

Mitral annular calcification – An overview

Mitral anuler kalsifikasyon - Derleme

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Abstract

Calcification of the mitral annulus has long been considered as a benign condition. However, recent investigations have shed a light on this condition. According to the severity of the disease, the result may be regurgitation or rarely stenosis of the mitral valve. In addition to the local effects, mitral annular calcification is considered as a surrogate for systemic inflammation, widespread calcifications and cardiovascular risk factors. Treatment is considered when calcification is severe enough to cause hemodynamic effects or is suspected to be a source of systemic embolization. Different surgical techniques are employed according to the localization and severity of the calcium deposition, the function of the valves and overall patient condition.

Keywords: Cardiovascular events; mitral annular calcification; stroke

Özet

Mitral anulus kalsifikasyonu uzun zamandan beri benign bir durum olarak kabul edilmiştir. Ancak yakın zamanda yapılan bazı çalışmalar bu konu üzerinde aydınlatıcı olmuştur. Hastalığın şiddetine bağlı olarak mitral kapakta yetmezlik veya nadiren stenoz ile sonuçlanabilir. Lokal etkilere ek olarak, mitral anuler kalsifikasyonun sistemik inflamasyon, tüm vücutta yaygın kalsifikasyon ve kardiyovasküler risk faktörleri için de bir belirteç olabileceği belirtilmektedir. Tedavi ise kalsifikasyon hemodinamik sonuçlara yol açacak kadar şiddetli olduğunda veya sistemik emboli için bir kaynak oluşturduğu düşünüldüğünde önerilmektedir. Kalsifikasyonun lokalizasyonu, şiddeti ve hastanın genel durumuna göre farklı cerrahi teknikler mevcuttur.

Anahtar kelimeler: Kardiyovasküler olaylar; mitral anuler kalsifikasyon; inme

Introduction

Annular calcification, one of the most common cardiac finding at autopsy, occurs when calcium is deposited in the region between the posterior left ventricular wall and the posterior mitral valve leaflet. Mitral annular calcification (MAC) is a chronic and progressive disorder involving the fibrous surrounding of the mitral valve. It is associated with atherosclerotic risk factors (1), abnormalities in mineral metabolism (as seen in chronic kidney disease) (2) and systemic inflammation (3). It is also seen more frequently in the elderly (4). Generally regarded as a benign process, MAC may result in mitral regurgitation and rarely mitral stenosis. In addition to valvular heart disease, MAC is shown to be associated with multiple cardiovascular disorders.

Prevalence

MAC prevalence in population-based studies is approximately 15% and this rate can increase up to 35% in patients with severe coronary artery disease and up to 42% in patients with reduced kidney functions (5-7). MAC is also more common in women compared to men.

Anatomy, Pathology, Pathophysiology

Mitral annular calcification is a common

echocardiographic finding especially in people with advanced age. MAC is observed more frequently in patients with atherosclerotic risk factors. In addition, there are numerous studies that show elevated levels of inflammation markers (e.g. high-sensitivity C-reactive protein) in patients with MAC. These two findings strongly suggest a close relation between systemic inflammation and MAC. Mild degrees of calcification appear as an isolated area of calcium deposition on the left ventricular side of the posterior annulus, near the base of the posterior mitral leaflet. In more advanced cases, calcification may extend to entire posterior annulus. By increasing the rigidity of the mitral annulus, systolic contraction of the annulus is impaired and thus, MAC may result in mild to moderate degrees of mitral regurgitation. Rarely, when calcification extends into the base of the mitral leaflets, functional mitral stenosis may ensue.

