Familial Dilated Cardiomyopathy

Lisa Ku, MS; Jennie Feiger, MS, MA; Matthew Taylor, MD; Luisa Mestroni, MD;
on behalf of the Familial Cardiomyopathy Registry

Cardiomyopathies are diseases of the heart muscle that render the heart unable to properly pump enough blood to the body. In the dilated form of cardiomyopathy (called dilated cardiomyopathy or DCM), the heart is enlarged (Figure 1). As the heart enlarges, it becomes less effective in pumping blood, which then leads to symptoms of heart failure and irregular heart rhythms (arrhythmias). It is estimated that approximately 1 out of every 2500 persons has DCM, although the disease is probably even more common. DCM affects both men and women and can affect both adults and children. As with other types of cardiomyopathies, DCM is a chronic disease without a known cure. However, the treatments currently available can significantly improve its course.

What Are the Clinical Signs of DCM?

DCM is usually detected by signs of heart failure, the common symptoms of which are shortness of breath, swelling of the ankles and legs, and fatigue. Details are given in the Cardiology Patient Page on heart failure by Flavell and Stevenson (Flavell C, Stevenson LW. Take heart with heart failure. *Circulation*. 2001;104:89–91). Age of onset and severity of symptoms can vary in affected individuals. Occasionally, some DCM patients may have signs of muscle weakness or dystrophy. Finally, some individuals with DCM may not have any clinical symptoms or signs, and can only be identified by diagnostic testing.

How Is DCM Diagnosed?

Echocardiography, an ultrasound test that produces images of the heart, is often the best way to identify DCM. An echocardiogram would be able to show enlargement of the left ventricle of the heart and reduced pumping ability in individuals with DCM. Other recommended screening tests are a physical examination and a standard electrocardiogram (ECG). Occasionally, more invasive testing, such as a biopsy of the heart or a coronary angiogram, may be necessary to distinguish DCM from other forms of heart disease.

Treatment for DCM

The treatment of DCM involves management of the patient's heart failure, arrhythmia, and problems with the natural electrical signal that makes the heart beat (conduction defects). The treatment of heart failure is based on administering medications such as angiotensin-converting enzyme (ACE) inhibitors, beta-blocking agents, diuretics, and digoxin. Management of more advanced heart failure may consist of synchronization of contraction of the right and left ventricles by means of a biventricular pacemaker, or heart transplantation. An arrhythmia can be managed with an implantable cardioverter-defibrillator to stop life-threatening rhythm disturbances via an electrical shock. Conduction defects may require a pacemaker to maintain a normal heart rate.

Origin of DCM: Importance of Genetic Factors

There are many possible causes of dilatation and dysfunction of the heart, such as coronary artery disease, infection, and excessive use of alcohol. In cases where the cause of DCM is unknown, the condition is called "idiopathic" dilated cardiomyopathy. About one-third to one-half of patients with idiopathic DCM have a family history of the disease in one or more relatives. These patients are considered to have familial dilated cardiomyopathy. Familial

From the University of Colorado Cardiovascular Institute and Adult Medical Genetics Program, University of Colorado Health Sciences Center, Denver, Colo.

Correspondence to Dr Luisa Mestroni, University of Colorado Cardiovascular Institute, Bioscience Park Center, #150, 12635 E Montview Blvd, Aurora, CO 80010–7116. E-mail Luisa.Mestroni@uchsc.edu

