



## LIVER CANCER

### What is cancer?

Cancer develops when cells in a part of the body begin to grow out of control. Although there are many kinds of cancer, they all start because of out-of-control growth of abnormal cells.

Normal body cells grow, divide, and die in an orderly fashion. During the early years of a person's life, normal cells divide more rapidly until the person becomes an adult. After that, cells in most parts of the body divide only to replace worn-out or dying cells and to repair injuries.

Because cancer cells continue to grow and divide, they are different from normal cells. Instead of dying, they outlive normal cells and continue to form new abnormal cells.

Cancer cells develop because of damage to DNA. This substance is in every cell and directs all its activities. Most of the time when DNA becomes damaged the body is able to repair it. In cancer cells, the damaged DNA is not repaired. People can inherit damaged DNA, which accounts for inherited cancers. Many times though, a person's DNA becomes damaged by exposure to something in the environment, like smoking.

Cancer usually forms as a tumor. Some cancers, like leukemia, do not form tumors. Instead, these cancer cells involve the blood and blood-forming organs and circulate through other tissues where they grow.

Often, cancer cells travel to other parts of the body, where they begin to grow and replace normal tissue. This process is called metastasis. Regardless of where a cancer may spread, however, it is always named for the place it began. For instance, breast cancer that spreads to the liver is still called breast cancer, not liver cancer.

Not all tumors are cancerous. Benign (non-cancerous) tumors do not spread (metastasize) to other parts of the body and, with very rare exceptions, are not life threatening.

Different types of cancer can behave very differently. For example, lung cancer and breast cancer are very different diseases. They grow at different rates and respond to different treatments. That is why people with cancer need treatment that is aimed at their particular kind of cancer.

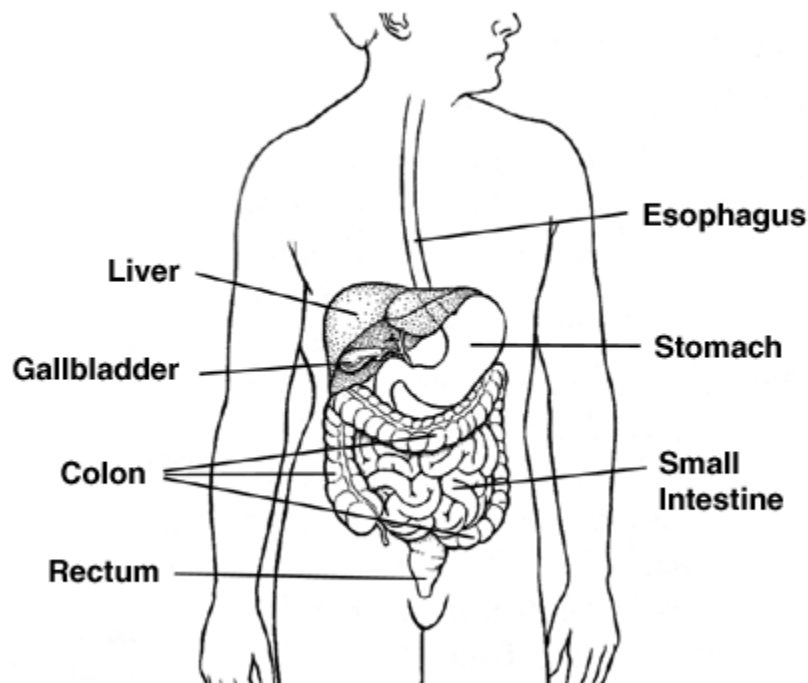
Cancer is the second leading cause of death in the United States. Nearly half of all men and a little over one third of all women in the United States will develop cancer during their lifetimes. Today, millions of people are living with cancer or have had cancer. The risk of developing most types of cancer can be reduced by changes in a person's lifestyle, for example, by quitting smoking and eating a better diet. The sooner a cancer is found and treatment begins, the better are the chances for living for many years.

## What Is Liver Cancer?

### About the Liver

The liver is the largest internal organ. It lies under your right ribs just beneath your right lung. If you were to poke your fingers up under your right ribs, you would almost be touching it.

It is shaped like a pyramid and divided into right and left lobes. The lobes are further divided into segments. The liver, unlike most other organs, gets blood from 2 sources: the *hepatic artery* supplies the liver with blood from the heart that is rich in oxygen and the *portal vein* carries nutrient-rich blood from the intestines.



You cannot live without your liver. It has several important functions:

- It breaks down and stores many of the nutrients absorbed from the intestine that are needed for the body to function. Some nutrients must be changed (metabolized) in the liver before they can be used by the rest of the body for energy or to build and repair body tissues.
- It makes most of the clotting factors that keep the body from bleeding too much when you are cut or injured.
- It secretes bile into the intestines to help absorb nutrients (especially fats).
- It plays an important role in removing toxic wastes from the body.

The liver is made up of several different types of cells. This is why there are several types of malignant (cancerous) and benign (non-cancerous) tumors that can form in the liver. These tumors have different causes, are treated differently, and have a different prognosis (outlook for health or recovery).

## Benign Tumors

Benign tumors can sometimes grow large enough to cause problems, but they generally do not invade nearby tissues or spread to distant parts of the body. If they need to be treated, they can usually be cured by removing them during surgery.

*Hemangiomas*, the most common type of benign liver tumor, start in blood vessels. Most hemangiomas of the liver cause no symptoms and do not need treatment. But some may bleed and need to be surgically removed.

*Hepatic adenomas* are benign tumors that start from hepatocytes (the main type of liver cell). Most cause no symptoms and do not need treatment. But some eventually cause symptoms, such as pain or a mass in the abdomen (stomach area) or blood loss. Because there is a risk that the tumor could rupture (leading to severe blood loss) and a small risk that it could eventually develop into liver cancer, most experts usually advise surgery to remove them if possible.

The use of certain drugs may increase the risk of getting these tumors. Women have a higher chance of having one of these tumors if they take birth control pills, although this is a rare complication. Stopping the pills can sometimes cause the tumor to shrink. Men who use anabolic steroids ("steroids") may also develop these. They may shrink when the drugs are stopped.

*Focal nodular hyperplasia (FNH)* is a tumor-like growth of several cell types (hepatocytes, bile duct cells, and connective tissue). Although FNH tumors are benign, sometimes it can be hard to tell them apart from true liver cancers, and doctors sometimes remove them when the diagnosis is unclear. If you have symptoms from an FNH tumor, it can be surgically removed and you can be cured.

Both hepatic adenomas and FNH tumors are more common in women than in men.

## Malignant Tumors That Start in the Liver

*Hepatocellular carcinoma (HCC)* or hepatocellular cancer is the most common form of liver cancer in adults. It is also sometimes called *hepatoma* because it comes from the hepatocytes (the main type of liver cell). It accounts for about 3 out of 4 cancers that start in the liver.

Hepatocellular cancers can have different growth patterns:

- Some begin as a single tumor that grows larger. Only late in the disease does it spread to other parts of the liver.
- A second type of liver cancer develops as many smaller cancer nodules throughout the liver almost from the start and is not confined to a single tumor. This is seen most often in people with cirrhosis (chronic liver damage) and is the most common pattern seen in the United States.

Under the microscope, doctors can distinguish several subtypes of HCC. Most often these subtypes do not affect treatment or prognosis (outlook). But one of these subtypes, *fibrolamellar*, is important to recognize. Patients with this rare (less than 1%) type are usually younger (below age 35), and the rest of their liver is not diseased. This subtype has a much better prognosis than other forms of HCC.

*Cholangiocarcinomas* account for about 10% to 20% of cancers that start in the liver. They are also called intrahepatic (starting within the liver) cholangiocarcinomas. These cancers start in the small bile ducts (tubes that carry bile to the gallbladder) within the liver.

Although the rest of this document discusses hepatocellular cancers, cholangiocarcinomas are often treated the same way. For more information on this type of cancer, see the American Cancer Society document, *Bile Duct (Cholangiocarcinoma) Cancer*.

*Angiosarcomas* and *hemangiosarcomas* are rare cancers that begin in blood vessels of the liver. People who have been exposed to vinyl chloride or to thorium dioxide (Thorotrast) are more likely to develop these cancers. Other cases are thought to be due to exposure to arsenic or radium, or to an inherited condition known as hemochromatosis. In about half of all cases, however, no likely cause can be identified.

These tumors grow rapidly and are usually too widespread to be removed surgically by the time they are found. Chemotherapy and radiation therapy may not help much. Many patients live less than 6 months after the diagnosis.

*Hepatoblastoma* is a very rare kind of cancer that develops in children, usually younger than 4 years old. The cells of hepatoblastoma are similar to fetal liver cells. About 70% of children with this disease are treated successfully with surgery and chemotherapy, and the survival rate is greater than 90% for early-stage hepatoblastomas.

## Secondary Liver Cancer

Most of the time when cancer is found in the liver it did not start there but has spread (metastasized) from a cancer that started somewhere else in the body, such as the pancreas, colon, stomach, breast, or lung. These tumors are named after their primary site of occurrence (where they started) and are called metastatic. For example, cancer that started in the lung and spread to the liver is called metastatic lung cancer with spread to the liver. In the United States and Europe, secondary (or metastatic) liver tumors are more common than primary liver cancer. The opposite is true for many areas of Asia and Africa.

For more information on liver metastases from different types of cancer, refer to the American Cancer Society documents on these cancer types, and to our document, *Advanced Cancer*.

**Most of the remaining sections of this document refer only to hepatocellular cancer.**

## What Are the Key Statistics About Liver Cancer?

The American Cancer Society estimates that 21,370 new cases (15,190 in men and 6,180 in women) of primary liver cancer and intrahepatic bile duct cancer will be diagnosed in the United States during 2008. About 18,410 people (12,570 men and 5,840 women) will die of these cancers in the United States during 2008.

The percentage of Americans developing liver cancer had been increasing in the second half of the 20th century, but the rate seems to have been stable in recent years. The actual number of cases has gone up, but this is because the population is increasing.