Clinical Correlations

As discussed above, mild to moderate degrees of MAC may result in mitral regurgitation and in rare cases, extensive calcification of the annulus can be a cause of mitral stenosis. Apart from valvular abnormalities, MAC is associated with various disorders. Kohsaka et al. (8) investigated the effect of MAC on cardiovascular outcomes. They concluded that MAC was a strong and independent predictor of cardiovascular events, especially myocardial

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infarction and vascular death. The risk increase was directly related to MAC severity. Ziyrek et al. (9) revealed that MAC is associated with endothelial dysfunction. They showed that in patients with MAC, carotid intima-media thickness was significantly increased and serum fetuin-A levels were markedly decreased compared to control group, suggesting a close association between MAC and cardiovascular risk factors in patients with coronary artery disease. Fetuin-A is a hepatic secretory glycoprotein that is shown to inhibit dystrophic vascular and valvular calcification. There is also a close relationship between decreased serum fetuin-A levels and atherosclerosis. Finding of decreased serum fetuin-A levels in patients with MAC is also suggestive of systemic inflammation in patients with MAC. Kurtoğlu et al. (10) examined the possible effects of MAC on cardiac autonomic functions. They showed that MAC was associated with reduced heart rate variability. The association of MAC with stroke has been a matter of debate. In the above mentioned study by Kohsaka et al. (8), mild to moderate degrees of MAC was not associated with stroke. The association between severe MAC and ischemic stroke was of borderline significance ($P=0.08$). In the Framingham study, however, MAC was associated with a relative risk of stroke of 2.1 after adjustment for clinical risk factors and exclusion of atrial fibrillation (11). More recently, De Marco et al. (12) investigated this issue in hypertensive patients. They found that MAC was associated with increased risk of ischemic stroke, independent of age, baseline or time-varying systolic blood pressure, prevalence or incidence of atrial fibrillation, history of previous cerebrovascular disease and they concluded that MAC is common in treated hypertensive patients with ECG documented left ventricular hypertrophy and is an independent predictor of incident ischemic stroke. In a different study, Celik et al. (13) MAC was significantly more prevalent in patients with renal stone formation compared to healthy controls. This association was also corroborated by determining serum markers of bone resorption. Davutoglu et al. (14) evaluated the association between MAC and osteoporosis in women. They assessed 340 women (mean age 56 ± 10 years) and concluded that MAC is associated with osteoporosis. In addition, bone mineral density measurement (T-scores) and age were highly predictive of MAC in women. Infective endocarditis can also be associated with MAC. Burnside et al. (15) evaluated clinical and autopsy findings of 7 patients with bacterial endocarditis superimposed on degenerative calcification of the annulus fibrosus of the mitral valve. The infection involved the posterior mitral leaflet in 6 patients and the anterior leaflet in one patient. They concluded that the calcification and resultant deformity of the valve probably predisposed these patients to infection and suggested appropriate antibiotic prophylaxis especially for elderly patients with MAC.

A rare variant of MAC is caseous calcification of the mitral annulus (CCMA). CCMA is a soft periannular extensive calcification, resembling a tumor, which is composed, of calcium, fatty acids and cholesterol with toothpaste like texture. The prevalence of CCMA on a necropsy series was found to be 2.7% of the cases of MAC. The most common clinical presentation is incidental finding of an intracardiac mass during cardiac imaging studies. Although it is usually silent clinically, CCMA may be complicated by systemic embolization.

Treatment

Extensive calcification of the mitral annulus poses a great challenge to the surgeon. There are various fatal complications of surgery including intractable hemorrhage, atrioventricular disruption and ventricular rupture. Since there are various patterns of calcium deposition throughout the annulus, different patterns of treatment are possible. The most frequently used technique is complete removal of the calcium bar and replacement of the mitral valve (16). If the valve is repairable, the procedure involves detachment of the posterior leaflet, excision of the calcium bar, reconstruction of the atrioventricular groove with pericardium and suturation of the posterior leaflet to the pericardial patch.

Conclusion

Mitral annular calcification is a common echocardiographic pattern observed especially in patients with advanced age. According to the cumulative evidence, it should not be assessed solely as benign effect of aging. The hemodynamic effects should be clearly defined, as well as the extent of calcium deposition. In addition the patient should be assessed for the risk of stroke. Follow-up can be considered especially for patients with extensive calcification.

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