The Turkish Journal of Pediatrics
Volume 25, No. 2, April-June 1983

ECHOCARDIOGRAPHIC FINDINGS IN LEFT VENTRICULAR TO RIGHT ATRIAL COMMUNICATION*

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Key words : *congenital cardiac anomaly, echocardiography, left ventricular to right atrial communication*

Congenital left ventricular-right atrial (LV-RA) communication is a rare anomaly. The clinical diagnosis of this condition is extremely difficult[1]. As a non-invasive method echocardiography appears to be useful in detecting LV-RA communication.

The purpose of this presentation is to describe characteristic M-Mode echocardiographic findings in four cases with this entity.

Material and Methods

The M-Mode echocardiographic records were obtained using an Ekoline 20-A Ultrasonoscope, Ekoline 21 and E for M recorders. The transducer was 13 mm in diameter and 2.25 M Hz.

Case Reports

Case 1. This 9-year-old girl had been asymptomatic. Physical examination revealed no cyanosis. A grade 4/6 holosystolic murmur was heard at the fourth left intercostal space accompanying a thrill. The second heart sound was normal in quality and intensity.

ECG revealed right ventricular conduction delay, right atrial enlargement, and biventricular hypertrophy. X-ray examination of the chest showed increased pul-

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monary vascular markings and cardiomegaly. Cardiac catheterization data are shown in Table I. Cineangiocardiography showed LV→RA, LV→RV shunts. Echocardiographic examination showed systolic fluttering of the tricuspid valve and paradoxical ventricular septal motion (Figure 1).

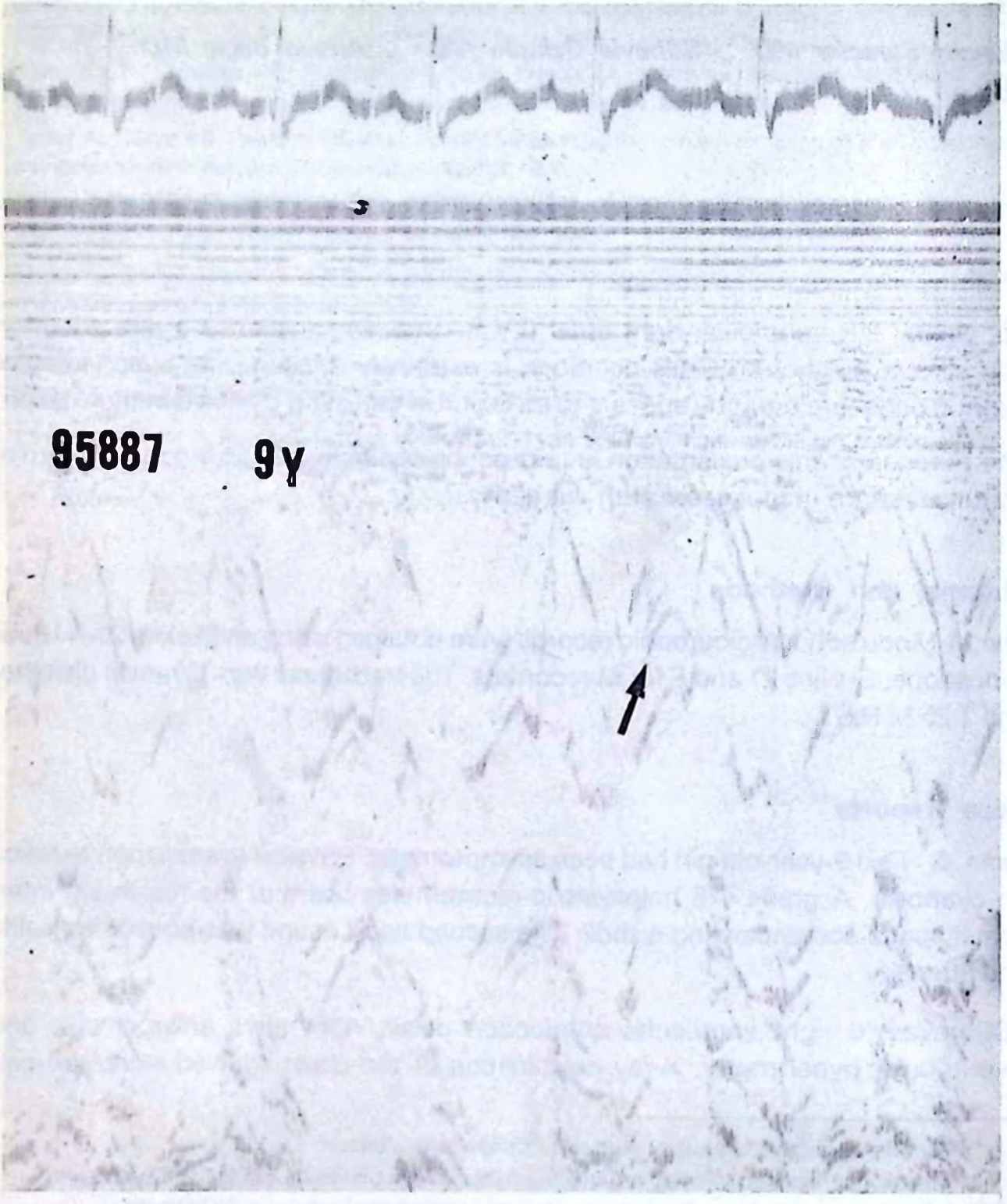

Figure 1.

