



Chemotherapy for Osteosarcoma

Chemotherapy (chemo) is the use of drugs to treat cancer. The drugs are usually given into a vein or artery and can reach and destroy cancer cells throughout the body.

Chemo is an important part of the treatment for most people with osteosarcoma (although some patients with low-grade osteosarcoma might not need it). Most osteosarcomas don't appear to have spread beyond the main tumor when they are first found. But in the past, when doctors tried to treat these cancers with surgery alone, the cancer would often come back in other parts of the body, where it would be very hard to control. Giving chemo along with surgery helps lower the risk of these cancers coming back.

Most osteosarcomas are treated with chemo before surgery (known as neoadjuvant chemotherapy) for about 10 weeks and then again after surgery (known as adjuvant chemotherapy) for up to a year. People with high-grade osteosarcomas that responded well to chemo before surgery usually get the same chemo drugs after surgery. People whose tumors responded poorly usually get different chemo after surgery.

Doctors give chemo in cycles, with each period of treatment followed by a rest period to give the body time to recover. Each cycle typically lasts for a few weeks.

Chemo drugs used to treat osteosarcoma

The drugs used most often to treat osteosarcoma include:

- Methotrexate (given in high doses along with leucovorin to help prevent side effects)
- Doxorubicin (Adriamycin)
- Cisplatin or carboplatin
- Epirubicin
- Ifosfamide
- Cyclophosphamide
- Etoposide
- Gemcitabine
- Topotecan

Usually, 2 or more drugs are given together. Some common combinations of drugs include:

- High-dose methotrexate, doxorubicin, and cisplatin (sometimes with ifosfamide)
- Doxorubicin and cisplatin

- Ifosfamide and etoposide
- Ifosfamide, cisplatin (or carboplatin), and epirubicin

Many experts recommend that the drugs be given in very high doses when possible. This can affect the bone marrow (where new blood cells are made), which can result in dangerously low white blood cell levels and an increased risk of infections. In these cases, drugs called growth factors (such as filgrastim, also known as G-CSF) may be given along with the chemo to help the body make new white blood cells as quickly as possible.

Before starting chemo, the doctor might advise putting a catheter (a thin, soft tube) into a large vein in the chest. This is sometimes called a venous access device (VAD) or central venous catheter (CVC) (</treatment/treatments-and-side-effects/central-venous-catheters.html>). The catheter is inserted surgically while the patient is sedated (sleepy) or under general anesthesia (in a deep sleep). One end of the catheter stays in the vein, while the other end lies just under or outside the skin. This lets the health care team give chemo and other drugs and draw blood samples without having to stick needles into the veins each time. The catheter usually remains in place for several months, and can make having chemo less painful. If such a device is used, the health care team will teach you how to care for it to reduce the risk of problems such as infections.

Side effects of chemotherapy

Chemo drugs can cause side effects. Children tend to have less severe side effects from chemo than adults and often recover from side effects more quickly. Because of this, doctors can give them higher doses of chemo to try to kill the tumor.

The side effects of chemo depend on the type and dose of drugs given and the length of time they are taken.

General side effects of chemo:

- Nausea and vomiting (</treatment/treatments-and-side-effects/physical-side-effects/nausea-and-vomiting.html>)
- Loss of appetite
- Diarrhea
- Hair loss
- Mouth sores

Because chemo can damage the bone marrow, where new blood cells are made, patients may have low blood cell counts, which can result in:

- Increased chance of infection (</treatment/treatments-and-side-effects/physical-side-effects/infections.html>) (from a shortage of white blood cells)
- Bleeding or bruising after minor cuts or injuries (from a shortage of platelets)
- Fatigue (</treatment/treatments-and-side-effects/physical-side-effects/fatigue.html>) or shortness of breath (from low red blood cell counts)

Most of these side effects tend to go away after treatment is finished. Often there are ways to make these side effects

less severe. For example, drugs can be given to help prevent or reduce nausea and vomiting, or to help get blood counts back to normal levels. Be sure to discuss any questions you have about side effects with the cancer care team, and tell them about any side effects so that they can be controlled.

Side effects of certain drugs: Some side effects are specific to certain drugs. Many of these side effects are rare, but they are possible. Before treatment, ask your cancer care team about the possible side effects of the drugs you or your child will be getting.

- **Ifosfamide** and **cyclophosphamide** can damage the lining of the bladder, which can cause blood in the urine. The chance of this happening can be lowered by giving a drug called *mesna* during chemotherapy, along with plenty of fluids.
- **Cisplatin** and **carboplatin** may cause nerve damage (called neuropathy) (</treatment/treatments-and-side-effects/physical-side-effects/peripheral-neuropathy.html>) leading to numbness, tingling, or pain in the hands and feet. This often goes away or gets better once treatment is stopped, but it might last a long time in some people. These drugs can sometimes affect hearing, especially of high-pitched sounds. Kidney damage can also occur after treatment. Giving lots of fluid before and after the drug is infused can help prevent this.
- **Etoposide** can also cause nerve damage. It can also increase the risk of later developing a cancer of white blood cells, known as acute myeloid leukemia (</cancer/acute-myeloid-leukemia.html>)(AML). Fortunately, this is not common.
- **High-dose methotrexate** can damage the white matter of the brain (called **leukoencephalopathy**) and the liver or kidneys. Before starting high-dose methotrexate, medicines are given to help protect the kidneys. Methotrexate blood levels may be checked to see how much leucovorin (also called **folinic acid**) should be given to help limit any damage to normal tissues.
- **Doxorubicin (Adriamycin)** and **epirubicin** can cause heart damage over time. This risk goes up as the total amount of the drug that is given goes up, so doctors are careful to limit the total dose. Your (child's) doctor may order a heart function test before and during treatment to see if this drug is affecting the heart. A drug called **dexrazoxane** may be given along with the chemo to help lessen the possible damage.
- Some chemo drugs can affect your (child's) ability to have children later in life. Talk to your (or your child's) cancer care team about the risks of infertility with treatment, and ask if there are options for preserving fertility (</treatment/treatments-and-side-effects/physical-side-effects/fertility-and-sexual-side-effects/preserving-fertility-in-children-and-teens-with-cancer.html>), such as sperm banking.

The doctors and nurses will watch closely for side effects. Don't hesitate to ask the cancer care team any questions about side effects.

For more information on the possible late or long-term side effects of chemo, including infertility and second cancers, see [Living as an Osteosarcoma Survivor \(/cancer/osteosarcoma/after-treatment/follow-up.html\)](/cancer/osteosarcoma/after-treatment/follow-up.html).

Tests to check for side effects of chemotherapy: Before each treatment, your (or your child's) doctor will check lab test results to be sure the liver, kidneys, and bone marrow are working well. Other tests might be done during and after treatment as well.

- The **complete blood count (CBC)** includes counts of white blood cells, red blood cells, and blood platelets. Chemo can lower the numbers of these blood cells, so blood counts will be watched closely during and after chemo. The white blood cells and platelets usually reach their lowest point about 2 weeks after chemo is given, though this can occur earlier with high-dose regimens.
- **Blood chemistry panels** measure certain blood chemicals that tell doctors how well the liver and the kidneys

are working. Some chemo drugs can damage the kidneys and liver.

- An **audiogram** might be done to check hearing, which can be affected by certain chemo drugs.
- If doxorubicin or epirubicin is to be given, tests such as an **echocardiogram** (an ultrasound of the heart) may be done before and during treatment to check heart function.

For more information, see [Chemotherapy \(/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html\)](/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html).

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