The other side of the coin in primary tricuspid valve disease: The incremental value of 3D echocardiography

Münevver Sarı, M.D.,1 Gökhan Kahveci, M.D.,1 Duhan Fatih Bayrak, M.D.,2 Abdulkadir Uslu, M.D.,1 Selçuk Pala, M.D.1

1Department of Cardiology, University of Health Sciences, Kartal Koşuyolu Training and Research Hospital, İstanbul, Turkey
2Department of Cardiology, Acıbadem University Faculty of Medicine, İstanbul, Turkey

Summary– Primary tricuspid valve regurgitation may be encountered in daily practice as a result of multiple etiologies. Described herein are the cases of 2 patients with severe primary tricuspid regurgitation. The underlying mechanism was posterior leaflet prolapse due to spontaneous chordae rupture in 1 case, and iatrogenic posterior leaflet tissue loss during removal of a permanent pacemaker in the other. Transthoracic and transesophageal echocardiography, which permit assessment of the tricuspid valve with multilevel imaging, are the techniques of choice for accurate detection and understanding of the etiology, the severity of valve regurgitation, and the determination of treatment options, in addition to providing assistance with timing and guidance during intervention. Three-dimensional echocardiography offers the ability to visualize the entire tricuspid valve and to identify which leaflets are affected by the pathology.

Primary tricuspid valve regurgitation (TR) is encountered less frequently than secondary TR. Possible causes of primary TR include rheumatic heart disease, myxomatous degeneration, endocarditis (especially in intravenous drug addicts), trauma/iatrogenic cases, pacemaker or defibrillator leads interfering with leaflet coaptation, carcinoid syndrome, endomyocardial fibrosis, Ebstein’s anomaly, congenitally dysplastic valves, and drug-induced valve disease. Although spontaneous tricuspid valve chordae rupture and leaflet prolapse is quite a rare condition, iatrogenic tricuspid valve deformations have been increasingly observed with the growing number of interventional procedures. [1–4] Echocardiography is the primary modality used to evaluate the etiology and to quantify TR, as well as to thoroughly assess the left-sided heart, right ventricle, right atrium, and inferior vena cava to make the appropriate diagnosis and decisions. [3–6]

Case 1 – A 40-year-old man presented with dyspnea on exertion and at rest persisting for a month. An elec-
trocardiogram indicated a sinus rhythm of 75/bpm. Transthoracic echocardiography (TTE) revealed prolapse of the posterior tricuspid valve leaflet with redundant tissue, severe TR (vena contracta, 1.02 cm), mild pericardial effusion, and normal left ventricle and mitral valve function (Fig. 1). Posterior tricuspid leaflet prolapse and chordae tendineae rupture were clearly observed with a 3-dimensional (3D), 4-beat, full volume examination using TTE with a Philips X5-1 ultrasound transducer probe (Philips Healthcare, Inc., Andover, MA, USA) (Fig. 2). The absence of a fever and negative blood cultures excluded infective endocarditis. The patient was referred for a surgical repair. He has been well for 6 months following the surgery.

Case 2 – A 65-year-old man presented with progressive dyspnea (New York Heart Association [NYHA] class III) on exertion and pretibial edema. An electrocardiogram revealed atrial fibrillation and a paroxysmal pacemaker rhythm. A TTE examination revealed mildly reduced left ventricle systolic function (45%), moderate secondary mitral regurgitation, and severe TR with no or only trivial septal or posterior leaflet tissue (Fig. 3a). His medical history included a first permanent pacemaker implantation in 2004, and pocket hematoma followed by pocket infection and pacemaker re-implantation on the right side of the chest. In 2008, surgical lead extraction was
performed due to infective endocarditis, and an epicardial VVI pacemaker had been surgically inserted. The 2D mid-esophageal 4-chamber view and 3D 1-beat zoom mode (Fig. 4), along with 3D color Doppler examination (Fig. 3b) showed severe TR, probably due to posterior leaflet tissue loss during removal of the pacemaker. Surgery to repair the tricuspid valve was recommended, but the patient declined. He has been followed up with medical treatment for continued NYHA class II dyspnea for 1 year.

DISCUSSION

Imaging of the tricuspid valve has some challenges and should include careful imaging from multiplane views due to the unique shape of the tricuspid valve (thin, nonuniform 3 leaflets, triangular, saddle-shaped annulus). The anterior and septal tricuspid leaflet (if the septum/left ventricle are in view) or posterior leaflet (with a more extreme rightward and inferior tilt) may be observed in 2D TTE parasternal inflow views. Parasternal short-axis views may allow for imaging of the anterior and posterior leaflet. From the apical 4-chamber view, the septal and anterior tricuspid leaflets may be imaged, and the posterior leaflet may be seen with posterior angulation (Fig. 5). ARRhythmia is another problem for 3D full-volume acquisition; in such cases, 1-beat zoom mode or a narrow sector is
used, as in Case 2. Images from 3D TTE may sometimes be of better quality when compared with 3D transesophageal images due to the anterior and apical position of the tricuspid valve, as in Case 1.

**Peer-review:** Externally peer-reviewed.

**Conflict-of-interest:** None.

**Informed consent:** Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

**Authorship contributions:** Concept: M.S., G.K., S.P.; Design: M.S., A.U., G.K., S.P.; Supervision: G.K., S.P.; Materials: M.S., F.D.B.; Data collection: M.S., A.U.; Literature search: M.S., F.D.B., G.K.; Writing: M.S., G.K.

---

**REFERENCES**


**Keywords:** Primary tricuspid valve regurgitation; three-dimensional echocardiography.

**Anahtar sözcüklər:** Primer triküspit kapak yetersizliği, 3-Boyutlu ekoqardiyografi.