Abnormal diastolic motion of interventricular septum during inspiratory phase

Echocardiographic study

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SUMMARY We report on a patient without heart disease who had pulsus paradoxus, associated with echocardiographic evidence of abnormal and exaggerated diastolic motion of interventricular septum. Both phenomena appeared at the peak of the inspiratory phase of respiration, and seemed to be produced from the same haemodynamic variations, of which the echocardiographic pattern appears to be a more sensitive index than the sphygmographic one.

Echocardiography has made possible the study of interventricular septal motion. Using this method, it has been shown that the interventricular septum presents abnormalities, both in direction and extent of movement, as a result of pathological change or because of exaggerated physiological variations.¹ It is known that, particularly in young people, the interventricular septum can show a periodic displacement with the different phases of respiration.²

To our knowledge, no case of abnormal diastolic motion of the interventricular septum, related to the peak of inspiration and as exaggerated as in our patient, has been reported in a subject without heart disease.

Case report

A 53-year-old man without any significant complaint was seen as an outpatient. The electrocardiogram was normal; and the chest x-ray films were also normal, except for evidence of moderate pulmonary emphysema which was confirmed by pulmonary function tests. Phonomechanographic examination showed a reduction in peripheral pulse amplitude during inspiration. The subject was normal in every other respect.

The echogram showed no alteration, except for an abnormal motion of the interventricular septum at the peak of inspiration (Fig. 1).

A reduction in arterial pulse amplitude was observed in every first beat after the abnormal septal motion (Fig. 2).

The average values of systolic and diastolic dimensions of the ventricles, both in inspiratory and expiratory phases, are reported in the Table.

It is apparent that at the peak of inspiration the right ventricular diastolic dimension was larger than in expiration, so that it was equal to the left ventricular diastolic dimension.

In the left ventricle, during inspiration, the usual systolic shortening of the internal transverse diameter was almost absent. But such systolic shortening was unusually high in the right ventricle in the same respiratory phase. It appeared to be dependent on the abnormal diastolic septal motion.

Discussion

The exaggerated paradoxical septal motion in this case was clearly connected to the phases of respiration. It appeared exclusively at the peak of inspiration, namely whenever intrathoracic negative pressure reached its maximum. It seems justifiable

Table Average values (mm) of right and left ventricular internal diameters (RVID and LVID) in systole and diastole and during inspiratory and expiratory phases

		Inspiration	Expiration
RVID	Diastole	46	29
	Systole	24	24
LVID	Diastole	38	55
	Systole	42	40

Fig. 1 Right and left ventricle M-mode echogram. Paper speed: 10 mm/s. Respiratory tracing is recorded. Abnormal septal movements are observed at the peak of inspiratory phases. RV, right ventricle; IVS, interventricular septum; RT, respiratory tracing; PLVW, posterior left ventricular wall; ECG, electrocardiogram

Fig. 2 Right and left ventricle M-mode echogram. Paper speed: 25 mm/s. Recording of right brachial external pulse tracing. A reduction in pulse amplitude is evident in the first beat after abnormal septal motion. BPT, brachial pulse tracing; other abbreviations as in Fig. 1.

to suppose that the abnormal septal motion was a consequence of haemodynamic variations produced from the lowering of intrathoracic pressure. Such a lowering might be unusually pronounced in our patient, because of his pulmonary emphysema.

During inspiration, right ventricular diastolic filling increased conspicuously, while left ventricular diastolic filling was reduced; consequently, an abnormal septal motion appeared. Therefore, the negative intrathoracic pressure, while increasing the systemic venous return, also leads to increased pooling of blood in the lungs, so reducing left ventricular preload.^{3 4} (Systemic venous return is further enhanced by abdominal venous compression as the diaphragm descends.)

In Fig. 2 echocardiographic evidence of paradoxical septal motion is more apparent than the sphygmographic pattern of pulsus paradoxus, with the implication that the former appears to be a more sensitive index of haemodynamic variations which are able to produce both phenomena.

In the present study we showed that the reduction in pulse amplitude was relatively small, and, since the transverse left ventricle diameter did not show variation in systolic shortening, it seems likely that the stroke volume was preserved by the shortening of the left ventricular diameters other than transverse.

References

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