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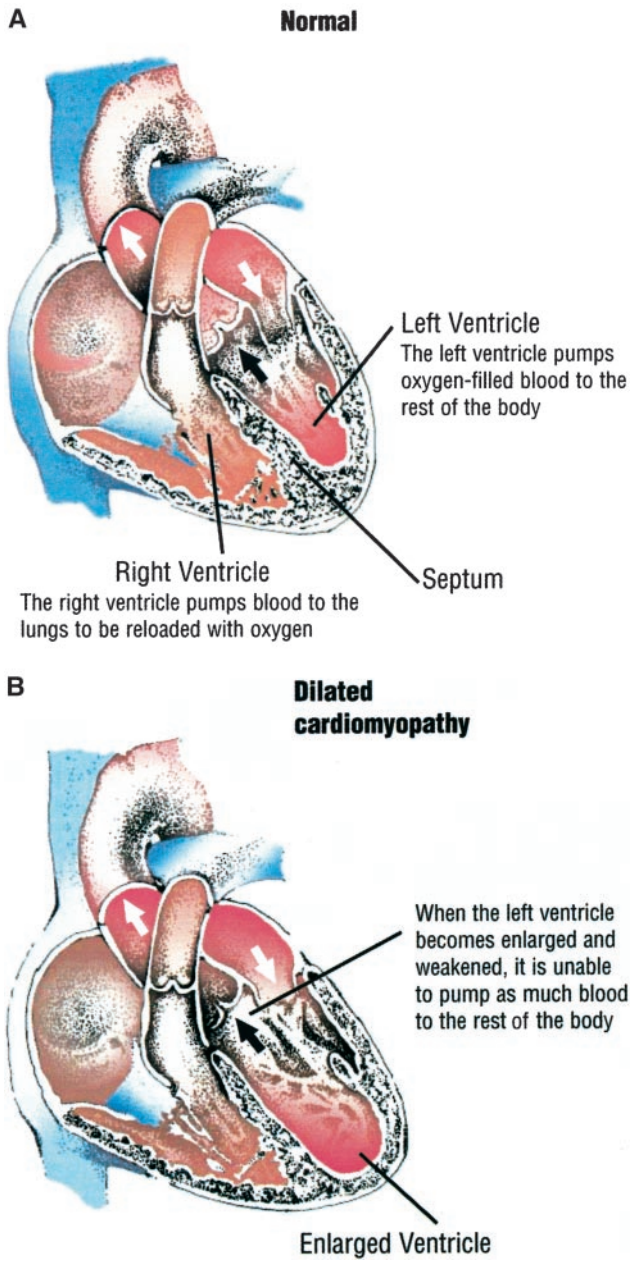

Figure 1. Normal (A) and DCM (B) hearts. DCM occurs as a result of enlargement of the left ventricle. Inefficient pumping of the blood can cause heart failure, and DCM may be complicated by arrhythmia, sudden death, and possibly the need for a heart transplant.

DCM is caused by defective genes that affect the function of the heart muscle. Several familial DCM genes are currently known, whereas others are still under investigation.

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Many individuals with DCM do not even consider that they may have an inherited form of the condition until they begin to analyze their family history. Familial DCM is clinically and diagnostically the same as other forms of DCM, so careful attention to family history is essential. It is important to recognize that if a person with DCM has just one affected relative, this could suggest a diagnosis of familial DCM.

Criteria for Familial DCM

One individual diagnosed with idiopathic DCM in a family, with at least:

one relative also diagnosed with idiopathic DCM

-or-

one first-degree relative with an unexplained sudden death under the age of 35 years.[1]

Occasionally, familial DCM is not limited to problems with the pumping function of the heart. Additional complications may also be present, such as conduction defects that cause low heart rate and loss of consciousness, arrhythmia that causes irregular heartbeats and potentially sudden unexpected death, or conditions involving other muscles in the body that cause muscle weakness. It is important to consider these other features of familial DCM when evaluating your family history.

What Is Being Done to Identify Family Members at Risk?

If a person is suspected to have a familial DCM, his/her relatives could be at risk for DCM. A detailed family tree (called a pedigree) provides important clues about whether familial DCM is present in a family. Among affected relatives, symptoms can be quite variable. For example, age of onset of symptoms can be anywhere from infancy to the 70s, even within the same family. Your physician or a genetic counselor can help construct your pedigree and analyze it for inheritance patterns. Most of the time, familial DCM follows an autosomal dominant inheritance pattern, although other patterns, such as recessive and sex-linked, have been reported as well. In autosomal dominant inheritance, men and women are equally affected, and first-degree relatives (parents, siblings, and children) of a patient with

DCM have a 50% chance of inheriting familial DCM. Often, several generations are affected (Figure 2).

