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Treating Ovarian Cancer

Local treatments

Some treatments are **local**, meaning they treat the tumor without affecting the rest of the body.

Types of local therapy used for ovarian cancer include:

- [Surgery for Ovarian Cancer](#)
- [Radiation Therapy for Ovarian Cancer](#)

Systemic treatments

Drugs used to treat ovarian cancer are considered **systemic therapies** because they can reach cancer cells almost anywhere in the body. They can be given by mouth or put directly into the bloodstream.

Depending on the type of ovarian cancer, different types of drug treatment might be used, including:

- [Chemotherapy for Ovarian Cancer](#)
- [Hormone Therapy for Ovarian Cancer](#)
- [Targeted Therapy for Ovarian Cancer](#)

Common approaches

Typically, treatment plans are based on the type of ovarian cancer, its stage, and any special situations. Most women with ovarian cancer will have some type of surgery to remove the tumor. Depending on the type of ovarian cancer and how advanced it is, you might need other types of treatment as well, either before or after surgery, or

sometimes both.

- [Treatment of Invasive Epithelial Ovarian Cancers, by Stage](#)
- [Treatment for Epithelial Tumors of Low Malignant Potential](#)
- [Treatment for Germ Cell Tumors of the Ovary](#)
- [Treatment for Stromal Tumors of the Ovary, by Stage](#)

Who treats ovarian cancer?

Based on your treatment options, you might have different types of doctors on your treatment team. These doctors could include:

- A **gynecologic oncologist**: a gynecology doctor who is specially trained to use surgery to treat ovarian cancer; many times they are also the ones to give chemotherapy and other medicines to treat ovarian cancer
- A **radiation oncologist**: a doctor who uses radiation to treat cancer
- A **medical oncologist**: a doctor who uses chemotherapy and other medicines to treat cancer

Many other specialists might be part of your treatment team as well, including physician assistants, nurse practitioners, nurses, psychologists, sex counselors, social workers, nutritionists, genetic counselors, and other health professionals.

- [Health Professionals Associated with Cancer Care](#)

Making treatment decisions

Your treatment plan will depend on many factors, including your overall health, personal preferences, and whether you plan to have children. Age alone isn't a determining factor since several studies have shown that older women tolerate ovarian cancer treatments well.

It's important to discuss all of your treatment options, including their goals and possible side effects, with your doctors to help make the decision that best fits your needs. It's also very important to ask questions if there's anything you're not sure about.

If time permits, it is often a good idea to seek a second opinion. A second opinion can give you more information and help you feel more confident about the treatment plan you choose.

- [What Should You Ask Your Doctor About Ovarian Cancer?](#)
- [Seeking a Second Opinion](#)

Thinking about taking part in a clinical trial

Clinical trials are carefully controlled research studies that are done to get a closer look at promising new treatments or procedures. Clinical trials are one way to get state-of-the-art cancer treatment. In some cases they may be the only way to get access to newer treatments. They are also the best way for doctors to learn better methods to treat cancer. Still, they're not right for everyone.

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

- [Clinical Trials](#)

Considering complementary and alternative methods

You may hear about alternative or complementary methods that your doctor hasn't mentioned to treat your cancer 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 a doctor's medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you feel better, many have not been proven to work. Some might even be harmful.

Be sure to talk to your 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 Integrative Medicine](#)

Help getting through cancer treatment

People with cancer need support and information, no matter what stage of illness they may be in. Knowing all of your options and finding the resources you need will help you make informed decisions about your care.

Whether you are thinking about treatment, getting treatment, or not being treated at all, you can still get supportive care to help with pain or other symptoms. Communicating with your cancer care team is important so you understand your diagnosis, what treatment is recommended, and ways to maintain or improve your quality of life.

Different types of programs and support services may be helpful, and can be an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help.

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.

- [Palliative Care](#)
- [Find Support Programs and Services in Your Area](#)

Choosing to stop treatment or choosing no treatment at all

For some people, when treatments have been tried and are no longer controlling the cancer, it could be time to weigh the benefits and risks of continuing to try new treatments. Whether or not you continue treatment, there are still things you can do to help maintain or improve your quality of life.

Some people, especially if the cancer is advanced, might not want to be treated at all. There are many reasons you might decide not to get cancer treatment, but it's important to talk to your doctors and you make that decision. Remember that even if you choose not to treat the cancer, you can still get supportive care to help with pain or other symptoms.

- [If Cancer Treatments Stop Working](#)

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.

- [About Ovarian Cancer](#)

- [Causes, Risk Factors, and Prevention](#)
- [Early Detection, Diagnosis, and Staging](#)
- [Treatment](#)
- [After Treatment](#)

Surgery for Ovarian Cancer

Surgery is the main treatment for most ovarian cancers. How much surgery you have depends on how far your cancer has spread and on your general health. For women of childbearing age who have certain kinds of tumors and whose cancer is in the earliest stage, it may be possible to treat the disease without removing both ovaries and the uterus.

Surgery for epithelial ovarian cancer

For epithelial ovarian cancer, surgery has 2 main goals: [staging](#)¹ and debulking. If your cancer isn't properly staged and debulked, you may need to have more surgery later, so it's important that this surgery is done by a specialist who's trained and experienced in ovarian cancer surgery, like a gynecologic oncologist.

Staging epithelial ovarian cancer

The first goal of ovarian cancer surgery is to *stage* the cancer to see how far the cancer has spread from the ovary. Usually this means removing the uterus (this operation is called a *hysterectomy*), along with both ovaries and fallopian tubes (this is called a *bilateral salpingo-oophorectomy* or BSO). In addition, the omentum is also removed (an *omentectomy*). The omentum is a layer of fatty tissue that covers the abdominal contents like an apron, and ovarian cancer sometimes spreads to this area. Some lymph nodes in the pelvis and abdomen might also be biopsied (taken out to see if the cancer has spread from the ovary).

