Clinical Significance of Incidentally Detected Aneurysms of the Membranous Ventricular Septum in Adults by Multidetector Computed Tomography

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Although the clinical relevance of aneurysm of the membranous ventricular septum (AMVS) in adults is unclear, the frequency of AMVS detection has been increased because cardiac multidetector computed tomography has been widely adopted for the evaluation of coronary artery disease. Therefore, we aimed to assess the clinical significance of AMVS in a longitudinal study. In 30,120 adults with suspected coronary artery disease who underwent cardiac multidetector computed tomography in 3 hospitals, 52 patients with AMVS were retrospectively selected. We evaluated the clinical symptoms and electrocardiographic abnormalities (cross-sectional study) and the prevalence of embolic stroke (observational study) during a median 40-month (range 6 to 74 months) observation period. For the assessment of embolic stroke, we excluded 9 patients with other explainable embolic sources. Conduction abnormalities were noted in 13 of 52 adults (25%) with AMVS on electrocardiography and embolic stroke occurred in 6 of 43 patients (14%). The mean age and the prevalence of hypertension were significantly higher in the embolic stroke group than in the event-free group ($p < 0.05$). Thrombi were detected in the 11.6% of AMVS, which was significantly related with embolic stroke ($p < 0.05$). The size and morphology did not change in 15 patients with serial follow-up images. In conclusion, our study suggests that AMVS in adults should not be ignored because AMVS may be related to conduction abnormality or embolic stroke, and it does not spontaneously resolve or diminish in size. **(Am J Cardiol 2015;115:354−359)**

The clinical relevance of an incidentally detected aneurysm of the membranous ventricular septum (AMVS) in adults is unclear. Although most patients with AMVS are asymptomatic, various complications including cerebral embolism,[1−4] cardiac arrhythmias,[5−7] right ventricular outflow tract obstruction,[8−10] bacterial endocarditis,[11] and rupture[12,13] may occur. AMVS-related cerebral stroke has been documented in several reports. However, to date, no study has been reported regarding the incidence of AMVS-related embolic events or the natural course of AMVS in adults. Therefore, our aim was to evaluate the clinical significance of incidentally detected AMVS in adults with cardiac multidetector computed tomography (MDCT) in a longitudinal study.

Methods

A database of electrocardiography (ECG)-gated cardiac MDCT from 3 tertiary general hospitals (Seoul National University Bundang Hospital, Seoul National University Hospital, and Asan Medical Center in Korea) was used for collection of study subjects. In 30,120 adults who underwent cardiac MDCT for the evaluation of coronary artery disease (CAD) from January 2007 to June 2012, we selected 52 adults (29 women; mean age, 54.0 ± 14.2 years) with incidentally detected AMVS using the key words of "ventricular septal aneurysm," and "aneurysm of membranous interventricular septum" or combination words of "ventricular septum," "membranous septum," "aneurysm," or "outpouching sac" and observed these patients for evaluation of clinical significance during the mean of 40 months. AMVS was defined as an outpouching sac protruding into the right ventricle, located near the membranous portion of the ventricular septum. We evaluated basic demographic data, risk factors, clinical symptoms, and ECG findings in all subjects.

During the median 40-month observation period (range 6 to 74 months) for the evaluation of the direct relation between AMVS and embolic stroke, we excluded 9 patients who had other explainable causes for stroke as follows: significant carotid or cerebral artery atherosclerosis (n = 2), other potential cardiogenic embolic sources, such as intraventricular thrombus (n = 1) and atrial fibrillation (n = 3), or paradoxical embolic source such as atrial septal defect (n = 3).[14] Among them, 3 patients have combined patent foramen ovale (PFO). PFO was usually diagnosed using echocardiography with intravenous agitated saline injection and Valsalva maneuver. However, in the patients without transthoracic echocardiography (TTE) examination, a channel-like appearance in the

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See page 359 for disclosure information.

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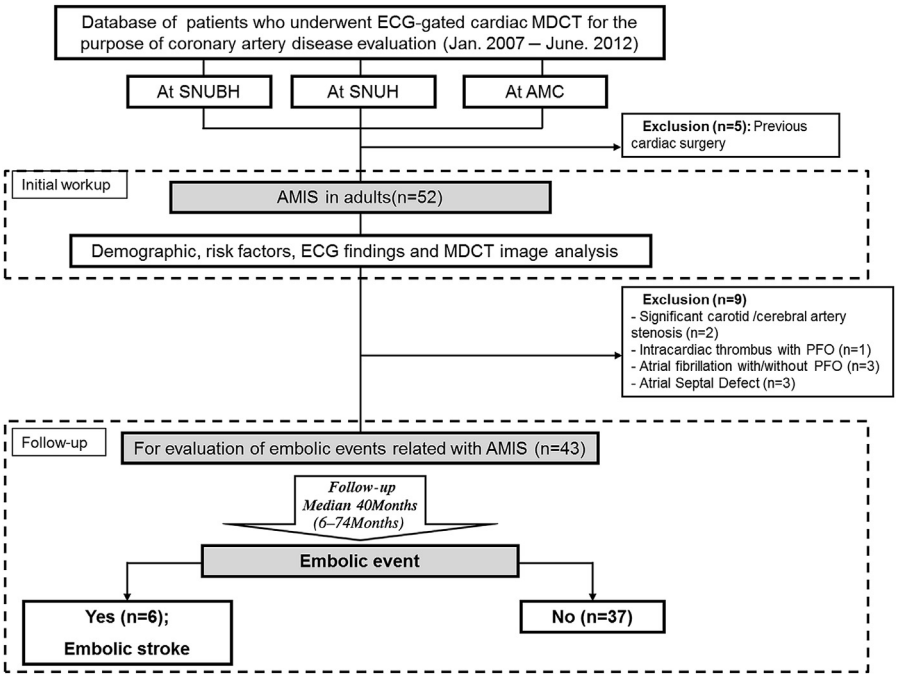