Tricuspid systolic flutter (Case 1).
The arrow indicates the systolic fluttering of the tricuspid valve. The vibrations are toward the transducer. The frequency of the vibrations is 25 sec, the amplitude 12 mm.

The patient was operated on for LV-RA communication. An interventricular septal defect below the insertion of the tricuspid valve was closed. Annuloplasty was done to repair the defect in the septal leaflet of the tricuspid valve. In the postoperative period no significant murmurs were heard, and echocardiographic examination showed no systolic fluttering of the tricuspid valve (Figure 2).

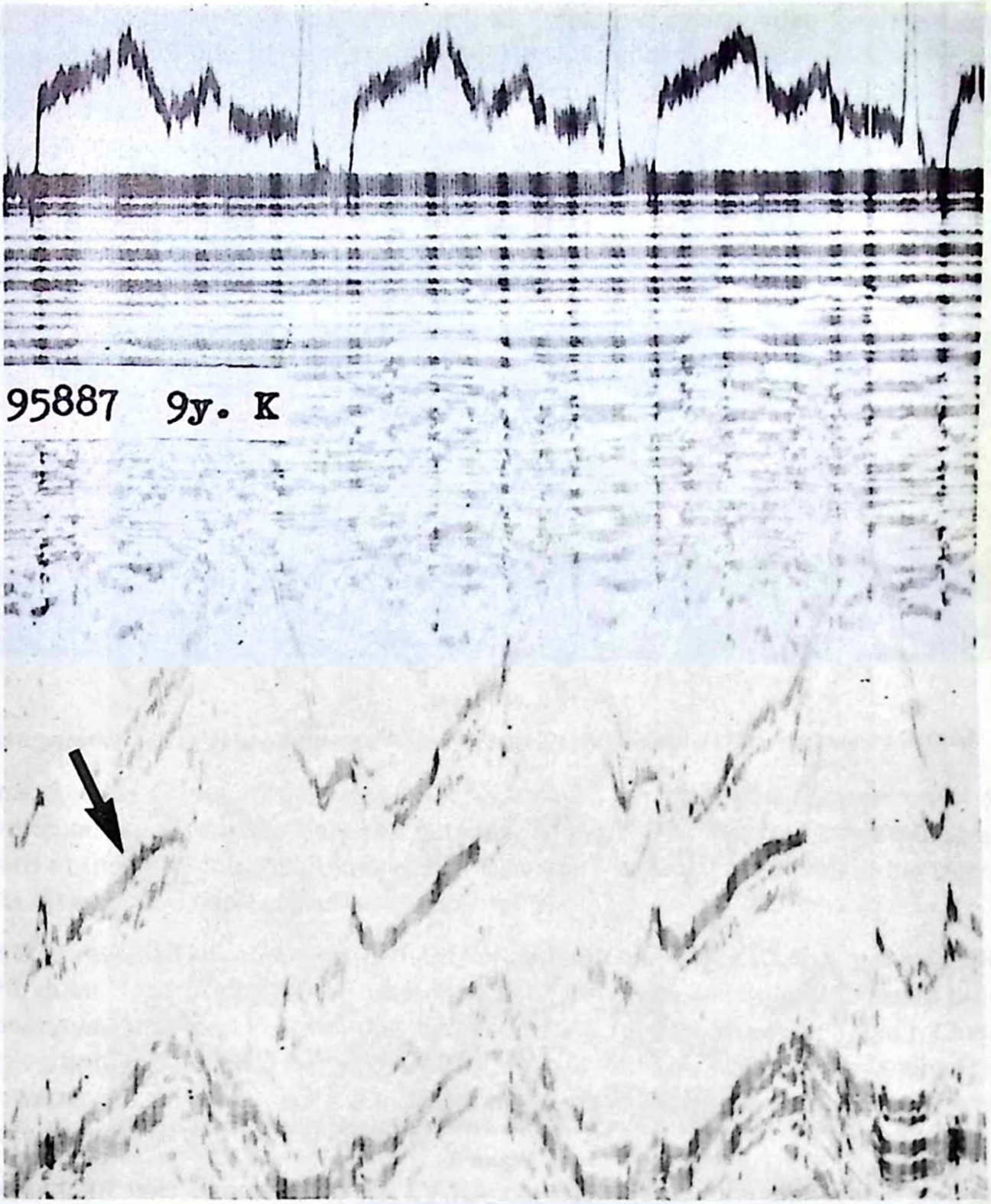

Figure 2.

