Echocardiographic Detection of Tricuspid Valve Prolapse

By Preminda A. N. Chandraratna, M.D., M.R.C.P., José M. Lopez, M.D., José J. Fernandez, M.D., and Lawrence S. Cohen, M.D.

With the technical assistance of D. Gindlesperger

SUMMARY
The echocardiographic findings in 12 patients with tricuspid valve prolapse are presented. Eight of these patients had associated mitral valve prolapse. Only one of the above patients had the characteristic physical signs of tricuspid incompetence. Two types of abnormality were noted on the echocardiogram of the tricuspid valve. In eight patients, the systolic segment of the tricuspid valve showed an initial horizontal motion followed by a posterior motion in midsystole. Four patients exhibited posterior motion of the tricuspid valve in early systole, which reached a maximum in midsystole, and this was followed by an anterior motion, thus producing a hammock-like configuration. We conclude that echocardiography is useful in the diagnosis of tricuspid valve prolapse. Since this condition may be associated with clinically significant tricuspid incompetence or bacterial endocarditis, its recognition is of clinical importance.

Additional Indexing Words:
Ultrasound
Mitral valve prolapse
Noninvasive technique
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ECHOCARDIOGRAPHY is a useful tool in the study of intracardiac structures. This method has been found to be a valuable aid in the assessment of mitral valve disease, aortic valve disease, congenital heart disease, and other forms of cardiac disease.1-5

Echocardiography is a reliable method of diagnosing mitral valve prolapse.6-9 Although tricuspid valve prolapse has been demonstrated by angiography, its detection by echocardiography has not been reported.10-11 We describe here the echocardiographic features of tricuspid valve prolapse in 12 patients. The diagnosis was confirmed at operation in two of the subjects.

Materials and Methods
Tricuspid valve prolapse was diagnosed by echocardiography in 12 patients who were referred for ultrasound evaluation for varied clinical reasons.

The group was composed of nine females and three males. Their ages ranged from eight to 76 years. Eight patients had mitral valve prolapse, one of whom also had Ebstein's anomaly of the tricuspid valve with an associated atrial septal defect. The diagnosis of Ebstein's anomaly was confirmed by an electrocatheter study in the right atrium which disclosed a large area of atrialized ventricle. The right ventricular angiogram on this patient showed tricuspid valve prolapse. Three had coronary artery disease, and there was one patient with idiopathic hypertrophic subaortic stenosis (IHSS). Six of the eight patients with combined mitral and tricuspid valve prolapse had the typical systolic click and late systolic murmur, and two patients had pansystolic murmurs. The above auscultatory signs were confirmed by phonocardiography in all patients. The diagnosis of mitral valve prolapse was substantiated by left ventricular angiography in three patients. Of the four patients without associated mitral valve prolapse, one had multiple systolic clicks and a late systolic murmur, and one had a midsystolic murmur.

The echocardiographic examination was performed with the patient supine. A 2.25 MHz, 0.5 inch, 10 cm focused transducer; a commercially available ultrasonoscope and an Electronics for Medicine recorder were used. The transducer was placed in the third or fourth interspace at the left sternal edge, and directed inferiorly, medially, and posteriorly so that the sound beam passed through the anterior leaflet of the tricuspid valve.

Results
The echocardiogram of the anterior leaflet of the tricuspid valve has a configuration similar to that of the mitral valve. The tricuspid valve in the closed position is on the same plane as the anterior wall of the aorta (fig. 1), whereas the mitral valve is continuous with the posterior wall of the aorta. Ultrasound recording of the tricuspid valve is easier in...
Echocardiogram of the aortic root and tricuspid valve in a patient with a ventricular septal defect. Note that the systolic segment of the tricuspid valve (TV) is on the same plane as the anterior wall of the aorta (AW Ao). PW Ao = posterior wall of aorta.

Echocardiogram of the tricuspid valve in a patient with mitral valve disease. Two leaflets of the tricuspid valve are seen. Note the gradual anterior slope of the systolic segment of the valve. ATV = anterior leaflet of the tricuspid valve. PTV = posterior (inferior) leaflet of the tricuspid valve.

patients who have a dilated right ventricle. In such patients, two leaflets may be recorded simultaneously (fig. 2).

