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Treating Liver Cancer

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

How is liver cancer treated?

Treatments for liver cancer include:

- [Surgery for Liver Cancer](#)
- [Ablation for Liver Cancer](#)
- [Embolization Therapy for Liver Cancer](#)
- [Radiation Therapy for Liver Cancer](#)
- [Targeted Drug Therapy for Liver Cancer](#)
- [Immunotherapy for Liver Cancer](#)
- [Chemotherapy for Liver Cancer](#)

Common treatment approaches

In creating your treatment plan, important factors to consider include the stage (extent) of the cancer and the health of your liver. But you and your cancer care team will also want to think about the possible side effects of treatment, your overall health, and the chances of curing the disease, extending life, or relieving symptoms.

- [Treatment of Liver Cancer, by Stage](#)

Who treats liver cancer?

Depending on your situation, you may have different types of doctors on your treatment

team. These doctors may include:

- A **surgical oncologist**: a doctor who treats cancer with surgery.
- A **radiation oncologist**: a doctor who treats cancer with radiation therapy.
- A **medical oncologist**: a doctor who treats cancer with medicines such as chemotherapy, targeted therapy, or immunotherapy.
- A **gastroenterologist**: a doctor who specializes in treating diseases of the digestive system, including the liver.
- An **interventional radiologist**: A doctor who specializes in procedures such as ablations and embolizations.

Many other specialists may be involved in your care as well, including nurse practitioners, nurses, social workers, nutritionists, rehabilitation specialists, and other health professionals.

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

Making treatment decisions

It is 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. Some important things to consider include:

- Your age and expected life span
- Any other serious health conditions you have
- The stage (extent) of your cancer
- Whether or not surgery can remove (resect) the cancer
- The likelihood that treatment will cure the cancer or help in some other way
- Your feelings about the possible side effects from treatment

You may feel that you must make a decision quickly, but it's important to give yourself time to absorb the information you have just learned. Ask questions if there is anything you're not sure about.

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

- [Questions to Ask About Liver 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 Alternative 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.

Surgery for Liver Cancer

The best option to cure liver cancer is with either surgical resection (removal of the tumor with surgery) or a liver transplant. If all cancer in the liver is completely removed, you will have the best outlook. Small liver cancers may also be cured with other types of treatment such as ablation or radiation.

Partial hepatectomy

Partial hepatectomy is surgery to remove part of the liver. Only people with good liver function who are healthy enough for surgery and who have a single tumor that has not grown into blood vessels can have this operation.

[Imaging tests](#)¹, such as CT or MRI with angiography are done first to see if the cancer can be removed completely. Still, sometimes during surgery the cancer is found to be too large or has spread too far to be removed, and the surgery that has been planned cannot be done.

Most patients with liver cancer in the United States also have [cirrhosis](#)². In someone with severe cirrhosis, removing even a small amount of liver tissue at the edges of a cancer might not leave enough liver behind to perform important functions.

People with cirrhosis are typically eligible for surgery if there is only one tumor (that has not grown into blood vessels) and they will still have a reasonable amount (at least 30%) of liver function left once the tumor is removed. Doctors often assess this function by assigning a Child-Pugh score (see [Liver Cancer Stages](#)³), which is a measure of cirrhosis based on certain lab tests and symptoms.

Patients in Child-Pugh class A are most likely to have enough liver function to have surgery. Patients in class B are less likely to be able to have surgery. Surgery is not typically an option for patients in class C.

Possible risks and side effects

Liver resection is a major, serious operation that should only be done by skilled and experienced surgeons. Because people with liver cancer usually have other liver problems besides the cancer, surgeons have to remove enough of the liver to try to get all of the cancer, but also leave enough behind for the liver to function.

- Bleeding: A lot of blood passes through the liver, and bleeding after surgery is a

major concern. Also, the liver normally makes substances that help the blood clot. Damage to the liver (both before the surgery and during the surgery) can add to potential bleeding problems.

- Infection
- Complications from anesthesia
- Blood clots
- Pneumonia
- New liver cancer: Because the remaining liver still has the underlying disease that led to the cancer, sometimes a new liver cancer can develop afterward.

Liver transplant

When it is available, a liver transplant may be the best option for some people with liver cancer. Liver transplants can be an option for those with tumors that cannot be removed with surgery, either because of the location of the tumors or because the liver has too much disease for the patient to tolerate removing part of it. In general, a transplant is used to treat patients with small tumors (either 1 tumor smaller than 5 cm across or 2 to 3 tumors no larger than 3 cm) that have not grown into nearby blood vessels. It can also rarely be an option for patients with resectable cancers (cancers that can be removed completely). With a transplant, not only is the risk of a second new liver cancer greatly reduced, but the new liver will function normally.

According to the Organ Procurement and Transplantation Network, about 1,000 liver transplants were done in people with liver cancer in the United States in 2016, the last year for which numbers are available. Unfortunately, the opportunities for liver transplants are limited. Only about 8,400 livers are available for transplant each year, and most of these are used for patients with diseases other than liver cancer. Increasing awareness about the importance of organ donation is an essential public health goal that could make this treatment available to more patients with liver cancer and other serious liver diseases.

Most livers used for transplants come from people who have just died. But some patients receive part of a liver from a living donor (usually a close relative) for transplant. The liver can regenerate some of its lost function over time if part of it is removed. Still, the surgery does carry some risks for the donor. About 370 living donor liver transplants are done in the United States each year. Only a small number of them are for patients with liver cancer.

People needing a transplant must wait until a liver is available, which can take too long

for some people with liver cancer. In many cases a person may get other treatments, such as [embolization](#) or [ablation](#), while waiting for a liver transplant. Or doctors may suggest surgery or other treatments first and then a transplant if the cancer comes back.

Possible risks and side effects

Like partial hepatectomy, a liver transplant is a major operation with serious risks and should only be done by skilled and experienced surgeons. Possible risks include:

- Bleeding
- Infection: People who get a liver transplant are given drugs to help suppress their immune systems to prevent their bodies from rejecting the new organ. These drugs have their own risks and side effects, especially the risk of getting serious [infections](#)⁴. By suppressing the immune system, these drugs might also allow any liver cancer that had spread outside of the liver to grow even faster than before. Some of the drugs used to prevent rejection can also cause high blood pressure, high cholesterol, and diabetes; can weaken the bones and kidneys; and can even lead to a [new cancer](#)⁵.
- Blood clots
- Complications from anesthesia
- Rejection of new liver: After a liver transplant, regular blood tests are done to check for signs of the body rejecting the new liver. Sometimes liver biopsies are also taken to see if rejection is happening and if changes are needed in the drugs that prevent rejection.