Figure 1. Flow chart of the study design. SNUBH = Seoul National University Bundang Hospital; SNUH = Seoul National University Hospital; AMC = Asan Medical Center.

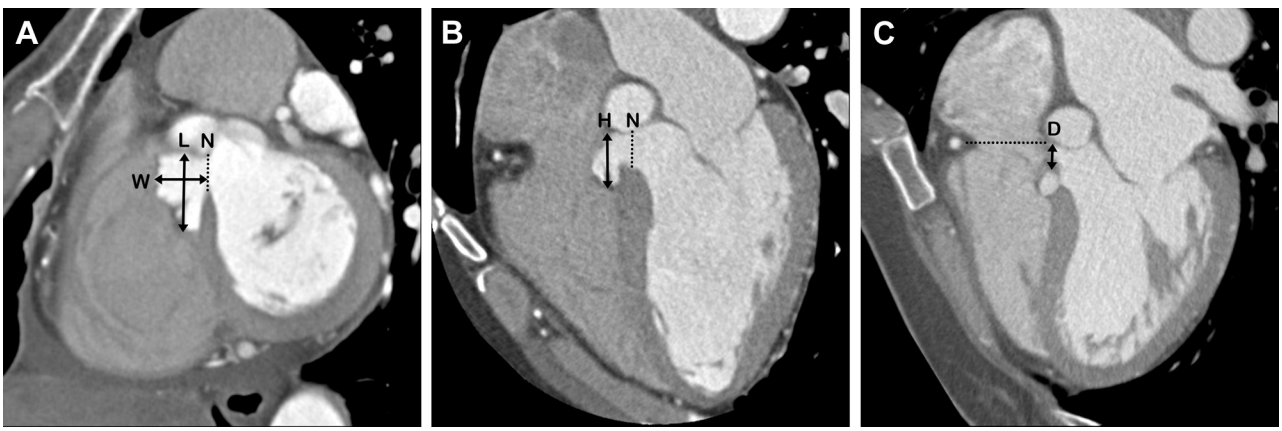

Figure 2. Measurement of various parameters on cardiac MDCT. The width (*double-headed arrow: W*) and length (*double-headed arrow: L*) of the AMVS are measured as the longest diameter perpendicular and parallel to the ventricular septum on the SA view, respectively *(A)*. The height (*double-headed arrow: H*) of the AMVS is measured as the longest diameter parallel to the ventricular septum on the 4-chamber view *(B)*. The neck diameter of the AMVS (*dotted line: N*) is measured as its narrowest portion in the axis of the ventricular septum on each SA *(A)* or 4-chamber *(B)* views. The distance from the tricuspid valve (*double-headed arrow: D*) is defined as the shortest diameter from the septal leaflet of the tricuspid valve along the axis of the ventricular septum on the 4-chamber view *(C)*.

interatrial septum with shunt on cardiac MDCT was considered as PFO.[15] Therefore, 43 patients (24 women; mean age, 52.5 ± 14.5 years) were finally longitudinally observed for the occurrence of embolic events. The study flow chart is summarized in Figure 1.

CT examinations were performed using 64-multidetector CT (Brilliance 64; Philips Medical Systems, Best, The Netherlands) with 64 × 0.625-mm slice collimation, 420-ms gantry rotation time, and 120-kVp tube voltage; dual-source MDCT (Somatom Definition; Siemens Medical Solutions, Forchheim, Germany) with 2 × 32 × 0.6-mm slice collimation, 330-ms gantry rotation time, and 100- to 120-kVp tube voltage; or 256-multidetector CT (Brilliance iCT; Philips Medical Systems, Eindhoven, Netherlands) with 128 × 0.625-mm detector collimation, 270-ms gantry rotation time, and 100- to 120-kVp tube voltage, according to body mass index. ECG-based tube current modulation was performed in all patients. As routine practice, the CT data were processed using 3-dimensional software (Rapidia; INFINITT, Seoul, Korea), and multiple reformations including the short-axis (SA), 2-chamber, and 4-chamber images were generated.