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Treating Retinoblastoma

If your child has been diagnosed with retinoblastoma, your child's treatment team will discuss the options with you. It's important to weigh the benefits of each treatment option against the possible risks and side effects.

How is retinoblastoma treated?

The main types of treatment for retinoblastoma are:

- [Surgery \(Enucleation\) for Retinoblastoma](#)
- [Radiation Therapy for Retinoblastoma](#)
- [Laser Therapy \(Photocoagulation or Thermotherapy\) for Retinoblastoma](#)
- [Cryotherapy for Retinoblastoma](#)
- [Chemotherapy for Retinoblastoma](#)

Common treatment approaches

Sometimes more than one type of treatment may be used. The treatment options are based on the extent ([stage¹](#)) of the cancer and other factors.

The goals of treatment for retinoblastoma are:

- To get rid of the cancer and save the child's life
- To save the eye if possible
- To preserve as much vision as possible
- To limit the risk of side effects later in life that can be caused by treatment, particularly second cancers in children with [hereditary retinoblastoma²](#)

The most important factors that help determine treatment are:

- The size and location of the tumor(s)
- Whether the cancer is just in one eye or both
- How good the vision in the eye is
- Whether the cancer has extended outside the eye

Overall, more than 9 in 10 children with retinoblastoma are cured. The chances of long-term survival are much better if the tumor has not spread outside the eye.

- [Treatment of Retinoblastoma, Based on Extent of the Disease](#)

Who treats retinoblastoma?

Retinoblastoma is rare, so not many doctors other than those in specialty eye hospitals and major children's cancer centers have much experience treating it. Children with retinoblastoma and their families have special needs that can best be met by these children's cancer centers. These centers have teams of specialists who know about retinoblastoma and the unique needs of children with cancer. This gives the child the best chance for recovery and, if possible, keeping their sight.

Children with retinoblastoma are treated by a team of doctors that often includes:

- A **pediatric ophthalmologist**: a doctor who treats eye diseases in children
- An **ocular oncologist**: a doctor (usually an ophthalmologist) who treats cancers of the eye
- A **pediatric oncologist**: a doctor who treats children with cancer
- A **radiation oncologist**: a doctor who treats cancer with radiation therapy

The team might also include other doctors, physician assistants (PAs), nurse practitioners (NPs), nurses, therapists, child psychologists, social workers, genetic counselors, and other professionals. Having a child go through cancer treatment often means meeting lots of specialists and learning about parts of the medical system you probably haven't been exposed to before.

- [How to Find the Best Cancer Treatment for Your Child](#)³
- [Navigating the Health Care System When Your Child Has Cancer](#)⁴

Making treatment decisions

Once the cancer is found and the needed [tests](#)⁵ have been done, the cancer care team

will discuss treatment options with you. It's important to discuss all of the options as well as their possible side effects with your child's doctors to help you make an informed decision.

If time allows, getting a second opinion from another doctor experienced with your child's type of cancer is often a good idea. This can give you more information and help you feel more confident about the treatment plan you choose. If you aren't sure where to go for a second opinion, ask your doctor for help.

If your child has retinoblastoma, be sure he or she is treated at a children's cancer center that has expertise in treating children with this rare form of cancer. Ask about the services offered at your treatment center. Your child's doctor or nurse can tell you what is available to help with any problems you or your child might have.

- [Questions to Ask About Retinoblastoma](#)⁶
- [How to Talk to Your Child's Cancer Care Team](#)⁷
- [Seeking a Second Opinion](#)⁸

Thinking about taking part in a clinical trial

Today, most children and teens with cancer are treated at specialized children's cancer centers. These centers offer the most up-to-date-treatment by conducting clinical trials (studies of promising new therapies). Children's cancer centers often conduct many clinical trials at any one time, and in fact most children treated at these centers take part in a clinical trial as part of their treatment.

Clinical trials are one way to get state-of-the art cancer treatment. Sometimes they may be the only way to get access to newer treatments (although there is no guarantee that newer treatments will be better). They are also the best way for doctors to learn better methods to treat these cancers. Still, they might not be right for everyone.