Liver cancer is more common in men than in women, although it is still fairly rare in the United States in both groups. An average man's lifetime risk of getting liver or intrahepatic bile duct cancer is 0.88% (about 1 in 114), while an average woman's risk is 0.4% (about 1 in 250). Most cases occur in people with certain risk factors (see the section, "What Are the Risk Factors for Liver Cancer?").

The average age at diagnosis for liver cancer is 65. More than 90% of people diagnosed with liver cancer are between 45 and 85 years of age. About 4% are between 35 and 44 years of age and less than 3% are under age 35.

This cancer is many times more common in developing countries in Africa and East Asia than in the United States. In many of these countries it is the most common type of cancer. Over 500,000 people are diagnosed with this cancer each year throughout the world.

## What Are the Risk Factors for Liver Cancer?

A risk factor is anything that affects your chance of getting a disease, such as cancer. Different cancers have different risk factors. For example, exposing skin to strong sunlight is a risk factor for skin cancer. Smoking is a risk factor for cancers in several organs. But risk factors are not absolute. Having a risk factor, or even several risk factors, does not mean that you will get the disease. And many people who get the disease may not have had any known risk factors.

Scientists have found several risk factors that make a person more likely to develop hepatocellular carcinoma (HCC).

## **Gender**

Hepatocellular carcinoma is much more common in males than in females, although much of this is likely due to behaviors affecting the risk factors described below. The fibrolamellar subtype of HCC occurs in about equal numbers in both sexes.

## **Chronic Viral Hepatitis**

Chronic (long-term) infection with hepatitis B virus (HBV) or hepatitis C virus (HCV) is the most common liver cancer risk factor. These infections lead to cirrhosis of the liver (see below) and are responsible for making liver cancer the most common cancer in many parts of the world.

In the United States, infection with hepatitis C is the most common cause of HCC, while in Asia and developing countries, hepatitis B is more common. People infected with both viruses have a very high risk of developing chronic hepatitis, cirrhosis, and liver cancer.

HBV and HCV are spread from person to person through sharing contaminated needles (such as in drug use), unprotected sex, or childbirth. They can also be passed on through blood transfusions, although this has rarely happened in the United States since the start of blood product testing for these viruses. In developing countries, children sometimes contract hepatitis B infection from prolonged contact with family members who are infected.

Of the 2 viruses, infection with HBV is more likely to cause symptoms, such as a flu-like illness and a yellowing of the eyes and skin (jaundice). But most people recover completely from HBV infection within a few months. Only a very small percentage of adults become chronic carriers (and have a higher risk for liver cancer), but the risk is higher in infants and small children who become infected.

HCV, on the other hand, is less likely to cause symptoms. But most people with HCV develop chronic infections, which are more likely to lead to liver damage or even cancer.

Other viruses can also cause hepatitis, such as the hepatitis A virus and hepatitis E virus. But people infected with these viruses do not develop chronic hepatitis or cirrhosis, and have no increased risk of liver cancer.

## **Cirrhosis**

Cirrhosis is a disease in which liver cells become damaged and are replaced by scar tissue. People with cirrhosis have an increased risk of liver cancer. Most (but not all) people who develop liver cancer already have some evidence of cirrhosis.

There are several possible causes of cirrhosis. Most cases in the United States occur in people who abuse alcohol. Chronic infections with HBV or HCV are also major causes of cirrhosis.

Certain types of inherited metabolic diseases (see below) can cause problems in the liver that lead to cirrhosis. Some types of autoimmune diseases that affect the liver can also cause cirrhosis.

### **Inherited Metabolic Diseases**

Certain inherited metabolic diseases can lead to cirrhosis. People with hemochromatosis absorb too much iron from their food. They are more likely to develop cirrhosis because of the high levels of iron in their liver. Other rare diseases that increase the risk of liver cancer include tyrosinemia, alpha1-antitrypsin deficiency, porphyria cutanea tarda, glycogen storage diseases, and Wilson disease.

### **Diabetes**

Diabetes can also increase the risk of liver cancer, usually in patients who have other risk factors such as heavy alcohol consumption and/or chronic viral hepatitis.

### **Obesity**

Obesity may increase the risk of developing liver cancer, probably because it can result in fatty liver disease and cirrhosis.

### **Aflatoxins**

These cancer-causing substances are made by a fungus that contaminates peanuts, wheat, soybeans, ground nuts, corn, and rice. Storage in a moist warm environment can lead to the growth of this fungus. Although this can occur almost anywhere in the world it is more common in warmer and tropical countries. Developed countries such as the United States and those in Europe regulate the content of aflatoxins in foods through testing. Long-term exposure to these substances is a major risk factor for liver cancer. The risk is increased even further in people with hepatitis B or C infection.

### **Vinyl Chloride and Thorium Dioxide (Thorotrast)**

These chemicals are risk factors for angiosarcoma of the liver (see the section, "What Is Liver Cancer?"). They also increase the risk of developing cholangiocarcinoma and hepatocellular cancer, but to a far lesser degree. Vinyl chloride is a chemical used in making some kinds of plastics. Thorotrast is a chemical that in the past was injected into some patients as part of certain x-ray tests. When the cancer-causing properties of these chemicals were recognized, steps were taken to eliminate them or minimize exposure to them. Thorotrast is no longer used and exposure of workers to vinyl chloride is strictly regulated.

### **Anabolic Steroids**

Anabolic steroids are male hormones that are used by some athletes to increase their strength. Long-term anabolic steroid use can slightly increase the risk of hepatocellular cancer. Cortisone-like steroids, such as hydrocortisone, prednisone, and dexamethasone, do not carry this same risk.

## **Arsenic**

Chronic exposure to drinking water contaminated with naturally occurring arsenic, such as that obtained from some wells, increases the risk of some types of liver cancer. This is more common in parts of East Asia but may be a concern in some areas of the United States.

## **Factors With Uncertain, Controversial, or Unproven Effects on Liver Cancer Risk**

### **Birth Control Pills**

Birth control pills, also known as oral contraceptives, are a cause of benign tumors called hepatic adenomas. They may also slightly increase the risk of hepatocellular cancer. Most of the studies linking oral contraceptives and liver cancer involve types of pills that are no longer used. Current birth control pills use different types of estrogens, different estrogen doses, and different combinations of estrogens with other hormones. It is not known if the newer pills significantly increase liver cancer risk.

### **Tobacco Use**

Some studies have found a link between smoking and liver cancer, but the extent of this is not known.

## **Do We Know What Causes Liver Cancer?**

Although several risk factors for hepatocellular cancer are known, the exact way in which these factors cause normal liver cells to become cancerous is only partially understood.

Cancers develop when damage occurs to the DNA of cells. DNA contains genes - the instructions for how the cells in our bodies function. Some of these genes help cells to grow at a proper rate. If these genes are altered, the cells may grow out of control and form a tumor.

Certain chemicals that cause liver cancer, such as aflatoxins, are known to damage the DNA in liver cells. For example, studies have shown that aflatoxins can damage the p53 gene, which normally works to prevent cells from growing too much. Damage to p53 DNA can lead to increased growth of abnormal cells and formation of cancers.

Infection of liver cells with hepatitis viruses can also cause DNA damage. These viruses have their own DNA, which carries instructions on how to infect cells and produce more viruses. In some patients this viral DNA can insert itself into a liver cell's DNA, where it may affect the cell's genes. But scientists still don't know exactly how this leads to cancer.

Although scientists are starting to understand this process, much more must be learned. It is hoped that a more complete understanding will help develop ways to better prevent and treat liver cancers.

## **Can Liver Cancer Be Prevented?**



Many liver cancers can be prevented by public health measures that reduce exposure to known risk factors for this disease.

Worldwide, the most significant risk factor is chronic infection with hepatitis B virus (HBV) and hepatitis C virus (HCV).

A vaccine has been available to help prevent hepatitis B infection since the early 1980s. All children, as well as adults at high risk (health care workers, those whose behaviors may put them at risk, etc.), should get this vaccine to reduce the risk of hepatitis and liver cancer.

There is no vaccine for hepatitis C. Preventing HCV infection, as well as HBV infection in people who have not been immunized, is based on understanding how these infections occur. These viruses can be spread through sharing contaminated needles (such as in drug use), unprotected sex, and through childbirth.

Blood transfusions were once a major source of infection as well, but this has become extremely rare. Blood banks in the United States perform tests on donated blood to look for these viruses. All infected blood is discarded. Because of screening, transfusion-associated cases now occur in less than one per 2 million transfused units of blood.

People at high risk for hepatitis B or C should be tested for these infections so they can be watched for the development of liver disease and treated if needed. Several drugs can be used to treat hepatitis B and C. If you have hepatitis B or C you should talk to your doctor about these treatments.

Two drugs -- interferon alfa and ribavirin -- can be used to treat chronic hepatitis C. Interferon can be given alone or along with ribavirin. Combined treatment using a newer form of interferon (peg-interferon) and ribavirin seems to be the most effective treatment at this time. Treatment usually lasts for 6 months to a year and can eliminate the hepatitis C virus in many people. One of the problems with treatment is that it can cause severe side effects, including flu-like symptoms, fatigue, depression, and low blood counts, which can make it hard to take.

A number of drugs can be used to treat chronic hepatitis B, including interferon (and peg-interferon), lamivudine (Epivir-HBV), adefovir (Hepsera), entecavir (Baraclude), and telbivudine (Tyzeka). These drugs have been shown to reduce the number of viruses and lessen liver damage. But they do not cure the disease, and their effect on the risk of liver cancer is unknown at this time.

In the United States, alcohol abuse remains a major cause of the cirrhosis that can lead to liver cancer. Prevention of liver cancers linked with alcohol abuse remains a challenge. Quitting smoking may also slightly lower the risk of liver cancer, as well as lowering the risk for many other life-threatening diseases.

Changing the way certain grains are stored in tropical and subtropical countries could reduce exposure to cancer-causing substances such as aflatoxins. Many developed countries already have regulations to prevent and monitor grain contamination.

