failure of renal replacement therapy despite inotropic support. Given the prohibitive surgical risk, transcatheter edge-to-edge repair was deemed unsuitable due to extensive annular dilation, and the patient underwent urgent percutaneous caval valve implantation with the TricValve® system. The procedure was technically successful, resulting in immediate hemodynamic stabilization, improved tolerance of dialysis, and rapid clinical recovery. Follow-up imaging confirmed optimal device positioning without complications. To our knowledge, this represents the first TricValve® implantation in a dialysis-dependent patient in Europe, demonstrating the feasibility and therapeutic value of this approach in carefully selected, high-risk patients with severe tricuspid regurgitation.

Keywords: Advanced, chronic, heart failure, hemodialysis, interventional cardiology, tricuspid regurgitation, ultrafiltration

ÖZET

Son dönem böbrek yetmezliği olan, idame diyalizi uygulanan ve şiddetli triküspit yetmezliği, kronik atriyal fibrilasyon ve kardiyak kaşeksi ile ileri derecede sağ kalp yetmezliği olan 72 yaşındaki bir erkek hastanın vakasını sunuyoruz. Hasta, inotropik destek olmasına rağmen böbrek replasman tedavisinin tekrar tekrar başarısız olmasına neden olan şiddetli hipotansiyon ve kardiyojenik şok ile başvurdu. Cerrahi riskin çok yüksek olması ve yaygın anüler dilatasyon nedeniyle transkateter kenardan kenara onarım uygun görülmedi ve hastaya TricValve® sistemi ile acil perkütan kaval kapak implantasyonu uygulandı. İşlem teknik olarak başarılı oldu ve hemen hemodinamik stabilizasyon, diyaliz toleransında iyileşme ve hızlı klinik iyileşme sağlandı. Takip görüntüleme, komplikasyon olmaksızın cihazın optimal konumlandırıldığını doğruladı. Bildiğimiz kadarıyla, bu, Avrupa'da diyalize bağımlı bir hastaya yapılan ilk TricValve® implantasyonu olup, ciddi triküspit yetmezliği olan, dikkatle seçilmiş yüksek riskli hastalarda bu yaklaşımın uygulanabilirliğini ve terapötik değerini göstermektedir.

Anahtar Kelimeler: İleri düzey, kronik, kalp yetmezliği, hemodiyaliz, girişimsel kardiyoloji, triküspit yetmezliği, ultrafiltrasyon

CASE REPORT
OLGU SUNUMU

Right heart failure (HF) due to severe tricuspid regurgitation is a growing clinical challenge, particularly in elderly patients with multiple comorbidities.[1,2] While optimal medical therapy remains the cornerstone of management, many patients continue to experience persistent congestion, poor functional status, and intolerance to renal replacement therapy. Surgical repair or replacement of the tricuspid valve is associated with high perioperative risk, and transcatheter edge-to-edge repair may be unsuitable in cases of advanced annular dilation or large coaptation gaps.[3,4] In this context, novel percutaneous approaches such as bicaval valve implantation (TricValve® system) have emerged as promising palliative strategies to reduce systemic venous congestion while preserving native valve anatomy.[5,6] We present the case of a dialysis-dependent patient with advanced right HF and prohibitive surgical risk, in whom TricValve® implantation provided immediate hemodynamic stabilization and restored tolerance to renal replacement therapy.

Aristi Boulmpou[1,2]
Alexandros Kallifatidis[1]
Panagiotis Charalampidis[1]
Dimitrios Zioutas[1]
Christodoulos Papadopoulos[1,2]
Dimitrios Kamentsidis[1]
Dimokritos Dimitriadis[1]

[1]*St. Luke's Hospital, Panorama, Thessaloniki, Greece*
[2]*Third Department of Cardiology, Aristotle University of Thessaloniki, Ippokrateio General Hospital, Thessaloniki, Greece*

Corresponding author:
Aristi Boulmpou
✉ aristi_bou1993@yahoo.gr

Received: October 30, 2025
Accepted: November 24, 2025

Cite this article as: Boulmpou A, Kallifatidis A, Charalampidis P, et al. When Everything Else Fails: TricValve® in a Dialysis-Dependent Patient with Advanced Right Heart Failure. *Turk Kardiyol Dern Ars.* 2026;00(0):000-000.