If you would like to learn more about clinical trials that might be right for your child, start by asking the treatment team if your clinic or hospital conducts clinical trials.

- [Clinical Trials](#)⁹

Considering complementary and alternative methods

You may hear about alternative or complementary methods that your doctor hasn't mentioned to treat your child's tumor or relieve symptoms. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage,

to name a few.

Complementary methods refer to treatments that are used *along with* your regular medical care. Alternative treatments are used *instead of* standard medical treatment. Although some of these methods might be helpful in relieving symptoms or helping people feel better, many have not been proven to work. Some might even be harmful.

Be sure to talk to your child's cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision.

- [Complementary and Alternative Medicine](#)¹⁰

Preparing for treatment

Before treatment, the doctors and other members of the team will help you, as a parent, understand the tests that will need to be done. The team's social worker will also counsel you about the problems you and your child might have during and after treatments such as surgery, and might be able to help you find housing and financial aid if needed.

- [When Your Child Has Cancer](#)¹¹

Help getting through cancer treatment

Your child's cancer care team will be your first source of information and support, but there are other resources for help when you need it. Hospital- or clinic-based support services can also be an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help. For children and teens with cancer and their families, other specialists can be an important part of care as well.

The American Cancer Society also has programs and services – including rides to treatment, lodging, and more – to help you get through treatment. Call our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists.

- [Finding Help and Support When Your Child Has Cancer](#)¹²
- [Find Support Programs and Services in Your Area](#)¹³

The treatment information given here is not official policy of the American Cancer Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor. Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

Surgery (Enucleation) for Retinoblastoma

Surgery is not needed for many retinoblastomas, especially for smaller tumors.

But if a tumor has grown large before it is found, vision in the eye might have already been lost, with no hope of getting it back. The usual treatment in this case is **enucleation**, an operation to remove the whole eye, plus part of the optic nerve attached to it.

Enucleation might also be needed if the cancer is not cured using other treatments that were meant to try to save the eye.

This surgery is done while the child is under general anesthesia (in a deep sleep). During the same operation, an **orbital implant** is usually put in to take the place of the eyeball. The implant is made of silicone or hydroxyapatite (a substance similar to bone). It is attached to the muscles that moved the eye, so it should move the same way as the eye would have.

Your child will probably be able to leave the hospital the same day or the next day.

After several weeks, you can visit an **ocularist**, who will create an artificial eye for your child. This is a thin shell that fits over the orbital implant and under the eyelids, like a big contact lens. It will match the size and color of the remaining eye. Once it's in place, it will be very hard to tell it apart from the real eye.

When retinoblastoma occurs in both eyes, enucleation of both eyes would result in complete blindness. If neither eye has useful vision because of damage already caused by the cancer, this may be the best way to make sure all of the cancer is gone. But if

there is any chance of saving useful vision in one or both eyes, doctors may advise trying other types of treatment first.

Possible risks and side effects

Complications during or right after surgery, such as bleeding, reactions to anesthesia, or infection, are not common, but they can happen.

The most obvious side effect of enucleation is the loss of vision in that eye, although most often the vision has already been lost because of the cancer.

Removing the eye also can affect the future growth of bone and other tissues around the eye socket, which can make the area look somewhat sunken. Using an orbital implant can sometimes lessen this effect. (Radiation therapy, which is often the other major treatment option in such cases, might cause the same side effect.)

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Radiation Therapy for Retinoblastoma

This treatment uses high energy x-rays or particles to kill cancer cells. Radiation therapy is an effective treatment for some children with retinoblastoma. Compared with surgery, it has the advantage of possibly saving vision in the eye. But radiation therapy also has some disadvantages (see Possible side effects below).

Two types of radiation therapy can be used to treat children with retinoblastoma.

External beam radiation therapy

External beam radiation therapy (EBRT) focuses radiation beams from a source outside the body on the cancer. This was once a common treatment for retinoblastoma. But because of the side effects it can cause, it is now most often used only for cancers that are not well-controlled with other treatments.