If there is fluid in the pelvis or abdominal cavity, it will be removed for testing. The surgeon may "wash" the abdominal cavity with salt water (saline) and send that fluid to the lab for testing. He or she may also take biopsies from different areas inside the abdomen and pelvis. All the tissue and fluid samples taken during the operation are

sent to a lab to look for cancer cells. Staging is very important because ovarian cancers at different stages are treated differently. If the staging isn't done correctly, the doctor may not be able to decide on the best treatment.

Debulking epithelial ovarian cancer

The other important goal of ovarian cancer surgery is to remove as much of the tumor as possible this is called *debulking*. Debulking is very important when ovarian cancer has already spread throughout the abdomen (belly) at the time of surgery. The aim of debulking surgery is to leave behind no visible cancer or no tumors larger than 1 cm (less than 1/2 an inch). This is called *optimally debulked*. **Patients whose tumors have been optimally debulked, have a better outlook (prognosis) than those left with larger tumors after surgery (called *sub-optimally debulked*).**

In some cases, other organs might be affected by debulking:

- Sometimes the surgeon will need to remove a piece of colon to debulk the cancer properly. In some cases, a piece of colon is removed and then the 2 ends that remain are sewn back together. In other cases, though, the ends can't be sewn back together right away. Instead, the top end of the colon is attached to an opening (stoma) in the skin of the abdomen to allow body wastes to get out. This is known as a *colostomy*. Most often, this is only temporary, and the ends of the colon can be reattached later in another operation. For more information, see [Colostomy Guide²](#).
- Sometimes, a part of the small intestine may need to be removed. Just like with the colon, the small intestine can either be reconnected (which is most common) or an ileostomy might be made. This is usually temporary, but will need special care, so ask your doctor if this is a possibility before having surgery. See [Ileostomy Guide³](#) to learn more.
- Debulking surgery might also mean removing a piece of the bladder. If this happens, a catheter (to empty the bladder) will be placed during surgery. This will be left in place until the bladder recovers enough to be able to empty on its own. Then, the catheter can be removed.
- Debulking might also require removing the spleen and/or the gallbladder, as well as part of the stomach, liver, and/or pancreas.

If both ovaries and/or the uterus are removed, you will not be able to become pregnant. It also means that you will go into menopause if you haven't done so already. Most women will stay in the hospital for 3 to 7 days after the operation and can resume their

usual activities within 4 to 6 weeks.

Intraoperative imaging

To know where the ovarian cancer is in your body to remove it, the surgeon typically uses your imaging tests done before surgery as well as a bright light and feeling for the tumors during the operation. Sometimes, tumors that are not easily seen or felt by hand might be missed. To help find these tumors, **intraoperative imaging** might be used. Intraoperative imaging uses a special imaging machine in the operating room during the surgery. For women with ovarian cancer, a florescent drug called pafolacianine (Cytalux) will be injected into your body a few hours before surgery and will attach to a specific protein found on ovarian cancer cells. During surgery, the imaging machine will give off near-infrared florescent light that will cause the "hidden" tumors, where the florescent drug has attached, to light up so the surgeon can see them. This procedure can help make sure all the cancer was removed.

The most common side effects from pafolacianine (Cytalux) are belly pain, heartburn, itching, chest pain, nausea, vomiting, and flushing.

Your doctor will probably ask you to avoid taking any supplements that have folic acid in them for a few days before the procedure so they don't disturb the test.

Surgery for ovarian germ cell tumors and ovarian stromal tumors

For germ cell tumors and stromal tumors, the main goal of surgery is to remove the cancer.

Most ovarian germ cell tumors are treated with a hysterectomy and bilateral salpingo-oophorectomy. If the cancer is in only one ovary and you still want to be able to have children, only the ovary containing the cancer and the fallopian tube on the same side are removed (leaving behind the other ovary and fallopian tube and the uterus).

Ovarian stromal tumors are often confined to just one ovary, so surgery may just remove that ovary. If the cancer has spread, more tissue may need to be removed. This could mean a hysterectomy and bilateral salpingo-oophorectomy and even debulking surgery.

Sometimes, after child bearing is finished, surgery to remove the other ovary, the other fallopian tube, and the uterus may be recommended, for both germ cell and stromal ovarian tumors.

More information about Surgery

For more general information about surgery as a treatment for cancer, see [Cancer Surgery](#)⁴.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁵.

Hyperlinks

1. www.cancer.org/cancer/ovarian-cancer/detection-diagnosis-staging/staging.html
2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery/ostomies/colostomy.html
3. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery/ostomies/ileostomy.html
4. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html
5. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html

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Chemotherapy for Ovarian Cancer

Chemotherapy (chemo) is the use of drugs to treat cancer. Most often, chemo is a systemic treatment, meaning the drugs enter the bloodstream and reach almost all areas of the body. Chemo can be useful to kill very small amounts of cancer cells that may still be around after surgery, for cancers that have metastasized (spread), or to shrink very large tumors to make surgery easier. Most of the time, chemo uses drugs that are injected into a vein (IV) or given by mouth. In some cases, chemotherapy may also be injected through a catheter (thin tube) directly into the abdominal cavity. This is called *intraperitoneal (IP) chemotherapy*.

Chemotherapy for epithelial ovarian cancer

Chemo for ovarian cancer usually involves getting two different types of drugs together. Getting a combination of drugs instead of just one drug alone seems to work better as a first treatment for ovarian cancer. Usually, the combination includes a type of chemo drug called a *platinum compound* (usually cisplatin or carboplatin), and another type of chemo drug called a *taxane*, such as paclitaxel (Taxol[®]) or docetaxel (Taxotere[®]). These drugs are usually given as an IV (put into a vein) every 3 to 4 weeks.

