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Osteosarcoma Causes, Risk Factors, and Prevention

Risk Factors

A risk factor is anything that affects your chance of getting a disease such as cancer. Learn more about the risk factors for osteosarcoma.

- [Osteosarcoma Risk Factors](#)
- [What Causes Osteosarcoma?](#)

Prevention

The risk of many adult cancers can be reduced with certain lifestyle changes (such as staying at a healthy weight or quitting smoking), but at this time there are no known ways to prevent osteosarcoma.

Most known [risk factors](#) for osteosarcoma cannot be changed. Other than radiation therapy, there are no known lifestyle-related or environmental causes of osteosarcoma, so at this time there is no way to protect against most of these cancers.

Osteosarcoma Risk Factors

A risk factor is anything that affects your chance of getting a disease such as cancer. Different cancers have different risk factors.

Lifestyle-related risk factors such as body weight, physical activity, diet, and tobacco use play a major role in many adult cancers. But these factors usually take many years to influence cancer risk, and they are not thought to play much of a role in childhood cancers, including childhood osteosarcomas. So far, lifestyle-related factors have not been linked to osteosarcomas in adults, either. Still, there are some factors that affect osteosarcoma risk.

Age

The risk of osteosarcoma is highest for those between the ages of 10 and 30, especially during the teenage growth spurt. This suggests there may be a link between rapid bone growth and risk of tumor formation. The risk goes down in middle age, but rises again in older adults (usually over the age of 60). Osteosarcoma in older adults is often linked to another cause, such as a long-standing bone disease.

Height

Children with osteosarcoma are usually tall for their age. This also suggests that osteosarcoma may be related to rapid bone growth.

Gender

Osteosarcoma is more common in males than in females. Females tend to develop it slightly earlier, possibly because they tend to have their growth spurts earlier.

Race/ethnicity

Osteosarcoma is slightly more common in African Americans and Hispanic/Latinos than in whites.

Radiation to bones

People who were treated with radiation therapy for another cancer might have a higher risk of later developing osteosarcoma in the area that was treated. Being treated at a younger age and being treated with higher doses of radiation both increase this risk.

It's not clear if [imaging tests](#)¹ that use radiation, such as x-rays, CT scans, and bone scans, raise the risk of developing osteosarcoma. The amount of radiation used for these tests is many times lower than that used for radiation therapy. If there is any increased risk it is likely to be very small, but doctors try to limit the use of these types of tests whenever possible, especially in children, just in case.

Certain bone diseases

People with certain non-cancerous bone diseases have an increased risk of developing osteosarcoma.

Paget disease of the bone: In this condition, abnormal bone tissue forms in one or more bones. It mostly affects people older than 50. The affected bones are heavy and thick but are weaker than normal bones and are more likely to break. Usually this condition by itself is not life-threatening. But bone sarcomas (mostly osteosarcoma) develop in about 1% of people with Paget disease, usually when many bones are affected.

Hereditary multiple osteochondromas: Osteochondromas are benign bone tumors formed by bone and cartilage. Each osteochondroma has a very small risk of developing into a bone sarcoma (most often a [chondrosarcoma](#)², but less often it can be an osteosarcoma).

Most osteochondromas can be cured by surgery. However, some people inherit a tendency to develop many osteochondromas starting when they are young, and it may not be possible to remove them all. The more osteochondromas a person has, the greater the risk of developing a bone sarcoma.

Inherited cancer syndromes

People with certain rare, inherited cancer syndromes have an increased risk of developing osteosarcoma.

- [Retinoblastoma](#)³ is a rare eye cancer of children. Some children have the inherited form of retinoblastoma (**hereditary retinoblastoma**), in which all the cells of the body have a mutation (change) in the *RB1* gene. These children also have an increased risk of developing bone or soft tissue sarcomas, including osteosarcoma. If radiation therapy is used to treat retinoblastoma, the risk of osteosarcoma in the bones around the eye is even higher.
- The **Li-Fraumeni syndrome** makes people much more likely to develop certain types of cancer, including [breast](#)⁴ cancer, [brain tumors](#)⁵, osteosarcoma, and other types of sarcoma. This syndrome is usually caused by a mutation of the *TP53* gene.
- Children with **Rothmund-Thomson syndrome** are short and tend to have skin and skeletal problems. They also are more likely to develop osteosarcoma. This syndrome is usually caused by abnormal changes in the *REQL4* gene.

- Other rare inherited conditions, including **Bloom syndrome**, **Werner syndrome**, and **Diamond-Blackfan anemia**, have also been linked to an increased risk of osteosarcoma.