How EBRT is done

Before treatments start, the radiation team takes careful measurements with [imaging tests](#)¹ such as MRI scans to determine the correct angles for aiming the radiation beams and the proper dose of radiation. This planning session is called **simulation**.

Radiation is usually given 5 days a week for several weeks. Each treatment is much like getting an x-ray, but the dose of radiation is much stronger. For each session, your child will lie on a special table while a machine delivers the radiation from precise angles.

The actual treatment each day lasts only a few minutes, but the setup time – getting your child into place for treatment – usually takes longer. The child's head is positioned in a custom-fitted mold that is similar to a cast used to treat broken bones. The treatment is not painful, but young children may be given medicine to make them sleep so they will stay still during treatment.

Newer forms of EBRT

Many centers now use newer types of external radiation therapy, which can target the tumor more precisely. This lowers the doses that surrounding normal tissues get, which may help reduce side effects.

Intensity modulated radiation therapy (IMRT)

IMRT lets doctors shape the radiation beams and aim them at the tumor from several angles, as well as adjust the intensity (strength) of the beams to limit the dose reaching the nearby normal tissues. This may let the doctor deliver a higher dose to the tumor, while reducing side effects. Many major hospitals and cancer centers now use IMRT.

Proton beam therapy

Protons are positive parts of atoms. Unlike the x-rays used in standard radiation, which release energy both before and after they hit their target, protons cause little damage to tissues they pass through and then release their energy after traveling a certain distance. Proton beam radiation may be able to deliver the same level of radiation to the tumor while causing much less damage to nearby normal tissues.

Early results with proton beam therapy are promising, but it's still fairly new, and there is very little long-term data on its use for retinoblastoma. Only a limited number of centers offer proton beam therapy in the United States at this time.

Possible side effects of EBRT

Some of the side effects of EBRT tend to go away after a short while and are usually not serious. Short-term problems might include effects on skin areas that receive radiation, which can range from mild sunburn-like changes and hair loss to more severe skin reactions.

More importantly, EBRT can damage nearby normal body tissues. This might eventually lead to cataracts (clouding of the lens of the eye) and damage to the retina or optic nerve, which could reduce vision. Radiation can also slow the growth of bones and other tissues near the eye, which can affect the way the area around the eye looks over time.

External radiation therapy can also increase the risk of developing a [second cancer](#)² in the area. This is especially important in children with the hereditary form of retinoblastoma, who are already at increased risk for developing other types of cancer.

Newer forms of radiation therapy, such as IMRT and proton beam therapy, target the tumor more precisely and spare more normal tissue. This may make some of these side effects less likely than in the past.

Brachytherapy (plaque radiotherapy)

The use of brachytherapy, also known as **internal radiation therapy** or **episcleral plaque radiotherapy**, is limited to small tumors.

During brachytherapy, a small amount of radioactive material is placed on the outside of the part of the eyeball where the tumor is, and it stays there for several days. The radioactive material is put in a small carrier (known as a **plaque**), which is shaped like a very small bottle cap. The plaque is made of gold or lead to shield nearby tissues from the radiation. The radiation travels a very short distance, so most of it will be focused only on the tumor.

The plaque is sewn in place on the eyeball with tiny stitches during a short operation. It is then removed during a second operation several days later. Both operations are done while the child is under general anesthesia (in a deep sleep). The child typically stays in the hospital while the plaque is in place.

Possible side effects of brachytherapy

Brachytherapy is less likely to cause side effects than external radiation. The main concern is damage to the retina or optic nerve, which can affect vision many months later. Recent advances in treatment may make this problem less likely. Brachytherapy

has not been linked to an increased risk of developing a second cancer.

Hyperlinks

1. www.cancer.org/cancer/retinoblastoma/detection-diagnosis-staging/how-diagnosed.html
2. www.cancer.org/cancer/retinoblastoma/after-treatment/follow-up.html

References

Hurwitz RL, Shields CL, Shields JA, et al. Chapter 27: Retinoblastoma. In: Pizzo PA, Poplack DG, eds. *Principles and Practice of Pediatric Oncology*. 7th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2016.