The typical course of chemo for epithelial ovarian cancer involves 3 to 6 cycles of treatment, depending on the stage and type of ovarian cancer. A cycle is a schedule of regular doses of a drug, followed by a rest period. Different drugs have varying cycles; your doctor will let you know what schedule is planned for your chemo.

Epithelial ovarian cancer often shrinks or even seems to go away with chemo, but the cancer cells may eventually begin to grow again. If the first chemo seemed to work well and the cancer stayed away for at least 6 to 12 months, it can be treated with the same chemotherapy used the first time. In some cases, different drugs may be used.

Some of the other chemo drugs that are helpful in treating ovarian cancer include:

- Albumin bound paclitaxel (nab-paclitaxel, Abraxane[®])
- Altretamine (Hexalen[®])
- Capecitabine (Xeloda[®])
- Cyclophosphamide (Cytosan[®])
- Etoposide (VP-16)
- Gemcitabine (Gemzar[®])
- Ifosfamide (Ifex[®])
- Irinotecan (CPT-11, Camptosar[®])
- Liposomal doxorubicin (Doxil[®])
- Melphalan
- Pemetrexed (Alimta[®])
- Topotecan
- Vinorelbine (Navelbine[®])

Intraperitoneal (IP) chemotherapy

For women who have stage III ovarian cancer (cancer that has not spread outside the abdomen) and whose cancers were optimally debulked (no tumors larger than 1 cm after surgery), intraperitoneal (IP) chemotherapy might be given in addition to systemic chemo (paclitaxel given in a vein).

In IP chemotherapy, the drugs cisplatin and paclitaxel are injected into the abdominal cavity through a catheter (thin tube). The tube can be placed during the staging/debulking surgery, but sometimes it is placed later. If it is done later, it can be placed by a surgeon using laparoscopy, or by an interventional radiologist under x-ray guidance. The catheter is usually connected to a [port](#)¹, a half dollar-sized disk topped with a pliable diaphragm. The port is placed under the skin against a bony structure of the abdominal wall, such as a rib or pelvic bone. A needle can be placed through the skin and into the port to give chemo and other drugs. Over time, problems may occur with the catheter (for example, it might become plugged or infected), but this is rare. .

Giving chemo this way gives the most concentrated dose of the drugs directly to the cancer cells in the abdominal cavity. This chemo also gets absorbed into the bloodstream and so can reach cancer cells outside the abdominal cavity. IP chemotherapy seems to help some women live longer than IV chemo alone, but the side effects are often more severe. Women getting IP chemotherapy might have more abdominal pain, nausea, vomiting, and other side effects, which might make some women stop their treatment early. The risk of side effects also means a woman must have normal kidney function and be in good overall health before starting IP chemo.

Women also cannot have a lot of adhesions or scar tissue inside their abdomen (belly) because this can keep the chemo from reaching all the exposed cancer cells.

Chemotherapy for germ cell tumors

If you have a germ cell tumor, you will likely be treated with combination chemo (several different drugs at once). The combination used most often is called BEP, and includes the chemotherapy drugs bleomycin, etoposide and cisplatin (Platinol). If the cancer is a dysgerminoma, these are usually very sensitive to chemotherapy, and can sometimes be treated with the less toxic combination of carboplatin and etoposide. Other drug combinations may be used if the cancer isn't responding to treatment or to treat cancer that has recurred (come back). These include:

- High dose chemotherapy (the exact drugs used can vary depending on what cancer center is giving the treatment)
- TIP (paclitaxel/Taxol, ifosfamide, and cisplatin/Platinol)
- VeIP (vinblastine, ifosfamide, and cisplatin/Platinol)
- VIP (etoposide/VP-16, ifosfamide, and cisplatin/Platinol)
- VAC (vincristine, dactinomycin, and cyclophosphamide)

Chemotherapy for stromal tumors

Ovarian stromal tumors are not often treated with chemotherapy, but when they are, the combination of carboplatin plus paclitaxel or PEB (cisplatin/Platinol, etoposide, and bleomycin) is used most often.

Side effects of chemotherapy

Chemo drugs can cause side effects. These depend on the type and dose of drugs given, and the length of treatment. Some of the most common possible side effects include:

- Nausea and vomiting
- Loss of appetite
- Loss of hair
- Hand and foot rashes
- Mouth sores

Chemo can also affect the blood-forming cells of the bone marrow, which can lead to:

- Increased chance of infections (from low white blood cell counts, also called *leukopenia*)
- Easy bruising or bleeding (from low blood platelet counts, also called *thrombocytopenia*)
- Fatigue (from low red blood cell counts and other reasons, also called *anemia*)

These side effects usually go away after treatment is finished. While you are in treatment, tell your cancer care team about any side effects you are having. There are often ways to lessen these side effects. For example, drugs can be given to help prevent or reduce nausea and vomiting.

Some chemo drugs may have long-term or even permanent side effects:

- Cisplatin can cause kidney damage. To help prevent this, doctors give lots of IV fluid before and after this drug is given.
- Both cisplatin and the taxanes can cause nerve damage (called *neuropathy*). This can lead to problems with numbness, tingling, or even pain in the hands and feet.
- Cisplatin can also damage the nerves to the ear, which can lead to hearing loss (called *ototoxicity*).
- Chemo can also cause early menopause and infertility (being unable to become pregnant), which may be permanent. This is rarely an issue in the treatment of epithelial ovarian cancer, since most women have both ovaries removed as a part of treatment.
- Rarely, some chemo drugs can permanently damage bone marrow. This can later cause a bone marrow cancer such as [myelodysplastic syndrome](#)² or even [acute myeloid leukemia](#)³. This is called a [second cancer](#)⁴. Your health care team knows which drugs can cause this problem and will discuss this possibility with you. Their positive effects against ovarian cancer offset the small chance that any of these drugs will cause another cancer.
- Ifosfamide can cause irritation and bleeding of the bladder lining (hemorrhagic cystitis). This can usually be prevented by giving the drug mesna with the ifosfamide.