Most developed countries have regulations to protect consumers and workers from known cancer-causing chemicals. These regulations have essentially eliminated certain chemicals as a cause of liver cancer. The US Environmental Protection Agency (EPA) recently lowered the allowable level of arsenic in drinking water in the United States, which should help to reduce exposure. But this may continue to be a problem in areas of the world where naturally occurring arsenic commonly gets into drinking water.

Certain inherited diseases can cause cirrhosis of the liver, increasing the risk of liver cancer. Finding and treating these diseases early in life could lower this risk. For example, all children in families where there is hemochromatosis should be screened for the disease and treated if they have it. Treatment consists of lowering their iron intake and removing small amounts of blood to use up the body's excess supply of iron.

## **Can Liver Cancer Be Found Early?**

Because signs and symptoms do not usually appear until the cancer is in its later stages, liver cancer is seldom diagnosed early. Small liver tumors are hard to detect on physical exam because most of the liver is covered by the right rib cage. By the time a tumor can be felt, it may already be quite large.

Many patients who develop liver cancer have long-standing cirrhosis (scar tissue formation due to liver cell damage). If a patient with cirrhosis gets worse for no apparent reason, doctors should suspect that liver cancer may be the cause and do appropriate tests.

If a person is known to have cirrhosis, whatever the cause, most doctors recommend liver cancer screening every 6 months with tests of alpha-fetoprotein and ultrasound. But it's not yet clear if screening will result in more effective treatment of liver cancer.

## **Alpha-fetoprotein (AFP) Blood Test**

AFP is a protein that is normally present at high levels in the blood of fetuses but disappears shortly after birth. If it is found in the blood of adults it suggests they may have liver cancer or other cancers such as testicular or gestation trophoblastic neoplasms. It can also be found in the blood of pregnant women if the placenta has become damaged.

Tests for AFP are used to look for early tumors in people at high risk for liver cancer. But it is usually not advised as a routine test to screen for liver cancer in people at average risk because there are potential problems with using it. Some liver tumors do not make much of this protein. Often by the time the AFP level is elevated, the tumor is too large to be removed or it has spread outside the liver. Some non-cancerous liver diseases can also raise AFP levels.

In areas where liver cancer is very common, use of the AFP blood test for screening has resulted in detecting many tumors at an earlier stage. Still, many experts feel that AFP testing isn't sensitive enough for people living in the United States and Europe, and recommend ultrasound (see below) as the main test, although the AFP level may still be measured along with it.

## **Ultrasonography (Ultrasound)**

Ultrasound is a test that uses sound waves and their echoes to produce a picture of internal organs or masses. A small instrument called a transducer emits sound waves and picks up the echoes as they bounce off the organs. The echoes are converted by a computer into an image that is displayed on a screen. This test can show masses growing in the liver, which can then be tested for cancer, if needed.

This is a very easy procedure to have done. It uses no radiation, which is why it is often used to look at developing fetuses. When you have an ultrasound exam, you simply lie on a table while the transducer (which is shaped like a wand) is placed on the skin over the part of your body being looked at. Usually, the skin is first lubricated with oil.

This test is used in people with certain liver cancer risk factors to help find cancers earlier. Many experts recommend that the test be done every 6 or 12 months. But no one knows for certain what the right screening interval should be.

## **Who Should Be Screened?**

People at higher risk from liver cancer may be helped by screening. Many doctors recommend testing for certain groups. This includes people with cirrhosis, whether it is due to HBV, HCV, alcohol, hemochromatosis, or other causes. In particular, if a person's cirrhosis is so severe that he or she is waiting to receive a liver transplant, he or she should be screened. Otherwise a cancer may develop during the wait and become so advanced that it is incurable. The development of a cancer will also move the person up on the transplant waiting list.

Some people with chronic HBV or HCV infections should also be screened, such as those with a family history of liver cancer. In other groups at increased risk, the benefits of screening may not be as clear. If you think you are at increased risk for liver cancer, talk to your doctor about whether screening is a good option for you.

## **How Is Liver Cancer Diagnosed?**

### **Signs and Symptoms of Liver Cancer**

Although signs and symptoms are usually not present until the late stages of liver cancer, sometimes they may show up early and lead to an early diagnosis. Many signs and symptoms of liver cancer are relatively non-specific -- that is, they can be caused by other cancers or by non-cancerous diseases. Still, if you have any of the following problems, please see a doctor right away:

- unexplained, unintentional weight loss
- constant loss of appetite

- feeling very full after a small meal (early satiety)
- enlarged liver or a mass that can be felt in the area of the liver (the upper right side of the abdomen)
- enlarged spleen (mass that can be felt in the upper left side of the abdomen)
- persistent pain in the abdomen
- swelling or fluid build-up in the abdomen
- skin itching
- yellowing of the skin and eyes (jaundice)
- enlarged veins that become visible through the skin
- worsening of your condition if you have chronic hepatitis or cirrhosis

Some liver tumors make hormones that act on organs other than the liver. These hormones may cause:

- high blood calcium levels (hypercalcemia), which can cause weakness or muscle problems
- low blood sugar levels (hypoglycemia), which can cause fatigue or fainting
- enlargement of the breasts in men (gynecomastia)

These unusual findings may cause doctors to suspect a disease of the nervous system or an endocrine (hormone-producing) gland, rather than a liver cancer.

If you have one or more of these symptoms, your doctor will try to find if they are due to liver cancer or some other cause.

## History and Physical Exam

The doctor will take your complete medical history (medical interview) to check for risk factors and symptoms. Then the doctor will examine you to look for signs of liver cancer and other health problems. He or she will likely pay special attention to your abdomen.

## Imaging Tests

These tests are used to create pictures of the inside of your body. They allow doctors to look for abnormalities, such as masses.

### Ultrasound (US)

This test is used to look for masses in the liver. It is described in the section "Can Liver Cancer Be Found Early?"

### Computed Tomography (CT)

The CT scan is an x-ray procedure that produces detailed cross-sectional images of your body. This test is very useful in identifying many types of liver tumors.

Instead of taking one picture like a standard x-ray, a CT scanner takes many pictures as it rotates around you. A computer then combines these into images of slices of the part of your body that is being studied. Often after the first set of pictures is taken you will get an

intravenous (IV) injection of a radiocontrast agent, a special dye that helps better outline structures in your body. A second set of pictures will then be taken.

You may need an IV line through which the contrast "dye" is injected. The injection can cause some flushing (redness and warm feeling). Some people are allergic and get hives or, rarely, more serious reactions like trouble breathing and low blood pressure. Be sure to tell the doctor if you have ever had a reaction to any contrast material used for x-rays.

CT scans take longer than regular x-rays. You need to lie still on a table for 15 to 30 minutes while they are being done. You might feel a bit confined by the machine you have to lie in while the pictures are being taken. But just like other computerized devices, they are getting faster.

### **Magnetic Resonance Imaging (MRI)**

MRI scans use radio waves and strong magnets instead of x-rays. The energy from the radio waves is absorbed by the body and then released in a pattern formed by the type of body tissue and by certain diseases. A computer translates the pattern into a very detailed image of parts of the body. Like a CT scanner, this produces cross-sectional slices of the body. An MRI can also produce slices that are parallel with the length of your body. A contrast material might be injected just as with CT scans.

MRI scans are very helpful in looking at liver cancers. Sometimes they can tell a benign tumor from a malignant one.

MRI scans may be a little more uncomfortable than CT scans. They take longer -- often up to an hour. You may be placed inside a large cylindrical tube, which is confining and can upset people with a fear of enclosed spaces. Newer, "open" MRI machines can help with this if needed. The MRI machine makes a buzzing noise that you may find disturbing. Some places will provide headphones with music to block this out.

### **Angiography**

Angiography is an x-ray procedure for looking at blood vessels. Contrast medium, or dye, is injected into an artery before x-ray images are taken. The dye outlines the blood vessels on x-ray pictures.

Angiography is useful in showing the arteries that supply blood to a liver cancer. This information can help surgeons decide whether a cancer can be removed and if so provides help in planning the operation.

Newer techniques can help make the angiography pictures more accurate. Digital subtraction angiography uses computers to produce more detailed images of blood vessels. Dynamic sequential CT scanning combines CT scanning and angiography. It is not routinely used but is sometimes helpful in planning surgery.

Angiography can be an uncomfortable procedure because the radiologist who performs the procedure has to put a small catheter into the artery leading to the liver. Usually the catheter is put into an artery in your inner thigh and threaded up into the liver artery. A local anesthetic is often used to numb the area before inserting the catheter. Then the dye is injected quickly to outline all the vessels while the x-rays are being taken.

For more information on these imaging procedures, see the American Cancer Society document, *Imaging (Radiology) Tests*.

## Other Procedures

### Laparoscopy

This procedure uses a thin, lighted tube, connected to a video monitor, to allow a doctor to look at the liver and other internal organs. The tube is inserted through a small incision in the front of the abdomen. Laparoscopy provides a view of organs, which can help in planning surgery or other treatments. Doctors can also use small instruments through this tube to remove small tissue samples (biopsies) to look at under the microscope.

Laparoscopy is usually done at an outpatient center but it is like an operation. You will be sedated (made sleepy), and the area where the incision will be made will be numbed. Because the surgeon only makes a small incision to insert the tubes, there is not much pain after surgery. You should be able to go home after you recover from the anesthesia.

### Biopsy

In most cases, the only way to be certain that liver cancer is present is to take a biopsy (sample of the tumor tissue) and look at it under a microscope. But in some cases, if imaging studies (CT or MRI) show a tumor mass that is likely cancerous and a blood test reveals the AFP level is very high, a biopsy may not be needed.

There are several biopsy methods that can be used to take samples of liver tissue.

**Surgical biopsies:** An incisional biopsy (removing a piece of the tumor) or an excisional biopsy (removing the entire tumor along with some surrounding normal liver tissue) can be done during a surgical operation. But since doctors usually prefer to know the exact type of tumor before surgery, other types of biopsy methods are often used.