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Sethi RV, Shih HA, Yeap BY, et al. Second nonocular tumors among survivors of retinoblastoma treated with contemporary photon and proton radiotherapy. *Cancer*. 2014;120(1):126-133.

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Laser Therapy (Photocoagulation or Thermotherapy) for Retinoblastoma

Lasers are highly focused beams of light that can be used to heat and destroy body tissues. Different types of laser therapy can sometimes be used to treat small retinoblastoma tumors.

Laser photocoagulation

Photocoagulation is a type of treatment that uses a laser beam aimed through the pupil (the dark spot in the front of the eye). The laser is focused on the blood vessels that surround and supply the tumor, destroying them by heating them. Photocoagulation is effective only for smaller tumors toward the back of the eye.

Your child will be under general anesthesia (in a deep sleep) during the treatment. The treatment is usually given 2 or 3 times, with about a month between treatments.

Possible side effects

In some cases, laser therapy can damage the retina, which can lead to blind spots or temporarily cause the retina to detach from the back of the eyeball.

Transpupillary thermal therapy (TTT)

For this treatment, also just called **thermotherapy**, the doctor uses a different type of laser than what's used in photocoagulation. This laser applies infrared light directly to the tumor to heat and kill the tumor cells. The temperatures aren't quite as high as those used in photocoagulation, so some of the blood vessels on the retina may be spared.

Thermotherapy can be used alone for very small tumors. For larger tumors, it can be used along with [chemotherapy](#) (called **thermochemotherapy**) or with [radiation therapy](#) (called **thermoradiotherapy**). Heat seems to help these other treatments work better.

The treatment is given while the child is asleep (under general anesthesia), usually for about 10 minutes at a time. Typically, 3 treatments about a month apart are needed to control each tumor. When used as part of thermochemotherapy, the heat is usually applied at a lower temperature over a slightly longer period of time, starting within a few hours after chemotherapy.

Possible side effects

Thermotherapy can sometimes cause part of the iris (the colored part of the eye) to shrink. Other possible effects include clouding of part of the eye lens or damage to the

retina, which might affect vision.

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Hurwitz RL, Shields CL, Shields JA, et al. Chapter 27: Retinoblastoma. In: Pizzo PA, Poplack DG, eds. *Principles and Practice of Pediatric Oncology*. 7th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2016.

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Cryotherapy for Retinoblastoma

In cryotherapy, the doctor uses a small metal probe that is cooled to very low temperatures, killing the retinoblastoma cells by freezing them. It is only effective for small tumors toward the front of the eye. It is not used routinely for children with several tumors.

The child will be in a deep sleep (under general anesthesia) during the treatment. After the child is asleep, the probe is placed on the outer surface of the eyeball next to the tumor, which is then frozen and thawed several times. Cryotherapy is usually given 2 or 3 times, with about a month between treatments.

Possible side effects

Cryotherapy can cause the eye and eyelid to swell for a few days. As with laser therapy, cryotherapy can damage the retina, which can lead to blind spots or temporarily cause the retina to detach from the back of the eyeball.

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Hurwitz RL, Shields CL, Shields JA, et al. Chapter 27: Retinoblastoma. In: Pizzo PA, Poplack DG, eds. *Principles and Practice of Pediatric Oncology*. 7th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2016.

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Chemotherapy for Retinoblastoma

Chemotherapy (chemo) is the use of anti-cancer drugs to treat cancer. Chemo can be given in different ways to treat retinoblastoma.

Systemic chemotherapy

Chemo drugs can be injected into a vein (IV) or given by mouth. These drugs enter the bloodstream and reach throughout the body. This is known as systemic chemotherapy.

Systemic chemo is given in cycles, with each treatment followed by a rest period to give

the body time to recover. Each chemo cycle typically lasts for a few weeks, and the total length of treatment is often several months.

Some of the chemo drugs used to treat retinoblastoma include:

- Carboplatin
- Cisplatin
- Vincristine
- Etoposide
- Cyclophosphamide
- Topotecan
- Doxorubicin

Most often, 2 or 3 drugs are given at the same time. A standard combination is carboplatin, vincristine, and etoposide, although for very small tumors, only carboplatin and vincristine may be enough. Other drugs might be used if these are not effective.