Other drugs can have other side effects, so ask your doctor what side effects to expect from the drugs that you will receive. Most side effects improve once treatment is stopped, but some can last a long time and may never go away completely.

More information about chemotherapy

For more general information about how chemotherapy is used to treat cancer, see [Chemotherapy](#)⁵.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁶.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/planning-managing/tubes-lines-ports-catheters.html
2. www.cancer.org/cancer/myelodysplastic-syndrome.html
3. www.cancer.org/cancer/acute-myeloid-leukemia.html
4. www.cancer.org/treatment/survivorship-during-and-after-treatment/long-term-health-concerns/second-cancers-in-adults.html
5. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html
6. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html

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Targeted Therapy for Ovarian Cancer

Targeted therapy is a type of cancer treatment that uses drugs to identify and attack cancer cells while doing little damage to normal cells. These therapies attack the cancer cells' inner workings—the programming that makes them different from normal, healthy cells. Each type of targeted therapy works differently, but they all change the way a

cancer cell grows, divides, repairs itself, or interacts with other cells.

Bevacizumab

Bevacizumab (Avastin) belongs to a class of drugs called *angiogenesis inhibitors*. For cancers to grow and spread, they need to make new blood vessels to nourish themselves (called angiogenesis). This drug attaches to a protein called VEGF (that signals new blood vessels to form) and slows or stops cancer growth.

Bevacizumab has been shown to shrink or slow the growth of advanced epithelial ovarian cancers. Bevacizumab appears to work even better when given along with chemotherapy having shown good results in terms of shrinking (or stopping the growth of) tumors. But it doesn't seem to help women live longer.

Bevacizumab can also be given with olaparib (see below) as [maintenance treatment](#) in women whose cancers have the BRCA mutation or genomic instability (see below) and have shrunk quite a bit with [chemotherapy](#) containing carboplatin or cisplatin.

This drug is given as an infusion into the vein (IV) every 2 to 3 weeks.

Side effects of bevacizumab

Common side effects include high blood pressure, tiredness, bleeding, low white blood cell counts, headaches, mouth sores, loss of appetite, and diarrhea. Rare but possibly serious side effects include blood clots, severe bleeding, slow wound healing, holes forming in the colon (called perforations), and the formation of abnormal connections between the bowel and the skin or bladder (fistulas). If a perforation or fistula occurs it can lead to severe infection and may require surgery to correct.

PARP inhibitors

Olaparib (Lynparza), rucaparib (Rubraca), and niraparib (Zejula) are drugs known as a *PARP (poly(ADP)-ribose polymerase) inhibitors*. PARP enzymes are normally involved in one pathway to help repair damaged DNA inside cells. The *BRCA* genes (*BRCA1* and *BRCA2*) are also normally involved in a different pathway of DNA repair, and mutations in those genes can block that pathway. By blocking the PARP pathway, these drugs make it very hard for tumor cells with an abnormal *BRCA* gene to repair damaged DNA, which often leads to the death of these cells. If you are not known to have a *BRCA* mutation, your doctor might test your blood or saliva and your tumor to be sure you have one before starting treatment with one of these drugs.

All of these drugs are taken daily by mouth, as pills or capsules.

Olaparib (Lynparza) and **rucaparib (Rubraca)** are used to treat advanced ovarian cancer, typically after chemotherapy has been tried. These drugs can be used in patients with or without mutations in one of the *BRCA* genes.

In women with a *BRCA* mutation:

- Olaparib can be used to treat advanced ovarian cancer that has gotten smaller in response to first treatment with chemotherapy containing cisplatin or carboplatin.
- Olaparib and rucaparib can be used to treat advanced ovarian cancer that has previously been treated with 2 or 3 chemotherapy drugs.
- Olaparib can be used with bevacizumab (see above) as [maintenance treatment](#) in women whose cancers have shrunk quite a bit with chemotherapy containing carboplatin or cisplatin.

In women without a *BRCA* mutation:

- If the tumor has a high genomic instability score (a test measuring the amount of abnormal genes in cancer cells), olaparib can be used with bevacizumab as maintenance treatment in women whose cancers have shrunk quite a bit with chemotherapy containing carboplatin or cisplatin.

In women with or without a *BRCA* mutation:

- Olaparib and rucaparib can be used to treat advanced ovarian cancer that has come back after treatment, and then shrank in response to chemotherapy containing cisplatin or carboplatin.

Olaparib and rucaparib can help extend the time before the cancer comes back or starts growing again.

These drugs have been shown to help shrink or slow the growth of some advanced ovarian cancers for a time. So far, though, it's not clear if they can help women live longer.

Niraparib (Zejula) may be used in different situations to treat ovarian cancer.

In women with or without a *BRCA* gene mutation:

- Niraparib might be used as maintenance treatment for ovarian cancer, where the cancer has shrunk with chemotherapy containing cisplatin or carboplatin

In women with a BRCA mutation:

- Niraparib might be used to treat advanced ovarian cancer after several chemotherapy drugs have been tried

In women without a BRCA mutation but whose tumor has a high genomic instability score (a test measuring the amount of abnormal genes in cancer cells):

- Niraparib might be used to treat advanced ovarian cancer after several chemotherapy drugs have been tried and if the cancer started growing 6 months or more after the last chemo was given

These drugs have been shown to help shrink or slow the growth of some advanced ovarian cancers for a time. So far, though, it's not clear if they can help women live longer.