Postoperative tricuspid valve echocardiogram (Case 1): systolic flutter has disappeared (arrow).

Case 2. This 14-year-old girl became tired on exertion. Physical examination revealed no cyanosis. A grade 4/6 holosystolic murmur was heard at the fourth left intercostal space. A systolic thrill was felt in the same area.

ECG showed right atrial enlargement, left ventricular hypertrophy, and prominent right ventricular hypertrophy. X-ray examination of the chest revealed cardiomegaly and increased pulmonary vascularity. Cardiac catheterization data are shown in Table I. Cineangiocardiography showed LV→RA, LV→RV shunts. Echocardiography showed systolic flutter of the tricuspid valve (Figure 3).

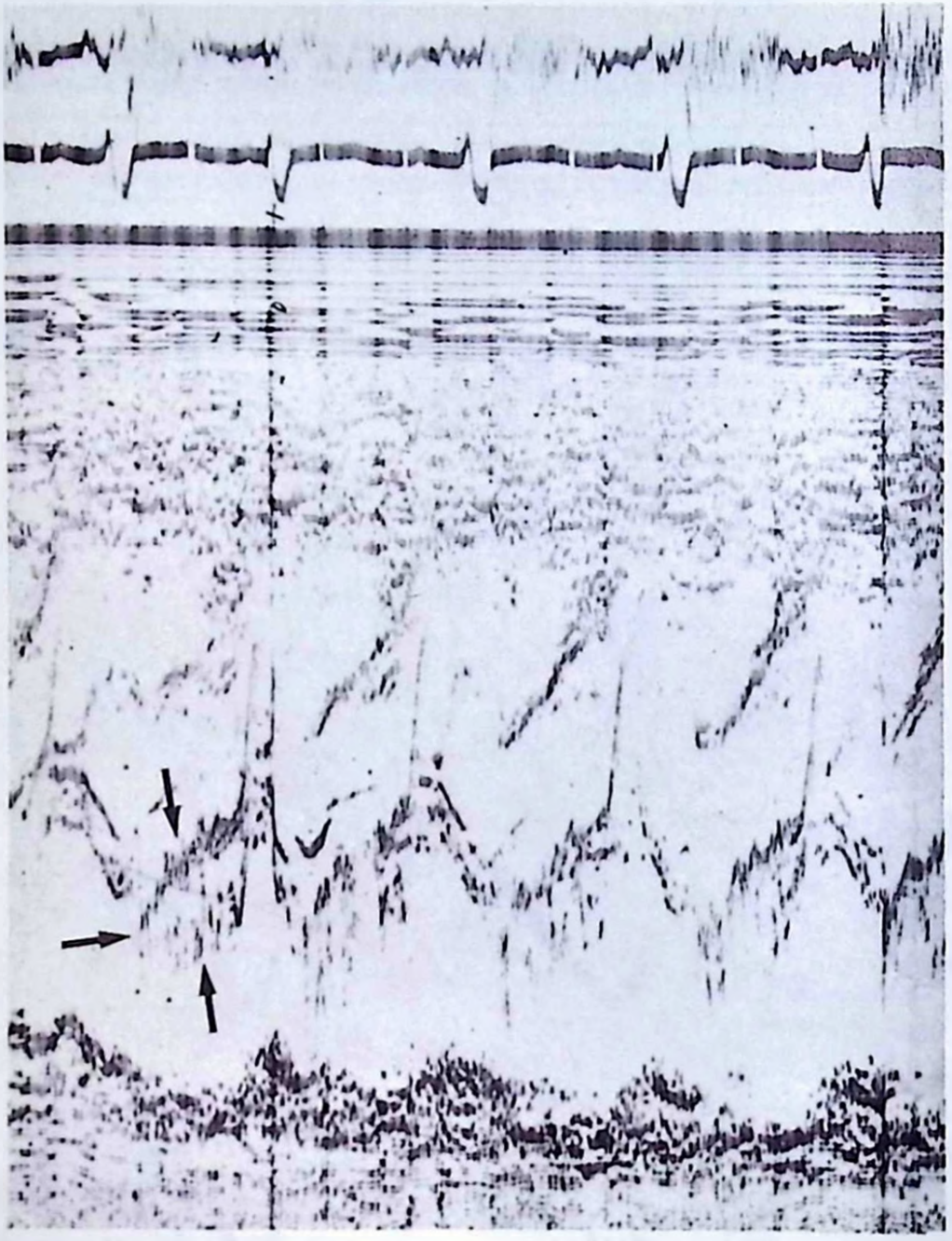

Figure 3.

Tricuspid systolic flutter (case 2).

The arrow indicates the systolic fluttering of the tricuspid valve. The vibrations are toward the back, contrary to Case 1. The frequency of the vibrations is 25 sec, the amplitude 14 mm.