Intra-arterial chemotherapy

Sometimes instead of systemic chemotherapy, the chemo is injected directly into the ophthalmic artery, the main artery that supplies blood to the eye. In this newer technique, a very thin catheter (a long, hollow, flexible tube) is inserted into a large artery on the inner thigh and slowly threaded through the blood vessels all the way up into the ophthalmic artery. (This is done with the child asleep under general anesthesia.) The chemo is then infused into the artery. The drug used most often is melphalan, but other drugs such as carboplatin and topotecan can also be used. This process may then be repeated every few weeks, depending on how much the tumor shrinks.

Because the chemo is put directly into the artery feeding the eye, doctors can use much smaller doses of chemo drugs (less than 10% of the doses used for systemic chemo). Therefore, there are fewer side effects from the chemo.

Results so far with this technique in eyes with advanced tumors have been promising, generally with good tumor control and few side effects. In many cases it has allowed doctors to save an eye that otherwise would have needed to be removed.

Intravitreal chemotherapy

In this newer approach, a tiny needle is used to inject a chemo drug (typically melphalan or topotecan) directly into the vitreous humor, the jelly-like substance inside the eye.

This is sometimes used (along with systemic or intra-arterial chemo) to treat tumors that are widespread within the eye and have not been helped by other treatments.

Ways chemotherapy is used

Chemo may be used in different situations:

- Chemo can be used as the first treatment to shrink some tumors that have not spread outside the eye. This is called **chemoreduction**. These tumors can then be treated more effectively with focal therapies such as [laser therapy](#), [cryotherapy](#), or [brachytherapy](#).
- Chemo is sometimes used when the eye has already been treated or removed, but the tumor has extended into some areas in the eye that make it more likely to have spread. This type of treatment is called **adjuvant chemotherapy**.
- Systemic chemo is also used to treat children whose retinoblastoma has spread outside the eye, a much more critical situation. If the cancer has spread to the brain, chemo may also be given directly into the cerebrospinal fluid that surrounds it. (This is known as **intrathecal chemotherapy**.) Tumors outside the eye may shrink for a time with standard doses of chemo, but they will usually start growing again. For this reason, if the cancer has spread to other parts of the body, doctors recommend giving more intense chemo, usually along with a [stem cell transplant](#)¹.

Possible side effects of chemo

Systemic chemo: Chemo drugs can affect cells in the body other than cancer cells, which can lead to side effects.

The [side effects](#)² of chemo depend on the types and doses of drugs used, and how long they are given. Possible short-term side effects include:

- Hair loss
- Mouth sores
- Loss of appetite
- Nausea and vomiting
- Diarrhea or constipation
- Increased chance of infections (from having too few white blood cells)
- Easy bruising or bleeding (from having too few blood platelets)

- Fatigue (from having too few red blood cells)

Most of these side effects go away after treatment is finished. There are often ways to lessen these side effects. For example, drugs can be given to help prevent or reduce nausea and vomiting. Be sure to discuss any questions about side effects with your child's cancer care team, and let them know if your child has side effects so they can be managed.

Along with the effects listed above, certain chemo drugs can cause specific side effects. For example:

- **Cisplatin** and **carboplatin** can affect the kidneys. Giving the child plenty of fluids during treatment can help reduce this risk. These drugs can also cause hearing loss in young children, especially in babies younger than 6 months. Your child's doctor may check your child's hearing with tests during or after treatment. When carboplatin is injected directly into the tissues near the eye (periocular chemotherapy), it can cause redness and swelling in the area.
- **Vincristine** can [damage nerves](#)³. Some children may feel tingling and numbness, particularly in their hands and feet.
- Some chemo drugs can increase the risk of developing a cancer of white blood cells known as [acute myeloid leukemia \(AML\)](#)⁴ later in life. Fortunately, this is not common.
- **Doxorubicin** can damage the heart. The risk of this happening goes up with the total amount of the drug given. Doctors try to limit this risk as much as possible by not giving more than the recommended doses and by checking the heart with an echocardiogram (an ultrasound of the heart) during treatment.
- **Cyclophosphamide** can damage the bladder, which can cause blood in the urine. The risk of this can be lowered by giving this drug along with plenty of fluids and with a drug called mesna, which helps protect the bladder. Cyclophosphamide can also lower the chances of having children in the future.