More information about Surgery

For more general information about surgery as a treatment for cancer, see [Cancer Surgery](#)⁶.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁷.

Hyperlinks

1. www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html
2. www.cancer.org/cancer/liver-cancer/causes-risks-prevention/risk-factors.html

3. www.cancer.org/cancer/liver-cancer/detection-diagnosis-staging/staging.html
4. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/low-blood-counts/infections.html
5. www.cancer.org/cancer/liver-cancer/after-treatment/second-cancers-after-liver-cancer.html
6. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html
7. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html

References

Fong Y, Dupey DE, Feng M, Abou-Alfa G. Ch. 57. Cancer of the Liver. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. DeVita, Hellman, and Rosenberg's *Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:844-864.

Kim WR, Lake JR, Smith JM, Schladt DP, Skeans MA, Harper AM et al. OPTN/SRTR 2016 Annual Data Report: Liver. *Am J Transplant*. 2018 Jan;18 Suppl 1:172-253. doi: 10.1111/ajt.14559.

National Cancer Institute. Physician Data Query (PDQ). Adult Primary Liver Cancer Treatment. Accessed at <https://www.cancer.gov/types/liver/hp/adult-liver-treatment-pdq> on February 28, 2019.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers. V.1.2019. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf on February 28, 2019.

Onaca N, Davis GL, Jennings LW, Goldstein RM, Klintmalm GB. Improved results of transplantation for hepatocellular carcinoma: a report from the International Registry of Hepatic Tumors in Liver Transplantation. *Liver Transpl*. 2009 Jun;15(6):574-80.

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Ablation for Liver Cancer

Ablation is treatment that destroys liver tumors without removing them. These techniques can be used in patients with a few small tumors and when surgery is not a good option (often because of poor health or reduced liver function). They are less likely to cure the cancer than surgery, but they can still be very helpful for some people. These treatments are also sometimes used in patients waiting for a liver transplant.

Ablation is best used for tumors no larger than 3 cm across (a little over an inch). For slightly larger tumors (1 to 2 inches, or 3 to 5 cm across), it may be used along with embolization. Because ablation often destroys some of the normal tissue around the tumor, it might not be a good choice for treating tumors near major blood vessels, the diaphragm, or major bile ducts.

People getting this type of treatment typically do not need to stay in a hospital. Often, ablation can be done without [surgery](#) by inserting a needle or probe into the tumor through the skin. The needle or probe is guided into place with ultrasound or CT scan. Sometimes, though, to be sure the treatment is aimed at the right place, the ablation may be done in the operating room under general anesthesia (you are asleep) and may need an incision (cut) like the one for a [partial hepatectomy](#).

Radiofrequency ablation (RFA)

Radiofrequency ablation is one of the most common ablation methods for small tumors. It uses high-energy radio waves. The doctor inserts a thin, needle-like probe into the tumor through the skin. A high-frequency current is then passed through the tip of the probe, which heats the tumor and destroys the cancer cells.

Microwave ablation (MWA)

Microwave ablation uses the energy from electromagnetic waves to heat and destroy the tumor using a probe.

Cryoablation (cryotherapy)

Cryoablation destroys a tumor by freezing it using a thin metal probe. The probe is guided into the tumor and then very cold gasses are passed through the probe to freeze the tumor which causes the cancer cells to die.

Ethanol (alcohol) ablation

This is also known as **percutaneous ethanol injection (PEI)**. In this procedure, concentrated alcohol is injected directly into the tumor to damage cancer cells. Sometimes multiple treatments of alcohol ablation may be needed.

Side effects of ablation therapy

Possible side effects after ablation therapy include abdominal pain, infection in the liver, fever and abnormal liver tests. Serious complications are uncommon, but they are possible.

[Newer ablation techniques](#)¹ in liver cancer are also being studied.

Hyperlinks

1. www.cancer.org/cancer/liver-cancer/about/new-research.html

References

Fong Y, Dupey DE, Feng M, Abou-Alfa G. Ch. 57 - Cancer of the Liver. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. DeVita, Hellman, and Rosenberg's *Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:844-864.

Minami Y, Kudo M. Radiofrequency ablation of liver metastases from colorectal cancer: a literature review. *Gut Liver*. 2012;7(1):1–6. doi:10.5009/gnl.2013.7.1.1

National Cancer Institute. Physician Data Query (PDQ). Adult Primary Liver Cancer Treatment. Accessed at <https://www.cancer.gov/types/liver/hp/adult-liver-treatment-pdq> on March 5, 2019.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers. V.1.2019. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf on March 5, 2019.

Raza A, Sood GK. Hepatocellular carcinoma review: current treatment, and evidence-based medicine. *World J Gastroenterol*. 2014;20(15):4115-27.