The patient was operated on for LV-RA communication. A ventricular septal defect below the insertion of the tricuspid valve was closed with a patch. Annuloplasty was done to repair the defect of the tricuspid valve. In addition, a muscular band was removed from the outflow tract of the RV. In the postoperative period echocardiography no longer showed a systolic flutter of the tricuspid valve (Figure 4).

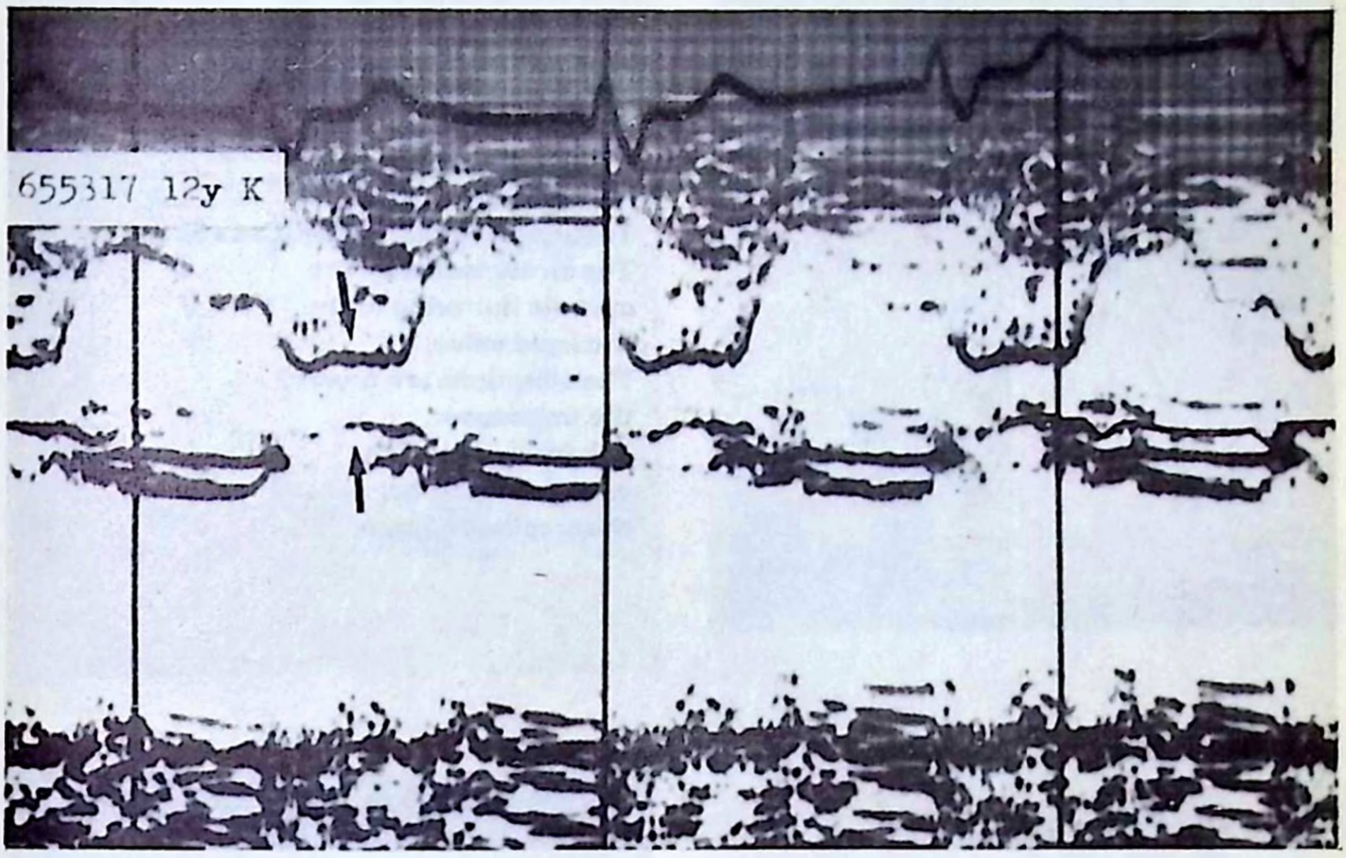

Figure 4.

Postoperative tricuspid valve echocardiogram (Case 2): systolic flutter has disappeared (arrow).

Case 3. This 11-year-old boy was referred to us with the clinical impression of a ventricular septal defect. He was acyanotic. A grade 4/6 holosystolic murmur was heard at the third-fourth left intercostal space. A systolic thrill was felt in the same area. The second heart sound was widely split.

An ECG revealed left atrial enlargement, left anterior hemiblock (Q_1S_3), and mild left ventricular hypertrophy. X-ray examination of the chest illustrated increased pulmonary vascular markings. Cardiac catheterization data are shown in Table I. Cineangiography showed LV→RA, LV→RV shunts. Echocardiographic examination showed systolic fluttering of the tricuspid valve and of the interventricular septum in the outflow tract of the LV (Figures 5, 6).