The way in which inherited gene changes make some people more likely to develop osteosarcoma is discussed in [What Causes Osteosarcoma?](#)

Hyperlinks

1. www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html
2. www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html
3. www.cancer.org/cancer/retinoblastoma.html
4. www.cancer.org/cancer/breast-cancer.html
5. www.cancer.org/cancer/brain-spinal-cord-tumors-adults.html

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Gorlick R, Janeway K, Marina N. Chapter 34: Osteosarcoma. In: Pizzo PA, Poplack DG, eds. *Principles and Practice of Pediatric Oncology*. 7th ed. Philadelphia Pa: Lippincott Williams & Wilkins; 2016.

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What Causes Osteosarcoma?

Researchers have found that osteosarcoma is linked with a number of other conditions, which are described in [Osteosarcoma Risk Factors](#). But the cause of most osteosarcomas is not clear at this time.

Scientists have learned how certain changes in the DNA in bone cells can cause them to become cancerous. DNA is the chemical in each of our cells that makes up our genes, which control how our cells function. We usually look like our parents because they are the source of our DNA. But DNA affects more than how we look. It influences our risks for developing certain diseases, including some kinds of cancer.

Some genes (parts of our DNA) control when our cells grow, divide to make new cells, and die:

- Genes that help cells grow, divide, or stay alive are called **oncogenes**.
- Genes that slow down cell division or make cells die at the right time are called **tumor suppressor genes**.

Cancers can be caused by gene changes that turn on oncogenes or turn off tumor suppressor genes.

Some people inherit gene mutations (changes) from a parent that increase their risk of cancer. In this situation, all of the cells in the body carry the same gene change. These are called **germline** or **inherited** mutations. But more often, cancer-causing changes are acquired during life rather than inherited before birth. In this case, the change occurs only in the cells that will develop into cancer. These are called **somatic** or **acquired** gene changes.

Inherited gene changes

Some inherited DNA mutations cause [syndromes](#) that are linked with an increased risk of osteosarcoma. For example:

- The **Li-Fraumeni syndrome** is usually caused by inherited mutations that turn off the *TP53* tumor suppressor gene. These mutations give a person a very high risk of developing one or more types of cancer, including [breast cancer](#)¹, [brain tumors](#)², osteosarcoma, and other cancers.
- Inherited changes in the **retinoblastoma** (*RB1*) tumor suppressor gene increase the

risk of developing [retinoblastoma](#)³, a type of eye cancer that affects children. Children with this gene change also have an increased risk for developing osteosarcoma, especially if they are treated with radiation.

If you are concerned you or your child might possibly have an inherited gene change, talk with your doctor about whether genetic testing might be helpful. You can also read more about this in [Genetics and Cancer](#)⁴.

Acquired gene changes

Most osteosarcomas are not caused by inherited gene mutations, but instead are the result of gene changes acquired during the person's lifetime.

Sometimes these gene changes are caused by radiation therapy used to treat another form of cancer, because radiation therapy can damage the DNA inside cells.

But many gene changes are probably just random events that sometimes happen inside a cell, without having an outside cause. Cells that are dividing quickly are more likely to create new cells with mistakes in their DNA, which increases the risk that a cancer such as osteosarcoma may develop. This may be why some normal situations (such as the teenage growth spurt) and some diseases (such as Paget disease of bone) that cause rapid bone growth increase the risk of osteosarcoma.

Other than radiation, there are no known lifestyle-related or environmental causes of osteosarcoma, so it's important to remember that in most cases there is nothing people with these cancers could have done to prevent them.

Researchers now understand some of the gene changes that occur in osteosarcomas, but it's not always clear what causes these changes. As we learn more about what causes osteosarcoma, hopefully we will be able to use this knowledge to develop ways to better prevent and treat it.

Hyperlinks

1. www.cancer.org/cancer/breast-cancer.html
2. www.cancer.org/cancer/brain-spinal-cord-tumors-adults.html
3. www.cancer.org/cancer/retinoblastoma.html
4. www.cancer.org/cancer/cancer-causes/genetics.html

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Can Osteosarcoma Be Prevented?

The risk of many adult cancers can be reduced with certain [lifestyle changes](#)¹ (such as staying at a healthy weight or quitting smoking), but at this time there are no known ways to prevent osteosarcoma.

Most known [risk factors](#) for osteosarcoma (age, height, race, gender, and certain bone diseases and inherited conditions) cannot be changed. Other than exposure to radiation (usually during [radiation therapy](#)²), there are no known lifestyle-related or environmental causes of osteosarcoma, so at this time there is no way to protect against most of these cancers.

Hyperlinks

1. www.cancer.org/healthy.html

2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html

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