**Needle biopsy:** If the tumor is very large or has spread throughout the liver, a needle can be placed through the skin in the abdomen and into the liver. The skin where the needle is placed is first numbed with local anesthesia. Tumor cells can then be sucked into the needle with a syringe. If the tumor is smaller, the doctor may use ultrasound or CT scanning to guide the needle. With this approach, the doctor slowly advances the needle while its position is checked by one of these imaging tests. When the images show that the needle is in the tumor, a sample is removed and sent to the lab to be looked at under a microscope.

**Laparoscopic biopsy:** Biopsy specimens can also be taken during laparoscopy. This allows the doctor to see the surface of the liver and take samples of abnormal-appearing areas.

## Lab Tests

### Alpha-fetoprotein (AFP) Blood Test

This is described in the section "Can Liver Cancer Be Found Early?" It can be helpful in determining if a liver mass might be cancer, although it is not accurate in every case. The AFP test can be useful in people diagnosed with liver cancer. The AFP level can help guide what treatment options might be appropriate. The test can also be used to help give an idea of how effective treatment is, as the AFP level should fall after treatment. It can be used after treatment as well, to look for possible signs that the cancer may have come back (recurred).

### Other Blood Tests

Because liver cancer often arises in damaged livers, doctors need to know the condition of your liver before proceeding with treatment. A series of blood tests can help with this. These *liver function tests (LFTs)* can assess the condition of the part of your liver not affected by the cancer. The tests look at levels of certain substances in your blood, such as bilirubin, albumin, alkaline phosphatase, AST, ALT, and GGT. You may not be able to have curative surgery if your liver is not healthy, as the surgery might require the doctor to remove a good part of your liver. This is a common problem in people with liver cancer.

The liver also makes proteins that help blood to clot when you are bleeding. A damaged liver may not make enough of these clotting factors, which could increase your risk of bleeding. Your doctor may order blood tests, such as a *prothrombin time (PT)*, to assess this risk.

If liver cancer has not yet been diagnosed, your doctor may also order other blood tests, such as tests for *hepatitis B and C*. Results showing you have been infected with either of these viruses may make it more likely that liver cancer is present.

## How Is Liver Cancer Staged?

Staging is the process of finding out how widespread a cancer is. The stage of a liver cancer is the most important factor in considering treatment options. The tests described above (in the section "How Is Liver Cancer Diagnosed?") are the ones used to determine the stage of the cancer.

A staging system is a standardized way for the cancer care team to summarize information about how far a cancer has spread. A major system used to describe the stages of liver cancer is the American Joint Committee on Cancer (AJCC) TNM system. But there are several other systems, and none is universally accepted.

### The American Joint Committee on Cancer (AJCC) TNM System

The TNM system for staging contains 3 key pieces of information:

- **T** describes the number and size of the primary tumor(s), measured in centimeters (cm), and whether the cancer has spread to organs next to the tumor.

- **N** describes the extent of spread to nearby (regional) lymph nodes.
- **M** indicates whether the cancer has **metastasized** (spread) to other organs of the body. (The most common sites of liver cancer spread are the lungs and bones.)

Numbers or letters appear after T, N, and M to provide more details about each of these factors:

- The numbers 0 through 4 indicate increasing severity.
- The letter X means "cannot be assessed" because the information is not available.

### **T Groups**

- **TX:** Primary tumor cannot be assessed
- **T0:** No evidence of primary tumor
- **T1:** Single tumor (any size) without invasion into blood vessels
- **T2:** Single tumor (any size) with invasion into blood vessels, OR multiple tumors where none are greater than 5 cm (about 2 inches) across
- **T3:** Multiple tumors that are greater than 5 cm (about 2 inches) across, OR a tumor involving a major branch of the portal or hepatic vein(s)
- **T4:** Tumor invading a nearby organ (other than the gallbladder), OR tumor invading the visceral peritoneum (covering surrounding the liver)

### **N Groups**

- **NX:** Regional lymph nodes cannot be assessed.
- **N0:** The cancer has not spread to the regional lymph nodes.
- **N1:** The cancer has spread to the regional lymph nodes.

### **M Groups**

- **MX:** Distant spread cannot be assessed.
- **M0:** The cancer has not spread to distant lymph nodes or other organs.
- **M1:** The cancer has spread to distant lymph nodes or other organs.

### **Stage Grouping**

The T, N, and M groups are then combined to give an overall stage:

**Stage I:** T1, N0, M0: There is a single tumor (any size) that does not invade blood vessels.

**Stage II:** T2, N0, M0: There is a single tumor (any size) that does invade blood vessels; OR there are several tumors, and all are less than 5 cm (2 inches) in diameter.

**Stage IIIA:** T3, N0, M0: There are several tumors, and at least one is larger than 5 cm (2 inches) in diameter; OR a tumor invades a branch of the major liver blood vessels (portal vein or hepatic vein).

**Stage IIIB:** T4, N0, M0: A tumor invades a nearby organ (other than the gallbladder); OR a tumor has penetrated the outer covering of the liver.



**Stage III C:** Any T, N1, M0: The cancer has invaded nearby lymph nodes. (Tumors can be any size or number.)

**Stage IV:** Any T, Any N, M1: The cancer has spread to other parts of the body. (Tumors can be any size or number, and nearby lymph nodes may or may not be involved.)

## **Localized Resectable, Localized Unresectable, and Advanced Liver Cancer**

For treatment purposes, doctors often classify liver cancers by whether or not they can be entirely cut out (resected). Resectable is the medical term meaning "able to be removed by surgery."

Less than 30% of patients with liver cancer have *resectable* tumors that can be completely removed by surgery. This would include most stage I and some stage II cancers in the TNM system.

Cancers that have not spread beyond the liver but cannot be completely removed by surgery are classified as *localized unresectable*. This would include some early stage cancers, as well as stage IIIA and IIIB cancers in the TNM system. There are several reasons that it might not be possible to safely remove a localized liver cancer. If the non-cancerous part of your liver is not healthy (due to cirrhosis, for example), surgery might not leave enough liver tissue behind for it to function properly. Also, curative surgery may not be possible if your cancer is spread throughout the liver or is close to the area where the liver meets the main arteries, veins, and bile ducts.

Cancers that have spread to lymph nodes or other organs are classified as *advanced*. These would include stage III C and stage IV cancers in the TNM system. Most advanced liver cancers cannot be treated with surgery.

### **Survival Rates Based on Extent of Liver Cancer**

Since symptoms of liver cancer often do not appear until the disease is advanced, only a small number of liver cancers are found in the early stages and can be removed with surgery. The 5-year survival rate for patients with resectable early stage cancer is in the range of 30% to 60%. This percentage drops for more advanced cancers or with more severe liver disease. The 5-year survival rate for people with advanced liver cancer (cancer that has spread widely throughout the liver or to distant sites) is less than 5%, and the average survival time is often measured in months.

The overall 5-year survival rate from liver cancer is less than 10%. One reason for this low survival rate is that most patients with liver cancer also have other liver problems such as cirrhosis, which itself can be fatal.

The 5-year survival rate refers to the percentage of patients who live at least 5 years after their cancer is diagnosed. Five-year rates are used to produce a standard way of discussing prognosis. Of course, some people live much longer than 5 years.

### **Child-Pugh Score (Cirrhosis Staging System)**

Because people with liver cancer often have 2 diseases, their cancer and cirrhosis, doctors treating liver cancer need to know the extent of the cirrhosis. They use a system called the Child-Pugh score. This system depends on 5 factors, the first 3 of which are blood tests:

- blood levels of bilirubin (the substance that can cause yellowing of the skin and eyes)
- blood levels of albumin (a major protein normally made by the liver)
- the prothrombin time (measures how well the liver is making blood clotting factors)
- whether there is fluid in the abdomen
- whether the liver disease is affecting brain function

Based on the score, liver function is divided into 3 classes. If all these factors are normal, then liver function is called class A. Mild abnormalities are class B, and severe abnormalities are class C. People with liver cancer and class C cirrhosis are generally too sick for any treatment.

## **How Is Liver Cancer Treated?**

*This information represents the views of the doctors and nurses serving on the American Cancer Society's Cancer Information Database Editorial Board. These views are based on their interpretation of studies published in medical journals, as well as their own professional experience.*

*The treatment information in this document is not official policy of the 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.*

After liver cancer is diagnosed and staged, the cancer care team can recommend one or more treatment options. Choosing a treatment plan is a major decision, so it is important to take time and think about all of the choices.

In creating your treatment plan, an important factor to consider is the stage (extent) of the cancer. But you and your cancer care team will also want to take into account your age, general state of health, and personal preferences.

It may be a good idea to seek a second opinion, especially with doctors experienced in treating liver cancer. A second opinion can provide more information and help you feel more confident about the treatment plan that is being considered. Some insurance companies require a second opinion before they will agree to pay for certain treatments. Most companies will pay for the second opinion.

The first part of this section describes the various types of treatments used for liver cancer. This is followed by a description of the most common approaches used for these cancers based on their stage.

## **Surgical Resection (Partial Hepatectomy)**

At this time, surgery, either by resection (removal of the tumor) or liver transplantation, offers the only reasonable chance to cure liver cancer. If removal of all known cancer in the liver (a partial hepatectomy) is successful, you will have the best outlook for survival. Unfortunately, complete removal of most liver cancers is not possible. Often the cancer has spread beyond the liver or has become quite large or may be present in too many different parts of the liver.

Your ability to have liver surgery also depends on the health of the parts of your liver not affected by the cancer. About 4 out of 5 people with liver cancer in the United States also have cirrhosis. If you have severe cirrhosis, the removal of even a small amount of liver tissue at the edges of your cancer might not leave enough to perform essential functions. People with cirrhosis are eligible for surgery only if the cancer is small, and they still have a reasonable amount of liver function left. Doctors often assess this function by assigning the Child-Pugh score (see the section "How Is Liver Cancer Staged?"), which is a measure of cirrhosis based on certain lab tests and symptoms. Patients who fall into class A are most likely to have enough liver function for surgery. Other options are considered for those in class B and C, although partial hepatectomy is sometimes done in people whose liver function is class B.

Another important factor is the skill of your surgical team. Liver resection is a major, serious operation that should only be done by skilled and experienced surgeons.

