

Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT)

What is CPVT?

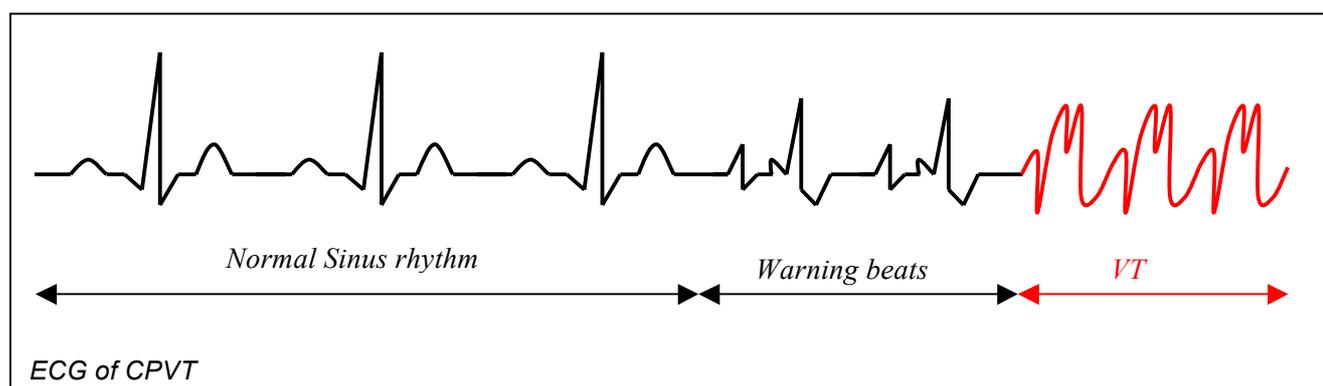
CPVT is a rare condition that affects the heart rhythm of fit and healthy people. It causes the heart to beat fast (ventricular tachycardia) usually during periods of high emotion or exercise (eg. Swimming). This can result in symptoms of fainting, dizziness and in some cases cardiac arrest and sudden death. It usually presents in children and teenagers.

CPVT can be difficult to diagnose, as usually tests taken at rest are normal (electrocardiogram (ECG) and ultrasound of the heart Echocardiogram). CPVT is diagnosed by an exercise test or a 24-hour Holter monitor.

What causes CPVT?

When the heart is under stress, eg. During exercise or emotional stimulation, the body releases adrenaline and noradrenaline (known as catecholamines), which cause the heart to beat faster and increase blood pressure. This response allows blood and oxygen to get to the required areas faster. People with CPVT have an abnormal response to adrenaline, such that it causes the heartbeat to become fast and irregular (ventricular tachycardia: VT). If this abnormal rhythm lasts for longer than a few seconds then not enough blood reaches the brain and can lead to fainting, collapse and sudden death.

Research has shown that in up to 50% of cases, CPVT is an inherited condition.

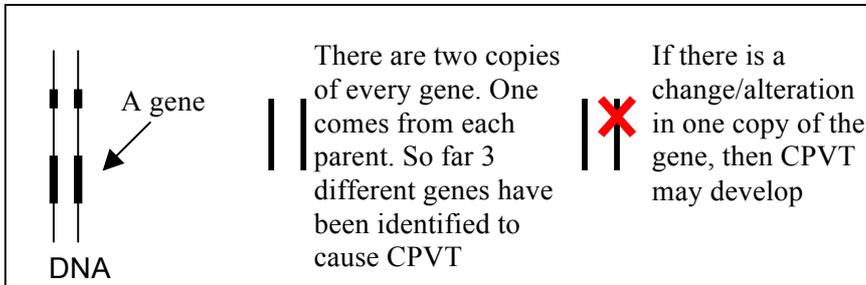


CPVT and Genetics

Our body is made up of millions of cells. There are many different types of cells, including brain cells, liver cells and heart cells to name a few. Each cell contains 46 chromosomes, which hold the genetic material that decides features such as the colour of our eyes and whether we are tall or short. These 46 chromosomes are grouped into 23 pairs, one of each pair coming from mum and the other from

dad. One of these pairs is known as the sex chromosomes, and these decide whether we are male or female.

