Effect of Age on Left Ventricular Ejection Fraction Assessed by Echocardiography

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Purpose

Various age-related changes of the cardiovascular system are well known. Yet, age-related changes of left ventricular ejection fraction (LVEF), left ventricular fractional shortening (LVFS), left ventricular volume (LVEDVI), and left ventricular muscle mass (LVMMI) have not conclusively been elucidated in a large population of healthy adult individuals.

Methods

Transthoracic two-dimensional echocardiography was performed in 6280 normal subjects (3032 (49%) males) for different reasons obtained retrospectively from case notes and patient interviews. Mean age at presentation was 44.6±20 years (range 7 to 80 years).

Results

With advancing age, a significant increase in LVEF was observed (females: p<0.0001; males: p<0.0001), which was more pronounced in females (62.7±0.4% for age <20 years vs. 65.0±0.3% for age 60-80 years) than in males (62.0±0.4% for age <20 years vs. 63.4±0.3% for age 60-80 years). Similarly, LVFS increased in females from 37.9±0.5% (age <20 years) to 41.9±0.4% (age 60-80 years) and in males from 37.3±0.5% (age <20 years) to 39.5±0.4% (age 60-80 years) (p<0.0001). LVEDVI decreased from 49.9±9.9 ml/m² (age 7-20 years) to 43.4±5.5 ml/m² (age 60-80 years) in females and from 56.5±0.8 ml/m² (7-20 years) to 48.9±0.5 ml/m² (age 60-80 years) in males (p<0.0001). LVMMI increased significantly in elderly subjects compared to younger ones (74.5±1.2 g/m² for age <20 years vs. 88.0±0.7 g/m² for age 60-80 years; p<0.0001).

Conclusions

LVEF, LVFS, and LVMMI increase with advancing age in healthy individuals, in particular in females. In contrast, LVEDVI decreases with age. These findings may have implications for the echocardiographic assessment of left ventricular function and size in the elderly and suggest that age-adjusted standard values for these parameters are needed.

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**Figure 1:** A. Age distribution in patient cohort. B. Indications for echocardiography referral. C. Correlation of mean left ventricular ejection fraction (LVEF) with age. *p<0.05 (ANOVA).

**Figure 2:** A. 5th, 50th and 95th percentiles for LVEF depending on age in women. B. 5th, 50th and 95th percentiles for LVEF depending on age in men.

**Figure 3:** A. Correlation of left ventricular myocardial mass indices (LVMMI) with age. *P<0.05 (ANOVA). B. Correlation of LV fractional shortening (LVFS) with age. *P<0.05 (ANOVA). C. Correlation of LV indexed end-diastolic volume (EDVI) with age. *P<0.05 (ANOVA). B. Correlation of LV end-systolic volume index (ESVI) with age. *P<0.05 (ANOVA).

Declaration of interest: There are no potential conflicts of interest to declare.