The patient was operated on for LV-RA communication. An infravalvar type of anomaly was corrected by direct suture. All echo findings disappeared in the postoperative period (Figures 7, 8).

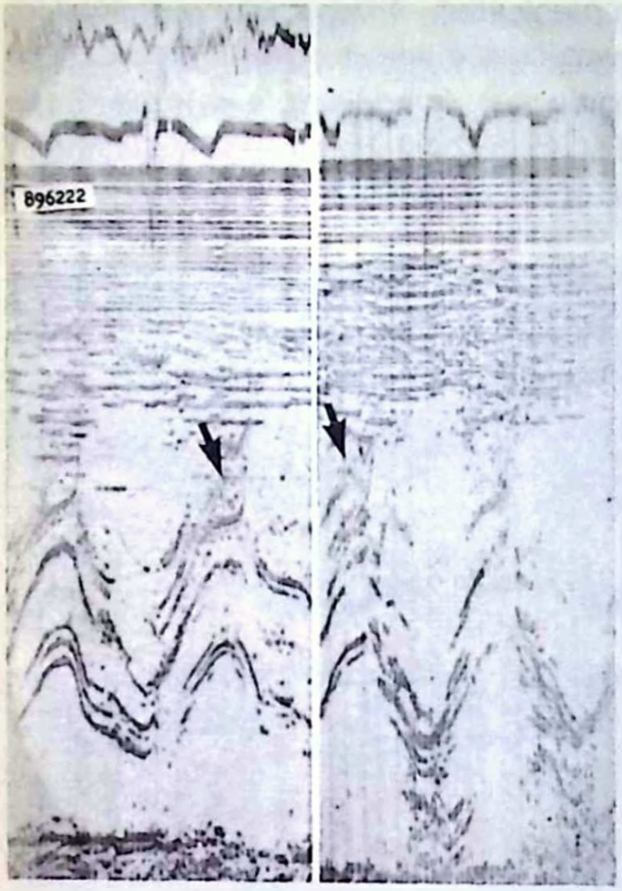

Figure 5.

Tricuspid systolic flutter (Case 3). The arrow indicates the systolic fluttering of the tricuspid valve. The vibrations are toward the transducer. The frequency of the vibration is 75 sec, the amplitude 2 mm.

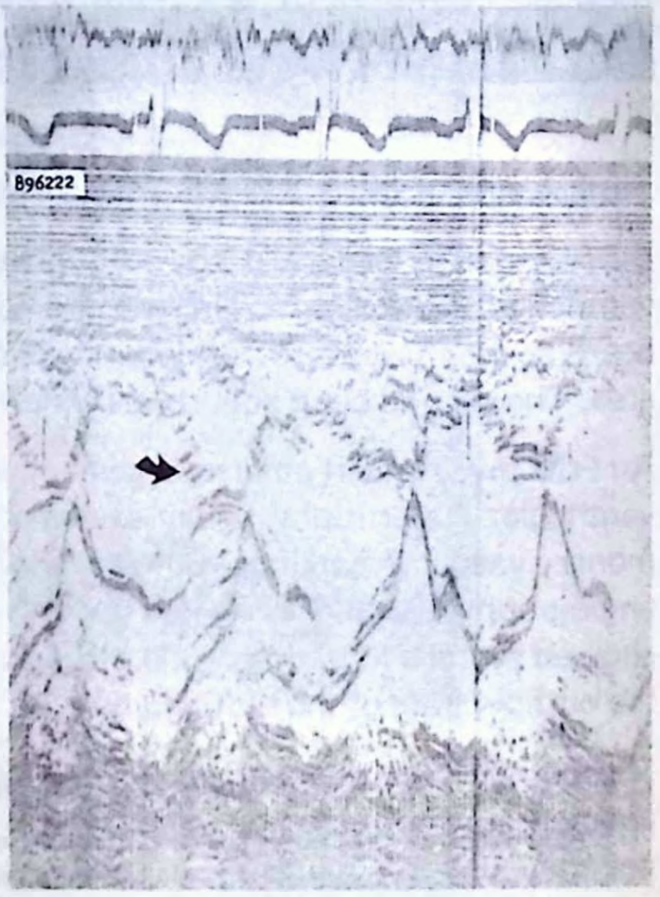

Figure 6.

Systolic flutter of the interventricular system. Arrow indicates vibrations on the left ventricular surface of the septum. This was recorded only in the outflow tract of the left ventricle.