Side effects of PARP inhibitors

Side effects of these drugs can include nausea, vomiting, diarrhea, fatigue, loss of appetite, taste changes, low red blood cell counts (anemia), belly pain, and muscle and joint pain. Rarely, some patients treated with these drugs have developed a blood cancer, such as [myelodysplastic syndrome](#)¹ or [acute myeloid leukemia](#)².

Drugs that target cells with *NTRK* gene changes

A very small number of ovarian cancers have changes in one of the *NTRK* genes. Cells with these gene changes can lead to abnormal cell growth and cancer. **Larotrectinib (Vitrakvi)** and **entrectinib (Rozlytrek)** are targeted drugs that stop the proteins made by the abnormal *NTRK* genes. These drugs can be used in people with advanced ovarian cancer whose tumor has an *NTRK* gene change and is still growing despite other treatments.

These drugs are taken as pills, once or twice a day.

Side effects of drugs that target *NTRK* gene changes

Common side effects include dizziness, fatigue, nausea, vomiting, constipation, weight gain, and diarrhea.

Less common but serious side effects can include abnormal liver tests, heart problems, and confusion.

More information about targeted therapy

To learn more about how targeted drugs are used to treat cancer, see [Targeted Cancer Therapy](#)³.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁴.

Hyperlinks

1. www.cancer.org/cancer/myelodysplastic-syndrome.html
2. www.cancer.org/cancer/acute-myeloid-leukemia.html
3. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html
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Hormone Therapy for Ovarian Cancer

Hormone therapy is the use of hormones or hormone-blocking drugs to fight cancer. This type of systemic therapy is rarely used to treat epithelial ovarian cancer, but is more often used to treat ovarian stromal tumors.

Luteinizing-hormone-releasing hormone (LHRH) agonists

LHRH agonists (sometimes called *GnRH agonists*) switch off estrogen production by the ovaries. These drugs are used to lower estrogen levels in women who are premenopausal. Examples of LHRH agonists include goserelin (Zoladex[®]) and leuprolide (Lupron[®]). These drugs are injected every 1 to 3 months. Side effects can include any of the symptoms of menopause, such as hot flashes and vaginal dryness. If they are taken for a long time (years), these drugs can weaken bones (sometimes leading to osteoporosis).

Tamoxifen

Tamoxifen is a drug that is often used to treat breast cancer. It can also be used to treat ovarian stromal tumors and is rarely used to treat advanced epithelial ovarian cancer. Tamoxifen acts as an anti-estrogen in many tissues in the body, but as a weak estrogen in others. The goal of tamoxifen therapy is to keep any estrogens circulating in the woman's body from stimulating cancer cell growth. The anti-estrogen activity of this drug can lead to side effects like hot flashes and vaginal dryness. Because tamoxifen acts like a weak estrogen in some areas of the body, it does not cause bone loss but can increase the risk of serious blood clots in the legs.

Aromatase inhibitors

Aromatase inhibitors are drugs that block an enzyme (called *aromatase*) that turns other hormones into estrogen in post-menopausal women. They don't stop the ovaries from making estrogen, so they are only helpful in lowering estrogen levels in women after menopause. These drugs are mainly used to treat breast cancer, but can also be used to treat some ovarian stromal tumors that have come back after treatment as well as low grade serous carcinomas. They include letrozole (Femara[®]), anastrozole (Arimidex[®]), and exemestane (Aromasin[®]). These drugs are taken as pills once a day.

Common side effects of aromatase inhibitors include hot flashes, joint and muscle pain, and bone thinning. The bone thinning can lead to osteoporosis and bones that break

easily.

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Radiation Therapy for Ovarian Cancer

Radiation therapy uses high energy x-rays or particles to kill cancer cells. These x-rays may be given in a procedure that is much like having a regular x-ray. Aggressive chemotherapy is usually more effective, so radiation therapy is rarely used in this country as the main treatment for ovarian cancer. However, it can be useful in treating areas where the cancer has spread, either near the main tumor or in a distant organ, like the brain or spinal cord.

External beam radiation therapy

This is the most common type of radiation therapy for women with ovarian cancer. External radiation therapy is much like getting an x-ray, but the radiation is stronger. A machine focuses the radiation on the area affected by the cancer. The procedure itself is painless. Each treatment lasts only a few minutes, but the setup time—getting you into place for treatment—usually takes longer. Treatments are given 5 days a week for several weeks.

Some common side effects include:

- Skin changes – the skin in the treated area may look and feel sunburned or even blister and peel
- Fatigue (tiredness)
- Nausea and vomiting
- Diarrhea
- Vaginal irritation, sometimes with a discharge (if the pelvis is being treated)

These side effects improve after treatment is stopped. Skin changes gradually fade, and the skin returns to normal in 6 to 12 months.

If you are having side effects from radiation, tell your cancer care team. There may be ways to manage them.

Brachytherapy

Brachytherapy, also known as *internal radiation*, is another way to deliver radiation therapy. Instead of aiming radiation beams from outside the body, a device containing radioactive seeds or pellets is placed inside the body, near the cancer. This is rarely done for ovarian cancer.

More information about radiation therapy

To learn more about how radiation is used to treat cancer, see [Radiation Therapy](#)¹.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)².

Hyperlinks

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

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

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Treatment of Invasive Epithelial Ovarian Cancers, by Stage

The first step in treating most stages of ovarian cancer is surgery to remove and [stage](#)¹ the cancer. Debulking is also done as needed. (See [Surgery for Ovarian Cancer](#).) Because fallopian tube and primary peritoneal cancers have the same staging system as ovarian cancers they are included in this section.