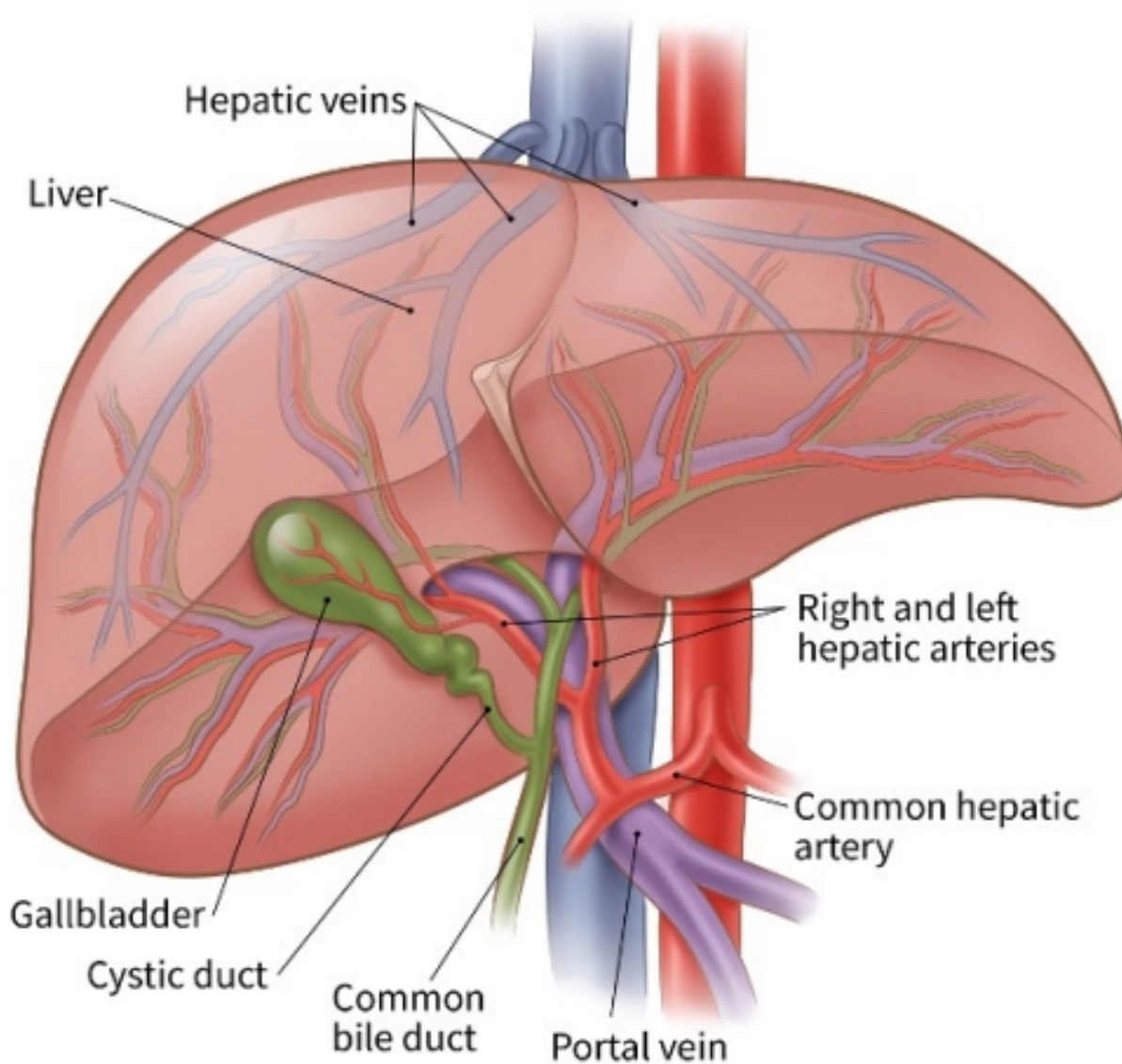
Salati U, Barry A, Chou FY, Ma R, Liu DM. State of the ablation nation: a review of ablative therapies for cure in the treatment of hepatocellular carcinoma. *Future Oncol.* 2017 Jul;13(16):1437-1448. doi: 10.2217/fon-2017-0061. Epub 2017 Jul 7.

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Embolization Therapy for Liver Cancer

Embolization is a procedure that injects substances directly into an artery in the liver to block or reduce the blood flow to a tumor in the liver.

The liver is special in that it has 2 blood supplies. Most normal liver cells are fed by the **portal vein**, whereas a cancer in the liver is mainly fed by the **hepatic artery**. Blocking the part of the hepatic artery that feeds the tumor helps kill off the cancer cells, but it leaves most of the healthy liver cells unharmed because they get their blood supply from the portal vein.



Embolization is an option for some patients with tumors that cannot be removed by surgery. It can be used for people with tumors that are too large to be treated with ablation (usually larger than 5 cm across) and who also have adequate liver function. It can also be used with ablation. Embolization can reduce some of the blood supply to the normal liver tissue, so it may not be a good option for some patients whose liver has been damaged by diseases such as hepatitis or cirrhosis. It isn't yet clear which type of embolization has a better long-term outcome.

People getting this type of treatment typically do not stay in the hospital overnight.

Trans-arterial embolization (TAE)

During trans-arterial embolization a catheter (a thin, flexible tube) is put into an artery in the inner thigh through a small cut and eased up into the hepatic artery in the liver. A dye is usually injected into the bloodstream to help the doctor watch the path of the catheter. Once the catheter is in place, small particles are injected into the artery to plug it up, blocking oxygen and key nutrients from the tumor.

Trans-arterial chemoembolization (TACE)

Trans-arterial chemoembolization is usually the first type of embolization used for large liver cancers that cannot be treated with surgery or ablation. It combines embolization with chemotherapy (chemo). Most often, this is done by giving chemotherapy through the catheter directly into the artery, then plugging up the artery, so the chemo can stay close to the tumor.

Drug-eluting bead chemoembolization (DEB-TACE)

Drug-eluting bead chemoembolization combines TACE embolization with drug-eluting beads (tiny beads that contain a chemotherapy drug). The procedure is essentially the same as TACE except that the artery is blocked after drug-eluting beads are injected. Because the chemo is physically close to the cancer and because the drug-eluting beads slowly release the chemo, the cancer cells are more likely to be damaged and die. The most common chemo drugs used for TACE or DEB-TACE are mitomycin C, cisplatin, and doxorubicin.

Radioembolization (RE)

Radioembolization combines embolization with radiation therapy. This is done by injecting small beads (called *microspheres*) that have a radioactive isotope (yttrium-90) attached to them into the hepatic artery. Once infused, the beads lodge in the blood vessels near the tumor, where they give off small amounts of radiation to the tumor site for several days. The radiation travels a very short distance, so its effects are limited mainly to the tumor.

Possible side effects of embolization

Possible complications after embolization include:

- Abdominal pain
- Fever

- Nausea
- Infection in the liver
- Blood clots in the main blood vessels of the liver

Sometimes, it can take 4-6 weeks to fully recover from the procedure. Because healthy liver tissue can be affected, there is a risk that liver function will get worse after embolization. This risk is higher if a large branch of the hepatic artery is embolized. Serious complications are not common, but they are possible.

