Right Ventricular Aneurysms Complicating Encephalomyocarditis Virus Myocarditis in Mice

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Inbred strains of BALB/c, C3H/He and DBA/2 mice were inoculated intraperitoneally with the M variant of encephalomyocarditis virus with a titer of 100 TCD₅₀ per 0.1 ml and followed up to the 8th month. Right ventricular aneurysms were noticed in 7 hearts of these 647 mice (1.1%) sacrificed from 8 to 10 months after inoculation with the virus. Myocardial fibers of the right ventricle were destroyed transmurally and fibrosis was found in the chronic stage. This study demonstrated that viral myocarditis may cause right ventricular aneurysms, albeit infrequently, suggesting a pathogenetic role of viral infection in right ventricular dysplasia or Uhl's anomaly.

ALTHOUGH myocardial infarction has been considered the most frequent cause of ventricular aneurysm, other etiologic factors are known to cause ventricular aneurysm. Aneurysm in the left ventricle has been reported to occur in experimental animals infected with coxsackieviruses B₁ and B₂. However, there is no evidence that viruses cause right ventricular aneurysm. Although ventricular aneurysms were not observed in our previous studies on coxsackievirus myocarditis in mice, we found right ventricular aneurysms in the present study on experimental encephalomyocarditis virus myocarditis in mice.

METHODS

Methods are similar to those reported previously. Inbred strains of BALB/c, C3H/He and DBA/2 mice were inoculated intraperitoneally with the M variant of encephalomyocarditis (EMC) virus with a titer of 100 TCD₅₀ (tissue culture infective dose) per 0.1 ml and were observed up to the 8th month. Their hearts were fixed in a 10% formalin solution, sectioned transversely at the middle portion of the ventricles, embedded in paraffin and stained with hematoxylin-eosin, Mallory-azan and von Kossa stains.

RESULTS

Gross myocardial lesions were found in 96 of 178 BALB/c (53.9%), 160 of 259 C3H/He (61.8%) and 143 of 210 DBA/2 mice (68.1%). Among these 647 mice, 7 (1.1%) developed right ventricular aneurysms. These aneurysms were observed on the 10th and 40th day (2 hearts) in BALB/c mice, on 8th month in C3H/He mice and on 30th day, 5th and 7th month in DBA/2 mice. The heart on the 10th day after inoculation with the virus showed cellular infiltrations

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and transmural destruction of myocardial fibers of the right ventricle (Figs. 1 and 2). In the chronic stage after the 30th day, the cellular infiltrations had decreased and fibrosis was seen transmurally in the right ventricle (Figs. 3–5). There were also myocardial lesions in the interventricular septum and left ventricle in these hearts.

Although we also found marked thinning of the interventricular septum and left ventricular wall, and dilatation of cavities of the right and the left ventricle, we did not find aneurysm of the left ventricle.

**DISCUSSION**

There have been only a few reports regarding virus-induced ventricular aneurysm. El-Khatib and coworkers\(^2\) have reported that 3 mice developed left ventricular aneurysm on the 17th day after inoculation with coxsackievirus B\(_3\) and on the 23th day with coxsackievirus B\(_4\). A case
of left ventricular aneurysm has been reported in rubella heart disease. However, there is no evidence that viruses produce right ventricular aneurysm. We found aneurysms in the right ventricle in the acute and the chronic stage following severe EMC virus myocarditis. Although myocardial lesions were also found in the interventricular septum and the left ventricle, left ventricular aneurysm was not seen.

The disease known as right ventricular dysplasia is a pathologic condition which primarily affects the right ventricle. The right ventricular musculature is partially or totally absent and is replaced by fatty and fibrous tissues. If the dysplasia is extensive, the right ventricle is paper-thin and there is an apposition of the endocardium to the epicardium. This condition has been described as Uhl's anomaly. Dysplasia may also involve the left ventricle and atria. Right ventricular aneurysm observed in the chronic stage following EMC virus myocarditis in the present study is similar to the change in right ventricular dysplasia.

This study demonstrates that viral myocarditis may cause right ventricular aneurysms, albeit infrequently, suggesting a pathogenetic role of viral infection in right ventricular dysplasia or Uhl's anomaly.

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