



Treatment of Aortic Dissection in Patients with Marfan Syndrome

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ABSTRACT

Marfan syndrome (MFS) is a rare genetic and connective tissue condition resulting from mutation to the fibrillin-1 gene. Some of the affected body systems include the cardiovascular, skeletal, and ocular, which involve mild to severe manifestations such as increased risk of aortic events, tall stature, as well as glaucoma. Aortic dissection, a rupture of the aortic artery, is a significantly prevalent event in the lives of MFS patients, which must be treated due to its high risk of mortality. In this literature review, which was conducted through PubMed and Google Scholar using the keywords Marfan syndrome, aortic dissection, surgery, and beta blocker, various treatment methodologies and preventative measures were evaluated based on effectiveness, such as surgical approaches, drug interventions, as well as lifestyle changes. Surgical intervention can present increased risk for Marfan syndrome patients who already have complicated cardiovascular histories and tendencies. However, the administration of drugs such as Irbesartan and beta blockers have been shown to alleviate systems. The next step within this field of study is to continue with clinical trials and other forms of testing in order to investigate additional procedures and treatment plans to address aortic aneurysm and subsequent dissection, since both the event and corresponding surgery pose substantive risks.

BACKGROUND

- Marfan syndrome, a rare autosomal dominant condition that affects one in 5000 people, results from mutation to the fibrillin-1 gene. There are haploinsufficient (HI) and dominant negative (DN) mutations. HI manifests itself through a weaker aortic wall; these patients are more likely to have cardiovascular complications.
- It is estimated that 90% of Marfan syndrome patients will experience a cardiovascular event at some point in their lives, and 20-25% will at some point develop type A aortic dissection (TAAD).
- Treatment is complicated because thoracic aortic aneurysms that can occur in conjunction with MFS can lead to aortic rupture and dissection, which are major causes of mortality. Procedures come with their own respective risks. The Bentall procedure is used when the aortic valve is not considered reparable. The David procedure, however, is valve-sparing.
- Beta-blockers have negative inotropic and chronotropic properties that slow aortic root growth. Angiotensin receptor blockers, such as Irbesartan, reduce aortic stress. Irbesartan has shown to reduce root dilation in adults and children and it shows potential for reducing negative aortic events. Different antihypertensive agents are used when beta blockers and angiotensin receptor blockers are not well-received by the patient. They are under investigation for safety and efficacy.
- Preventative measures include annual echocardiograms, CT scans, and MRIs to assess the condition of the aorta. Patients should lower heart rate and blood pressure by avoiding strenuous physical activity, decongestants, caffeine, and triptans.

RESULTS



- The most effective drug implementation includes both beta-blockers and angiotensin receptor, as a study shows. Lack of beta-blockers or losartan are associated with a greater likelihood of rupture or dissection.
- Prophylactic surgery should take place when aortic diameter is 50 mm or higher. Surgery can be considered at 45 mm in the case of a patient with relevant family history or accelerated aortic growth (growth of over 3 mm in a single year).
- Preventative measures are encouraged in order to prevent aortic events.

Figure 1. MR image of aorta in long axis with contrast. Image from "Aortic stiffness and diameter predict progressive aortic dilatation in patients with Marfan syndrome."

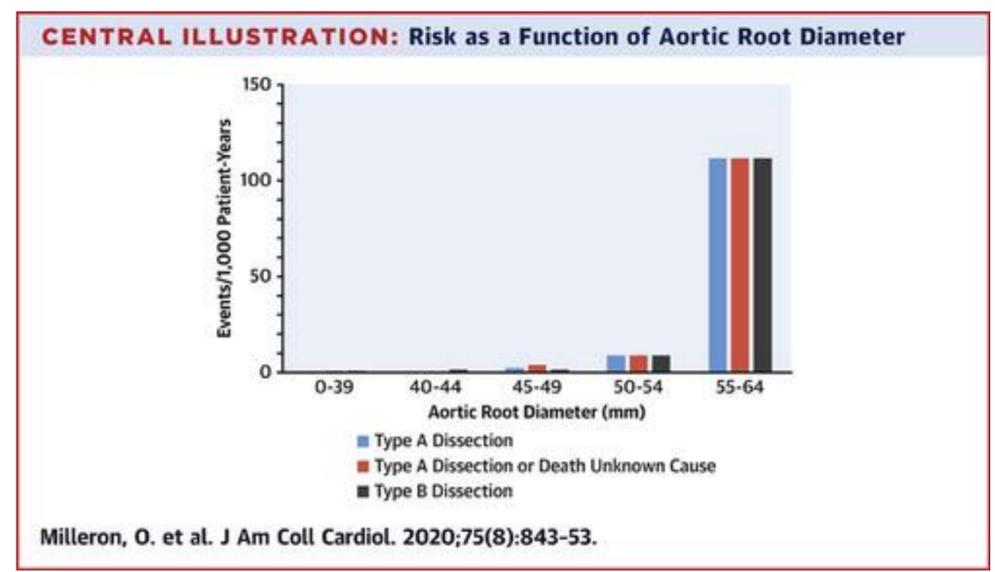


Figure 2. Various aortic root diameters and types of aortic dissection compared to the likelihood of an aortic event occurring. As aortic root diameter increases, the risk of an associated aortic event increases as well, especially once the patient's root measures to a diameter of 55 mm.

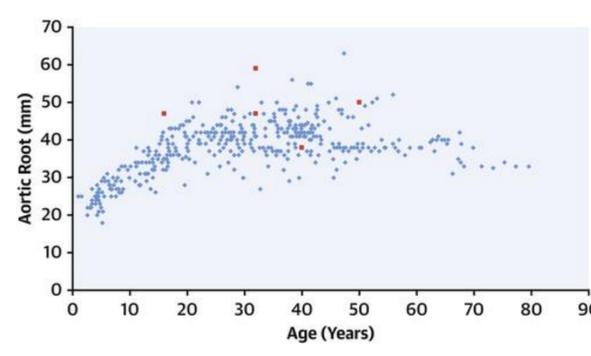


Figure 3. Age as it relates to aortic root length. Age is important to consider, as it introduces potential for other risk factors when it comes to surgery, in conjunction with aortic root diameter. Figure from "Pathogenic FBN1 Genetic Variation and Aortic Dissection in Patients With Marfan Syndrome."

CONCLUSIONS

- The combination of beta-blockers and angiotensin receptor blockers should be used for the most protection against aortic dissection and rupture.
- The rate of aortic root growth must be monitored in order to determine the best time for surgery on a patient-by-patient basis. If the diameter increases by 3 mm per year or greater or relevant family history is present, then surgery can take place at a root diameter of 45 mm. Otherwise, 50 mm is the optimal diameter for surgery.
- Regular and consistent CV monitoring is necessary for MFS health long-term.

FUTURE DIRECTIONS

- Additional clinical trial testing should be conducted in order to better understand how MFS patients specifically respond to such methodologies.
- Specifically, more antihypertensive agents must be further tested for safety and efficacy, due to the fact that these are directed into usage when beta-blockers and angiotensin receptor blockers are not tolerated.
- Age as a variable and contributing factor could be tested and considered. For instance, such testing could reveal at what point an elderly person might best tolerate invasive aortic surgery. Similarly, it would be important to determine whether or not optimal surgical diameter varies by age.

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