Familial aortic aneurysm: genetic causes and screening recommendations.

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Introduction

Familial Aortic Aneurysm (FAA) is a rare but potentially life-threatening condition that is inherited in an autosomal dominant pattern [1]. FAA is characterized by the weakening and enlargement of the aorta, the main artery that carries blood from the heart to the rest of the body. If left untreated, an aortic aneurysm can rupture, leading to internal bleeding and possibly death. In this article, we will explore the genetic causes of FAA and the screening recommendations for individuals at risk.

Genetic Causes of Familial Aortic Aneurysm

FAA is caused by mutations in several genes that are involved in the formation and maintenance of the aortic wall. The most common genes associated with FAA are the FBN1 gene, which encodes the protein fibrillin-1, and the TGFBR1 and TGFBR2 genes, which encode the receptors for the protein transforming growth factor-beta (TGF-beta) [2]. Mutations in these genes result in a loss of function or a dominant negative effect on the protein products, which leads to the weakening and enlargement of the aortic wall. Fibrillin-1 is a structural protein that provides support and elasticity to the aortic wall. Mutations in the FBN1 gene result in a decreased amount of functional fibrillin-1, leading to a weakened aortic wall. This condition is known as Marfan syndrome, which is characterized by tall stature, long limbs, and a high risk of aortic aneurysm and dissection.

Transforming growth factor-beta (TGF-beta) is a signaling protein that regulates the growth and differentiation of cells in the aortic wall. Mutations in the TGFBR1 and TGFBR2 genes result in a decreased sensitivity of the receptors to TGF-beta, leading to uncontrolled growth and remodeling of the aortic wall. This condition is known as Loeys-Dietz syndrome, which is characterized by aortic aneurysm and dissection, as well as other features such as craniofacial abnormalities and skeletal deformities.

Other genes associated with FAA include MYH11, ACTA2, COL3A1, and SMAD3, which encode proteins involved in smooth muscle contraction, cytoskeleton organization, collagen synthesis, and TGF-beta signaling, respectively.

Inheritance Pattern of Familial Aortic Aneurysm

FAA is inherited in an autosomal dominant pattern, which means that a mutation in one copy of the gene is sufficient to cause the condition. Each child of an affected individual has a 50% chance of inheriting the mutation and developing FAA. However, the severity and age of onset of FAA can vary among affected individuals, even within the same family. This is due to the presence of other genetic and environmental factors that can modulate the expression and progression of the condition.

Screening Recommendations for Familial Aortic Aneurysm

Given the potential life-threatening consequences of FAA, it is important to identify affected individuals as early as possible and to monitor their aortic health regularly. The following are the screening recommendations for FAA:

Family history assessment: Individuals with a family history of FAA or related conditions such as Marfan syndrome or Loeys-Dietz syndrome should undergo a thorough evaluation of their family history, including the age of onset, severity, and outcomes of aortic aneurysm or dissection in affected relatives. This information can help determine the likelihood of the individual carrying the mutation and the need for further testing.

Genetic testing: If a mutation in one of the FAA-associated genes is identified in an affected family member, genetic testing can be offered to at-risk relatives to confirm or exclude the presence of the mutation. Genetic testing can also provide information about the specific gene affected, which can help guide the clinical management and surveillance of the individual [3-5].

Imaging studies: Individuals with a confirmed or suspected diagnosis of FAA should undergo imaging studies to assess the size and morphology of their aorta. The preferred imaging modality is a computed tomography (CT) angiogram, which can provide detailed information about the aortic anatomy, as well as the presence of any aneurysms or dissections. Magnetic resonance imaging (MRI) angiography can also be used, but it is less commonly used due to its lower availability and longer scan time.

Medical and surgical management: The medical and surgical management of FAA aims to prevent the development and rupture of aortic aneurysms and dissections. Medical management includes the use of beta-blockers, which can decrease the force and frequency of heart contractions and reduce the stress on the aortic wall. Surgical management includes the repair or replacement of the aortic segment

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affected by the aneurysm or dissection. The choice of surgical technique depends on the location, size, and morphology of the aneurysm, as well as the age and health status of the individual.

Conclusion

Familial Aortic Aneurysm is a rare but potentially life-threatening condition that is inherited in an autosomal dominant pattern. FAA is caused by mutations in genes involved in the formation and maintenance of the aortic wall, leading to the weakening and enlargement of the aorta. Individuals with a family history of FAA or related conditions should undergo a thorough evaluation of their family history, genetic testing, and imaging studies to assess their risk and guide their clinical management and surveillance. Regular follow-up monitoring and medical and surgical management can help prevent the development and rupture of aortic aneurysms and dissections, and improve the overall outcomes of individuals with FAA.

References

1. Whiffin N, Walsh R. CardioClassifier: disease- and gene-specific computational decision support for clinical genome interpretation. Genet Med. 2018;20(10):1246-54.
2. Li Q. InterVar: clinical interpretation of genetic variants by the 2015 ACMG-AMP guidelines. Am J Hum Genet. 2017;100(2):267-80.
3. Guo J. Wide mutation spectrum and frequent variant Ala27Thr of FBN1 identified in a large cohort of Chinese patients with sporadic TAAD. Sci Rep.2015;5:13115.
4. Elefteriades JA. Guilt by association: paradigm for detecting a silent killer (thoracic aortic aneurysm). Open Heart.2015; 2(1):e000169.
5. Peng J, Xiang J. VIP-HL: semi-automated ACMG/AMP variant interpretation platform for genetic hearing loss. Hum Mutat. 2021; 42(12):1567-75.

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