leukaemia & blood cancer NEW ZEALAND

Vision to Cure. Mission to Care.

MYELOPROLIFERATIVE NEOPLASMS – POLYCYTHAEMIA VERA (PV)

A fact sheet for patients, families and whānau

WHAT IS A MYELOPROLIFERATIVE NEOPLASM (MPN)?

MPNs are a group of diseases in which the bone marrow makes too many cells (either red blood cells, white blood cells or platelets). MPNs are a type of blood cancer. There are four main types of chronic myeloproliferative (my-low-pro-lif-er-a-tiv) neoplasms:

- Essential thrombocythaemia (ET)
- Polycythaemia vera (PV)
- Primary myelofibrosis (MF)
- Chronic myeloid leukaemia (CML)

Less common types of MPNs include:

- Chronic eosinophilic leukaemia (CEL)
- Chronic neutrophilic leukaemia (CNL)

Your blood

Blood is made up of blood cells and plasma. Plasma is a light-yellow coloured liquid in which blood cells travel around your body.

You have three main types of blood cells, which are red blood cells, platelets and white blood cells. These blood cells are created in your bone marrow and are then released into your bloodstream so they can be used.

Bone marrow is the spongy material inside your bones (see Figure 01). In your bone marrow there are cells called blood stem cells. Blood stem cells create the new blood cells in your body.

Red blood cells transport oxygen from the lungs to all the cells in the body. There is a protein called haemoglobin (heem-a-glow-bin) in each red blood cell that carries the oxygen throughout the body and gives it the red colour. A low level of haemoglobin in your body is called anaemia (a-nee-me-a).

White blood cells fight infections. If your white blood cell count is low, you are more at risk of getting an infection. There are five different types of white blood cells that work slightly differently to protect the body against infection. Neutrophils (new-tra-fils) are the most common type of white blood cell and are the first-line defence against bacteria entering your body. A low amount of neutrophils in your body is called neutropenia (new-tra-pee-nee-a).

Platelets help your blood to clot and prevent or stop bleeding. For example, if you get a cut, the platelets go to where the injury is, stick together and stop the bleeding (see Figure 02 for the different cells in your blood).

Figure 01
Bone marrow

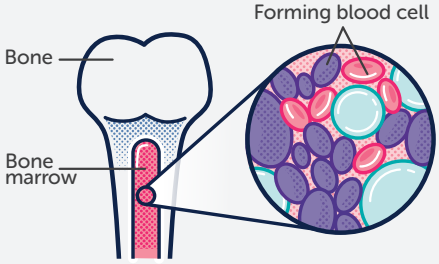
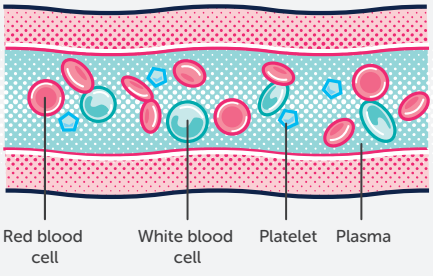


Figure 02



What is polycythaemia vera (PV)?

PV is a rare disease where there are too many red blood cells made in the bone marrow. For many people with PV there is also an increase of white blood cells and platelets. Having too many blood cells can cause complications like bleeding or blood clots.

PV is a rare chronic disease with approximately 30 people diagnosed in New Zealand each year. Although it can be diagnosed at any age, the average age for diagnosis is 60 years old. PV is more common in men than women.

What causes PV?

The cause of PV is not fully understood but it is believed that mutations of particular genes lead to the increased production of red blood cells in the bone marrow. In 90-95% of people with PV, the bone marrow has acquired a mutation in the JAK2 gene. JAK proteins send signals that affect the production of blood cells in the bone marrow. When they are working properly they carefully monitor the number of blood cells that are being made.

The mutation in the JAK2 gene leads to loss of the control in the bone marrow and a signal is now always 'turned on' regardless of signals from your body to tell it to stop. The end result of the signal being 'turned on' can mean too many red blood cells are being made and often white blood cells and platelets can also be increased.

The cause of JAK2 mutation is not known, but can occur over a person's lifetime. Therefore, it is not contagious and generally not inherited. In rare cases, PV has been found to run in families, which increases the risk of developing PV over time.

What are the symptoms of PV?

PV develops slowly and may not cause symptoms for many years. It is often picked up in a routine blood test.

Symptoms may include:

- Headache
- Weakness or dizziness
- Fatigue
- Red or itchy skin
- Changes in vision
- Excessive sweating
- Shortness of breath
- Excessive bleeding or bruising
- Weight loss
- Feeling bloated or abdominal pain due to enlarged spleen

Complications of PV

The most important complication to avoid is the development of thrombosis (blood clots). This is because the survival rate from PV is generally good (similar to people without the disease) for the first 10-15 years unless there is a complication from thrombosis.

Thrombosis (blood clots) may be a complication of PV due to the greater number of red blood cells and platelets. Blood clots can cause a stroke, heart attack or pulmonary embolism (blockage in the lungs).

Because the symptoms of PV are very non-specific, approximately one in four people are diagnosed with PV at time of presentation to hospital with a thrombotic event.

An enlarged spleen might also be a complication of PV (36% or one-third). The spleen is an organ on the left side of the abdomen near the stomach and rib cage. The spleen's job is to filter the blood, store blood cells and destroy old blood cells. The spleen can become enlarged when it is working harder to manage the amount of blood cells.

Having an enlarged spleen might cause symptoms like:

- Weight loss
- Indigestion or bloating
- Loss of appetite
- Generalised itching

There is a small risk that PV can transform to primary myelofibrosis (my-low-fibe-row-sis) or acute myeloid leukaemia.