Intra-arterial chemo: Much lower doses of chemo are used in this approach, so the side effects tend to be limited to the eye area. Possible side effects include:

- Swelling around the eye
- Detachment of the retina from the back of the eye
- Bleeding inside the eye
- Weakening of the muscles that move the eye

- Drooped eyelid
- Loss of eyelashes

Possible long-term side effects are not yet clear, as this technique is still fairly new. Treatment might affect the small blood vessels in and around the eye, although it's not yet known if this might affect vision as the child gets older. This approach also exposes the child to some radiation, because real time x-rays are used to help guide the catheter into place. It's not yet clear if (or how much) this might raise cancer risk later in life.

Intravitreal chemo: As with intra-arterial chemo, the side effects from this newer technique seem to be limited to the eye and nearby areas. Each treatment might damage the retina slightly, which might affect vision.

In the past, there was concern that placing a needle into the eye to give the chemo might open a small hole that could allow tumor cells to spread outside of the eye. However, studies have found that this risk is very low, and doctors now use techniques that lower this risk even further.

Hyperlinks

1. www.cancer.org/cancer/retinoblastoma/about/new-research.html
2. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/peripheral-neuropathy.html
4. www.cancer.org/cancer/acute-myeloid-leukemia.html

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Treatment of Retinoblastoma, Based on Extent of the Disease

If your child has retinoblastoma, a number of factors can affect the treatment options your child's doctor recommends. Some of these include:

- The size and location of the tumor(s)
- Whether the cancer is just in one eye or both
- The chance for saving vision in the eye(s)
- Whether the cancer has spread outside the eye

Many of these factors are taken into account as part of the [stage](#)¹ of the cancer.

If the retinoblastoma is **only in one eye**, treatment depends on whether vision in the eye can be saved.

If the retinoblastoma is in **both eyes**, doctors will try to save at least one eye if at all possible so that the child maintains some vision.

Many children will get several types of treatment. Treatment might be needed for months or even years.

No matter which types of treatment are used, it's very important that they are given by

experts at centers experienced in treating these tumors.

If the eye can see and probably can be saved

For some smaller tumors, focal treatments such as [laser therapy](#) or [cryotherapy](#) might be the only treatment needed.

But more often, tumors are larger or in hard-to-treat areas. Treatment usually includes a combination of [chemotherapy](#) and focal treatments.

If **systemic chemotherapy** (chemotherapy given by vein) is used, it is typically given for about 6 months to shrink the tumor as much as possible. More recently, many centers have begun to give chemotherapy directly into the artery that feeds the eye (known as **intra-arterial chemotherapy**) instead of systemic chemotherapy. If the cancer has spread widely inside the eye, chemo might also be injected directly into the eye (known as **intravitreal chemotherapy**). Usually a few treatments are needed, each given a few weeks apart.

Depending on how much the tumor shrinks and where it is in the eye, different focal treatments can then be applied, usually starting after the first or second cycle of chemotherapy. Treatment options might include [brachytherapy \(plaque radiotherapy\)](#), cryotherapy, or laser therapy (photocoagulation or thermotherapy). External radiation therapy might also be given, but if so, it's usually delayed until the end of chemotherapy.

If the combination of these treatments doesn't control the disease, the eye might [need to be removed](#).

If the eye cannot see or cannot be saved

If there is no vision in the eye, if the tumor is so advanced within the eye that there is no hope of cure by other means, or if there is painful glaucoma (increased pressure inside the eye), then the eye is [removed](#) and an orbital implant is placed in the socket.

