About Multiple Myeloma

Overview

If you have been diagnosed with multiple myeloma or are worried about it, you likely have a lot of questions. Learning some basics is a good place to start.

- What Is Multiple Myeloma?

Research and Statistics

See the latest estimates for new cases of multiple myeloma and deaths in the US and what research is currently being done.

- Key Statistics for Multiple Myeloma
- What’s New in Multiple Myeloma Research and Treatment?

What Is Multiple Myeloma?

Cancer starts when cells in the body begin to grow out of control. Cells in nearly any part of the body can become cancer, and can spread to other areas of the body. To learn more about how cancers start and spread, see What Is Cancer?

Multiple myeloma is a cancer formed by malignant plasma cells. Normal plasma cells are found in the bone marrow and are an important part of the immune system.

The immune system is made up of several types of cells that work together to fight infections and other diseases. Lymphocytes (lymph cells) are the main cell type of the immune system. The major types of lymphocytes are T cells and B cells.

When B cells respond to an infection, they mature and change into plasma cells. Plasma cells make the antibodies (also called immunoglobulins) that help the body
attack and kill germs. Lymphocytes are in many areas of the body, such as lymph nodes, the bone marrow, the intestines, and the bloodstream. Plasma cells, however, are mainly found in the bone marrow. Bone marrow is the soft tissue inside some hollow bones. In addition to plasma cells, normal bone marrow has cells that make the different normal blood cells.

When plasma cells become cancerous and grow out of control, they can produce a tumor called a \textit{plasmacytoma}. These tumors generally develop in a bone, but they are also rarely found in other tissues. If someone has only a single plasma cell tumor, the disease is called an \textit{isolated} (or \textit{solitary}) \textit{plasmacytoma}. If someone has more than one plasmacytoma, they have \textit{multiple myeloma}.

Multiple myeloma is characterized by several features, including:

**Low blood counts**

In multiple myeloma, the overgrowth of plasma cells in the bone marrow can crowd out normal blood-forming cells, leading to low blood counts. This can cause anemia — a shortage of red blood cells. People with anemia become pale, weak, and fatigued. Multiple myeloma can also cause the level of platelets in the blood to become low (called \textit{thrombocytopenia}). This can lead to increased bleeding and bruising. Another condition that can develop is \textit{leukopenia} — a shortage of normal white blood cells. This can lead to problems fighting infections.

**Bone and calcium problems**

Myeloma cells also interfere with cells that help keep the bones strong. Bones are constantly being remade to keep them strong. Two major kinds of bone cells normally work together to keep bones healthy and strong. The cells that lay down new bone are called \textit{osteoblasts}. The cells that break down old bone are called \textit{osteoclasts}. Myeloma cells make a substance that tells the osteoclasts to speed up dissolving the bone. Since the osteoblasts do not get a signal to put down new bone, old bone is broken down without new bone to replace it. This makes the bones weak and they break easily. Fractured bones are a major problem in people with myeloma. This increase in bone break-down can also raise calcium levels in the blood. (Problems caused by high calcium levels are discussed in \textit{How Is Multiple Myeloma Diagnosed}?)

**Infections**
Abnormal plasma cells do not protect the body from infections. As mentioned before, normal plasma cells produce antibodies that attack germs. For example, if you developed pneumonia, normal plasma cells would produce antibodies aimed at the specific bacteria that were causing the illness. These antibodies help the body attack and kill the bacteria. In multiple myeloma, the myeloma cells crowd out the normal plasma cells, so that antibodies to fight the infection can’t be made. The antibody made by the myeloma cells does not help fight infections. That’s because the myeloma cells are just many copies of the same plasma cell – all making copies of the same exact (or monoclonal) antibody.

**Kidney problems**

The antibody made by myeloma cells can harm the kidneys. This can lead to kidney damage and even kidney failure.

**Monoclonal gammopathy**

Having many copies of the same antibody is known as a *monoclonal gammopathy*. This condition can be found with a blood test. Although people with multiple myeloma have a monoclonal gammopathy, not everyone with monoclonal gammopathy has multiple myeloma. It can also occur in other diseases, such as Waldenstrom macroglobulinemia and some lymphomas. It can also occur in a disorder known as *monoclonal gammopathy of undetermined significance (MGUS)*, which does not cause problems like multiple myeloma does. However, some people with MGUS will eventually go on to develop multiple myeloma or other diseases.

**Light chain amyloidosis**

Antibodies are made up of protein chains joined together – 2 short light chains and 2 longer heavy chains. In light chain amyloidosis, abnormal plasma cells make too many light chains. These light chains can deposit in tissues, where they build up. This accumulation of light chains can lead to an abnormal protein in tissues known as amyloid. The buildup of amyloid in certain organs can lead them to enlarge and not work well. For example, when amyloid builds up in the heart, it can cause an irregular heart beat and cause the heart to enlarge and get weaker. A weak heart can lead to a condition called *congestive heart failure*, with symptoms like shortness of breath and swelling in the legs. Amyloid in the kidneys can cause them to work poorly. This may not cause symptoms early on, but the poor kidney function may be found on blood tests. If it gets worse, amyloid in the kidney can lead to kidney failure. See [Signs and](#)
Symptoms of Multiple Myeloma for more information about the signs and symptoms of light chain amyloidosis.