References

Abou-Alfa GK, Jarnigan W, Dika IE, D'Angelica M, Lowery M, Brown K, et al. Ch. 77 - Liver and Bile Duct Cancer. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020:1314–1341.

Fong Y, Dupey DE, Feng M, Abou-Alfa G. Ch. 57 - Cancer of the Liver. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:844-864.

Kloeckner R, Weinmann A, Prinz F, et al. Conventional transarterial chemoembolization versus drug-eluting bead transarterial chemoembolization for the treatment of hepatocellular carcinoma. *BMC Cancer*. 2015;15:465. Published 2015 Jun 10. doi:10.1186/s12885-015-1480-x.

Lewandowski RJ, Geschwind JF, Liapi E, Salem R. Transcatheter intraarterial therapies: Rationale and overview. *Radiology*. 2011;259:641–657.

National Cancer Institute. Physician Data Query (PDQ). Adult Primary Liver Cancer Treatment. Accessed at <https://www.cancer.gov/types/liver/hp/adult-liver-treatment-pdq> on March 7, 2019.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers. V.1.2019. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf on March 7, 2019.

Raza A, Sood GK. Hepatocellular carcinoma review: current treatment, and evidence-

based medicine. *World J Gastroenterol.* 2014;20(15):4115-27.

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Radiation Therapy for Liver Cancer

Radiation therapy uses high-energy rays (or particles) to kill cancer cells. It may not be a good option for some patients whose liver has been greatly damaged by diseases such as hepatitis or cirrhosis.

Radiation can be helpful in treating:

- Liver cancer that cannot be removed by surgery
- Liver cancer that cannot be treated with ablation or embolization or did not respond well to those treatments
- Liver cancer that has spread to other areas such as the brain or bones
- People with pain because of large liver cancers
- People with a tumor thrombus (a collection of liver cancer cells) blocking the portal vein.

How is radiation therapy given?

[External beam radiation therapy](#)¹ (EBRT) focuses radiation from a source outside of the body on the cancer. Getting radiation therapy is much like getting an x-ray, but the radiation is stronger. The procedure itself is painless. Each treatment lasts only a few minutes, although the setup time – getting you into place for treatment – usually takes longer. Most often, EBRT treatments are small doses of radiation given 5 days a week for several weeks.

Although liver cancer cells are sensitive to radiation, much care is taken when planning the treatment to avoid damaging normal liver tissue as much as possible. Newer radiation techniques, such as **stereotactic body radiation therapy (SBRT)**, help doctors target liver tumors while reducing the radiation to nearby healthy tissues. This

makes it more effective and reduces side effects. SBRT allows treatment to be completed in a short-time compared to EBRT. It uses very focused beams of high-dose radiation given on one or a few days. Beams are aimed at the tumor from many different angles. To focus the radiation precisely, the person is put in a specially designed body frame for each treatment. This type of radiation may be used in people with small cancers who are waiting for a liver transplant.

Radioembolization

As mentioned in [Embolization Therapy for Liver Cancer](#), tumors in the liver can be treated by injecting small radioactive beads into the hepatic artery. The beads then lodge in the liver near the tumor and give off small amounts of radiation that travel only a short distance.

Possible side effects of radiation therapy for liver cancer

Some of the more common side effects of radiation therapy include:

- Skin changes in areas getting radiation, ranging from redness to blistering and peeling
- Nausea and vomiting
- Fatigue
- Diarrhea
- Loss of appetite

These effects typically go away within a few weeks after treatment ends.

A more serious side effect of radiation therapy to the liver is **radiation-induced liver disease (RILD)**. It commonly happens 3 to 4 months after treatment and usually only lasts a set time, but can be fatal in some instances. Signs and symptoms seen with RILD can include abnormal blood liver tests, an enlarged liver and spleen, ascites (fluid build up in the abdomen), and jaundice. Ask your doctor what side effects to expect and how to prevent or relieve them.

More information about radiation therapy

To learn more about how radiation is used to treat cancer, see [Radiation Therapy²](#).

To learn about some of the side effects listed here and how to manage them, see

Managing Cancer-related Side Effects³

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation/external-beam-radiation-therapy.html
2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html

References

Abou-Alfa GK, Jarnigan W, Dika IE, D'Angelica M, Lowery M, Brown K, et al. Ch. 77 - Liver and Bile Duct Cancer. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020:1314–1341.

Fong Y, Dupey DE, Feng M, Abou-Alfa G. Ch. 57 - Cancer of the Liver. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:844-864.

National Cancer Institute. Physician Data Query (PDQ). Adult Primary Liver Cancer Treatment. Accessed at <https://www.cancer.gov/types/liver/hp/adult-liver-treatment-pdq> on March 7, 2019.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers. V.1.2019. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf on March 7, 2019.

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Targeted Drug Therapy for Liver Cancer

As researchers learn more about the changes in cells that cause cancer, they have been able to develop newer drugs that specifically target these changes. Targeted drugs work differently from standard chemotherapy drugs (which are described in [Chemotherapy for Liver Cancer](#)) and often have different side effects.

Like chemotherapy, these drugs enter the bloodstream and reach almost all areas of the body, which makes them potentially useful against cancers that have spread to distant parts of the body. Because standard chemo is not very effective in most patients with liver cancer, doctors are focusing more on using targeted therapies.

Kinase inhibitors

Kinases are proteins on or near the surface of a cell that carry important signals to the cell's control center. Many of the targeted drugs used to treat liver cancer are **kinase inhibitors**. These drugs block several kinase proteins, which normally help tumor cells grow in one of two ways:

- Some kinases help tumor cells grow directly.
- Some kinases help tumors form the new blood vessels they need in order to get bigger (a process called **angiogenesis**).

Blocking these proteins can often help stop the growth of the cancer.

Sorafenib (Nexavar) and lenvatinib (Lenvima)

One of these drugs can be used as the first treatment for liver cancer if it cannot be treated by surgery or if it has spread to other organs.

Sorafenib is a pill taken twice daily. Lenvatinib is a pill that is taken once a day.

Sorafenib may work better in people with liver cancer caused by hepatitis C.