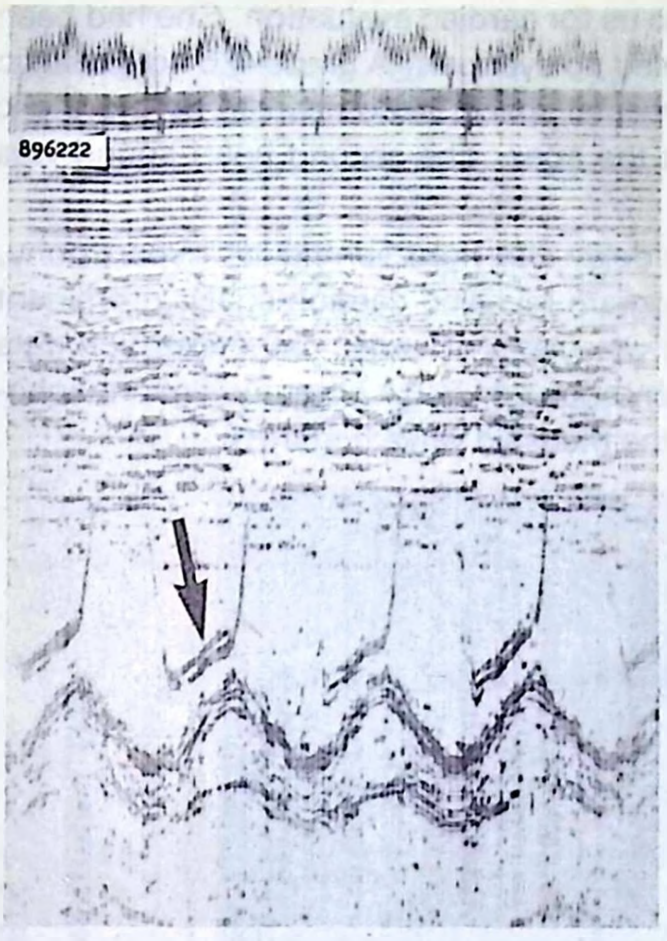

Figure 7.

Postoperative tricuspid valve echocardiogram (Case 3): systolic flutter has disappeared (arrow).

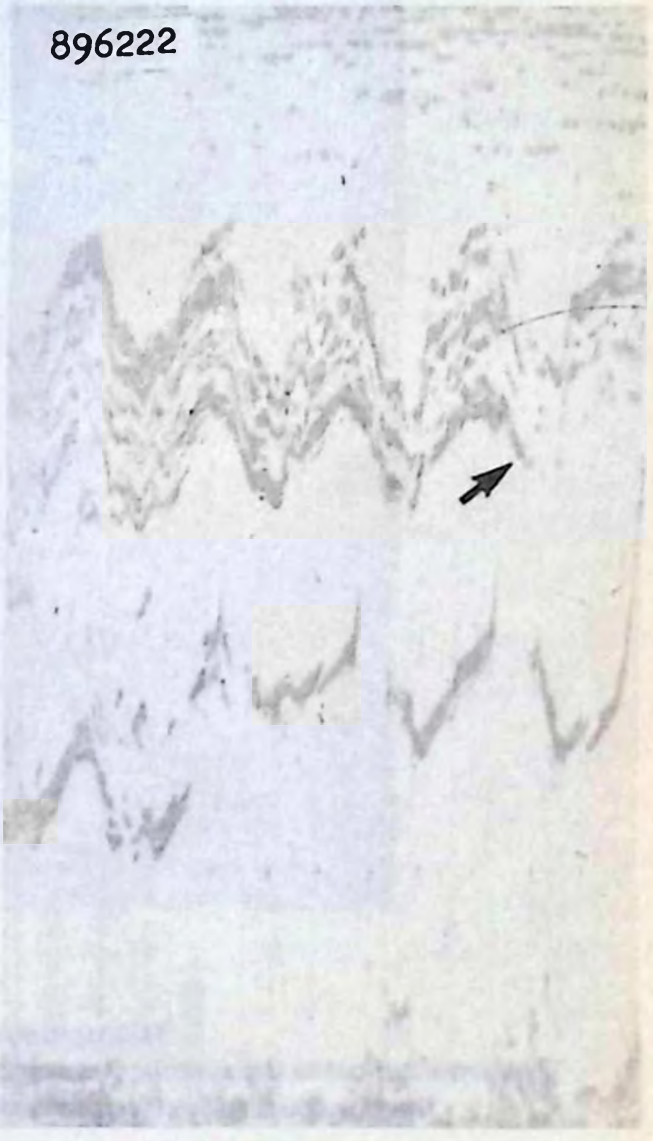

Figure 8.

Postoperative ventricular septal echocardiogram: systolic flutter has disappeared.

Case 4. This 7-year-old girl was referred to us for cardiac evaluation. She had been asymptomatic. Physical examination revealed no cyanosis. A grade 4/6 holosystolic murmur was heard at the fourth left intercostal space, accompanied by a systolic thrill. A middiastolic rumble was heard at the apex. The second heart sound was normal.

ECG showed right ventricular conduction delay and right ventricular hypertrophy, with a prolonged PR interval. A telecardiogram revealed cardiomegaly, prominent pulmonary artery segment, and increased vascularity. Cardiac catheterization data are shown in Table I. Cineangiocardiography showed LV-RA communication. Echocardiograms showed systolic fluttering of the tricuspid valve (Figure 9).