Important Clues in Your Family History

Ask your relatives about these symptoms to help determine if there is an inherited form of DCM in your family.

- History of DCM
- History of heart failure and its symptoms:
  - Shortness of breath
  - Fluid retention/swelling of ankles and legs
  - Fatigue/tiredness
- Unexplained sudden death/cardiac arrest (some people will mistakenly call sudden death a heart attack, which is caused by coronary artery disease, when it might really be caused by DCM)
- Muscle problems (cramps, stiffness, history of muscular dystrophy)
- Heart rhythm or conduction problems, including those that require implantation of a defibrillator or pacemaker
- Palpitations (fluttering or awareness of heartbeat)
- Syncope (loss of consciousness)
- Young age of onset in any of the above

Family members, especially first-degree relatives, might benefit from screening for DCM. Screening tests are the same as those for diagnosing DCM (physical examination, ECG, echocardiogram). Family screening frequently detects relatives with asymptomatic mild heart disease. In these cases, early diagnosis and treatment to prevent or delay the progression of heart failure (with ACE inhibitors and/or beta-blocking agents) and arrhythmia may be indicated. In the beginning stages of this disease, early diagnosis and treatment can potentially save lives and preserve quality of life.

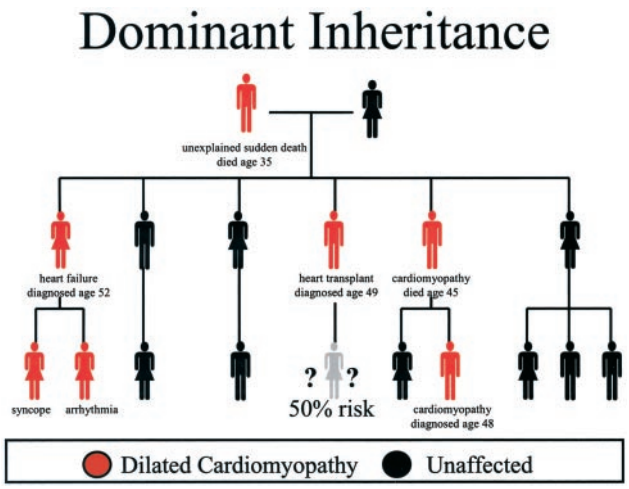

Figure 2. Example of a family history with autosomal dominant transmission, the most common mode of inheritance for familial DCM. Both men and women are affected, and multiple generations are involved. Detailed evaluations, including echocardiograms, of relatives at risk can help determine affected or unaffected status. The woman indicated in gray in the third generation has not been evaluated yet. As she has an affected parent, she has a 50% risk of inheriting the condition (and equally a 50% risk of not inheriting the condition).

If the screening results are normal, it does not necessarily mean that the family members are free of DCM, particularly if these relatives are young. It is often worthwhile for relatives to be screened every 2 to 3 years. Talk to your doctor about appropriate recommendations for you and your family.

Genetic testing may also be an option to identify family members at risk. More than 10 genes have been identified in familial DCM. Currently, genetic tests are available for a small subset of these genes. Research is ongoing to identify more genes and to develop genetic tests. If a gene mutation is identified in a person who has familial DCM, then his/her relatives could undergo genetic testing to determine if they are predisposed to DCM.

Genetic Counseling for Familial DCM

Genetic counselors are health professionals who can help provide risk information about familial DCM to patients and their families. They can explain the role of heredity in developing DCM. They can analyze your family history, select appropriate genetic tests, and interpret genetic test results. They can also help you manage the challenges of having or being at risk for a genetic disorder. To find a genetic counselor near you, contact the National Society of Genetic Counselors at (610) 872-1192.

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Additional Resources

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American Heart Association. Circulation journal: cardiology patient page. Available at http://www.circ.ahajournals.org/collected/patient.shtml. Accessed September 29, 2003.

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