Hypertrophic Cardiomyopathy Mechanisms

Hypertrophic cardiomyopathy is a familial disease leading to ventricular hypertrophy. It is a cause of sudden death in young athletes, and is typically asymptomatic until death, though patients are sometimes mildly symptomatic.



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Pathophysiology

2/3 Autosomal-Dominant
(2) Tutu / (3) Tree and Domino
Approximately 60-70% of hypertrophic cardiomyopathy cases are familial, which follows an autosomal dominant inheritance pattern. Furthermore, as this is mostly an autosomal dominant disease, children of a parent with HCM have a 50% chance of inheriting the disease.

1/3 Sporadic Type
(1) Wand / (3) Tree and Sporadic-spear
The majority of cases of hypertrophic cardiomyopathy are familial, displaying autosomal dominant inheritance, but up to ? of cases result from sporadic, de novo mutations in any one of several sarcomere protein genes that influence the cell contractility.

Mutation in Gene for Sarcomere Protein
Mutant Shark-mirror
Hypertrophic cardiomyopathy (HCM) results from a mutation in one of the many sarcomere protein genes.

Cardiac Myosin Binding Protein C
Mayo-sun and Protein-ribbon Cat
The majority of hypertrophic cardiomyopathy cases result from a mutation in cardiac myosin binding protein-C. However, it is important to note that many sarcomere mutations may result in HCM with varying levels of penetrance, heterogeneity, age of onset, and severity. Another causative mutation of note occurs in the ?-myosin heavy chain which occurs on chromosome 14 and results in higher penetrance, earlier age of onset, and more severe disease.

Asymmetric Septal Hypertrophy
Asymmetrical Scepter Hiker-trophy
Along with left ventricular hypertrophy, roughly 2/3 of patients with HCM develop asymmetric septal hypertrophy (towards the left ventricular outflow tract).

Outflow Tract Obstruction
Heart Outflow Obstructed
Left ventricular hypertrophy (common with HCM), along with asymmetric septal hypertrophy leads to left ventricular outflow obstruction. The asymmetric septa bulges towards the left ventricle, causing a large part of this obstruction. This occurs in 25% of patients, but 70% of patients show symptoms of outflow obstruction if provoked under specific conditions.

Diastolic Dysfunction
Dysfunctional Dice Won't Fill Heart
Diastolic dysfunciton occurs due to hypertrophy. The primary abnormality is reduced stroke volume due to impaired diastolic filling, as a result of increased left ventricular stiffness. Paired with increased demand (as a result of outflow obstruction), this increase in diastolic pressure (decreased blood volume), symptoms such as angina and arrhythmias arise.

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