

Multiple myeloma

Definition

By Mayo Clinic Staff

Multiple myeloma is a cancer that forms in a type of white blood cell called a plasma cell. Plasma cells help you fight infections by making antibodies that recognize and attack germs.

Multiple myeloma causes cancer cells to accumulate in the bone marrow, where they crowd out healthy blood cells. Rather than produce helpful antibodies, the cancer cells produce abnormal proteins that can cause kidney problems.

Treatment for multiple myeloma isn't always necessary. If you're not experiencing signs and symptoms, you may not require treatment. If signs and symptoms develop, a number of treatments can help control your multiple myeloma.

Symptoms

Signs and symptoms of multiple myeloma can vary and, early in the disease, there may be none.

When signs and symptoms do occur, they can include:

- Bone pain, especially in your spine or chest
- Nausea
- Constipation
- Loss of appetite
- Mental fogginess or confusion
- Fatigue
- Frequent infections
- Weight loss
- Weakness or numbness in your legs
- Excessive thirst

Causes

It's not clear what causes myeloma.

Doctors know that myeloma begins with one abnormal plasma cell in your bone marrow - the soft, blood-producing tissue that fills in the center of most of your bones. The abnormal cell multiplies rapidly.

Because cancer cells don't mature and then die as normal cells do, they accumulate, eventually overwhelming the production of healthy cells. In the bone marrow, myeloma cells crowd out healthy white blood cells and red blood cells, leading to fatigue and an inability to fight infections.

The myeloma cells continue trying to produce antibodies, as healthy plasma cells do, but the myeloma cells produce abnormal antibodies that the body can't use. Instead, the abnormal antibodies (monoclonal proteins, or M proteins) build up in the body and cause problems, such as damage to the kidneys.

A connection with MGUS

Multiple myeloma almost always starts out as a relatively benign condition called monoclonal gammopathy of undetermined significance (MGUS).

In the United States, about 3 percent of people older than age 50 have MGUS. Each year, about 1 percent of people with MGUS develop multiple myeloma or a related cancer.

MGUS, like multiple myeloma, is marked by the presence of M proteins - produced by abnormal plasma cells - in your blood. However, in MGUS, the levels of M proteins are lower and no damage to the body occurs.

Risk factors

Factors that may increase your risk of multiple myeloma include:

- **Increasing age.** Your risk of multiple myeloma increases as you age, with most people diagnosed in their mid-60s.
- **Male sex.** Men are more likely to develop the disease than are women.
- **Black race.** Blacks are about twice as likely to develop multiple myeloma as are whites.
- **History of a monoclonal gammopathy of undetermined significance (MGUS).** Every year 1 percent of the people with MGUS in the United States develop multiple myeloma.

Complications

Complications of multiple myeloma include:

- **Frequent infections.** Myeloma cells inhibit your body's ability to fight infections.
- **Bone problems.** Multiple myeloma also can affect your bones, leading to bone pain, thinning bones and broken bones.
- **Reduced kidney function.** Multiple myeloma may cause problems with kidney function, including kidney failure. Higher calcium levels in the blood related to eroding bones can interfere with your kidneys' ability to filter your blood's waste. The proteins produced by the myeloma cells can cause similar problems.
- **Low red blood cell count (anemia).** As myeloma cells crowd out normal blood cells, multiple myeloma can also cause anemia and other blood problems.

Tests

Tests and procedures used to diagnose multiple myeloma include:

- **Blood tests.** Laboratory analysis of your blood may reveal the M proteins produced by myeloma cells. Another abnormal protein produced by myeloma cells - called beta-2-microglobulin - may be detected in your blood and give your doctor clues about the aggressiveness of your myeloma.

Additionally, blood tests to examine your kidney function, blood cell counts, calcium levels and uric acid levels can give your doctor clues about your diagnosis.

- **Urine tests.** Analysis of your urine may show M proteins, which are referred to as Bence Jones proteins when they're detected in urine.
- **Examination of your bone marrow.** Your doctor may remove a sample of bone marrow for laboratory testing. The sample is collected with a long needle inserted into a bone (bone marrow aspiration and biopsy).

In the lab, the sample is examined for myeloma cells. Specialized tests, such as fluorescence in situ hybridization (FISH) can analyze myeloma cells to understand their chromosome abnormalities. Tests are also done to measure the rate at which the myeloma cells are dividing.