DOI: 10.5543/tkda.2025.75501

Case Report

A 72-year-old male with end-stage renal disease, on renal replacement therapy for the past 30 years, had longstanding advanced right HF with severe tricuspid regurgitation, cardiac cachexia, and permanent atrial fibrillation (AF). He was on maximally tolerated HF medication. His renal replacement therapy had become increasingly challenging over the preceding years due to chronically low arterial blood pressure and persistent congestion. During a recent dialysis session, he developed discomfort, dizziness, and profound hypotension, leading to his urgent transfer to our center.

On presentation, the patient was hemodynamically unstable, exhibiting signs of cardiogenic shock, and was admitted to the intensive care unit (ICU) requiring inotropic support. On physical examination, auscultation of the lung fields revealed bilateral crackles, while signs of peripheral congestion were also evident. Cardiac auscultation detected a prominent holosystolic murmur over the tricuspid area, consistent with severe tricuspid regurgitation, and a softer systolic murmur at the aortic area. Peripheral pulses were weak and thready. Electrocardiography showed AF with a rapid ventricular response. Laboratory evaluation indicated a borderline hematocrit, markedly elevated N-terminal pro–B-type natriuretic peptide (NT-proBNP) levels (~18,000 pg/mL), and increased serum creatinine levels, as the patient was already on maintenance dialysis. Chest X-ray demonstrated bilateral pleural effusions (predominantly right-sided), interlobar fluid collection, and radiographic signs of pulmonary congestion.

Transthoracic echocardiography revealed preserved left ventricular ejection fraction, significant dilation of the right heart chambers, and severe tricuspid regurgitation. Right ventricular (RV) function was borderline, with a tricuspid annular plane systolic excursion (TAPSE) of 17 mm and an estimated RV systolic pressure of 58 mmHg (Figure 1). In addition, moderate aortic stenosis and mild aortic regurgitation were noted.

ABBREVIATIONS

AF	Atrial fibrillation
CT	Computed tomography
EuroSCORE II	European System for Cardiac Operative Risk Evaluation II
HF	Heart failure
ICU	Intensive care unit
IVC	Inferior vena cava
NT-proBNP	N-terminal pro–B-type natriuretic peptide
NYHA	New York Heart Association
RV	Right ventricular
SVC	Superior vena cava
TAPSE	Tricuspid annular plane systolic excursion

The patient remained in the ICU on inotropic support. Several attempts at renal replacement therapy were made, but blood pressure response remained poor, reflecting the severity of his clinical condition. Given the high surgical risk (European System for Cardiac Operative Risk Evaluation II [EuroSCORE II]: 38.1% and Society of Thoracic Surgeons [STS] score: 53%), a surgical approach for the severe tricuspid regurgitation was deemed prohibitive.

After multidisciplinary discussion, we opted for urgent percutaneous caval valve implantation (TricValve® system). Transcatheter edge-to-edge repair with TriClip™ was initially considered but ultimately rejected due to extensive tricuspid annular dilation, a wide coaptation gap, and a high predicted risk of procedural failure.

Pre-procedural computed tomography (CT) angiography of the venous system [inferior vena cava (IVC), superior vena cava (SVC), and peripheral veins] confirmed favorable anatomy for TricValve® implantation. Under sedation, and following administration of intravenous unfractionated heparin, the procedure was initiated via the right femoral vein.

