



G1 The Significance of Ventricular Volume Measurement in the Macroscopic Evaluation of a Postmortem Heart

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After attending this presentation, attendees will understand how measuring the ventricular volume at autopsy could be a new indicator used in forensic pathology, one that can complement the limitation of classical evaluation methods of the postmortem heart.

This presentation will impact the forensic science community by proposing a new indicator for evaluating a postmortem heart macroscopically.

A normal heart maintains its structure by being very well adapted to its role of supplying blood to the pulmonary and the systemic circulation systems. But, in various conditions, the heart goes through a remodeling process resulting in reduced cardiac contractility and ultimately cardiac failure. During this process, hemodynamic and morphological changes occur concurrently. The morphological changes can be clinically categorized into cardiac hypertrophy and cardiac dilatation. An accurate evaluation of the heart during autopsy is critical. The weight, shape, and consistency of the heart and the thickness of the ventricular wall are used as parameters for evaluation of the postmortem heart and diagnosis of cardiomyopathy at autopsy.

A total of 58 hearts were categorized into four groups: 13 cases in the control group; 14 cases in the dilated heart group; 9 cases in the hypertrophied heart group; and, 22 cases in the undetermined heart group by using conventional evaluation methods. In addition, the ventricular weight and volume were measured and analyzed.

The weights of male and female hearts in the control group were 329.2 ± 30.2 g and 277.9 ± 30.7 g, respectively, and the ventricular weights were 271.5 ± 34.4 g and 219.3 ± 23.9 g. Left ventricular and right ventricular volumes for male were 25.8 ± 9.7 ml and 34.3 ± 13.2 ml; and they were 15.7 ± 8.2 ml and 35.6 ± 9.0 ml for females. The thickness of the left ventricular free wall in males and females were 1.4 ± 0.1 cm and 1.3 ± 0.1 cm, respectively, and for the interventricular septum they were 1.3 ± 0.3 cm for both males and females.

In the group of dilated hearts, the ventricular weight, the ventricular volume, ventricular volume/ventricular weight, and left ventricular volume/right ventricular volume were increased and the thickness of the ventricular wall was decreased. Such a result is the consequence of excess increase of ventricular volume, particularly of the left ventricle. In the group of hypertrophied hearts, the ventricular weight, ventricular volume, the thickness of the ventricular wall were increased; but, ventricular volume/ventricular weight and left ventricular volume/right ventricular volume did not change significantly. Such a result is the consequence of ventricular hypertrophy exceeding ventricular dilation in the hypertrophied heart group. The increase in ventricular volume was thought to be mostly due to the increase in right ventricular volume. The most evident morphological characteristics that distinguish hypertrophied hearts from dilated hearts were a more obvious increase in ventricular weight than volume, and in right ventricular volume than left in the hypertrophied heart. Such characteristics were revealed using ventricular volume to weight ratios and left ventricular volume to right ventricular volume ratios in this study.

In the group of undetermined hearts, compared with the control group, ventricular volume showed only a slight increase, but the ventricular weight increased by approximately 400g. Additionally, the ventricular volume to weight ratio and the ratio of left and right ventricular volume remained relatively similar with those of the control group and hypertrophied heart group. It was thought that secondary myocardial changes in the undetermined heart group would have progressed to a dilated heart through cardiac hypertrophy. In the group of undetermined hearts, it was later found that four of the cases should have been included in the dilated heart group and another two cases in the hypertrophied heart group according to aforementioned characteristics.

This study concludes that measurement of the ventricular weight and volume may be an objective parameter that can aid in distinguishing between dilated and hypertrophied forms of secondary cardiomyopathies, as well as providing an objective indicator for evaluating the degree of change in cardiac remodeling at autopsy.

Ventricular Volume, Postmortem Heart, Cardiac Remodeling