The patterns of tricuspid valve prolapse seen in our patients resembled those described in subjects with mitral valve prolapse. Either a midsystolic posterior motion (eight patients) or a hammock-like posterior motion starting in early systole (four patients) was seen on the tricuspid valve echocardiogram. Figures 3 and 4 illustrate the first pattern of motion seen in our patients with tricuspid valve prolapse. The normal pattern of gradual anterior movement of the tricuspid valve during systole (fig. 2) is replaced by an initial horizontal movement followed by a posterior motion of the valve. The second type of abnormality that was observed is depicted in figure 5. In contrast to the first pattern, the posterior movement of the systolic segment of the tricuspid valve begins early in systole, reaches a maximum toward midsystole and then moves anteriorly in the latter half of systole, thus producing a hammock-like appearance. In two patients (whose echocardiograms are shown in figs. 3 and 5), the diagnosis of tricuspid valve prolapse was confirmed at operation. The mitral valve echocardiogram of the patient described in figure 4 is shown in
This echocardiogram shows tricuspid valve prolapse. This patient had associated mitral valve prolapse. The tricuspid valve (TV) moves posteriorly in midsystole (vertical arrow).

Discussion

The clinical and angiographic aspects of mitral valve prolapse have been extensively studied. The echocardiographic features of this condition were first described by Shah and Gramiak and subsequent reports have confirmed the usefulness of ultrasound in the diagnosis of mitral valve prolapse. Ainsworth and associates have recently reported the cineangiographic features of tricuspid valve prolapse. Six of 13 patients with mitral valve prolapse were found to have tricuspid valve prolapse as well.

The patterns of tricuspid valve prolapse that we observed are similar to those that have been described in patients with mitral valve prolapse. Echocardiographic visualization of the tricuspid valve is much more difficult than that of the mitral valve. Two leaflets of the tricuspid valve can usually be seen only in patients who have dilated right ventricles. The septal leaflet is hardly ever seen on the echocardiogram. Because of these limitations, it may not always be
Mitrval valve echocardiogram of the patient referred to in figure 4. Mitrval valve prolapse is seen. AMV = anterior leaflet of mitral valve. PMV = posterior leaflet of mitral valve.

Figure 6

Possible to diagnose tricuspid valve prolapse by echocardiography, especially if prolapse is confined to the septal or the inferior (posterior) leaflet. This is in contrast to mitral valve prolapse in which the diagnosis can be confirmed in many instances by the ultrasound examination.

It is of interest that eight of our patients had combined mitral and tricuspid valve prolapse. This association suggests a congenital etiology for the tricuspid valve prolapse in these patients. In two of these patients, myxomatous degeneration of the mitral valve was found at operation. Thus it is possible that they had a similar pathology of the tricuspid valve.

Only one of our patients had the characteristic jugular venous pulse and pulsatile liver of tricuspid incompetence. This patient also had severe mitral incompetence and mitral valve prolapse and presented with a clinical picture which resembled rheumatic heart disease and congestive heart failure. He was found to have floppy mitral and tricuspid valves at surgery. One of the four patients who did not have associated mitral valve prolapse had multiple systolic clicks and a late systolic murmur. Thus, the presence of a systolic click and late systolic murmur in a patient may indicate mitral valve prolapse, tricuspid valve prolapse, or a combination of the two.

Bacterial endocarditis has been reported to be associated with mitral valve prolapse. Since it is possible that patients with tricuspid valve prolapse may also develop associated endocarditis, antibiotic prophylaxis for dental and other operative procedures in these patients is probably advisable.

The patient with Ebstein’s anomaly had both mitral and tricuspid valve prolapse. This combination of lesions in association with Ebstein’s anomaly has not been previously reported.

In summary, the echocardiographic features of tricuspid valve prolapse are described. Since patients with this condition may develop clinically significant tricuspid incompetence or bacterial endocarditis, detection is of clinical importance.

References


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P N Chandraratna, J M Lopez, J J Fernandez and L S Cohen

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