Regorafenib (Stivarga) and cabozantinib (Cabometyx)

These drugs can be used to treat advanced liver cancer, typically if other treatments are no longer helpful.

Regorafenib is a pill, typically taken once a day for 3 weeks, followed by a week off. Cabozantinib is a pill taken once a day.

Side effects of kinase inhibitors

Common side effects of these drugs can include fatigue, loss of appetite, hand-foot syndrome (redness and irritation of the hands and feet), high blood pressure, weight loss, diarrhea, and abdominal (belly) pain.

Less common but more serious side effects can include problems with blood flow to the heart, bleeding, abnormal thyroid tests, and perforations (holes) in the stomach or intestines.

Monoclonal antibodies

Monoclonal antibodies are man-made versions of immune system proteins (antibodies) that are designed to attach to a specific target. The monoclonal antibodies used to treat liver cancer affect a tumor's ability to form new blood vessels, which it needs to grow beyond a certain size. This new blood vessel growth is called **angiogenesis**, so these drugs are often referred to **angiogenesis inhibitors**.

Bevacizumab (Avastin)

Bevacizumab is a monoclonal antibody that targets vascular endothelial growth factor (VEGF), a protein that helps new blood vessels to form. This drug can be used along with the [immunotherapy](#) drug atezolizumab (Tecentriq) as the first treatment for liver cancer that cannot be treated by surgery or that has spread to other organs.

This drug is given as an infusion into a vein (IV), typically once every 3 weeks.

Ramucirumab (Cyramza)

Ramucirumab is a monoclonal antibody that targets a VEGF receptor (VEGFR) protein on cells, which can help stop the formation of new blood vessels. This drug can be used to treat advanced liver cancer, typically after another treatment stops working.

This drug is given as an infusion into a vein (IV), usually once every 2 weeks.

Side effects of angiogenesis inhibitors

Common side effects of these drugs can include:

- High blood pressure

- Tiredness (fatigue)
- Bleeding
- Low white blood cell counts (with increased risk of infections)
- Headaches
- Mouth sores
- Loss of appetite
- Diarrhea

Rare but possibly serious side effects can include blood clots, severe bleeding, holes (called perforations) in the stomach or intestines, heart problems, and slow wound healing.

More information about targeted therapy

To learn more about how targeted drugs are used to treat cancer, see [Targeted Cancer 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/targeted-therapy.html
2. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html

References

Abou-Alfa GK, Jarnigan W, Dika IE, D'Angelica M, Lowery M, Brown K, et al. Ch. 77 - Liver and Bile Duct Cancer. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020:1314–1341.

Bruix J, Tak WY, Gasbarrini A, et al. Regorafenib as second-line therapy for intermediate or advanced hepatocellular carcinoma: multicentre, open-label, phase II safety study. *Eur J Cancer*. 2013 Nov;49(16):3412-9. Epub 2013 Jun 25.

Fong Y, Dupey DE, Feng M, Abou-Alfa G. Ch. 57 - Cancer of the Liver. In: DeVita VT,

Lawrence TS, Rosenberg SA, eds. DeVita, Hellman, and Rosenberg's *Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:844-864.

National Cancer Institute. Physician Data Query (PDQ). Adult Primary Liver Cancer Treatment. Accessed at <https://www.cancer.gov/types/liver/hp/adult-liver-treatment-pdq> on February 27, 2019.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers. V.3.2020. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf on June 10, 2020.

Raza A, Sood GK. Hepatocellular carcinoma review: current treatment, and evidence-based medicine. *World J Gastroenterol*. 2014;20(15):4115-27.

Stuart KE. Systemic treatment for advanced hepatocellular carcinoma. UpToDate website. <https://www.uptodate.com/contents/systemic-treatment-for-advanced-hepatocellular-carcinoma>. Updated January 16, 2019. Accessed March 11, 2019.

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Immunotherapy for Liver Cancer

Immunotherapy is the use of medicines that help a person's own immune system find and destroy cancer cells. It can be used to treat some people with liver cancer.

Immune checkpoint inhibitors

An important part of the immune system is its ability to keep itself from attacking normal cells in the body. To do this, it uses "checkpoints" – proteins on immune cells that need to be turned on (or off) to start an immune response. Cancer cells sometimes use these checkpoints to avoid being attacked by the immune system. Newer drugs that target these checkpoints hold a lot of promise as liver cancer treatments.

PD-1 and PD-L1 inhibitors

PD-1 is a checkpoint protein on immune cells called *T cells*. When PD-1 attaches to PD-L1, a protein on other cells in the body, it acts as a type of “off switch” that basically tells the T cell to leave the other cell alone. Some cancer cells have large amounts of PD-L1, which helps them hide from an immune attack. Drugs that target either PD-1 or PD-L1 can block this binding and boost the immune response against cancer cells.

Atezolizumab (Tecentriq) targets the PD-L1 protein. Blocking this protein can help boost the immune response against cancer cells. This can shrink some tumors or slow their growth.

This drug can be used along with the [targeted drug](#) bevacizumab (Avastin) as the first treatment for liver cancer that cannot be treated by surgery or that has spread to other organs.

This drug is given as an infusion into a vein (IV), typically once every 2, 3, or 4 weeks.

Pembrolizumab (Keytruda) and **nivolumab (Opdivo)** are drugs that target PD-1, which can help boost the immune response against cancer cells. This can shrink some tumors or slow their growth.

These drugs can be used in people with advanced liver cancer who have previously been treated (such as with the [targeted drug](#) sorafenib [Nexavar]). Giving nivolumab along with ipilimumab (see below) may also be an option. The combination of the two drugs may help shrink the cancer more than nivolumab alone (although it might also have more side effects).

These drugs are given as an intravenous (IV) infusion, typically every 2, 3, 4, or 6 weeks.

CTLA-4 inhibitor

Ipilimumab (Yervoy) is another drug that boosts the immune response, but it has a different target. It blocks CTLA-4, another protein on T cells that normally helps keep them in check.

This drug is given as an intravenous (IV) infusion, usually once every 3 weeks for 4 treatments. It can be used in combination with nivolumab to treat liver cancer that has previously been treated (such as with the [targeted drug](#) sorafenib [Nexavar]). The combination of the two drugs may help shrink the cancer more than nivolumab alone (although it might also have more side effects).