Stage I cancers

The initial treatment for stage I ovarian cancer is [surgery to remove the tumor](#). Most often the uterus, both fallopian tubes, and both ovaries are removed (a hysterectomy with bilateral salpingo-oophorectomy). The treatment after surgery depends on the sub-

stage of the cancer.

Stages IA and IB (T1a or T1b, N0, M0): The treatment after surgery depends on the way the cancer cells look in the lab (called the *tumor grade*).

- For grade 1 (also called low grade) tumors, most women don't need any treatment after surgery. Women who want to be able to have children after treatment might be given the option of having an initial surgery that removes only the ovary containing the cancer along with the fallopian tube on the same side.
- For grade 2 (high grade) tumors, patients are either watched closely after surgery without further treatment, or they are treated with [chemotherapy](#) (chemo). The chemo used most commonly is carboplatin and paclitaxel (Taxol) for 3-6 cycles, but cisplatin can be used instead of carboplatin, and docetaxel (Taxotere) can be used instead of paclitaxel.
- For grade 3 (high grade) tumors, the treatment usually includes the same chemotherapy that is given for grade 2 Stage IA and IB cancers.

Stage IC (T1c, N0, M0): Standard surgery to remove the cancer is still the first treatment. After surgery, chemo is recommended, usually with 3 to 6 cycles of treatment with carboplatin and paclitaxel.

Stage I fallopian tube and primary peritoneal cancers are treated the same way as stage I ovarian cancer.

Stage II cancers

For stage II (including IIA and IIB) cancers, treatment starts with [surgery for staging and debulking](#). This includes a hysterectomy and bilateral salpingo-oophorectomy. The surgeon will try to remove as much of the tumor as possible.

After surgery, [chemo](#) is recommended for at least 6 cycles. The combination of carboplatin and paclitaxel is used most often. Some women with stage II ovarian cancer are treated with intraperitoneal (IP) chemotherapy instead of intravenous (IV) chemotherapy.

Stage II fallopian tube and primary peritoneal cancers are also treated with surgery for staging and debulking, followed by chemo.

Stage III cancers

Stage III cancers (including IIIA1, IIIA2, IIIB, and IIIC) are generally treated similarly to stage II cancers.

First, the cancer is surgically [staged](#)² and the tumor is [debulked](#) (like stage II). The uterus, both fallopian tubes, both ovaries, and omentum (fatty tissue from the upper abdomen near the stomach and intestines) are removed. The surgeon will also try to remove as much tumor as possible. The goal is to leave behind no visible tumor or no tumor larger than 1 cm. When this goal is reached, the cancer is said to have been *optimally debulked*. Sometimes tumor is growing on the intestines, and in order to remove the cancer, part of the intestine will have to be removed. Sometimes pieces of other organs (like the bladder or liver) may also have to be removed to take out the cancer. The smaller the remaining tumor, the better the outlook will be.

After recovery from surgery, combination [chemo](#) is given. The combination used most often is carboplatin (or cisplatin) and a taxane, such as paclitaxel (Taxol), given IV (into a vein) for 6 cycles. The [targeted drug](#) bevacizumab (Avastin) might be given along with chemo as well. (If it is, it's typically continued alone after chemo for up to about a year.)

Another option is to give intra-abdominal ([intraperitoneal or IP](#)) [chemo](#) along with intravenous (IV) chemo, after surgery. IP chemo is usually only considered if the cancer was optimally debulked it may not work as well if a lot of tumor is left in the abdomen.

After surgery, and during and after chemo, blood tests checking for the CA-125 tumor marker will be done to see how well the treatment is working. A CT scan, PET-CT scan, or MRI might also be done.

For women who are not healthy enough to have full staging and debulking surgery, chemo might be given as the first treatment. If the chemo works and the woman becomes stronger, surgery to debulk the cancer may be done, often followed by more chemo. Most often, 3 cycles of chemo are given before surgery, with at least 3 more after surgery (for a total of at least 6 cycles). Giving chemo before surgery is also sometimes an option for some women with advanced cancers that aren't likely to be optimally debulked if surgery is done first.

Maintenance therapy: If the cancer shrinks a lot or appears to be gone after chemotherapy with a platinum drug (cisplatin or carboplatin), doctors might recommend additional treatment for some women. This is called *maintenance therapy*. It is aimed at killing any cancer cells that were left behind after treatment but are too small to be seen on tests. The goal of maintenance therapy is to keep the cancer from coming back after platinum chemotherapy. Drugs that might be used include bevacizumab, niraparib, rucaparib, and olaparib. But since the studies so far show that maintenance therapy does not necessarily help a woman live longer and may cause more side effects, this is

still being studied in [clinical trials](#)³.

Stage IV cancers

In stage IV, the cancer has spread to distant sites, like the liver, the lungs, or bones. These cancers are very hard to cure with current treatments, but they can still be treated. The goals of treatment are to help patients feel better and live longer.

Stage IV can be treated like stage III, with [surgery](#) to remove the tumor and debulk the cancer, followed by [chemo](#) (and possibly the [targeted drug](#) bevacizumab [Avastin]). (If bevacizumab is given, it might be continued alone after chemo or with olaparib.)

Another option is to treat with chemo first. Then, if the tumors shrink from the chemo, surgery may be done, followed by more chemo. Most often, 3 cycles of chemo are given before surgery, with at least 3 more after surgery.

Another option is to limit treatments to those aimed at improving comfort (but not at fighting the cancer). This type of treatment is called *palliative*.

Recurrent or persistent ovarian cancer

Cancer is called *recurrent* when it come backs after treatment. Recurrence can be local (in or near the same place it started) or distant (spread to organs like the lungs or bone). Persistent tumors are those that never went away completely after treatment. Advanced epithelial ovarian cancer often comes back months or years after the initial treatment.

