Evaluation of Association between MVP Syndrome and Keratoconus

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Abstract

Background- According to previous studies, it appears that there is a 4.2% chance of keratoconus in patients with the MVP syndrome. Also, keratoconus is seen as a part of systemic disorders like atopia, mitral valve prolapse, Down's syndrome, osteogenesis imperfecta and hypermobility of joints. More studies have dedicated concurrent evidence between keratoconus and the MVP syndrome. In a recent study performed in Tehran, an association between the MVP syndrome and keratoconus was confirmed. We also wanted to evaluate an inverse relationship in MVP patients.

Methods- 392 patients with the MVP syndrome based on findings in physical exam and echocardiography evaluation (Ving Med 750-800 with 2.5 MHZ phased array transducer) were referred to an optometrist to have cornea examination by videokeratography (topography Humphrey system) and assessment of keratoconus findings.

Results- There is no relationship between the MVP syndrome and keratoconus.

Conclusion-Our findings do not support the hypothesis that MVP is a part of systemic diseases that include keratoconus ***(Iranian Heart Journal 2005; 6 (1,2): 68-71).***

Key word: mitral valve prolapse Ë keratoconus conus

The MVP syndrome is one of the most prevalent cardiac valvular abnormalities and was previously thought to affect as much as 5-15% of the population. It now appears likely that over-diagnosis occurs in many individuals, perhaps because of the absence of rigorous echocardiographic criteria.

Using such criteria showed that the MVP syndrome occurred in only 2.4% of the population. Most frequently, the MVP syndrome occurs as a primary condition that is not associated with other diseases. However, it has also been associated with many conditions.

MVP occurs quite commonly in heritable disorders of the connective tissue that increase the size of the mitral leaflets and apparatus, including Marfan syndrome, Ehlers Danlos syndrome, osteogenesis imperfecta and pseudoxanthoma elasticum. There may be a higher incidence of MVP in patients with asthenic habitus and various congenital thoracic deformities.

Keratoconus is an idiopathic, progressive, non-inflammatory thinning of the central cornea that usually manifests itself at puberty. Its prevalence is estimated to be approximately 50-230 cases per 100,000 population.

Keratoconus has been associated with many systemic disorders such as atopic disease, Down's syndrome, osteogenesis imperfecta and joint hypermobility, but its specific origin remains unknown.[15]

As association between mitral valve prolapse and keratoconus was postulated first in 1982 by Beardsley and Foulks, who screened 32 patients with keratoconus for mitral valve prolapse and noted an overall prevalence of 38%. Thereafter, Sharif and associates reported a 58% rate of mitral valve prolapse in patients with advanced keratoconus, requiring corneal transplantation.

Street and associates, however, failed to replicate these findings. Lichter and associates showed that a borderline association of MVP with keratoconus and with allergy existed.[16]

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The aim of the present study was to examine the prevalence of keratoconus in patients with mitral valve prolapse using state of the art diagnostic techniques.

Methods

The study group consisted of 392 patients (aged 15-75 years) who were diagnosed as mitral valve prolapse based on findings of physical exam and two dimensional M-mode and Doppler echocardiography (Ving Med 750-800 with 2.5 MHz phased- array transducer) using Perloff major criteria: Auscultation (mid to late systolic clicks and late systolic murmur or "whoop" alone or in combination at the cardiac apex), or: Echocardiography (marked superior systolic displacement of mitral leaflets $\geq$ 2mm above annulus with coaptation point at or superior to annular plane - mild to moderate superior systolic displacement of mitral valve leaflets with chordal rupture-Doppler mitral regurgitation - annular dilation). All the patients had pure MVP without history of rheumatic or other cardiac disease.

They did not have other ocular disease, no history of using RGP lens in the last 3 weeks or soft lens in the past 1 week. All the patients were referred to an optometrist for screening of keratoconus by video-keratography (topographic Humphrey system), and a computer software program was used to calculate three indices quantifying the keratoconus phenotype:

Central steepening of more than 47.2 diopters, inferior-superior diopter variance more than 1.4 diopters and relative skewing of the steepest radial axes above and below the horizontal meridian (SRAX index) of more than 21.

The results were evaluated by an ophthalmologist.

Statistical analysis

It was performed with SPSS 10 - Fisher exact test as necessary. A probability value less than 0.05 was considered significant.

Results

From 392 patients with MVP, 37% were female and 63% were male. The patients' age ranged between 15-75 years (mean 31.2 years). Statistical analysis was performed based on the SPSS10 method. There is no relationship between the MVP syndrome and keratoconus.

Discussion

The etiology of mitral valve prolapse is unknown. On gross inspection, there is redundancy of the mitral leaflets, mitral annular dilatation and elongation and attenuation of cordae tendineae.

The histopathologic change known as myxomatous degeneration occurs and consists of the replacement of the normal collagen matrix of the fibrosa layer with acid mucopolysaccharides, specifically hyaluronic acid and chondroitin sulfate.[1,2] Electron microscopic studies have shown an alteration in the ratio of collagen to ground substance and breakage of collagen cross-links.[3] The accumulated evidence suggests that mitral valve prolapse can result from an alteration in collagen metabolism. This has led to the hypothesis that inherent abnormalities of the connective tissue underlie the varied manifestations of mitral valve prolapse.[4] In all probability though, mitral valve prolapse represents a final common pathway in response to a variety of insults affecting the mitral apparatus.

Human heart valves, like the cornea, are composed of collagen types 1 and AB but also have a small proportion of type III collagen.[5-6] One electrophoretic study of severe mitral valve prolapse with ruptured chordae tendineae demonstrated an absence of collagen types AB and III, although this is not found in all cases.

Keratoconus is a non-inflammatory ectasia of the central cornea. It usually manifests itself around the time of puberty and is almost always bilateral.[7,11,12] Both keratoconus and mitral valve prolapse are seen most commonly in their primary or idiopathic form.

While keratoconus may be seen with other ocular anomalies and mitral valve prolapse with other cardiac conditions, both have been associated with systemic disease of the mesenchymal system such as Ehlers-Danlos syndrome, Marfan's syndrome, pseudoxanthoma elasticum and osteogenesis imperfecta.[8-10,13]

Therefore, it is known that an alteration of the ratio of collagen subtypes occurs in both keratoconus and mitral valve prolapse[14] It is not known if this is a primary or secondary finding, nor does it implicate any specific collagen subtype defect as a common cause, although it is conceivable that a single event during embryogenesis might affect these two structures as both corneal stroma and atrioventricular valves form during the sixth to seventh week of fetal life.[17]

Are these clinical, histopathologic and biochemical similarities between keratoconus and mitral valve prolapse coincidental, or might these two seemingly unrelated disorders be different manifestations of similar defects in collagen metabolism?

Conclusion

Our study has shown that there is indeed no increased prevalence of keratoconus in the mitral valve prolapse population, and no common etiologic factor has been determined.

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