A possible problem with partial hepatectomy is that sometimes a new liver cancer can develop afterwards, because the liver still contains the underlying disease that led to the first one.

## **Liver Transplant**

A liver transplant has become the best option for some people with small liver cancers when it is available. At the present time, liver transplants are reserved for those with small tumors (either 1 tumor smaller than 5 cm or 1 to 3 tumors no larger than 3 cm) but whose cancer cannot be totally removed, either because of the location of the tumors or because the liver is too diseased to withstand removal of part of it.

According to the Organ Procurement and Transplantation Network, about 5,500 liver transplants are done each year in the United States. Fewer than 10% of these are done in people with liver cancer. The 5-year survival for these patients is around 60%. Not only is the risk of a second new liver cancer significantly reduced, but the new liver will function normally.

Unfortunately, the opportunities for liver transplantation are limited. Not many livers are available for patients with cancer because they are generally used for more curable diseases. Increased 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.

An option that has become more popular in recent years is having a living donor give a part of their liver for transplant to a close relative. This can be successful, but it carries risk for the donor. About 300 living donor transplants are done in the United States each year. Only a small percent 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. Some doctors suggest a limited resection first and then a transplant if the cancer comes back.

People who get a liver transplant have to be given drugs to help suppress the immune system and prevent the body from rejecting the new organ. But these drugs have their own risks and side effects, especially including the risk of getting serious infections. Some of the drugs used to prevent rejection can also cause high blood pressure, high cholesterol, diabetes, and can weaken the bones and kidneys. After a liver transplant, it is important to check blood tests periodically for signs of rejection. Sometimes liver biopsies are also taken to see if rejection is occurring and whether changes in the anti-rejection medications are needed. Future advances are expected to reduce the risk of liver rejection and the severity of side effects caused by these drugs.

## **Tumor Ablation or Embolization**

Ablation refers to local methods that destroy the tumor without removing it. These techniques are usually reserved for patients with only a few small tumors for whom surgical resection is not possible. They are not considered curative but may produce survival rates equal to surgery in people with small tumors.

*Radiofrequency ablation (RFA)* uses high-energy radio waves for treatment. A thin, needle-like probe temporarily placed into the tumor releases these radio waves. Placement of the probe is guided by ultrasound or CT scans. The probe releases a high-frequency current that heats the tumor and destroys the cancer cells. This has become a major treatment method for small tumors.

*Ethanol (alcohol) ablation*, also known as percutaneous ethanol injection (PEI), involves injecting concentrated alcohol directly into the tumor to kill cancer cells. This is usually done through the skin using a needle, which is guided by ultrasound or CT scans.

*Cryosurgery* destroys a tumor by freezing it with a very cold metal probe. The probe is guided into the tumor using ultrasound. This method may be used to treat larger tumors than either of the other ablation techniques but sometimes requires general anesthesia (where you are asleep).

Since these 3 treatments usually do not require surgery to remove any of the patient's liver, they are good options for patients whose disease is not curable with surgery or for patients awaiting transplantation.

*Hepatic artery embolization* is another option for tumors that cannot be removed. This technique is used to reduce the blood flow in the hepatic artery, the artery that feeds most liver cancer cells. This is done by injecting materials that plug up the artery. Most of the healthy liver cells will not be affected because they get their blood supply from the portal vein.

This procedure involves putting a catheter into an artery in the inner thigh and threading it up into the liver. A dye is usually injected into the bloodstream at this time to allow the doctor to monitor the path of the catheter via angiography, a special type of x-ray. Once the catheter is in place, small particles are injected into the artery to plug it up.

Embolization also reduces some of the blood supply to the normal liver tissue. This may be dangerous for patients with diseases such as hepatitis and cirrhosis that are affecting the part of the liver not affected by cancer.

*Chemoembolization* involves combining embolization with chemotherapy. This is done either by coating the embolization particles with chemotherapy drugs before injection, or by giving chemotherapy directly into the artery through the catheter, then plugging up the artery. Studies are now under way to determine whether this is more effective than embolization alone.

*Radioembolization* combines embolization with radiation therapy. It is done by injecting small radioactive beads or oils into the hepatic artery, which give off small amounts of radiation only at the tumor sites. These techniques are still fairly new and are discussed in more detail in the section "What's New in Liver Cancer Research and Treatment?"

## **Radiation Therapy**

Radiation therapy uses high-energy rays to kill cancer cells. There are several kinds of radiation therapy.

*External-beam radiation therapy* focuses radiation delivered from outside the body on the cancer. With liver cancer, this type of radiation therapy can be used to shrink the cancer to palliate symptoms such as pain. But it has not been shown to improve survival. Although liver cancer cells are sensitive to the radiation, this treatment can't be used at very high doses because normal liver tissue is also easily damaged by radiation.

*Three-dimensional conformal radiation therapy (3DCRT)* is a newer form of external-beam radiation therapy that uses sophisticated computers to precisely map the location of a tumor. The patient is fitted with a plastic mold resembling a body cast to keep the body still so that the radiation can be aimed more accurately. Radiation beams are aimed at the tumor from

several directions. This allows doctors to reduce radiation damage to normal liver tissue and therefore direct higher doses of radiation at tumors. When available, conformal radiation therapy is usually preferred over standard radiation therapy.

## Chemotherapy

Chemotherapy is treatment with drugs to destroy cancer cells. Systemic (whole-body) chemotherapy uses anti-cancer drugs that are injected into a vein or given by mouth. These drugs enter the bloodstream and reach all areas of the body, making this treatment potentially useful for cancers that have spread to distant organs.

Unfortunately, liver cancer resists most chemotherapy drugs. The drugs that have been most effective in shrinking the tumors are doxorubicin (Adriamycin), 5-fluorouracil, and cisplatin. But even these drugs shrink fewer than 1 of 5 tumors, and the responses often do not last long. Combinations of drugs continue to be studied, but in most studies, systemic chemotherapy has not helped patients to live longer.

Because of the poor response to systemic chemotherapy, doctors are now studying whether putting chemotherapy drugs directly into the hepatic artery might be more effective. This technique, known as hepatic artery infusion (HAI), is described in the section "What's New in Liver Cancer Research and Treatment?"

Chemotherapy drugs kill cancer cells but also damage some normal cells, which can lead to side effects. These side effects depend on the types of drugs, the amount taken, and the length of treatments. Temporary side effects of chemotherapy might include:

- nausea and vomiting
- loss of appetite
- loss of hair
- mouth sores

Because chemotherapy can damage the bone marrow, where blood cells are made, the blood cell counts might become low. This can result in:

- increased chance of infection (due to a shortage of white blood cells)
- bleeding or bruising after minor cuts or injuries (due to a shortage of platelets)
- fatigue and shortness of breath (due to low red blood cell counts)

Most side effects go away once treatment is stopped. Hair will usually grow back after treatment ends. Anyone who has problems with side effects should talk with their cancer care team. There are remedies for many of the temporary side effects of chemotherapy. For example, drugs can be given to prevent or reduce nausea and vomiting. Other drugs, called growth factors, can be given to help the bone marrow recover after chemotherapy. Be sure to ask your oncology doctor or nurse about medications to help reduce side effects, and let him or her know when you do experience side effects so they can be managed effectively.

## Clinical Trials

You have had to make a lot of decisions since you've been told you have cancer. One of the most important decisions you will make is deciding which treatment is best for you. You may have heard about clinical trials being done for your type of cancer. Or maybe someone on your health care team has mentioned a clinical trial to you. Clinical trials are one way to get state-of-the-art cancer care. Still, they are not right for everyone.

Here we will give you a brief review of clinical trials. Talking to your health care team, your family, and your friends can help you make the best treatment choice for you.

### **What Are Clinical Trials?**

Clinical trials are carefully controlled research studies that are done with patients. These studies test whether a new treatment is safe and how well it works in patients, or they may test new ways to diagnose or prevent a disease. Clinical trials have led to many advances in cancer prevention, diagnosis, and treatment.

### **The Purpose of Clinical Trials**

Clinical trials are done to get a closer look at promising new treatments or procedures in patients. A clinical trial is only done when there is good reason to believe that the treatment, test, or procedure being studied may be better than the one used now. Treatments used in clinical trials are often found to have real benefits and may go on to become tomorrow's standard treatment.

Clinical trials can focus on many things, such as:

- new uses of drugs that are already approved by the US Food and Drug Administration (FDA)
- new drugs that have not yet been approved by the FDA
- non-drug treatments (such as radiation therapy)
- medical procedures (such as types of surgery)
- herbs and vitamins
- tools to improve the ways medicines or diagnostic tests are used
- medicines or procedures to relieve symptoms or improve comfort
- combinations of treatments and procedures

Researchers conduct studies of new treatments to try to answer the following questions:

- Is the treatment helpful?
- What's the best way to give it?
- Does it work better than other treatments already available?
- What side effects does the treatment cause?
- Are there more or fewer side effects than the standard treatment used now?
- Do the benefits outweigh the side effects?
- In which patients is the treatment most likely to be helpful?

### **Phases of Clinical Trials**

There are 4 phases of clinical trials, which are numbered I, II, III, and IV. We will use the example of testing a new cancer treatment drug to look at what each phase is like.

**Phase I clinical trials:** The purpose of a phase I study is to find the best way to give a new treatment safely to patients. The cancer care team closely watches patients for any harmful side effects.

For phase I studies, the drug has already been tested in lab and animal studies, but the side effects in patients are not fully known. Doctors start by giving very low doses of the drug to the first patients and increase the doses for later groups of patients until side effects appear or the desired effect is seen. Doctors are hoping to help patients, but the main purpose of a phase I trial is to test the safety of the drug.

Phase I clinical trials are often done in small groups of people with different cancers that have not responded to standard treatment, or that keep coming back (recurring) after treatment. If a drug is found to be reasonably safe in phase I studies, it can be tested in a phase II clinical trial.

**Phase II clinical trials:** These studies are designed to see if the drug works. Patients are given the best dose as determined from phase I studies. They are closely watched for an effect on the cancer. The cancer care team also looks for side effects.