Possible side effects of checkpoint inhibitors

Side effects of these drugs can include:

- Feeling tired or weak
- Fever
- Cough
- Nausea
- Itching
- Skin rash
- Loss of appetite
- Muscle or joint pain
- Constipation or diarrhea

Other, more serious side effects occur less often:

Infusion reactions: Some people might have an infusion reaction while getting these drugs. This is like an allergic reaction, and can include fever, chills, flushing of the face, rash, itchy skin, feeling dizzy, wheezing, and trouble breathing. It's important to tell your doctor or nurse right away if you have any of these symptoms while getting these drugs.

Autoimmune reactions: These drugs work by basically removing one of the safeguards on the body's immune system. Sometimes the immune system starts attacking other parts of the body, which can cause serious or even life-threatening problems in the lungs, intestines, liver, hormone-making glands, kidneys, skin, or other organs.

Serious side effects seem to occur more often with ipilimumab than with the PD-1 and PD-L1 inhibitors.

It's very important to report any new side effects to your health care team promptly. If serious side effects do occur, treatment may need to be stopped and you may get high doses of corticosteroids to suppress your immune system.

More information about immunotherapy

To learn more about how drugs that work on the immune system are used to treat cancer, see [Cancer Immunotherapy](#)¹.

To learn about some of the side effects listed here and how to manage them, see

Managing Cancer-related Side Effects²

Hyperlinks

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

References

Fong Y, Dupey DE, Feng M, Abou-Alfa G. Ch. 57 - Cancer of the Liver. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. DeVita, Hellman, and Rosenberg's *Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:844-864.

National Cancer Institute. Physician Data Query (PDQ). Adult Primary Liver Cancer Treatment. Accessed at <https://www.cancer.gov/types/liver/hp/adult-liver-treatment-pdq> on March 11, 2019.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers. V.3.2020. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf on June 10, 2020.

Stuart KE. Systemic treatment for advanced hepatocellular carcinoma. UpToDate website. <https://www.uptodate.com/contents/systemic-treatment-for-advanced-hepatocellular-carcinoma>. Updated January 16, 2019. Accessed March 11, 2019.

Zhu AX, Finn RS, Edeline J, Cattan S et al. Pembrolizumab in patients with advanced hepatocellular carcinoma previously treated with sorafenib (KEYNOTE-224): a non-randomised, open-label phase 2 trial. *Lancet Oncol*. 2018 Jul;19(7):940-952. doi: 10.1016/S1470-2045(18)30351-6. Epub 2018 Jun 3.

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Chemotherapy for Liver Cancer

Chemotherapy (chemo) is treatment with drugs to destroy cancer cells. Chemo may be an option for people whose liver cancer cannot be treated with surgery, has not responded to local therapies such as ablation or embolization, or when targeted therapy is no longer helpful.

Which chemotherapy drugs are used for liver cancer?

Unfortunately, most chemo drugs do not have a great effect on liver cancer. Recent advances have shown that a combination of drugs may be more helpful than using just a single chemo drug. But even these combinations of drugs shrink only a small number of tumors, and the responses often do not last long. And most studies show systemic chemo has not helped patients live longer.

The most common chemotherapy drugs for treating liver cancer include:

- Gemcitabine (Gemzar)
- Oxaliplatin (Eloxatin)
- Cisplatin
- Doxorubicin (pegylated liposomal doxorubicin)
- 5-fluorouracil (5-FU)
- Capecitabine (Xeloda)
- Mitoxantrone (Novantrone)

Sometimes, combinations of 2 or 3 of these drugs are used. GEMOX (gemcitabine plus oxaliplatin) is one option for people who are fairly healthy and may tolerate more than one drug. 5-FU based chemotherapy, for example with FOLFOX (5-FU, oxaliplatin and leucovorin), is another option for people with bad liver disease.

How is chemotherapy given?

You can get chemotherapy in different ways.

Systemic chemotherapy

Drugs are injected right into a vein (IV) or taken by mouth. These drugs enter the bloodstream and reach almost all areas of the body, possibly making this treatment

useful for cancers that have spread to other parts of the body.