If you imagine a chromosome as being like a ball of wool, you could stretch it out into one long strand, which is known as the DNA. Along the length of DNA there are regions called genes. As there are two copies of every chromosome, there are also two copies of every gene (as mentioned, one from each parent). Genes act as recipes to make certain things in the body, and each recipe is unique based on the order of units it is made up of. If there is a mistake in one of these genes (a mix-up in the order of these units) it may lead to the development of disease. This mistake is known as a gene alteration.

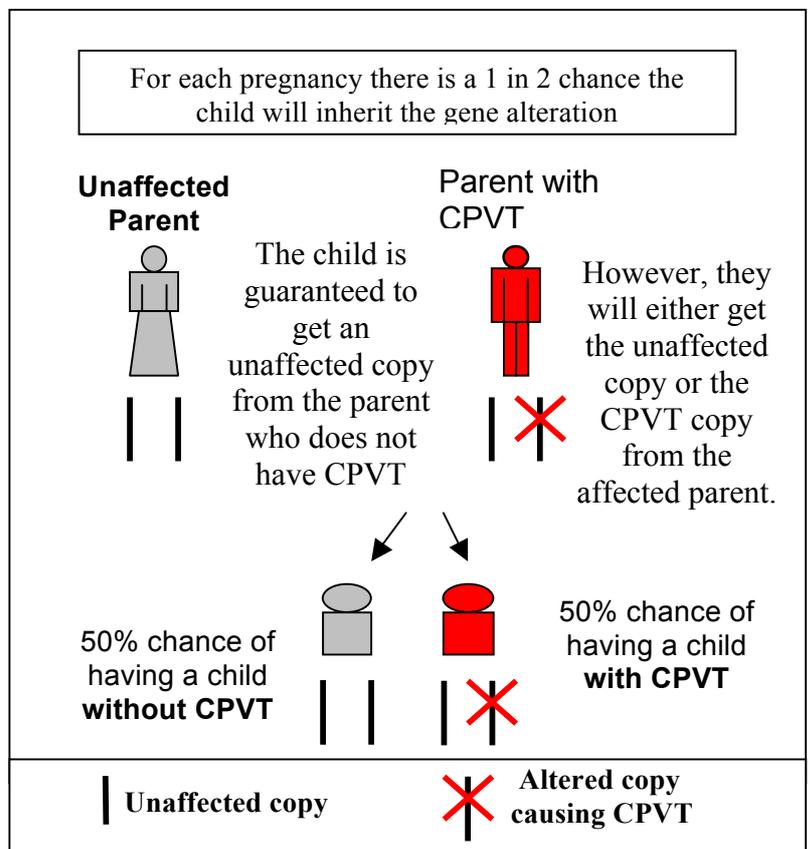


In the case of CPVT we know of alterations in 3 genes that can cause the condition. If there is an alteration in one of these genes CPVT may result.

How is CPVT inherited?

CPVT is known as an autosomal dominant condition, whereby the gene with the alteration “dominates” over the unaffected gene, causing the condition. This means that an affected person has inherited one altered CPVT copy of the gene from one parent, and one unaffected copy from the other parent. Likewise, if a person who carries this CPVT copy of the gene has a child, then **the chance that the child will be affected is 50%, or 1 in 2**. This is because they are guaranteed to get an unaffected copy of the gene from the unaffected parent, and they can either get an altered (CPVT) copy or an unaffected copy from the parent with the condition. This is illustrated in the diagram.

In rare instances, a person may have a gene alteration that has not been inherited from their parents. Instead, the alteration has arisen some time after conception. This means that their brothers and sisters are not likely to develop the condition, however, the gene alteration can still be passed down to any children of the affected person.



What is genetic testing?