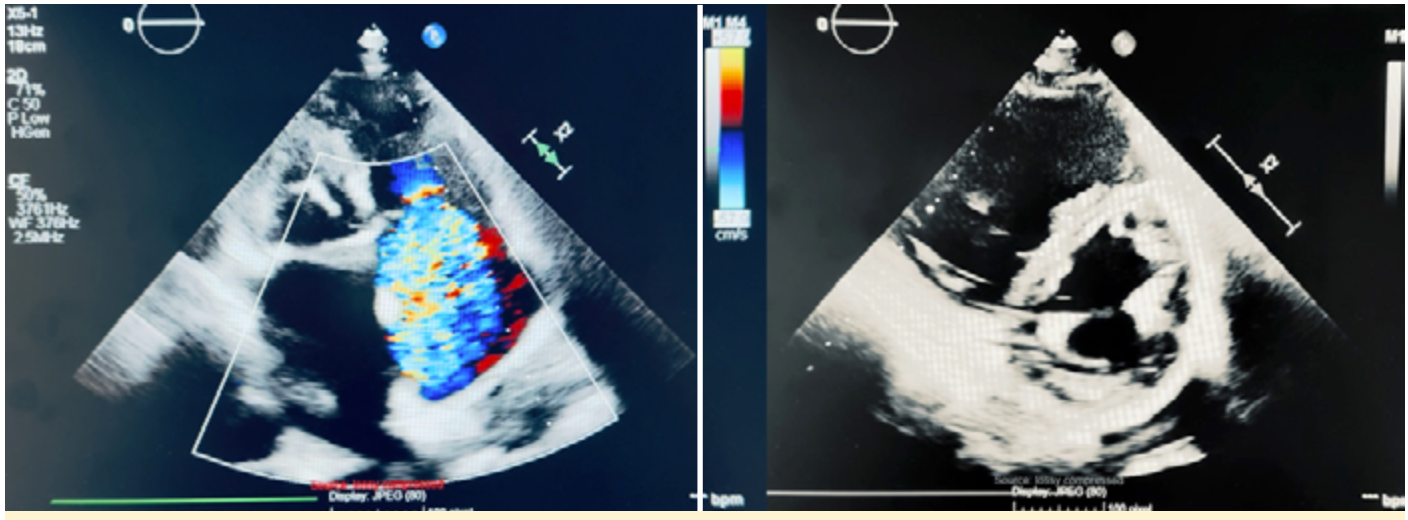

Figure 1. Transthoracic echocardiography. (Left) Apical four-chamber view with color Doppler demonstrating severe tricuspid regurgitation with a broad, high-velocity regurgitant jet. (Right) Corresponding grayscale image showing significant dilatation of the right ventricle and a D-shaped left ventricle, corresponding to increased right heart pressures.