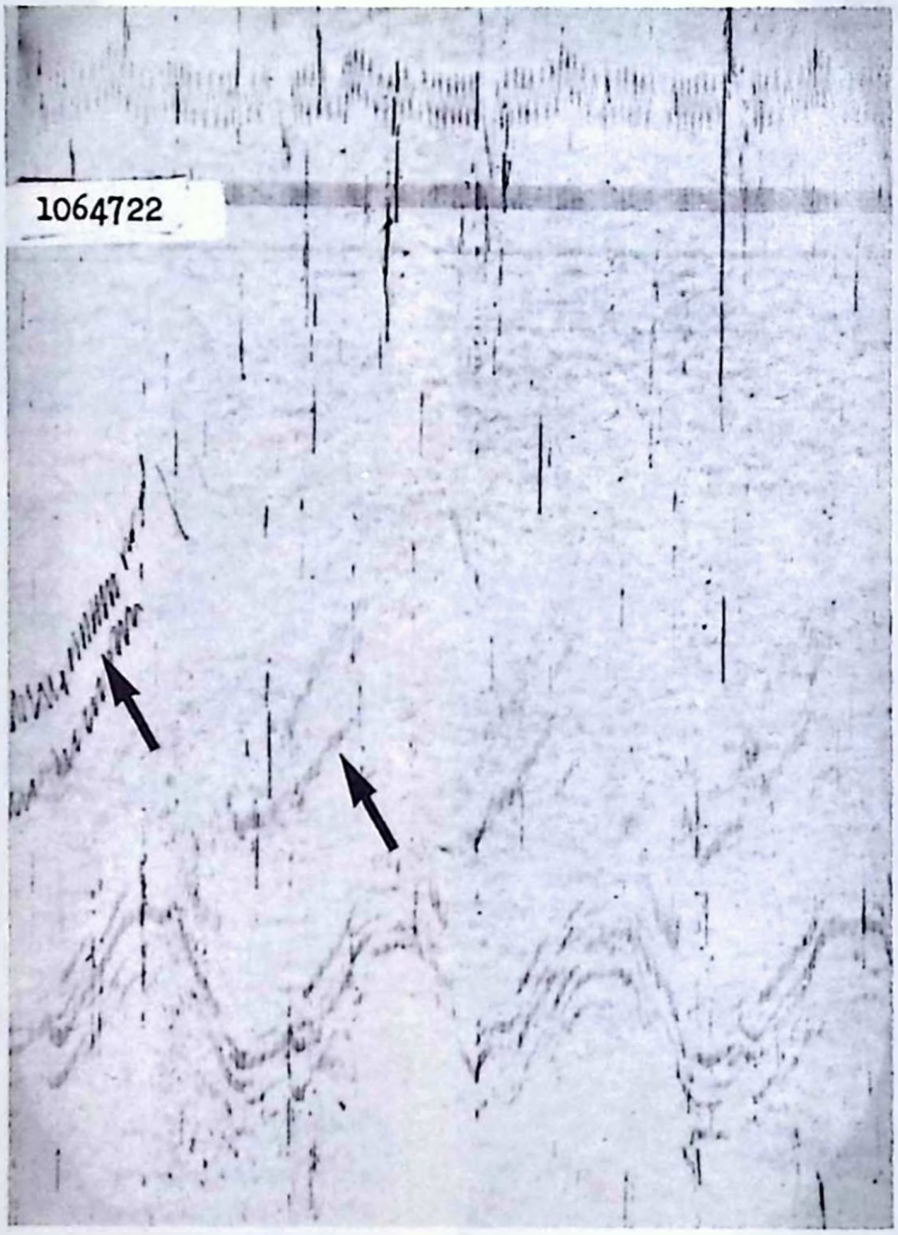

Figure 9.

Tricuspid systolic flutter (Case 4).
The arrow indicates the systolic fluttering of the tricuspid valve. The vibrations are towards the transducer. The frequency of the vibration is 71 sec, amplitude 2 mm.

TABLE I

Cardiac Catheterization Data

Cases	V. Cava	RA		RV		PA		AO		
	% O_2	% O_2	Pressure	% O_2	Pressure	% O_2	Pressure	% O_2	Pressure	QP/QS
Case 1	73	76	5	82	30/0-5	84	25/10	95	100/65	2
Case 2	56	82	8	87	70/0-10	87	50/15	94	110/70	4.89
Case 3	60	72	5	80	32/0	80	28/12	96	115/75	2.5
Case 4	75	85	6	85	45/0-5	85	45/22	96	100/70	2

RA : Right atrium
RV : Right ventricle
PA : Pulmonary artery
AO : Aorta

Discussion

The diagnosis of LV-RA communication is often not suspected on the basis of clinical findings[2]. Frequently the lesion is detected at the time of catheterization or occasionally not until the defect has been visualized at the time of operation[2]. Therefore as a non-invasive method echocardiography appears to be very useful in the diagnosis of this congenital cardiac anomaly. In our four cases systolic fluttering of the tricuspid valve was observed echocardiographically.