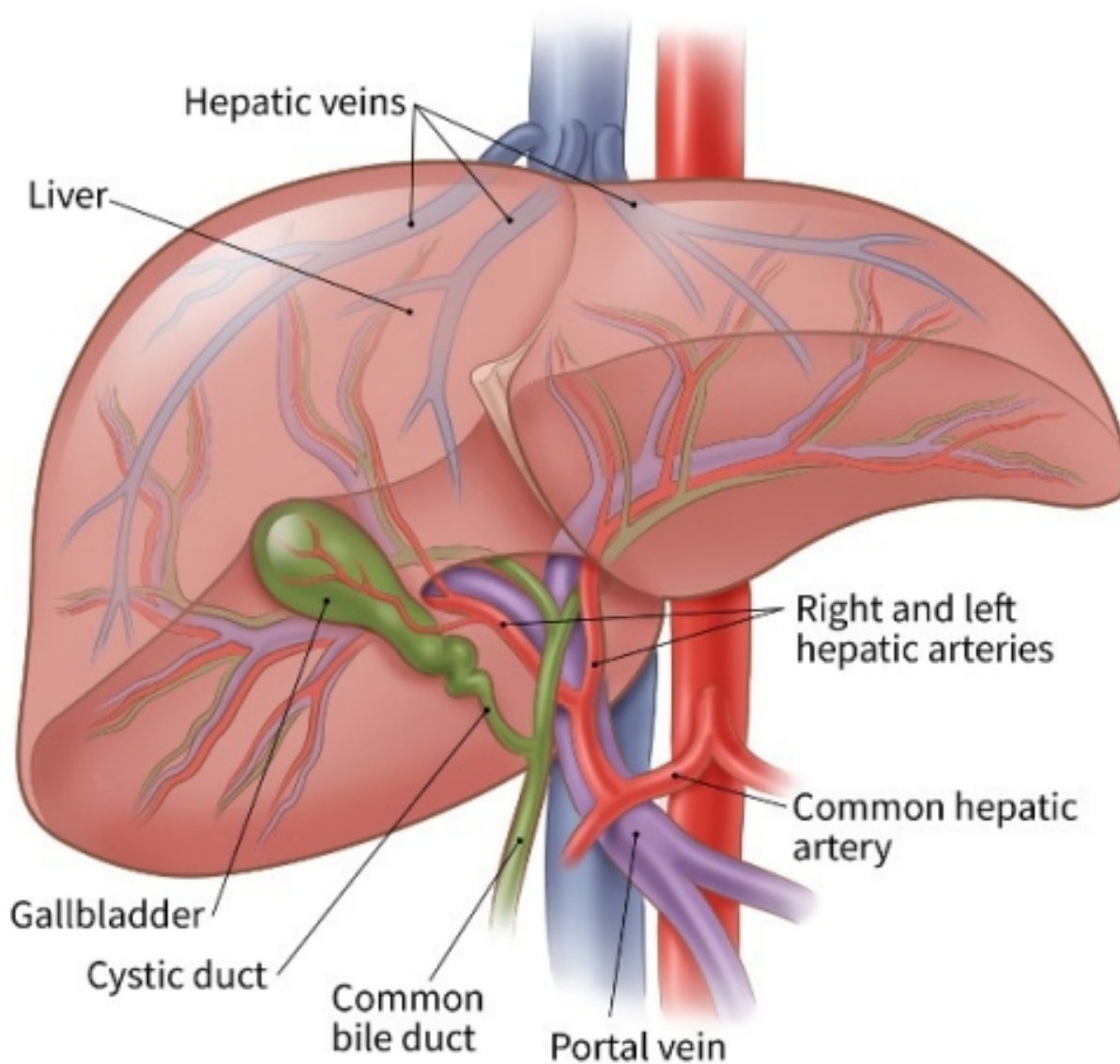
For IV chemo, a slightly larger and sturdier catheter is required in the vein system to administer chemo. They are known as [central venous catheters](#)¹ (CVCs), central venous access devices (CVADs), or central lines. They are used to put medicines, blood products, nutrients, or fluids right into your blood. They can also be used to take out blood for testing. Many different kinds of CVCs are available. The 2 most common types are the port and the PICC line.

Doctors give chemo in cycles, with each period of treatment followed by a rest period to give you time to recover from the effects of the drugs. Cycles are most often 2 or 3 weeks long. The schedule varies depending on the drugs used. For example, with some drugs, the chemo is given only on the first day of the cycle. With others, it is given for a few days in a row, or once a week. Then, at the end of the cycle, the chemo schedule repeats to start the next cycle.

Treatment for advanced liver cancer is based on how well it is working and what side effects you have.

Regional chemotherapy

Drugs are put right into an artery that leads to the part of the body with the tumor. This focuses the chemo on the cancer cells in that area. It reduces side effects by limiting the amount of drug reaching the rest of the body. Hepatic artery infusion, or chemo given directly into the hepatic artery, is regional chemotherapy that can be used for liver cancer.



Hepatic artery infusion

Doctors have studied putting chemo drugs directly into the hepatic artery at a constant rate to see if it might be more effective than systemic chemo. This technique is known as hepatic artery infusion (HAI). It is slightly different from [chemoembolization](#) because surgery is needed to put an infusion pump under the skin of the abdomen (belly). The pump is attached to a catheter that connects to the hepatic artery. This is done while the patient is under general anesthesia. The chemo is injected with a needle through the skin into the pump's reservoir and it is released slowly and steadily into the hepatic artery.

The healthy liver cells break down most of the drug before it can reach the rest of the body. This method gets a higher dose of chemo to the tumor than systemic chemo but doesn't increase side effects. The drugs most commonly used for HAI include floxuridine (FUDR), cisplatin, and oxaliplatin.

HAI may be used for people with very large liver cancers that cannot be removed with surgery or cannot be treated entirely with [TACE](#). This technique may not be useful in all patients because it requires surgery to insert the pump and catheter, an operation that many liver cancer patients may not be able to tolerate.

Early studies have found that HAI is often effective in shrinking tumors, but more research is still needed.

Possible side effects of chemotherapy for liver cancer

Chemo drugs attack cells that are dividing quickly, which is why they work against cancer cells. But other cells in the body, such as those in the bone marrow, the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are also likely to be affected by chemo, which can lead to side effects.

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

- Hair loss
- Mouth sores
- Loss of appetite
- Nausea and vomiting
- Diarrhea
- Increased chance of infections (from low white blood cell counts)
- Easy bruising or bleeding (from low blood platelet counts)
- Fatigue (from low red blood cell counts)

These side effects usually don't last long and go away after treatment is finished. There are often ways to lessen them. For example, drugs can be given to help prevent or reduce nausea and vomiting. Be sure to ask your doctor or nurse about drugs to help reduce side effects.

Along with the possible side effects in the list above, some drugs may have their own specific side effects. Ask your health care team what you can expect.

You should report any side effects you notice while getting chemotherapy to your medical team so that you can be treated promptly. In some cases, the doses of the chemotherapy drugs may need to be reduced or treatment may need to be delayed or stopped to prevent side effects from getting worse.

More information about chemotherapy

For more general information about how chemotherapy is used to treat cancer, see [Chemotherapy](#)².

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)³.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/planning-managing/tubes-lines-ports-catheters.html
2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html

References

Abou-Alfa GK, Jarnigan W, Dika IE, D'Angelica M, Lowery M, Brown K, et al. Ch. 77 - Liver and Bile Duct Cancer. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020:1314–1341.

Cho CS, Lubner S, Owen D. Ch. 118 – Metastatic Cancer to the Liver. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:1957-1969.

Fong Y, Dupey DE, Feng M, Abou-Alfa G. Ch. 57 - Cancer of the Liver. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:844-864.

Gao S, Zhang PJ, Guo JH, et al. Chemoembolization alone vs combined chemoembolization and hepatic arterial infusion chemotherapy in inoperable

hepatocellular carcinoma patients. *World J Gastroenterol*. 2015;21(36):10443-52.

He MK, Le Y, Li QJ, et al. Hepatic artery infusion chemotherapy using mFOLFOX versus transarterial chemoembolization for massive unresectable hepatocellular carcinoma: a prospective non-randomized study. *Chin J Cancer*. 2017;36(1):83. Published 2017 Oct 23. doi:10.1186/s40880-017-0251-2.