Primary myelofibrosis (PMF or MF) is when the bone marrow is scarred, also known as fibrosis. Therefore, rather than making too many blood cells it stops making enough and often people with MF need regular blood transfusions. Bone marrow is like a factory, the consequence of having a factory fully cranked up for many years is that it is more likely to fail prematurely. The chance of this happening is >1% per year.

Acute myeloid leukaemia could develop from PV, which is an aggressive bone marrow cancer. Rather than making useful cells (red blood cells, white blood cells or platelets), the bone marrow starts to make cells that serve no function. These cells can quickly take over the bone marrow and crowd out the normal cells. The chance of developing acute myeloid leukaemia is 0.5 - 1% per year.

How is PV diagnosed?

For many people, PV is diagnosed after a routine blood test that shows high numbers of red blood cells. Sometimes there are also high numbers of white blood cells and platelets. Further tests might be done to find out why those blood levels are high and to rule out other blood conditions.

Common tests for diagnosing PV are:

- Bone marrow biopsy to see what's happening in the bone marrow and blood production
- Blood tests including genetic tests to check for a JAK2 gene mutation
- Erythropoietin level in the blood (signal for red cell production)

Bone marrow biopsy is a test where the doctor takes a sample of your bone marrow to be examined under a microscope. The sample is usually taken from the back of your hip bone (iliac crest).

The doctor might give you a drug to make you relaxed and sleepy. You might also have some pain relief.

To do a bone marrow biopsy the doctor puts a long needle through the numbed skin into the bone, where they draw out some of the liquid bone marrow.

We recommend you take someone with you for this procedure for support and also to drive you home as you might feel drowsy from the drugs.

How is PV managed?

To date there is no cure to remove the JAK2 mutation from the bone marrow cells. Since the prognosis of PV is generally excellent, the main focus is to manage symptoms and prevent the risk of developing a thrombosis (blood clot).

This is mainly done by two general approaches to reduce the thickness (haemocrit) of the blood.

Venesection

Venesection or phlebotomy (fle-bot-o-mee) can be used to manage PV by taking out some of the blood in your veins to reduce the number of blood cells. This is often the first treatment option as there aren't many risks or side effects to this treatment. It is a lot like donating blood but the aim is to bring your red blood cell count closer to normal.

You may need regular venesections every few weeks or months until you reach an acceptable blood thickness level. Iron is also removed with the blood cells, which is required to make more red blood cells. Once the iron is removed the production of red blood cells slows down, so less venesections would be required in the future.

Venesection is very effective in controlling red blood cells but isn't as effective in controlling platelets and white blood cells. The most common side effects from venesection are headaches and dizziness.

Drugs

The most common drugs used in PV are:

- Hydroxyurea
- Aspirin

Hydroxyurea (Hydrea)

Hydroxyurea is classed as a chemotherapy drug because it causes cell death. It works by suppressing the function of your bone marrow and controlling blood cell production. It interferes with the DNA of blood cells so instead of growing and maturing normally, they die.

Common side effects of hydroxyurea include symptoms of low blood counts like increased risk of infection, anaemia and bruising/bleeding.

Other common side effects include:

- Fatigue and extreme tiredness
- Diarrhoea or constipation
- Gout (pain and inflammation in joints)

Less common side effects that affect less than 1% of people include:

- Nausea, vomiting, loss of appetite
- Itchy skin, ulcers, skin rashes
- Changes in kidney function
- Headache, dizziness or hallucinations
- Fever or chills

Aspirin

Aspirin is used to reduce the risk of blood clots and manage any clots that have already formed by making them less 'sticky'. It is part of a group of drugs called non-steroidal anti-inflammatory drugs (NSAID). This means that it reduces inflammation but isn't a steroid.

Common side effects include stomach discomfort or indigestion, bruising and bleeding.

Currently all the treatment for PV is focused on preventing thrombosis complications. There is no proven way to reduce the risk of developing myelofibrosis (MF) or acute myeloid leukaemia.

The only cure for PV is by having an allogenic stem cell transplant (bone marrow/stem cells donated from someone else). Unfortunately, this is a very high-risk procedure and is only suitable for younger patients (under the age of 65) who also have good general health.

Clinical trials

Clinical trials are research studies that help determine whether a new treatment is safe, effective and works better than the current treatment. Ask your haematologist if there are any clinical trials that you are eligible to be on. The benefits of participating in a clinical trial are that you have access to the latest treatments or developments to current treatments. There may also be some risks involved, which depend on the type of clinical trial and your own health.

PV and pregnancy

In general, pregnancy increases a woman's risk of blood clots so if you have PV as well then there is a greater risk. Many drugs used to treat PV should be avoided if pregnant due to the risk on the developing foetus. You should discuss the options with your haematologist if you are planning on getting pregnant in the future, and what the safest and most effective treatments are.

Future treatments

There is ongoing research into developing a cure for PV and more effective ways to manage different MPNs. For the latest information on specific drugs it is best to ask your haematologist. Drugs that are publicly funded in New Zealand may be different to other countries.

Looking after your health

It is important to try and have a balanced lifestyle with a focus on quality sleep, good nutrition, adequate hydration and regular exercise. Drinking plenty of water each day is very important. It is also good to reduce stress in your life as much as possible.

A history of smoking or high blood pressure can increase your risk of thrombosis even more. Your doctor may advise you on ways to stop smoking and/or maintain a healthy weight and blood pressure.

It can be hard to know how to make these changes so please ask your health care team or LBC Support Services Coordinator for more information. They may be able to refer you to other helpful organisations that can also support you.

Important information available online

For more information and to download other fact sheets, see our website **www.leukaemia.org.nz**