LV-RA communications are usually classified in two main groups, depending upon whether the septal defect is above or below the tricuspid valve[1] (Figure 10). Anatomically the membranous ventricular septum is divided by the insertion of the septal leaflet of the tricuspid valve into atrioventricular and interventricular portions.

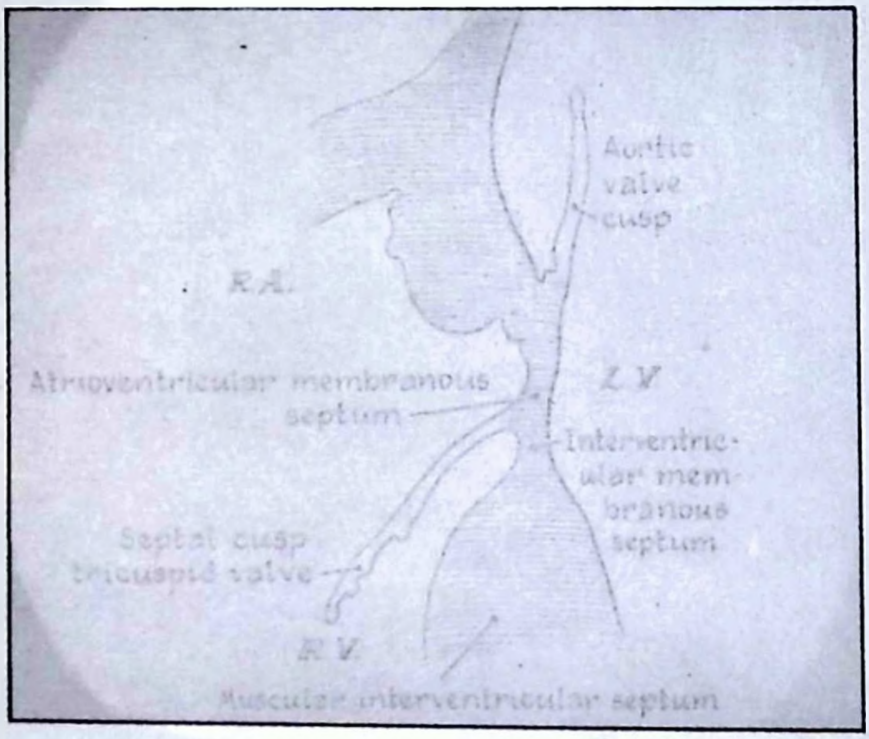

Figure 10.

Anatomic types of LV-RA communication.
Above arrow: supravalvar type.
Below arrow: infravalvar type.

To our knowledge, echo findings of four cases of LV-RA communication have been published so far in the literature[3,4]; in three of these cases there was an infravalvar type of anomaly. Of the three cases we have treated surgically, there was intravalvar LV-RA communication. Since our fourth case has not yet been operated on, the type of anomaly in this case is still not known.

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

In our second case, unlike the others, the main direction of the flutter was posterior. Our explanation for this finding is as follows: In cases with normal or slightly elevated RV pressure the shunt is from the left ventricle to the right atrium through the right ventricle, namely postero-anterior, in other words towards the transducer. Therefore, the main vibrations of the tricuspid valve are anterior. However, in our second case, the pressure of the right ventricle was significantly elevated, because the right ventricle was obstructed by the outflow tract. Since the systolic pressure gradient between the left and right ventricles was minimal, the main shunt was from the RV to the RA through the tricuspid defect. As a result of this the magnitude of the shunt was anteroposterior, and the echo vibrations were toward the back.

Since the initial diagnosis of our four cases had been ventricular septal defect, we suggest that an echocardiogram be made in all cases giving a clinical impression of ventricular septal defect or endocardial cushion defect so as to detect LV-RA communication. Echocardiographically, we have not observed systolic fluttering of the tricuspid valve in any type of endocardial cushion defect.

The mechanism of tricuspid flutter may be explained as the effect of a jet of blood from one of the ventricles onto the tricuspid valve in systole.

We recorded vibrations on the left ventricular surface of the septum in our fourth case. This was detected only in the outflow tract of the LV. The mechanism of production of systolic septal vibration may be related to LV-RA shunt. To our knowledge this is the first echocardiographic finding of its kind to be reported in the literature.

Summary

Congenital LV-RA communication is a rare anomaly. The clinical diagnosis of this condition is extremely difficult. As a non-invasive method echocardiography appears to be useful in detecting this condition.

In our four cases with this entity the characteristic M-Mode echocardiographic finding was systolic fluttering of the tricuspid valve. Vibrations of the tricuspid valve were anterior in three of our cases while in the fourth, where there was elevated RV pressure, they were posterior. Three of our four cases were operated on, and in the postoperative period abnormal echo findings had disappeared.

In addition to echo findings of the tricuspid valve we recorded systolic fluttering of the interventricular septum in the outflow tract of the left ventricle in our fourth case.

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