Genetic testing involves looking for a mistake in the genes known to cause CPVT. It is a long and difficult task that has been likened to looking for a single spelling mistake in an encyclopaedia set. This is because most families have their own unique gene alteration that may exist in one of the genes we have already identified, or even in a gene not yet discovered to be involved in this condition. A genetic

result may take more than 6 months. In an individual with CPVT syndrome, when they look for the gene alteration in the 3 most common CPVT genes, they find the gene alteration that causes this condition in about 70% of families.

If genetic testing does not reveal a gene alteration then we call it an inconclusive test result. This means that a gene alteration most likely exists, but either our current technology is not yet good enough to detect the alteration, or the alteration is in a gene which has not yet been identified.

Once the gene alteration is identified in the affected person we can then offer a gene test to other family members. This test takes 4-6 weeks for a result, and will quickly determine if the individual has inherited the CPVT copy or the unaffected copy of the gene. This is called preclinical genetic testing, and allows a person to know if they are likely to develop the condition even before symptoms are present. If they do not carry the gene alteration then we can say that they will not develop CPVT, and future tests are not necessary. If they are shown to have the CPVT gene alteration then there is a good chance they will develop the condition, and close follow-up would be recommended.

Genetic testing of the known HCM genes has recently become a commercial test. This means that there is a cost involved for the patient and testing needs to be organised on their behalf by a doctor. If you would like to know more about centres offering commercial genetic testing, please look at our Information Sheet on Cardiac Genetic Services or contact the Registry Coordinator on registry@centenary.org.au or (02) 9565 6185 or speak to your regular cardiologist or doctor.

Genetic testing can affect applications for life insurance. If you would like to more please visit the Financial Services Council website at www.fsc.org.au for current guidelines (go to the Search bar and type in "Genetic") or call (02) 9299 3022.

Will a diagnosis of CPVT change my lifestyle?

There are key recommendations we advise people about when they are diagnosed with CPVT. These guidelines help to reduce the risk of the most devastating outcome – sudden cardiac death.

- **Avoid competitive sports and strenuous physical activity:** Competitive sports include those that require significant exertion, for example: Touch football, Basketball, Netball, Squash, running and even social games that you may not think are too strenuous. We recommend people avoid competitive sports because it has been observed that a large proportion of the young people who die suddenly due to CPVT, die during or just after exercise.
- **Regular light exercise:** Although there is a lot of emphasis on avoiding sport, it is still important to maintain a healthy lifestyle. Regular light exercise such as walking is not only good for your heart, but also good for your general health.
- **Regular check-ups with your cardiologist:** It is important to monitor the progression of your condition, and you should also report any new symptoms. This is because we use many different factors to determine whether you are at an increased risk of sudden death. Your risk of sudden death determines what mode of treatment will most benefit you.
- **Surgical procedures:** You should inform the attending doctor of your condition before any surgical or dental procedures.
- **Consult with your GP or cardiologist before taking any new medications:** It is important to talk to your doctor before taking any new medications, including over-the-counter (OTC) medications, complementary medicines, natural products and herbal remedies.

- **Encourage relatives to be screened:** As mentioned, siblings and children of an affected person have a 1 in 2 (50%) chance of being affected. Screening of relatives involves them seeing a cardiologist where they will have a physical examination, an ECG and an Echocardiogram (ultrasound of the heart). The relative must inform the doctor that there is a family history of hypertrophic cardiomyopathy to ensure no signs are missed. Find a specialist cardiac genetic service, like the Genetic Heart Disease Clinics held at the Sydney Heart Centre at RPAH (tel 02 9517 2011). See our Information Sheet on Cardiac Genetic Services to find your local service or speak to your regular cardiologist about organising screening for family members.

Further information:

If you have any further questions, please contact:

Your local GP or cardiologist

Your local Genetic Cardiac Service (see our Information Sheet on Genetic Cardiac Services)

Australian Genetic Heart Disease Registry

www.heartregistry.org.au

Tel: 02 9565 6185 or registry@centenary.org.au

Visit the Registry website today to find out how to enrol. Your participation can help save and improve lives by improving our knowledge of genetic heart conditions in Australia.