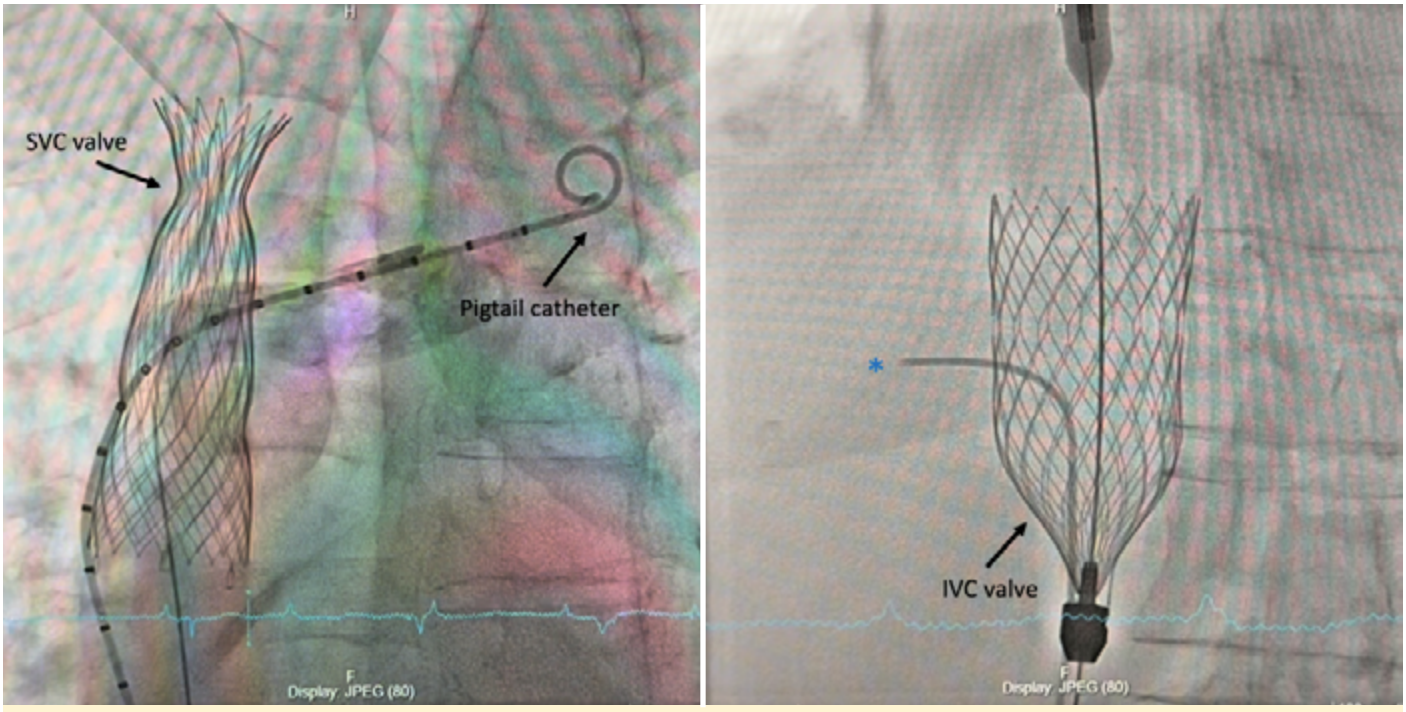

Figure 2. Fluoroscopic guidance during TricValve® implantation. (Left) Deployment of the superior caval valve with positioning relative to the superior vena cava. A pigtail catheter was placed in the right atrium for pressure tracking. (Right) Deployment of the inferior caval valve under fluoroscopic control, with appropriate visualization confirming stable device release. A catheter was positioned in the hepatic veins to confirm that the device did not cause any obstruction (blue star).

The superior caval valve was first advanced and deployed under fluoroscopic guidance. Angiography confirmed appropriate positioning relative to the orifice of the left subclavian vein. Subsequently, the inferior caval valve was introduced and deployed with concurrent angiographic visualization of the hepatic veins to ensure correct placement (Figure 2, Video 1).

Valve positioning was excellent, with no significant paravalvular leak observed. Hemodynamic measurements were performed before and after valve deployment. Before implantation, mean right atrial pressure was approximately 26 mmHg, consistent with severe systemic venous congestion. Following deployment of both valves, right atrial pressure decreased markedly to about 8 mmHg, confirming substantial hemodynamic improvement. During the procedure, a pigtail catheter was placed in the right atrium, confirming a significant reduction in right atrial pressure following implantation (Figures 2 and 3).

The post-procedural course was uneventful. The patient remained in the ICU for 24 hours and was then transferred to the cardiology ward, where he stayed for an additional three days. He showed rapid clinical improvement with stabilization of hemodynamics, improving from New York Heart Association (NYHA) class IV at presentation to class III by early post-procedural follow-up. Tolerance of renal replacement therapy was excellent; whereas preprocedural sessions were often limited or aborted due to hypotension, postprocedural treatments were completed uneventfully, with stable blood pressure and no signs of intradialytic intolerance. A post-procedural CT angiography was performed, confirming correct positioning of the prosthetic valve and excluding paravalvular leak or other complications (Figure 4, Video 2).

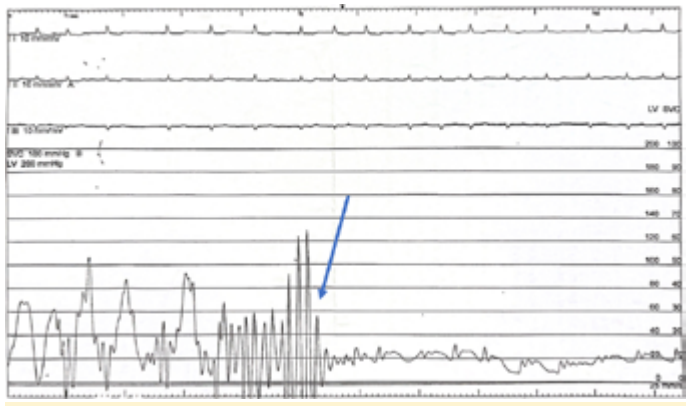

Figure 3. Hemodynamic tracings before and after TricValve® implantation. The blue arrow indicates a significant reduction in right atrial pressure immediately following device deployment, reflecting effective relief of systemic venous congestion.

Guideline-directed HF therapy was continued, and antithrombotic treatment with low-molecular-weight heparin was initiated under close nephrologist supervision.

Discussion

The TricValve® system is a novel percutaneous solution for patients with symptomatic severe tricuspid regurgitation and right HF who are inoperable or not suitable for transcatheter edge-to-edge repair. It consists of two self-expanding bioprosthetic valves implanted in the SVC and IVC, aiming to reduce systemic venous reflux while preserving native valve anatomy.