Phase II trials are often done in larger groups of patients with a specific cancer type that has not responded to standard treatment. If a drug is found to be effective in phase II studies, it can be tested in a phase III clinical trial.

**Phase III clinical trials:** Phase III studies involve large numbers of patients -- most often those who have just been diagnosed with a specific type of cancer. Phase III clinical trials may enroll thousands of patients.

Often, these studies are randomized. This means that patients are randomly put in one of two (or more) groups. One group (called the control group) gets the standard, most accepted treatment. Another group (or more than one group) will get the new treatment being studied. All patients in phase III studies are closely watched. The study will be stopped early if the side effects of the new treatment are too severe or if one group has much better results than the others.

Phase III clinical trials are usually needed before the FDA will approve a treatment for use by the general public.

**Phase IV clinical trials:** Once a drug has been approved by the FDA and is available for all patients, it is still studied in other clinical trials (sometimes referred to as phase IV studies). This way more can be learned about short-term and long-term side effects and safety as the drug is used in larger numbers of patients with many types of diseases. Doctors can also learn



more about how well the drug works, and if it might be helpful when used in other ways (such as in combination with other treatments).

### **What It Will Be Like to Be in a Clinical Trial**

If you are in a clinical trial, you will have a team of experts taking care of you and watching your progress very carefully. Depending on the phase of the clinical trial, you may receive more attention (such as having more doctor visits and lab tests) than you would if you were treated outside of a clinical trial. Clinical trials are specially designed to pay close attention to you.

However, there are some risks. No one involved in the study knows in advance whether the treatment will work or exactly what side effects will occur. That is what the study is designed to find out. While most side effects go away in time, some may be long-lasting or even life threatening. Keep in mind, though, that even standard treatments have side effects. Depending on many factors, you may decide to enter (enroll in) a clinical trial.

### **Deciding to Enter a Clinical Trial**

If you would like to take part in a clinical trial, you should begin by asking your doctor if your clinic or hospital conducts clinical trials. There are requirements you must meet to take part in any clinical trial. But whether or not you enter (enroll in) a clinical trial is completely up to you.

Your doctors and nurses will explain the study to you in detail. They will go over the possible risks and benefits and give you a form to read and sign. The form says that you understand the clinical trial and want to take part in it. This process is known as giving your informed consent. Even after reading and signing the form and after the clinical trial begins, you are free to leave the study at any time, for any reason. Taking part in a clinical trial does not keep you from getting any other medical care you may need.

To find out more about clinical trials, talk to your cancer care team. Here are some questions you might ask:

- Is there a clinical trial that I could take part in?
- What is the purpose of the study?
- What kinds of tests and treatments does the study involve?
- What does this treatment do? Has it been used before?
- Will I know which treatment I receive?
- What is likely to happen in my case with, or without, this new treatment?
- What are my other choices and their pros and cons?
- How could the study affect my daily life?
- What side effects can I expect from the study? Can the side effects be controlled?
- Will I have to stay in the hospital? If so, how often and for how long?
- Will the study cost me anything? Will any of the treatment be free?
- If I am harmed as a result of the research, what treatment would I be entitled to?
- What type of long-term follow-up care is part of the study?
- Has the treatment been used to treat other types of cancers?

### **How Can I Find Out More About Clinical Trials That Might Be Right for Me?**

The American Cancer Society offers a clinical trials matching service for patients, their family, and friends. You can reach this service at 1-800-303-5691 or on our Web site at <http://clinicaltrials.cancer.org>.

Based on the information you give about your cancer type, stage, and previous treatments, this service can put together a list of clinical trials that match your medical needs. The service will also ask where you live and whether you are willing to travel so that it can look for a treatment center that you can get to.

You can also get a list of current clinical trials by calling the National Cancer Institute's Cancer Information Service toll free at 1-800-4-CANCER (1-800-422-6237) or by visiting the NCI clinical trials Web site at [www.cancer.gov/clinicaltrials](http://www.cancer.gov/clinicaltrials).

For even more information on clinical trials, the American Cancer Society has a document called *Clinical Trials: What You Need to Know*. You can read this on the Web site, [www.cancer.org](http://www.cancer.org), or have it sent to you by calling 1-800-ACS-2345.

### **Complementary and Alternative Therapies**

When you have cancer you are likely to hear about ways to treat your cancer or relieve symptoms that are different from mainstream (standard) medical treatment. These methods can include vitamins, herbs, and special diets, or methods such as acupuncture or massage—among many others. You may have a lot of questions about these treatments. Here are some you may have thought of already:

- How do I know if a non-standard treatment is safe?
- How do I know if it works?
- Should I try one or more of these treatments?
- What does my doctor know/think about these methods? Should I tell the doctor that I'm thinking about trying them?
- Will these treatments cause a problem with my standard medical treatment?
- What is the difference between "complementary" and "alternative" methods?
- Where can I find out more about these treatments?

### **The Terms Can Be Confusing**

Not everyone uses these terms the same way, so it can be confusing. The American Cancer Society uses *complementary* to refer to medicines or methods that are used *along with* your regular medical care. *Alternative* medicine is a treatment used *instead of* standard medical treatment.

**Complementary Methods:** Complementary treatment methods, for the most part, are not presented as cures for cancer. Most often they are used to help you feel better. Some methods that can be used in a complementary way are meditation to reduce stress, acupuncture to relieve pain or peppermint tea to relieve nausea. There are many others. Some of these

methods are known to help, while others have not been tested. Some have been proven not to be helpful. A few have even been found harmful. However, some of these methods may add to your comfort and well-being.

There are many complementary methods that you can safely use right along with your medical treatment to help relieve symptoms or side effects, to ease pain, and to help you enjoy life more. For example, some people find methods such as aromatherapy, massage therapy, meditation, or yoga to be useful.

**Alternative Treatments:** Alternative treatments are those that are used instead of standard medical care. These treatments have not been proven safe and effective in clinical trials. Some of these methods may even be dangerous and some have life-threatening side effects. The biggest danger in most cases is that you may lose the chance to benefit from standard treatment. Delays or interruptions in your standard medical treatment may give the cancer more time to grow.

### **Deciding What to Do**

It is easy to see why people with cancer may consider alternative methods. You want to do all you can to fight the cancer. Sometimes mainstream treatments such as chemotherapy can be hard to take, or they may no longer be working.

Sometimes people suggest that their method can cure your cancer without having serious side effects, and it's normal to want to believe them. But the truth is that most non-standard methods of treatment have not been tested and proven to be effective for treating cancer.

As you consider your options, here are 3 important steps you can take:

- Talk to your doctor or nurse about any method you are thinking about using.
- Check the list of "red flags" below.
- Contact the American Cancer Society at 1-800-ACS-2345 to learn more about complementary and alternative methods in general and to learn more about the specific methods you are thinking about.

### **Red Flags**

You can use the questions below to spot treatments or methods to avoid. A "yes" answer to any one of these questions should raise a "red flag."

- Does the treatment promise a cure for all or most cancers?
- Are you told not to use standard medical treatment?
- Is the treatment or drug a "secret" that only certain people can give?
- Does the treatment require you to travel to another country?
- Do the promoters attack the medical or scientific community?

### **The Decision Is Yours**

Decisions about how to treat or manage your cancer are always yours to make. If you are thinking about using a complementary or alternative method, be sure to learn about the

method and talk to your doctor about it. With reliable information and the support of your health care team, you may be able to safely use the methods that can help you while avoiding those that could be harmful.

## **Treatment of Liver Cancer by Stage**

Although the AJCC (TNM) staging system is often used for precisely describing the extent of spread of a liver cancer, a simpler system is more practical for use in selecting treatment options. This system divides liver cancers into 1 of 3 categories: localized resectable, localized unresectable, and advanced. In general, if you have a small cancer and good liver function, surgery to remove the cancer is appropriate. If your liver function is poor and you meet the criteria for transplantation, then that is the best option. To control the tumor while awaiting transplant, you might be treated with embolization, ethanol injection, or radiofrequency ablation.

### **Localized Resectable (some T1 or T2, N0, M0 tumors)**

If your cancer is at an early stage and the part of your liver not affected by cancer is healthy, surgery may cure you. Unfortunately, only a small number of people with liver cancer fall into this category. An important factor affecting prognosis is the size of the tumor and whether it invaded blood vessels. A large tumor (over 2 inches) or one that invades blood vessels is more likely to come back or spread elsewhere. Another factor is the health of the liver; the presence of cirrhosis, for example, may increase the risk of developing a second tumor.

Clinical trials are now looking into whether patients getting surgery will be helped by adjuvant (additional) treatment with chemotherapy, chemoembolization, or other new treatment techniques.

### **Localized Unresectable (some T1-4, N0, M0 tumors)**

If the cancer is too large or is in a sensitive area, there are too many tumors to be removed, or if the rest of your liver is unhealthy, the cancer may not be removable by surgery. Most doctors would recommend liver transplantation if it is possible. This can cure the cancer and the cirrhosis. Transplantation is also considered for patients with small cancers who cannot undergo a surgical resection because they have cirrhosis. This is a major operation where the liver is removed and replaced with one from a donor who has just died. Although this is a very difficult operation, it has helped many people. The 5-year survival in patients getting a liver transplant for liver cancer is around 60%.

If you are not a candidate for a transplant, your doctor may recommend ablation of the tumor(s) using cryosurgery, radiofrequency ablation, or injection of alcohol. Other options may include embolization (with or without chemotherapy or radiation), chemotherapy (either systemic or via hepatic artery infusion), and/or conformal radiation therapy.

Although these treatments are not considered to be curative they most likely will reduce any symptoms you might have, and may prolong your life. Because these treatments are not known to be curative, you might want to consider taking part in a clinical trial.

**Advanced (includes all N1 or M1 tumors)**

Advanced cancer has spread throughout the liver or outside of the liver (either to the lymph nodes or to other organs). There is no standard treatment for this stage of liver cancer.