If the cancer affects only one eye, no other treatments may be needed. But sometimes, after looking at the removed eye under the microscope, the doctors find that some retinoblastoma cells might have escaped the eye, which means the cancer might come back later in other parts of the body. These children may be given [chemotherapy](#), possibly along with [radiation therapy](#) to the area around the eye, to try to lower this risk.

In some instances where there are large tumors in both eyes, chemo may be used first to try to shrink the tumors and avoid the need for surgery in both eyes. If chemo

shrinks the tumors enough, focal therapies such as brachytherapy (plaque radiotherapy), [cryotherapy](#), or [laser therapy](#) (photocoagulation or thermotherapy) might allow at least one eye (and some vision) to be saved.

Some children with retinoblastoma in only one eye may actually have the [hereditary form of retinoblastoma](#)², which means they will probably develop cancer in the other eye as well. Therefore, it's very important to consider [genetic counseling and testing](#)³ to determine if the child has hereditary retinoblastoma. If so, they need to have the other eye examined regularly after treatment.

If the cancer has spread outside the eye

In this uncommon situation, treatment is usually a combination of [chemotherapy](#), [radiation](#), and in some cases [surgery](#).

If the cancer has spread only to the orbit (the area around the eye), treatment with chemotherapy, surgical removal (enucleation) of the eye, and radiation therapy to the orbit is often successful.

If the cancer has spread outside the orbit to distant parts of the body such as the liver or the bones and bone marrow, the chances of a cure using standard chemotherapy and other treatments are not as good. In these cases, using higher doses of chemotherapy followed by a [stem cell transplant](#)⁴ is usually recommended.

Cancers that have spread to the brain (including trilateral retinoblastomas, which are retinoblastomas that usually start in the pineal gland) are very hard to treat. High-dose chemotherapy and stem cell transplant has shown some promise for these cancers. [Clinical trials](#)⁵ using other newer treatments may be an option in this situation as well.

If the cancer comes back in the eye after initial treatment

Treatment of cancer that recurs in the eye depends on the size and location of the tumor and on what treatments were used the first time.

If the tumor is small, the child's sight can often be saved and the cancer destroyed with local treatments such as [cryotherapy](#), [laser therapy](#), [radiation therapy](#) (if not already used), or other treatments. [Chemotherapy](#) might be given first to shrink the tumor, which might help the other treatments work better.

If the child's sight cannot be saved, the eye might [need to be removed](#).

Either way, the chance of a cure is very good as long as the cancer is still confined to the eye.

If the cancer comes back outside the eye after initial treatment

Cancers that recur outside the eye are harder to treat. Options might include [chemotherapy](#) and [radiation](#), or high-dose chemotherapy with a [stem cell transplant](#)⁶ in some cases. In this situation, the treatment and the chances of cure are similar to what is described above (when the cancer has spread outside the eye before initial treatment).

Summary of treatment

If the cancer is in only one eye and the potential for saving sight is good, chemotherapy (either by vein or directly into the artery of the eye) and focal treatments such as cryotherapy, laser therapy (photocoagulation or thermotherapy), or plaque radiation are used (although very small tumors, which are very rare, can be treated with focal treatments alone). If there is little or no chance to save the eye (or useful vision), the eye will likely need to be removed.

If the cancer is in both eyes, then the doctors will try to save as much vision as possible. The treatment usually starts with chemotherapy, followed by focal treatments. Surgery might still be needed if these treatments aren't effective.

If the cancer has spread outside of the eye, treatment is usually a combination of chemotherapy, radiation, and in some cases surgery.

In all cases, children who have had retinoblastoma need to be followed closely for some time after treatment.

The treatment information given here is not official policy of the American Cancer Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor. Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

Hyperlinks

1. www.cancer.org/cancer/retinoblastoma/detection-diagnosis-staging/staging.html
2. www.cancer.org/cancer/retinoblastoma/causes-risks-prevention/what-causes.html
3. www.cancer.org/cancer/retinoblastoma/detection-diagnosis-staging/how-diagnosed.html
4. www.cancer.org/cancer/retinoblastoma/about/new-research.html
5. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html
6. www.cancer.org/cancer/retinoblastoma/about/new-research.html

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