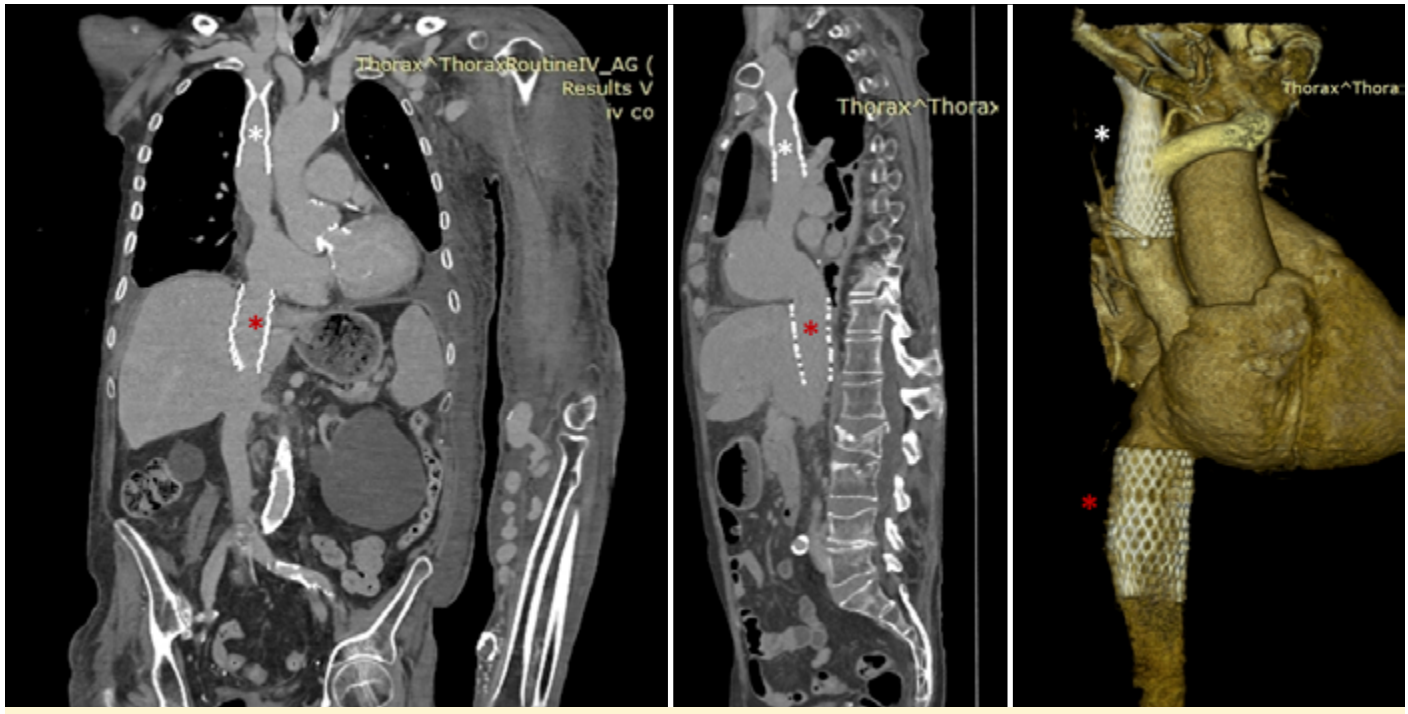

Figure 4. Post-procedural cardiac computed tomography (CT) angiography. Coronal (left) and sagittal (middle) views demonstrate the TricValve® prostheses in the superior (white stars) and inferior (red stars) vena cava with correct positioning. (Right) Three-dimensional reconstruction confirming stable device deployment and absence of paravalvular leak or migration (white star: superior vena cava valve; red star: inferior vena cava valve).

In this case, multimodality cardiovascular imaging played a pivotal role in both patient selection and procedural success. Transthoracic echocardiography demonstrated the extent of right heart dilation, severity of tricuspid regurgitation, and borderline RV function, while CT angiography provided a detailed assessment of the venous anatomy (IVC, SVC, hepatic and subclavian veins), confirming suitability for TricValve® implantation and guiding device sizing and positioning. Fluoroscopy and angiography were essential intra-procedurally to verify deployment accuracy and valve function.

Dialysis dependence is typically an exclusion criterion in TricValve® trials and registries due to concerns regarding venous anatomy alterations, intraprocedural instability, and increased thrombotic risk. Our case expands current knowledge by demonstrating that caval valve implantation may be feasible and clinically effective even in this population. This experience suggests that selected dialysis-dependent patients with refractory venous congestion may benefit from TricValve® therapy and highlights the need for future studies to re-evaluate candidacy criteria.

