Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Endothelin-1 and Atrial Cardiomyopathy

Takumi J Matsubara, MD and Katsuhito Fujiu, MD

(Int Heart J 2019; 60: 238-240)

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.

Atrial fibrillation (AF) is an arrhythmia which causes ischemic stroke and it is increasing worldwide. The incidence of AF is high in patients with cardiovascular disease such as heart failure, valvular disease, atherosclerotic disease, and cardiomyopathy including hypertrophic cardiomyopathy (HCM). It has been reported that AF was detected in 20% to 30% of HCM patients with heart failure or stroke episodes. A prediction method for AF in patients with cardiovascular disease is needed for appropriate patient management. There are a few predictive factors, such as left atrial diameter or NYHA class II to III chronic heart failure. However, no reliable predictive factors have been reported thus far.
Patients with heart failure, valvular disease, vascular disease, hypertension, or diabetes mellitus have elevated serum ET-1 levels. ET-1 increases intracellular Ca²⁺ levels and cell apoptosis of atrial cardiomyocytes. Intracellular Ca²⁺ overload provokes electrical remodeling of atrial myocardial cells. Apoptosis and superoxide-MMP cascade activation cause tissue fibrosis which leads to anatomical remodeling. Recently, electrical and anatomical remodeling is recognized as atrial cardiomyopathy. Atrial cardiomyopathy causes AF and ischemic stroke. HF indicates heart failure; HT, hypertension; DM, diabetes mellitus; ET-1, endothelin-1; MMP, matrix metalloproteinase; and AF, atrial fibrillation.

Disclosures

Conflicts of interest: The authors declare that they do not have any conflicts of interest related to this study.

References

1. Zegkos T, Efthimiadis GK, Parcharidou DG, et al. Atrial fibrillation in hypertrophic cardiomyopathy: A turning point towards increased morbidity and mortality. Hellenic J Cardiol 2017; 58: 331-9.
2. Patten M, Pecha S, Aydin A. Atrial fibrillation in hypertrophic cardiomyopathy: Diagnosis and considerations for management. J Atr Fibrillation 2018; 10: 1556.
3. Liu L, Wu L, Zheng L, et al. Associations between multiple circulating biomarkers and the presence of atrial fibrillation in hypertrophic cardiomyopathy with or without left ventricular outflow tract obstruction. Int Heart J 2019; 60: 327-35.
4. Hathaway CK, Grant R, Hagaman JR, et al. Endothelin-1 critically influences cardiac function via superoxide-MMP9 cascade. Proc Natl Acad Sci U S A 2015; 112: 5141-6.
5. Shubeita HE, McDonough PM, Harris AN, et al. Endothelin induction of inositol phospholipid hydrolysis, sarcomere assembly, and cardiac gene expression in ventricular myocytes. A paracrine mechanism for myocardial cell hypertrophy. J Biol Chem 1990; 265: 20555-62.
6. Mayyas F, Niebauer M, Zurick A, et al. Association of left atrial endothelin-1 with atrial rhythm, size, and fibrosis in patients with structural heart disease. Circ Arrhythm Electrophysiol 2010; 3: 369-79.
7. Kockskämper J, Seidlmaier L, Walther S, Hellenkamp K, Maier LS, Pieske B. Endothelin-1 enhances nuclear Ca²⁺ transients in atrial myocytes through Ins(1,4,5)P₃-dependent Ca²⁺ release from perinuclear Ca²⁺ stores. J Cell Sci 2008; 121: 186-95.
8. Allessie MA. Atrial fibrillation-induced electrical remodeling in humans: what is the next step? Cardiovasc Res 1999; 44: 10-2.
9. Mueller EE, Momen A, Massé S, et al. Electrical remodelling precedes heart failure in an endothelin-1-induced model of cardiomyopathy. Cardiovasc Res 2011; 89: 623-33.
10. Sabbah HN. Apoptotic cell death in heart failure. Cardiovasc Res 2000; 45: 704-12.
11. Dzeshka MS, Lip GY, Snezhitskiy V, Shantsila E. Cardiac fibrosis in patients with atrial fibrillation: Mechanisms and clinical
implications. J Am Coll Cardiol 2015; 66: 943-59.
12. Guichard JB, Nattel S. Atrial cardiomypathy: A useful notion in cardiac disease management or a passing fad? J Am Coll Cardiol 2017; 70: 756-65.

13. Schneider JG, Tilly N, Hierl T, et al. Elevated plasma endothelin-1 levels in diabetes mellitus. Am J Hypertens 2002; 15: 967-72.