Mahvi DA and Mahvi DM. Ch. 58 - Liver Metastases. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020:846 - 862.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers. V.1.2019. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf on March 12, 2019.

Stuart KE. Systemic treatment for advanced hepatocellular carcinoma. UpToDate website. <https://www.uptodate.com/contents/systemic-treatment-for-advanced-hepatocellular-carcinoma>. Updated January 16, 2019. Accessed March 12, 2019.

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Treatment of Liver Cancer, by Stage

Although the AJCC (TNM) staging system (see [Liver Cancer Stages¹](#)) is often used to describe the spread of a liver cancer, doctors use a more practical system to determine treatment options. Liver cancers are often categorized as:

- Potentially resectable or transplantable cancer
- Unresectable (inoperable) cancer that has not spread
- Advanced cancer

Potentially resectable or transplantable liver cancers (stage I and

some stage II cancers)

Potentially resectable

If your cancer is early stage and the rest of your liver is healthy, [surgery](#) (partial hepatectomy) may cure you. Only a small number of people with liver cancer are in this category. Important factors that may influence the outcome are the size of the tumor(s) and if nearby blood vessels are affected. Larger tumors or those that invade blood vessels are more likely to come back in the liver or spread elsewhere after surgery. How well your liver is working and your general health are also important. For some people with early-stage liver cancer, a liver transplant could be another option.

[Clinical trials](#)² are now looking at whether patients who have a partial hepatectomy will be helped by getting other treatments in addition to surgery. Some studies have found that using [chemoembolization](#) or other treatments along with surgery may help some patients live longer. More research is needed to know the value (if any) of adding other treatments to surgery.

Potentially transplantable

If your cancer is at an early stage, but the rest of your liver isn't healthy, you may be able to be treated with a liver transplant. Liver transplant may also be an option if the tumor is in a part of the liver that makes it hard to remove (such as very close to a large blood vessel). Candidates for liver transplant might have to wait a long time for a liver to become available. While they are waiting, they are often given other treatments, such as [ablation](#) or [embolization](#), to keep the cancer under control.

Unresectable (inoperable) liver cancers that have not spread

Unresectable cancers include cancers that haven't yet spread to lymph nodes or distant sites, but that can't be removed safely by partial hepatectomy. This might be because:

- The tumor is too large to be removed safely.
- The tumor is in a part of the liver that makes it hard to remove (such as very close to a large blood vessel).
- There are several tumors or the cancer has spread throughout the liver.
- The person isn't healthy enough for liver surgery.

Treatment options might include [ablation](#), [embolization](#), or both for the liver tumor(s). Other options may include [targeted therapy](#), [immunotherapy](#), [chemotherapy](#) (either

systemic or by hepatic artery infusion), and/or [radiation therapy](#). For some of these cancers, treatment may shrink the tumor(s) enough so that [surgery](#) (partial hepatectomy or transplant) may become possible.

These treatments are very unlikely to cure the cancer, but they can reduce symptoms and may even help a person live longer. Because these cancers can be hard to treat, [clinical trials](#)³ of newer treatments may offer a good option in many cases.

Advanced (metastatic) liver cancers (includes all N1 or M1 tumors)

Advanced liver cancer has spread either to the lymph nodes or to other organs. Because these cancers are widespread, they cannot be treated with surgery.

For people whose liver is functioning well enough (Child-Pugh class A or B), initial treatment options might include:

- The [immunotherapy](#) drug atezolizumab (Tecentriq) plus the [targeted drug](#) bevacizumab (Avastin)
- Either of the targeted drugs sorafenib (Nexavar) or lenvatinib (Lenvima)

If these drugs are no longer working, other targeted drugs, such as regorafenib (Stivarga), cabozantinib (Cabometyx), or ramucirumab (Cyramza) are possible options. The immunotherapy drugs pembrolizumab (Keytruda), nivolumab (Opdivo), or nivolumab with ipilimumab (Yervoy) might also be helpful.

As with unresectable liver cancer that has not spread, [clinical trials](#)⁴ of newer targeted therapies, immunotherapy, new approaches to chemotherapy (new drugs and ways to deliver chemotherapy), new forms of radiation therapy, and other new treatments may be helpful. These clinical trials are also important for improving the outcome for future patients.

Treatments such as radiation might also be used to help relieve [pain](#)⁵ and other symptoms. Please be sure to discuss any symptoms you have with your cancer team, so they can treat them effectively.

Recurrent liver cancer

Cancer that comes back after treatment is called **recurrent**. Recurrence can be local (in or near the same place it started) or distant (spread to organs such as the lungs or bone). Treatment of liver cancer that returns after initial therapy depends on many

factors, including where it comes back, the type of initial treatment, and how well the liver is functioning.

People with resectable cancer that recurs in the liver might be eligible for further [surgery](#) or local treatments like [ablation](#) or [embolization](#).

If the cancer is widespread, [targeted therapy](#), [immunotherapy](#), or [chemotherapy](#) drugs may be options. Patients may also wish to ask their doctor whether a [clinical trial](#)⁶ may be right for them.

Treatment can also be given to [relieve pain and other side effects](#)⁷. Please be sure to discuss any symptoms you have with your cancer care team, so they may be treated effectively.

Hyperlinks

1. www.cancer.org/cancer/liver-cancer/detection-diagnosis-staging/staging.html
2. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.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
5. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/pain.html
6. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html
7. www.cancer.org/treatment/treatments-and-side-effects/palliative-care.html

References

Abou-Alfa GK, Jarnigan W, Dika IE, D'Angelica M, Lowery M, Brown K, et al. Ch. 77 - Liver and Bile Duct Cancer. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020:1314–1341.

Fong Y, Dupey DE, Feng M, Abou-Alfa G. Ch. 57 - Cancer of the Liver. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019:844-864.

National Cancer Institute. Physician Data Query (PDQ). Adult Primary Liver Cancer Treatment. Accessed at <https://www.cancer.gov/types/liver/hp/adult-liver-treatment-pdq>

on March 13, 2019.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Hepatobiliary Cancers. V.3.2020. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf on June 10, 2020.

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