Sometimes, more [surgery](#) is recommended. Most women with recurrent or persistent ovarian cancer are treated with some form of [chemo](#). Which chemo drugs are used depends on what was used the first time and how well it worked (how long the cancer stayed away). The longer it takes for the cancer to come back after treatment, the better the chance that additional chemo will work. If it has been at least 6 months since any chemo, carboplatin and paclitaxel are often used (even if these drugs were given before). Giving carboplatin with another drug is also an option.

If the cancer comes back in less than 6 months (or if it never went away at all), different chemo drugs usually will be tried. There are many different chemo drugs that can be used to treat ovarian cancer, so some women may receive several different chemo regimens over several years.

Treatment with [targeted drugs](#) might also be helpful. For example, bevacizumab

(Avastin) may be given with chemo. A PARP inhibitor drug such as olaparib (Lynparza), rucaparib (Rubraca), or niraparib (Zejula) may also be an option at some point. In addition, some women benefit from [hormonal treatment](#) with drugs like anastrozole, letrozole, or tamoxifen. Someone who didn't initially receive chemo can be treated with the same drugs that are used for newly diagnosed cancer usually carboplatin and paclitaxel.

A [clinical trial](#)⁴ for new treatments might provide important advantages for women with recurrent or persistent ovarian cancer. Ask your cancer care team for information about suitable clinical trials for your type of cancer.

Palliative treatments

Palliative treatments are used to relieve the symptoms of ovarian cancer.

Women with ovarian cancer can have a buildup of fluid in the abdomen. This is called *ascites*. It can be very uncomfortable but can be treated with a procedure called *paracentesis*. After the skin is numbed, a needle is used to withdraw the fluid, often several quarts, into a bottle. Often, ultrasound is used to guide the needle. Often the fluid builds up again, and this procedure needs to be repeated. Sometimes a catheter (a thin flexible tube) is placed into the abdomen and left there so that fluid can be removed as often as is needed without using a needle. Another option is to inject chemo directly into the abdomen to slow the buildup of fluid. Treatment with bevacizumab (Avastin) may also help slow fluid buildup. These treatments can relieve symptoms for some women and, rarely, might help some women live longer. Often, however, their effects are temporary, and the cancer returns or persists.

Ovarian cancer can also block the intestinal tract. This is called *obstruction*, and can cause abdominal pain, nausea, and vomiting. Dealing with an intestinal blockage can be difficult. There are several procedures that might be done, depending on the type of obstruction and your overall health:

- Doctors may place a tube through the skin and into the stomach to allow the stomach juices to drain, so that the digestive tract isn't completely blocked.
- Sometimes a stent (a stiff tube) can be put into the large intestine to relieve a blockage. Since this option has a high risk of complications, you should discuss the risks and benefits with your doctor first.
- For some women, surgery can be done to relieve intestinal obstruction. This is usually only done if you are well enough to get additional treatments (like chemo) after surgery. Often, however, the cancer has grown so much in the abdomen that

surgery to unblock the intestine doesn't work.

Hyperlinks

1. www.cancer.org/cancer/ovarian-cancer/detection-diagnosis-staging/staging.html
2. www.cancer.org/cancer/ovarian-cancer/detection-diagnosis-staging/staging.html
3. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html
4. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html

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Treatment for Epithelial Tumors of Low Malignant Potential

Borderline epithelial tumors are also known as *atypical proliferating tumors* and used to be called *low malignant potential tumors*. These tumors look the same as invasive epithelial ovarian cancers when seen on an ultrasound or CT scan. Doctors can't be sure whether a tumor is invasive or borderline until a biopsy sample has been taken (usually during surgery) and checked in a lab.

Surgery for borderline tumors is similar to the surgery for invasive ovarian cancer, with the goals of removing the tumor along with full [staging](#)¹ and [debulking](#).

- For women who have finished having children, the uterus, both fallopian tubes, and both ovaries are removed. Surgical staging is done to see if the tumor has spread outside the ovary or pelvis. Sometimes, this means removing the omentum and some lymph nodes, and doing washings of the abdomen and pelvis.
- For women who want to be able to become pregnant in the future, only the ovary with the tumor and the fallopian tube on that side is removed. Rarely, just the part of the ovary containing the tumor is removed. These women still should have surgical staging to see if the tumor has spread. If the tumor is only in one ovary, the woman is usually observed without further treatment and monitored with ultrasound exams.

For tumors that haven't spread outside the ovary, [Chemotherapy](#) (chemo) and [radiation therapy](#) are not generally the first treatments used. Observation is often recommended for borderline tumors because they grow very slowly and even when they spread they are rarely fatal.

If the tumor has spread outside the ovary when it is first diagnosed, the surgeon will remove as much of it as possible (debulking). Treatment after surgery depends on whether the spread is *invasive* or not. When borderline tumors spread, they can form tumor implants (deposits) on the peritoneum (lining of the abdomen) and on the surface of organs in the abdomen and pelvis. Most often, these implants are non-invasive, meaning they haven't grown into the abdominal lining or organs.

- For women with non-invasive spread from a borderline tumor, chemo has not been shown to be helpful after debulking surgery. These women are usually watched closely without further treatment.
- For women whose tumor implants are invasive, chemo may be an option, but the benefit from chemo for these cancers is unclear. When chemo is used, it is usually the same as chemo given for invasive ovarian cancer.

If the tumor comes back after initial surgery, further debulking surgery might be considered. Chemo and, rarely, radiation therapy are also options for recurrent borderline tumors.

Hyperlinks

1. www.cancer.org/cancer/ovarian-cancer/detection-diagnosis-staging/staging.html

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Treatment for Germ Cell Tumors of the Ovary

Treating benign germ cell tumors

Women with benign (non-cancerous) germ cell tumors such as mature teratomas (dermoid cysts) are cured by removing the part of the ovary that has the tumor (ovarian cystectomy) or by removing the entire ovary.