- **Imaging tests.** Imaging tests may be recommended to detect bone problems associated with multiple myeloma. Tests may include X-ray, MRI, CT or positron emission tomography (PET).

Treatments for myeloma

Though there's no cure for multiple myeloma, with good treatment results you can usually return to near-normal activity.

Standard treatment options include:

- **Targeted therapy.** Targeted drug treatment focuses on specific abnormalities within cancer cells that allow them to survive. Bortezomib (Velcade) and carfilzomib (Kyprolis) are targeted drugs that block the action of a substance in myeloma cells that breaks down proteins. This action causes myeloma cells to die. Both medications are administered through a vein in your arm.
- **Biological therapy.** Biological therapy drugs use your body's immune system to fight myeloma cells. The drugs thalidomide (Thalomid), lenalidomide (Revlimid) and pomalidomide (Pomalyst) enhance the immune system cells that identify and attack cancer cells. These medications are taken in pill form.
- **Chemotherapy.** Chemotherapy drugs kill fast-growing cells, including myeloma cells. Chemotherapy drugs can be given through a vein in your arm or taken in pill form. High doses of chemotherapy drugs are used before a stem cell transplant.
- **Corticosteroids.** Corticosteroids, such as prednisone and dexamethasone, regulate the immune system to control inflammation in the body. They also are active against myeloma cells. Corticosteroids can be taken in pill form or administered through a vein in your arm.
- **Stem cell transplantation.** A stem cell transplant is a procedure to replace your diseased bone marrow with healthy bone marrow.

Before a stem cell transplant, blood-forming stem cells are collected from your blood. You then receive high doses of chemotherapy to destroy your diseased bone marrow. Then your stem cells are infused into your body, where they travel to your bones and begin rebuilding your bone marrow.

- **Radiation therapy.** This treatment uses beams of energy, such as X-rays, to damage myeloma cells and stop their growth. Radiation therapy may be used to quickly shrink myeloma cells in a specific area - for instance, when a collection of abnormal plasma cells form a tumor (plasmacytoma) that's causing pain or destroying a bone.

How treatments are used

Which combination of treatments to receive will depend on consideration of a good candidate for stem cell transplant. This depends on the risk of disease progressing, age and overall health.

- **If you're considered a candidate for stem cell transplant,** your initial therapy will likely include a combination of treatments, such as targeted therapy, biological therapy, corticosteroids and, sometimes, chemotherapy.

Your stem cells will likely be collected after you've undergone a few months of treatment. You may undergo the stem cell transplant soon after your cells are collected or the transplant may be delayed until after a relapse, if it occurs. In some cases, doctors recommend two stem cell transplants for people with multiple myeloma.

After your stem cell transplant, you'll likely receive targeted therapy or biological therapy as a maintenance treatment to prevent a recurrence of myeloma.

- **If you're not considered a candidate for stem cell transplant,** your initial therapy will likely include chemotherapy combined with corticosteroids, targeted therapy or biological therapy.

In select cases, doctors use a reduced-intensity stem cell transplant in older people who are in very good health but can't tolerate the strong chemotherapy doses used in a traditional stem cell transplant. A reduced-intensity or "mini" stem cell transplant uses lower doses of chemotherapy.

- **If your myeloma recurs or doesn't respond to treatment,** your doctor may recommend repeating another course of the treatment that initially helped you. Another option is trying one or more of the other treatments typically used as first line therapy, either alone or in combination.

Research on a number of new treatment options is ongoing, and you may be eligible for a clinical trial in order to gain access to those experimental treatments. Talk to your doctor about what clinical trials may be available to you.

Treating complications

Because multiple myeloma can cause a number of complications, you may also need treatment for those specific conditions. For example:

- **Bone pain.** Pain medications, radiation therapy and surgery may help control bone pain.
- **Kidney complications.** People with severe kidney damage may need dialysis.
- **Infections.** Your doctor may recommend certain vaccines to prevent infections, such as the flu and pneumonia.
- **Bone loss.** Your doctor may recommend medications called bisphosphonates, such as pamidronate (Aredia) or zoledronic acid (Zometa), to help prevent bone loss.
- **Anemia.** If you have persistent anemia, your doctor may recommend medications to increase your red blood cell count.