In this patient, alternative management strategies were carefully considered but ultimately deemed insufficient. Medical therapy had already been optimized, yet persistent systemic venous congestion and profound intradialytic hypotension continued to limit effective renal replacement therapy. Intensified ultrafiltration strategies were unsuccessful, as even minimal volume removal triggered hemodynamic instability. Balloon tricuspid valvuloplasty was also evaluated but was unlikely to provide durable benefit given the marked tricuspid annular dilation and torrential regurgitation. These limitations underscored the need for a more definitive approach to reduce venous reflux and improve circulatory support. CT imaging also confirmed adequate SVC and IVC diameters, appropriate landing zones without excessive tapering, and favorable hepatic and subclavian vein takeoff, allowing safe anchoring of the prostheses. Importantly, there were no venous obstructions, such as IVC filters, thrombus, or significant SVC/IVC stenosis, which would contraindicate caval valve implantation. These anatomical features, combined with the patient's refractory venous congestion, intolerance to dialysis, and prohibitive risk for surgery or edge-to-edge repair, supported the decision to proceed with TricValve® implantation.

To our knowledge, this case represents the first reported TricValve® implantation in a dialysis-dependent patient in Europe. Beyond its novelty, it highlights the potential of caval valve implantation as a life-saving option in severe tricuspid regurgitation and advanced right HF when surgery and transcatheter edge-to-edge repair are not feasible. In this critically ill patient, the intervention provided immediate hemodynamic stabilization and restored tolerance to renal replacement therapy, demonstrating its feasibility even in complex, high-risk scenarios. While multimodality imaging was essential for diagnosis, procedural planning, and follow-up, the most important lesson from this case is that advanced percutaneous therapies may offer meaningful benefit when conventional treatment strategies reach their limits. Broader clinical experience and dedicated studies will be required to define the role of TricValve® in this high-risk population.

Ethics Committee Approval: This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

Informed Consent: Written informed consent was obtained from the patient for the publication of this case report.

Conflict of Interest: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study received no financial support.

Use of AI for Writing Assistance: No artificial intelligence-assisted technologies were used in the preparation of this manuscript.

Author Contributions: Concept – P.C., D.Z., D.D.; Design – A.B., D.D.; Supervision – D.D.; Resource – D.Z., D.D.; Materials – D.D.; Data Collection and/or Processing - A.B., A.K, D.D.; Analysis and/or Interpretation - A.B., C.P.; Literature Review – A.B., P.C., D.K.; Writing – A.B., A.K., D.D.; Critical Review – D.Z., C.P., D.D.

Peer-review: Internally peer-reviewed.

Video 1. Angiography demonstrating successful expansion of the TricValve® system, with both the inferior and superior vena cava valves in the appropriate position.

Video 2. Computed tomography (CT) scan demonstrating the implanted TricValve® system, with visualization of both the inferior and superior vena cava valves in situ.

References

1. Adamo M, Chioncel O, Pagnesi M, et al. Epidemiology, pathophysiology, diagnosis and management of chronic right-sided heart failure and tricuspid regurgitation. A clinical consensus statement of the Heart Failure Association (HFA) and the European Association of Percutaneous Cardiovascular Interventions (EAPCI) of the ESC. *Eur J Heart Fail*. 2024;26(1):18-33. [CrossRef]
2. Agarwal V, Hahn R. Tricuspid Regurgitation and Right Heart Failure: The Role of Imaging in Defining Pathophysiology, Presentation, and Novel Management Strategies. *Heart Fail Clin*. 2023;19(4):505-523. [CrossRef]
3. Vahanian A, Beyersdorf F, Praz F, et al.; ESC/EACTS Scientific Document Group. 2021 ESC/EACTS Guidelines for the management of valvular heart disease. *Eur Heart J*. 2022;43(7):561-632. Erratum in: *Eur Heart J*. 2022;43(21):2022. [CrossRef]
4. Polat F, Kaya Z, Kahveci G, Ateş İ. Tricuspid Valve Transcatheter Edge-to-Edge Repair (TriClip): Initial Outcomes and Experience in Türkiye. *Turk Kardiyol Dern Ars*. 2024;52(6):375-383. [CrossRef]
5. Blasco-Turrión S, Briedis K, Estévez-Loureiro R, et al. Bicaval TricValve Implantation in Patients With Severe Symptomatic Tricuspid Regurgitation: 1-Year Follow-Up Outcomes. *JACC Cardiovasc Interv*. 2024;17(1):60-72. [CrossRef]
6. Estévez-Loureiro R, Sánchez-Recalde A, Amat-Santos IJ, et al. 6-Month Outcomes of the TricValve System in Patients With Tricuspid Regurgitation: The TRICUS EURO Study. *JACC Cardiovasc Interv*. 2022;15(13):1366-1377. [CrossRef]