Treating malignant germ cell tumors

As with epithelial ovarian cancers, it is a good idea to consult with a gynecologic oncologist for treating malignant germ cell tumors, especially because these are so uncommon. About 2-3% of all ovarian cancers are germ cell tumors.

For most types and stages of germ cell cancers

Most types and stages of germ cell cancers of the ovary are treated the same way, with [surgery](#) and [chemotherapy](#) (chemo).

Surgery: In general, all women with malignant germ cell tumors will have the same staging surgery that is done for epithelial ovarian cancer. For women who still want to be able to have children, the cancerous ovary and the fallopian tube on the same side are removed, but the uterus, the ovary, and the fallopian tube on the opposite side are left behind. This isn't an option when the cancer is in both ovaries. If preserving fertility is not a concern, complete staging including removing both ovaries, both fallopian tubes, and the uterus is generally recommended.

Sometimes, the doctor might consider removing only a part of one ovary to allow a woman to keep her ovarian function. Even when both ovaries need to be removed, a woman may wish to keep her uterus to allow future pregnancy through the use of in-vitro fertilization.

If cancer has spread beyond the ovaries, debulking surgery may be done as a part of the initial surgery. This removes as much cancer as possible without damaging or removing essential organs.

Chemotherapy: Most women with germ cell cancer will need to be treated with combination chemo for at least 3 cycles. The combination used most often is PEB (or BEP), and includes the chemo drugs cisplatin, etoposide, and bleomycin. Dysgerminomas are usually very sensitive to chemo, and can sometimes be treated with the less toxic combination of carboplatin and etoposide. Other drug combinations may be used to treat cancer that has recurred (come back) or hasn't responded to treatment.

Germ cell cancers can raise blood levels of the tumor markers human chorionic gonadotropin (HCG), alpha-fetoprotein (AFP), and/or lactate dehydrogenase (LDH). If the blood levels of these are high before treatment starts, they are rechecked during chemo (usually before each cycle). If the chemo is working, the levels will go down. If the levels stay up, it might be a sign that a different treatment is needed.

Stage IA dysgerminoma

If dysgerminoma is limited to one ovary, surgery to remove that ovary and the fallopian tube on the same side might be the only treatment needed, without chemo after surgery. This approach requires close follow-up so that if the cancer comes back it can be found early and treated. Most women in this stage are cured with surgery and never need chemo.

Grade 1 immature teratoma

A grade 1 immature teratoma is made up mostly of non-cancerous tissue, and only a few cancerous areas are seen. These tumors rarely come back after being removed. If careful staging has determined that a grade 1 immature teratoma is limited to one or both ovaries, surgery to remove the ovary or ovaries containing the cancer and the fallopian tube or tubes might be the only treatment needed.

Treating recurrent or persistent germ cell tumors

Recurrent tumors are those that come back after initial treatment. Persistent tumors are those that never disappeared even after treatment. Sometimes increased blood levels of the tumor markers HCG and AFP will be the only sign that a germ cell cancer is still there (or has come back). Other times a definite tumor might be seen and removed by surgery.

Treatment for recurrent or persistent germ cell tumors might include surgery, chemo or, rarely, radiation therapy. For chemo, a combination of drugs is used most often. PEB (cisplatin, etoposide, and bleomycin) may be used if this combination of drugs was not used before. For women who have already been treated with PEB, [other drug combinations](#) are used.

For recurrent or persistent germ cell cancer, a clinical trial for new treatments may provide important advantages. Ask your cancer care team for information about [clinical trials](#)¹ for your type of cancer.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html

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Treatment for Stromal Tumors of the Ovary, by Stage

Stage I

All stage I stromal tumors are treated with [surgery](#) to remove the ovary with the tumor. Most women with stage I tumors are watched closely after the operation and don't require further treatment. However, some stage I tumors are more likely to come back after surgery, for example:

- Very large tumors
- Tumors where the cyst broke open (ruptured)
- Poorly-differentiated tumors (also called high grade the cancer cells don't look like normal tissue when examined in the lab).

These cancers are said to be at *high risk* for recurrence. Women with high-risk stage I stromal cancers have 2 options after surgery: observation (being watched closely) or [chemotherapy](#) (chemo).

Stages II, III, and IV

These cancers are treated with surgery to remove the ovary with the tumor. [Surgery](#) is also used to stage and debulk the cancer, as needed. This may be followed by [chemo](#) or [hormone therapy](#). Often, the chemo used is the same type used to treat germ cell tumors (PEB: cisplatin, etoposide, and bleomycin). The combination of carboplatin and paclitaxel (Taxol) may also be used. [Hormone treatment](#) is most often used to treat advanced stromal tumors in women who cannot tolerate chemo, but who want to try treatment. This may mean treatment with a drug such as leuprolide (Lupron) and goserelin (Zoladex), the drug tamoxifen, or an aromatase inhibitor. Rarely, [radiation therapy](#) may be an option.

Recurrent stromal tumors

Cancer that comes back after treatment is said to be *recurrent*. This can happen many years later for stromal tumors. Even so, the prognosis (outlook) might still be good because they grow so slowly. Surgery may be repeated. Any of the chemo regimens used initially can also be used to treat a relapse. [Hormone therapy](#) is also an option to treat recurrence. There really isn't a standard treatment for recurrent stromal cancer, so

treatment as part of a clinical trial is also a good option. [Radiation therapy](#) might also sometimes be helpful.

For tumors that produce hormones, the hormone blood levels may be checked regularly after surgery to check for increased levels that could suggest the tumor has returned. The level of a hormone called inhibin can also go up with some stromal tumors and might be useful to check for recurrence.

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