As with localized resectable liver cancer, clinical trials of new approaches to chemotherapy (new drugs and regional chemotherapy), new forms of radiation therapy (with radiosensitizers or targeting via antibodies), and other new treatments (immunotherapy and gene therapy) may help you. These clinical trials are also important for improving the outlook for future patients.

Treatments, such as radiation or chemotherapy, may be used to help relieve pain and other symptoms. Please be sure to discuss any symptoms you have with your cancer team, so they may be treated effectively.

**Recurrent Liver Cancer**

Treatment of liver cancer that returns after initial therapy depends on many factors, including the site of the recurrence, the type of initial treatment, and the functioning of the liver. Patients with localized resectable disease that recurs in the same spot may be eligible for further surgery. If the cancer is widespread, chemotherapy is an option, although it is not often successful in shrinking liver cancer. Patients may wish to ask their doctor whether a clinical trial, or use of an experimental treatment, may be right for them.

In addition, other forms of treatment, such as tumor embolization, may be used to relieve pain and other symptoms. Please be sure to discuss any symptoms you have with your cancer care team, so they may be treated effectively.

**More Treatment Information**

For more details on treatment options -- including some that may not be addressed in this document -- the National Comprehensive Cancer Network (NCCN) and the National Cancer Institute (NCI) are good sources of information.

The NCCN, made up of experts from many of the nation's leading cancer centers, develops cancer treatment guidelines for doctors to use when treating patients. Those are available on the NCCN Web site ([www.nccn.org](http://www.nccn.org)).

The NCI provides treatment guidelines via its telephone information center (1-800-4-CANCER) and its Web site ([www.cancer.gov](http://www.cancer.gov)). Detailed guidelines intended for use by cancer care professionals are also available on [www.cancer.gov](http://www.cancer.gov).

**What Should You Ask Your Doctor About Liver Cancer?**

As you cope with cancer and cancer treatment, we encourage you to have honest, open discussions with your doctor. Feel free to ask any question that's on your mind, no matter how small it might seem. Here are some questions you might want to ask. Be sure to add

your own questions as you think of them. Nurses, social workers, and other members of the treatment team may also be able to answer many of your questions.

- What kind of liver cancer do I have? (There are different types of liver cancer. Also, there are certain subtypes of hepatocellular carcinoma such as the "fibrolamellar" variety that carry a better prognosis than others.)
- Has my cancer spread beyond the liver?
- Can the stage of my cancer be determined and what does that mean?
- Is my cancer resectable?
- What treatment choices do I have?
- What do you recommend and why?
- What risks or side effects are there to the treatments you suggest?
- What are the chances my cancer will recur with these treatment plans?
- How will treatment affect my daily activities?
- What should I do to be ready for treatment?
- Based on what you've learned about my cancer, what is my prognosis?
- Should I consider taking part in a clinical trial?

In addition to these sample questions, you may wish to write down some of your own. For instance, you may want to ask about second opinions or about clinical trials for which you may qualify.

## **What Happens After Treatment for Liver Cancer?**

Completing treatment can be both stressful and exciting. You will be relieved to finish treatment, yet it is hard not to worry about cancer coming back. (When cancer returns, it is called recurrence.) This is a very common concern among those who have had cancer.

It may take a while before your confidence in your own recovery begins to feel real and your fears are somewhat relieved. Even with no recurrences, people who have had cancer learn to live with uncertainty.

## **Follow-up Care**

After your treatment is over, it is very important to keep all follow-up appointments. During these visits, your doctors will ask about symptoms, do physical exams, and may order blood tests (such as AFP levels or liver function tests) or imaging studies, such as CT or MRI scans. If you have been treated with a surgical resection or a liver transplant, most doctors recommend follow-up with imaging tests and blood tests every 3 to 6 months for the first 2 years, then tests every 6 to 12 months. Follow-up is needed to check for cancer recurrence or spread, as well as possible side effects of certain treatments.

This is the time for you to ask your health care team any questions you need answered and to discuss any concerns you might have.

Almost any cancer treatment can have side effects. Some may last for a few weeks to several months, but others can be permanent. Don't hesitate to tell your cancer care team about any symptoms or side effects that bother you so they can help you manage them effectively.

It is also important to keep medical insurance. Even though no one wants to think of their cancer coming back, it is always a possibility. If it happens, the last thing you want is to have to worry about paying for treatment. Many people have been bankrupted by cancer recurrence.

### **Anti-Viral Treatment**

If you had hepatitis B or C as the main risk factor for the liver cancer, there is a good chance that you can be reinfected. Your doctors may want to put you on drugs to prevent this.

### **Seeing a New Doctor**

At some point after your cancer diagnosis and treatment, you may find yourself in the office of a new doctor. Your original doctor may have moved or retired, or you may have moved or changed doctors for some reason. It is important that you be able to give your new doctor the exact details of your diagnosis and treatment. Make sure you have the following information handy:

- a copy of your pathology report from any biopsy or surgery
- if you had surgery, a copy of your operative report
- if you were hospitalized, a copy of the discharge summary that every doctor must prepare when patients are sent home from the hospital
- finally, since some drugs can have long-term side effects, a list of your drugs, drug doses, and when you took them

### **Lifestyle Changes to Consider During and After Treatment**

Having cancer and dealing with treatment can be time-consuming and emotionally draining, but it can also be a time to look at your life in new ways. Maybe you are thinking about how to improve your health over the long term. Some people even begin this process during cancer treatment.

### **Make Healthier Choices**

Think about your life before you learned you had cancer. Were there things you did that might have made you less healthy? Maybe you drank too much alcohol, or ate more than you needed, or smoked, or didn't exercise very often. Emotionally, maybe you kept your feelings bottled up, or maybe you let stressful situations go on too long.

Now is not the time to feel guilty or to blame yourself. However, you can start making changes today that can have positive effects for the rest of your life. Not only will you feel better but you will also be healthier. What better time than now to take advantage of the motivation you have as a result of going through a life-changing experience like having cancer?

You can start by working on those things that you feel most concerned about. Get help with those that are harder for you. For instance, if you are thinking about quitting smoking and need help, call the American Cancer Society's Quitline<sup>®</sup> tobacco cessation program at 1-800-ACS-2345.

### **Diet and Nutrition**

Eating right can be a challenge for anyone, but it can get even tougher during and after cancer treatment. For instance, treatment often may change your sense of taste. Nausea can be a problem. You may lose your appetite for a while and lose weight when you don't want to. On the other hand, some people gain weight even without eating more. This can be frustrating, too.

If you are losing weight or have taste problems during treatment, do the best you can with eating and remember that these problems usually improve over time. You may want to ask your cancer team for a referral to a dietitian, an expert in nutrition who can give you ideas on how to fight some of the side effects of your treatment. You may also find it helps to eat small portions every 2 to 3 hours until you feel better and can go back to a more normal schedule.

One of the best things you can do after treatment is to put healthy eating habits into place. You will be surprised at the long-term benefits of some simple changes, like increasing the variety of healthy foods you eat. Try to eat 5 or more servings of vegetables and fruits each day. Choose whole grain foods instead of white flour and sugars. Try to limit meats that are high in fat. Cut back on processed meats like hot dogs, bologna, and bacon. Get rid of them altogether if you can. If you drink alcohol, limit yourself to 1 or 2 drinks a day at the most. And don't forget to get some type of regular exercise. The combination of a good diet and regular exercise will help you maintain a healthy weight and keep you feeling more energetic.

### **Rest, Fatigue, Work, and Exercise**

Fatigue is a very common symptom in people being treated for cancer. This is often not an ordinary type of tiredness but a "bone-weary" exhaustion that doesn't get better with rest. For some, this fatigue lasts a long time after treatment, and can discourage them from physical activity.

However, exercise can actually help you reduce fatigue. Studies have shown that patients who follow an exercise program tailored to their personal needs feel physically and emotionally improved and can cope better.

If you are ill and need to be on bed rest during treatment, it is normal to expect your fitness, endurance, and muscle strength to decline some. Physical therapy can help you maintain strength and range of motion in your muscles, which can help fight fatigue and the sense of depression that sometimes comes with feeling so tired.



Any program of physical activity should fit your own situation. An older person who has never exercised will not be able to take on the same amount of exercise as a 20-year-old who plays tennis 3 times a week. If you haven't exercised in a few years but can still get around, you may want to think about taking short walks.

Talk with your health care team before starting, and get their opinion about your exercise plans. Then, try to get an exercise buddy so that you're not doing it alone. Having family or friends involved when starting a new exercise program can give you that extra boost of support to keep you going when the push just isn't there.

If you are very tired, though, you will need to balance activity with rest. It is okay to rest when you need to. It is really hard for some people to allow themselves to do that when they are used to working all day or taking care of a household. (For more information about fatigue, please see the publication, *Cancer Related Fatigue and Anemia Treatment Guidelines for Patients*.)

Exercise can improve your physical and emotional health.

- It improves your cardiovascular (heart and circulation) fitness.
- It strengthens your muscles.
- It reduces fatigue.
- It lowers anxiety and depression.
- It makes you feel generally happier.
- It helps you feel better about yourself.

And long term, we know that exercise plays a role in preventing some cancers. The American Cancer Society, in its guidelines on physical activity for cancer prevention, recommends that adults take part in at least 30 minutes of moderate to vigorous physical activity, above usual activities, on 5 or more days of the week; 45 to 60 minutes of intentional physical activity are preferable. Children and teens are encouraged to try for at least 60 minutes a day of energetic physical activity on at least 5 days a week.

## **How About Your Emotional Health?**

Once your treatment ends, you may find yourself overwhelmed by emotions. This happens to a lot of people. You may have been going through so much during treatment that you could only focus on getting through your treatment.

Now you may find that you think about the potential of your own death, or the effect of your cancer on your family, friends, and career. You may also begin to re-evaluate your relationship with your spouse or partner. Unexpected issues may also cause concern -- for instance, as you become healthier and have fewer doctor visits, you will see your health care team less often. That can be a source of anxiety for some.

This is an ideal time to seek out emotional and social support. You need people you can turn to for strength and comfort. Support can come in many forms: family, friends, cancer support groups, church or spiritual groups, online support communities, or individual counselors.