Other names for light chain amyloidosis include AL and primary amyloidosis. This is sometimes considered a separate disease from multiple myeloma, but because treatment is often similar to that of myeloma, we will discuss it in this document.

Light chain amyloidosis is only one of the diseases where amyloid builds up and causes problems. Amyloidosis can also be caused by a genetic (hereditary) disease called familial amyloidosis. Long-standing (chronic) infection and/or inflammation can also cause amyloidosis. This is known as secondary or AA amyloidosis. This document does not talk about these other kinds of amyloidosis.

Monoclonal gammopathy of undetermined significance

In monoclonal gammopathy of undetermined significance (MGUS), abnormal plasma cells produce many copies of the same antibody (a monoclonal antibody protein). However, these plasma cells do not form an actual tumor or mass and do not cause any of the other problems seen in multiple myeloma. MGUS usually does not affect a person’s health. In particular, it doesn’t cause weak bones, high calcium levels, kidney problems, or low blood counts. It’s most often found when a routine blood test finds a high level of protein in the blood and further testing shows the protein is a monoclonal antibody. In MGUS, the number of plasma cells may be increased, but they still make up less than 10% of the cells in the bone marrow.

Some people with MGUS will eventually develop multiple myeloma, lymphoma, or amyloidosis. Each year, about 1% of people with MGUS develops one of these diseases. The risk is higher in people whose protein levels are particularly high. Patients with MGUS don’t need treatment, but they are watched closely to see if they get a disease that does need to be treated, such as multiple myeloma.

Recently, scientists have studied the genes of the plasma cells in patients with MGUS. They found that the genetic make-up of these plasma cells resembles myeloma plasma cells more than it resembles that of normal plasma cells. This suggests that these cells are truly malignant, not just slow growing. Because people with MGUS are generally elderly, they may not live long enough for it to transform into myeloma.

Solitary plasmacytomas
This is another type of abnormal plasma cell growth. Rather than many tumors in different locations as in multiple myeloma, there is only one tumor, hence the name *solitary* plasmacytoma.

Most often, a solitary plasmacytoma develops in a bone, where it may be called an *isolated plasmacytoma of bone*. When a plasmacytoma starts in other tissues (such as the lungs or other organs), it is called an *extramedullary plasmacytoma*. Solitary plasmacytomas are most often treated with radiation therapy. Sometimes surgery may be used for a single extramedullary plasmacytoma. As long as no other plasmacytomas are found later on, the patient’s outlook is usually excellent. However, since many people with a solitary plasmacytoma will develop multiple myeloma, these people are watched closely for signs of this disease.

- References
  See all references for Multiple Myeloma

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Key Statistics for Multiple Myeloma

Multiple myeloma is a relatively uncommon cancer. In the United States, the lifetime risk of getting multiple myeloma is 1 in 143 (0.7%).

The American Cancer Society’s estimates for multiple myeloma in the United States for 2018 are:

- About 30,770 new cases will be diagnosed (16,400 in men and 14,370 in women).
- About 12,770 deaths are expected to occur (6,830 in men and 5,940 in women).

Visit the American Cancer Society’s Cancer Statistics Center for more key statistics.

- References
  See all references for Multiple Myeloma

What’s New in Multiple Myeloma Research and Treatment?

Important research into multiple myeloma is being done in many university hospitals, medical centers, and other institutions around the world. Each year, scientists find out more about what causes the disease and how to improve treatment. Many new drugs are being tested.

Researchers have found that bone marrow-support tissues and bone cells produce growth factors that increase the growth of myeloma cells. In turn, the myeloma cells produce substances that cause bone cells to undergo changes that weaken the bones. These discoveries are helping the researchers develop new drugs to block these growth factors, slow down the cancer, and reduce bone destruction. For example, bone marrow support (stromal) cells produce interleukin-6 (IL-6). Because IL-6 is a strong growth factor for multiple myeloma cells and eventually destroys bone, some current research efforts are focused on developing ways to block IL-6 function.

A form of arsenic, arsenic trioxide, is used to treat a certain kind of leukemia, and is also being tested to treat myeloma.

Drugs that act differently than the ones in use are being studied. For example, a drug called panobinostat is a histone deacetylase (HDAC) inhibitor, which means it affects the proteins in chromosomes. It has shown promising results when used in combination with bortezomib (Velcade) and dexamethasone, and it is now approved for use along with these drugs.

A test called gene expression profiling has been studied in recent years in multiple myeloma. This test looks to see what genes are active in cancer cells, and may be able to tell if and when a patient with multiple myeloma will need to have chemotherapy. Much more work lies ahead though, before this test can be used routinely.

- References