Traumatic Tricuspid Regurgitation
3D Transthoracic Echocardiography-Guided Surgical Strategy

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Summary

Traumatic tricuspid regurgitation is a rare and progressive disease. Early diagnosis and surgical valve repair are very important. A 57-year-old male was referred to our hospital with a history of blunt chest trauma. Three-dimensional echocardiography showed severe tricuspid regurgitation and demonstrated two main anterior leaflet chordae of the tricuspid valve rupture and the whole anterior leaflet prolapsed. The diagnosis was severe tricuspid regurgitation due to leaflet chordae rupture secondary to blunt chest trauma. Surgical repair of the tricuspid valve was performed in this patient. At 3-month follow-up, the right ventricle was decreased in size with significantly improved right ventricular function. The signs and symptoms of right heart failure were relieved. In this case, 3-dimensional transthoracic echocardiography enabled fast and non-invasive evaluation of the spatial destruction of the tricuspid valve and subvalvular apparatus to assist in the planning of valve repair. (Int Heart J 2017; 58: 451-453)

Key words: Tricuspid valve prolapse, Valve repair, Right heart failure, Transthoracic

Traumatic tricuspid regurgitation (TR) is a rare cardiovascular complication of blunt chest trauma.¹ When feasible, tricuspid valve repair is preferable to valve replacement. We report a clinical case in which we describe the usefulness of 3-dimensional (3D) transthoracic echocardiography (TTE) for the diagnosis and detailed preoperative assessment of traumatic TR to assist in planning the surgical procedure.

Case Report

A 57-year-old male was referred to our hospital with increasing occurrence of palpitations, dyspnea on exertion, and fatigue. Two months prior to presentation, he suffered from a punch in the chest by door panel, including a minor rib fracture. Physical examination revealed the following: blood pressure 118/72 mmHg, heart rate 103 beats/minute, temperature 36.4°C, and respiratory rate 20 breaths/minute. Physical examination revealed hepatomegaly, peripheral edema, and a grade 3-4/6 systolic murmur at the right lower sternal edge. The initial laboratory examination demonstrated that C-reactive protein (CRP) was 26.6 mg/L (n < 8.0 mg/L), troponin I 7.2 ng/mL (n < 0.033 ng/mL), and creatine kinase 291 U/L (n = 38-174 U/L).

2D TTE revealed that the right atrium and right ventricle were dilated. RV fractional area change (FAC) was 20% (Figure 1A). Tricuspid annular plane systolic excursion (TAPSE) was 11 mm. The right ventricular systolic function was impaired. Color Doppler echocardiography demonstrated the presence of severe tricuspid regurgitation (Figure 2A). The precise mechanism for severe TR was not clearly defined. It might be functional TR with dilatation of the right heart or primary tricuspid valve pathology caused by trauma, infective endocarditis, or congenital heart disease. To better define the anatomy of the tricuspid valve, 3D TTE was performed. 3D datasets were acquired from both the right ventricle focused apical 4-chamber view and the right ventricular inflow tract view. A real-time “en face” view of the tricuspid valve was obtained by cropping the 3D dataset. The whole anterior leaflet prolapsed due to the rupture of two main chordae (Figure 3). Both the posterior and septal leaflets were restricted in motion due to annular dilation and RV remodeling.

The patient was medically treated with furosemide and spironolactone, but symptoms and signs of right heart failure were uncontrolled with medications. Therefore, surgical repair of the tricuspid valve was performed. Intraoperative 3D transesophageal echocardiography (TEE) confirmed the 3D TTE findings. During surgery, two main chordae were found ruptured from the anterior papillary (Figure 4), resulting in prolapse of the whole anterior leaflet of the tricuspid valve. The anterior leaflet was fixed using artificial chordae and stabilized with a rigid annuloplasty ring (Physio 32 mm Edward Lifesciences, Irvine, USA). After surgery, TEE showed that tricuspid regurgitation was trivial. The post-operative course was unventful. At 3-month follow-up, the patient remained asymptomatic. The right ventricle was normal in size with a normal systolic function (Figure 1B). Tricuspid regurgitation remained...
Discussion

Traumatic TR is a rare complication of blunt chest trauma and has been reported to cause high mortality and morbidity. The frequency of traumatic TR has increased over the past 40 years.  

Surgical treatment strategies for TR include valve repair or valve replacement, of which the former is generally superior to the latter. Valve repair, however, is not always successful.
RV FAC and TAPSE confirmed the right ventricular systolic dysfunction secondary to the tricuspid lesion. Early diagnosis and treatment preserved right ventricular function and achieved good tricuspid valve function. After surgery, tricuspid regurgitation was trivial. The signs and symptoms of right heart failure were relieved. At 3-month follow-up, the right ventricle had decreased in size with significantly improved right ventricular function.

Our findings suggest that 1) all clinicians should consider traumatic TR whenever a patient presents with blunt chest trauma, even if they initially focus on acute injuries, 2) for patients with severe traumatic TR, tricuspid valve repair is beneficial for reduction of right ventricle volume indices and preservation of right ventricular function, and 3) 3D TTE enable detailed pre-operative assessment, allowing surgeons to plan the surgical procedure before entering the operating room. 3D TEE can be performed in the operating room after anesthesia induction to obtain further anatomical details prior to the actual surgery. This strategy will reduce patient discomfort and the corresponding costs.

**Disclosure**

**Conflict of interest:** The authors declare that they have no conflicts of interest to report.

**REFERENCES**


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Figure 4. During surgery, two main chordae were found ruptured from the anterior papillary muscle (arrow), resulting in prolapse of the entire anterior leaflet of the tricuspid valve.