Almost everyone who has been through cancer can benefit from getting some type of support. What's best for you depends on your situation and personality. Some people feel safe in peer-support groups or education groups. Others would rather talk in an informal setting, such as church. Others may feel more at ease talking one-on-one with a trusted friend or counselor. Whatever your source of strength or comfort, make sure you have a place to go with your concerns.

The cancer journey can feel very lonely. It is not necessary or realistic to go it all by yourself. And your friends and family may feel shut out if you decide not to include them. Let them in -- and let in anyone else who you feel may help. If you aren't sure who can help, call your American Cancer Society at 1-800-ACS-2345 and we can put you in touch with an appropriate group or resource.

You can't change the fact that you have had cancer. What you can change is how you live the rest of your life -- making healthy choices and feeling as well as possible, physically and emotionally.

### **What Happens if Treatment Is No Longer Working?**

If cancer continues to grow after one kind of treatment, or if it returns, it is often possible to try another treatment plan that might still cure the cancer, or at least shrink the tumors enough to help you live longer and feel better. On the other hand, when a person has received several different medical treatments and the cancer has not been cured, over time the cancer tends to become resistant to all treatment. At this time it's important to weigh the possible limited benefit of a new treatment against the possible downsides, including continued doctor visits and treatment side effects.

Everyone has his or her own way of looking at this. Some people may want to focus on remaining comfortable during their limited time left.

This is likely to be the most difficult time in your battle with cancer -- when you have tried everything medically within reason and it's just not working anymore. Although your doctor may offer you new treatment, you need to consider that at some point, continuing treatment is not likely to improve your health or change your prognosis or survival.

If you want to continue treatment to fight your cancer as long as you can, you still need to consider the odds of more treatment having any benefit. In many cases, your doctor can estimate the response rate for the treatment you are considering. Some people are tempted to try more chemotherapy or radiation, for example, even when their doctors say that the odds of benefit are less than 1%. In this situation, you need to think about and understand your reasons for choosing this plan.

No matter what you decide to do, it is important that you be as comfortable as possible. Make sure you are asking for and getting treatment for any symptoms you might have, such as pain. This type of treatment is called "palliative" treatment.

Palliative treatment helps relieve these symptoms, but is not expected to cure the disease; its main purpose is to improve your quality of life. Sometimes, the treatments you get to control your symptoms are similar to the treatments used to treat cancer. For example, radiation therapy might be given to help relieve bone pain from bone metastasis. Or chemotherapy might be given to help shrink a tumor and keep it from causing a bowel obstruction. But this is not the same as receiving treatment to try to cure the cancer.

At some point, you may benefit from hospice care. Most of the time, this can be given at home. Your cancer may be causing symptoms or problems that need attention, and hospice focuses on your comfort. You should know that receiving hospice care doesn't mean you can't have treatment for the problems caused by your cancer or other health conditions. It just means that the focus of your care is on living life as fully as possible and feeling as well as you can at this difficult stage of your cancer.

Remember also that maintaining hope is important. Your hope for a cure may not be as bright, but there is still hope for good times with family and friends -- times that are filled with happiness and meaning. In a way, pausing at this time in your cancer treatment is an opportunity to refocus on the most important things in your life. This is the time to do some things you've always wanted to do and to stop doing the things you no longer want to do.

## **What's New in Liver Cancer Research and Treatment?**

Because there are only a few effective ways to prevent or treat liver cancer at this time, there is always a great deal of research going on in the area of liver cancer. Scientists are looking for causes and ways to prevent liver cancer, and doctors are working to improve treatments.

### **Prevention**

The most effective way to reduce the worldwide burden of liver cancer is to prevent it from happening in the first place. Some scientists believe that vaccinations and improved treatments for hepatitis could prevent about half of liver cancer cases worldwide. Researchers are studying ways to prevent or treat hepatitis infections before they cause liver cancers. Research into developing a vaccine to prevent hepatitis C is ongoing. Progress is being made in treating chronic hepatitis with drugs that boost the patient's immune system.

### **Screening**

Several new blood tests are being studied to see if they can pick up liver cancer earlier than the test already being used. So far, none of these has proved more helpful than the ones already in use.

### **Surgery**

Newer techniques are being developed to make both partial hepatectomy and liver transplantation safer and more effective.

Doctors are studying ways to make more liver cancers resectable by trying to shrink them before surgery. Studies are now looking at different types of *neoadjuvant* therapies (therapies

given before surgery), including chemotherapy, immunotherapy, embolization, and radiation therapy. Early results have been promising but have only looked at small numbers of patients.

Another active area of research involves using *adjuvant* therapies -- those given right after surgery to try to reduce the chances that the cancer will return. Unfortunately, most of the studies involving adjuvant chemotherapy or chemoembolization have not shown that they prolong survival times. Some promising results have been seen with radioembolization (see next section), but these need to be confirmed in larger studies.

Doctors are also beginning to study a technique called *laparoscopic surgery*. In this procedure, several small incisions are made in the abdomen, through which specially designed instruments are inserted to view and cut out the diseased portion of the liver. It does not require a large incision in the abdomen, which means there is less blood loss, less pain after surgery, and quicker recovery. At this time, laparoscopy is still considered an experimental form of treatment for liver cancer. It is being studied mainly in patients with small tumors in certain parts of the liver that can be easily reached through the laparoscope.

## Radiation Therapy

The major problem with using radiation therapy against liver cancer is that it also damages healthy liver tissue. Researchers are now working on ways to deliver radiation therapy only to the cancer, sparing the normal tissue. Several new approaches to radiation therapy are being tried, including using *radiosensitizers* (drugs that make cancers more vulnerable to radiation).

*Radioembolization* is another exciting area of research. This involves infusing radioactive substances directly into the hepatic artery, from which they can target liver tumors more precisely.

One technique uses tiny glass beads (called microspheres) that are attached to a radioactive element (yttrium-90). Once infused, these beads lodge in the blood vessels near the tumor, where they give off radioactivity for a short while. At least one form of these beads, known as TheraSphere, has been approved for use by the FDA and is now being used in several cancer treatment centers. Long-term data on its effectiveness are not yet available.

Another technique uses oil that contains radioactive iodine-131. This substance, known as I-131 Lipiodol, is also infused directly into the hepatic artery. One clinical trial found this type of radioembolization may be effective, but more studies are needed to confirm this. It is not available in the United States at this time.

## Chemotherapy

New forms of systemic and regional chemotherapy combined with other treatments are being tested in clinical trials. A small portion of tumors respond to chemotherapy, although it has not yet been shown to prolong survival.

Newer chemotherapy agents, such as oxaliplatin, gemcitabine, and docetaxel, are now being tested against liver cancer in clinical trials, as are more targeted therapies such as erlotinib (Tarceva) and thalidomide.

### **Hepatic Artery Infusion (HAI)**

One way researchers are attempting to improve on the effectiveness of chemotherapy is to deliver it directly into the hepatic artery, which supplies most tumors. The healthy liver then removes most of the remaining drug before it can reach the rest of the body. The drugs most commonly used include floxuridine (FUDR), cisplatin, mitomycin C, and doxorubicin.

While early studies have found that HAI is effective in shrinking a number of tumors, more research is still needed. This technique may not be useful in all cases because it often requires surgery to insert a catheter into the hepatic artery, an operation that many liver cancer patients may not tolerate well.

### **Targeted Therapy**

New drugs are being developed that target specific points on the cancer cell and kill it. One of these, called erlotinib (Tarceva), has shown some benefit in people with advanced liver cancer. Several other targeted drugs are now under study.

### **Gene Therapy**

Scientists are learning more about many of the genes that are damaged when normal liver cells become cancerous. The hope is to develop gene therapies aimed at replacing these defective DNA sequences. The p53 gene is a tumor suppressor gene that is often altered in liver cancers. In normal liver cells, it prevents excessive growth, helps cells repair damage to their DNA, and promotes the death of cells when DNA damage becomes too much to be repaired. Restoring normal p53 DNA to liver cancer cells might suppress tumor growth and cause the cancer cells to die. Clinical trials are in progress to study the effectiveness of this type of therapy, including possible short and long-term side effects.

## **Additional Resources**

### **More Information From Your American Cancer Society**

The following information may also be helpful to you. These materials may be ordered from our toll-free number, 1-800-ACS-2345 (1-800-227-2345).

After Diagnosis: A Guide for Patients and Families (also available in Spanish)

Caring for the Patient with Cancer at Home (available in Spanish as “Home Care for the Person With Cancer”)

Pain Control: A Guide for People with Cancer and Their Families (also available in Spanish)

The following books are available from the American Cancer Society. Call us at 1-800-ACS-2345 to ask about costs or to place your order.

*American Cancer Society's Guide to Pain Control, Second Edition*

*Cancer in the Family: Helping Children Cope with a Parent's Illness*

*Caregiving: A Step-By-Step Resource for Caring for the Person with Cancer at Home*

*Coming to Terms with Cancer: A Glossary of Cancer-Related Terms*

*Consumers Guide to Cancer Drugs, Second Edition*

*Informed Decisions: The Complete Book of Cancer Diagnosis, Treatment, and Recovery, Second Edition*

## **National Organizations and Web Sites\***

In addition to the American Cancer Society, other sources of patient information and support include:

American Liver Foundation  
Telephone: 1-800-GO-LIVER (1-800-465-4837)  
Internet Address: [www.liverfoundation.org](http://www.liverfoundation.org)

National Cancer Institute  
Telephone: 1-800-4-CANCER (1-800-422-6237)  
Internet Address: [www.cancer.gov](http://www.cancer.gov)

United Network for Organ Sharing  
Telephone: 1-888-894-6361  
Internet Address: [www.unos.org](http://www.unos.org)

*\*Inclusion on this list does not imply endorsement by the American Cancer Society.*

The American Cancer Society is happy to address almost any cancer-related topic. If you have any more questions, please call us at 1-800-ACS-2345 at any time, 24 hours a day.

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For additional assistance please contact your American Cancer Society  
1 - 800 - ACS-2345 or [www.cancer.org](http://www.cancer.org)