Echocardiographic Diagnosis of Congenital Left Ventricular-Right Atrial Communication

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SUMMARY

The clinical diagnosis of congenital left ventricular-right atrial (LV-RA) communication is difficult. Echocardiography appears to be a useful method in the diagnosis of this congenital cardiac defect. In previous reports authors have described M-mode echocardiographic findings of this anomaly. We present here two-dimensional echo findings in a patient with congenital LV-RA communication.

A 12 year old boy presented the following echocardiographic findings. A perimembranous septal defect and an abnormal tricuspid septal leaflet were seen. The defect was located at the membranous atrioventricular septum, resulting in a communication between the RA and the LV. Pulsed Doppler echocardiography demonstrated turbulent flow through the defect during systole, suggesting an LV-RA communication. M-mode echo examination of the septal tricuspid leaflet revealed systolic fluttering of the tricuspid valve. Peripheral vein contrast echocardiography showed passage of the echo contrast material from the RA to the LV (positive contrast effect). At the same time there was a negative contrast effect during ventricular systole, indicating a left to right shunt from the LV to the RA.

After surgical repair of the anomaly, systolic flutter of the tricuspid valve and the other findings disappeared echocardiographically, as they did in the other reported cases.

We can conclude that two-dimensional echocardiography with M-mode evaluation is a reliable method for the diagnosis of congenital LV-RA communication, and that this method should be applied to all cases where this anomaly is suspected clinically.

Additional Indexing Words:
Peripheral vein contrast echocardiography Surgical operation

CONGENITAL left ventricular-right atrial (LV-RA) communication is a rare anomaly. The prevalence of this lesion has been estimated to be about 1% of all congenital cardiac defects.1) The clinical diagnosis of this
condition is difficult.\(^1\) Frequently the lesion is detected at the time of cardiac catheterization or not until the defect has been visualized at the time of surgery.\(^1\) There are a few case reports describing echocardiographic findings of congenital LV-RA communication,\(^2\)–\(^6\) most of them studied by M-mode echocardiography.\(^3\)–\(^4\) In a previous report we have described M-mode echocardiographic findings in 4 cases.\(^4\) Two-dimensional echocardiographic findings of congenital LV-RA communication have not been well described. Recently we have performed M-mode and two-dimensional echocardiographic examinations in a patient with LV-RA communication.

**SUBJECT AND METHODS**

The patient was a 12 year old male who had been asymptomatic. His physical examination revealed no cyanosis. A grade 4/6 harsh holosystolic murmur was heard at the 4th left intercostal space, accompanied by a thrill. The second heart sound was normal in quality and intensity. The electrocardiogram showed a normal QRS axis in the frontal plane. Right ventricular conduction delay was present. X-ray examination of the chest showed mild cardiomegaly. The right atrium was enlarged and pulmonary vascular markings were increased.

Echocardiographic findings were as follows: A perimembranous septal defect and abnormal tricuspid septal leaflet were seen. The defect was located at the membranous atrioventricular septum, resulting in communication between the RA and the LV (Fig. 1). Pulsed Doppler echocardiography demonstrated turbulent flow through the defect during systole, suggesting an LV-RA communication. M-mode echo examination of the septal tricuspid leaflet revealed systolic fluttering of the tricuspid valve (Fig. 2). Peripheral vein injection of 10 cc of a 3% saline solution showed passage of the echo contrast material from the RA to the LV (positive contrast effect). At the same time there was a negative contrast effect during ventricular systole, indicating a left to right shunt from the LV to the RA.

The diagnosis of congenital LV-RA communication was made based upon the above studies. This was later confirmed by cardiac catheterization and angiography. Pressures in the cardiac chambers and great vessels were within normal limits. Oxygen saturations showed an 8% step up at the right atrial level in two set studies. Cineangiocardiograms illustrated a left ventricular to right atrial communication.

The patient was operated on and an atrioventricular septal defect below the insertion of the tricuspid valve was closed with a patch. The defect at the septal leaflet of the tricuspid valve was repaired.
ECHOCARDIOGRAPHY IN LV-RA COMMUNICATION

**DISCUSSION**

Congenital LV-RA communication can be diagnosed by echocardiography. In our case the diagnosis of this lesion was made before cardiac catheterization.

In the postoperative period there were no significant murmurs. Echocardiographic examination showed no further systolic fluttering of the tricuspid valve. There was a dense echo in the area of the repaired septal defect.

Echocardiographic studies were performed using Honeywell Ultra Imager and Toshiba Sonolayer SSH-60A echocardiographs.
This anomaly is usually classified as one of two main groups, depending upon whether the septal defect is above or below the tricuspid valve. Anatomically, the membranous ventricular septum is divided by insertion of the septal leaflet of the tricuspid valve into the atrioventricular and interventricular portions. Among the few reported cases, including our 4 patients previously reported, the anomaly was mostly of the infravalvular type, as was the case in our patient.2)–6)

Nanda et al2) have described M-mode echocardiographic findings of this anomaly as a high frequency, low amplitude flutter of the tricuspid valve in systole and none in diastole. We recorded systolic fluttering of the tricuspid valve in our 5 cases. In one of them, unlike the others, the main direction of the flutter was posteriorly4) (Fig. 3). To our knowledge this is the only case illustrating this kind of fluttering in the medical literature. Our explanation for this findings is that in cases with normal or slightly elevated right ventricular pressure, the main shunt is from the left ventricle to the right atrium, namely postero-anteriorly. Therefore, the main vibrations of the tricuspid valve are anteriorly. However, in the case demonstrating posterior fluttering, the pressure in the right ventricle was significantly elevated because of the right ventricular outflow obstruction. Since the systolic pressure gra-
Dient between the right and left ventricles was minimal, the main shunt was from the RV to the RA through the defect of the septal tricuspid leaflet. As a result of this, the direction of the main shunt was antero-posteriorly.

Although M-mode echocardiography illustrates systolic fluttering of the tricuspid valve in infravalvular LV-RA communication, Nanda and Riemenschneider have noticed that in the supravalvular type of anomaly there was no fluttering of the tricuspid valve.1),2)

In one of our previous patients we also recorded vibrations on the left ventricular surface of the interventricular septum.4) The mechanism of production of systolic septal vibrations may be related to the LV-RA shunt.

In two-dimensional echo study, visualization of the defect located at the atrioventricular septum, and connecting the LV to the RA, are possible. With this finding the lesion can be differentiated from a ventricular septal defect. In a patient with an abnormal tricuspid septal leaflet detected by two-dimensional echo, and with systolic fluttering of the tricuspid valve seen in M-mode echocardiography, the atrioventricular septum should be carefully investigated for LV-RA communication using the two-dimensional technique. It is our belief that if the defect is detected by this method, the diagnosis of LV-RA communication is definite.

Peripheral vein echo contrast injection may be helpful in the detection of LV-RA communication. Since the pressure in the LV may be lower than in the RA during right atrial systole, the positive contrast passage from the RA to the LV can be seen as in our patient. During ventricular systole, because of the high pressure gradient between the LV and RA, the shunt is from the LV to the RA and the negative contrast effect is seen on the echo contrast study. Furthermore, Doppler demonstration of the shunt through the defect is possible.

After surgical repair of the anomaly, systolic flutter of the tricuspid valve disappeared echocardiographically in our patient as it did in the other reported cases.3)–4)

We can conclude that two-dimensional echocardiography with M-mode evaluation is a reliable method for the diagnosis of congenital LV-RA communication, and that this method should be applied to all cases where this anomaly is suspected clinically.

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