



## Chemoembolization

Chemoembolization places chemotherapy and synthetic materials called embolic agents into a blood vessel feeding a cancerous tumor to cut off the tumor's blood supply and trap the chemotherapy within. It is most often used to treat liver cancer but may also be used in patients whose cancer has spread to other areas of the body. Chemoembolization may be used as a standalone treatment or in combination with surgery, chemotherapy, radiation therapy or radiofrequency ablation.



Your doctor will instruct you on how to prepare, including any changes to your medication schedule. Tell your doctor if there's a possibility you are pregnant and discuss any recent illnesses, medical conditions, allergies and medications you're taking, including herbal supplements and aspirin. You may be advised to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners several days prior to your procedure. You also may be told not to eat or drink anything after midnight before your procedure. Plan to stay at the hospital overnight. Leave jewelry at home and wear loose, comfortable clothing. You will be asked to wear a gown.

## What is Chemoembolization?

Chemoembolization is a combination of local delivery of chemotherapy and a procedure called embolization to treat cancer, most often of the liver. It is a non-surgical and minimally invasive procedure performed in radiology usually by an interventional radiologist.

In chemoembolization, anti-cancer drugs are injected directly into the blood vessel feeding a cancerous tumor. In addition, synthetic material called an embolic agent is placed inside the blood vessels that supply blood to the tumor, in effect trapping the chemotherapy in the tumor.

## What are some common uses of the procedure?

Chemoembolization is most beneficial to patients whose disease is predominately limited to the liver,

whether the tumor began in the liver or spread to the liver (metastasized) from another organ.

Cancers that may be treated by chemoembolization include:

- hepatoma or hepatocellular carcinoma (primary liver cancer)
- cholangiocarcinoma (primary cancer of the bile ducts in the liver)
- Metastasis (spread) to the liver from:
  - colon cancer
  - breast cancer
  - carcinoid tumors and other neuroendocrine tumors
  - islet cell tumors of the pancreas
  - ocular melanoma
  - sarcomas
  - other vascular primary tumors in the body

Some success has been demonstrated with patients whose cancer has spread to other areas of the body.

Depending on the number and type of tumors, chemoembolization may be used as the sole treatment or may be combined with other treatment options such as surgery, chemotherapy, radiation therapy, or radiofrequency ablation.

## How should I prepare?

Several days before the procedure, you will have an office consultation with the interventional radiologist who will be performing your procedure.

Prior to your procedure, your blood may be tested to determine how well your kidneys are functioning and whether your blood clots normally.

You should report to your doctor all medications that you are taking, including herbal supplements, and if you have any allergies, especially to local anesthetic medications, general anesthesia or to contrast materials containing iodine (sometimes referred to as "dye" or "x-ray dye"). Your physician may advise you to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners for a specified period of time before your procedure.

Women should always inform their physician and x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy so as not to expose the fetus to radiation. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby. See the Safety page for more information about pregnancy and x-rays.

You will receive specific instructions on how to prepare, including any changes that need to be made to your regular medication schedule.

If you are going to be given a sedative during the procedure, you may be asked not to eat or drink anything for four to eight hours before your exam. If so, you should have a relative or friend accompany you and drive you home afterward.

Children may require general anesthesia for the procedure to help them hold still and be comfortable for

the procedure. The anesthesia department will provide instructions to the family.

You should plan to stay overnight at the hospital for one or more days.

You will be given a gown to wear during the procedure.

## What does the equipment look like?

In this procedure, x-ray equipment, a catheter and embolic agents are used.

The equipment typically used for this examination consists of a radiographic table, one or two x-ray tubes and a television-like monitor that is located in the examining room. Fluoroscopy, which converts x-rays into video images, is used to watch and guide progress of the procedure. The video is produced by the x-ray machine and a detector that is suspended over a table on which the patient lies.

A catheter is a long, thin plastic tube that is considerably smaller than a "pencil lead", or approximately 1/8 inch in diameter.

Various materials called embolic agents are used to occlude or block off blood vessels, but the most common are oil or plastic particles made from polyvinyl alcohol (PVA).

Other equipment that may be used during the procedure includes an intravenous line (IV), ultrasound machine and devices that monitor your heart beat and blood pressure.

## How does the procedure work?

Chemoembolization attacks the cancer in two ways. First, it delivers a very high concentration of chemotherapy, or anti-cancer drugs, directly into the tumor, without exposing the entire body to the effects of those drugs. Second, the procedure cuts off blood supply to the tumor, trapping the anti-cancer drugs at the site and depriving the tumor of the oxygen and nutrients it needs to grow.

The liver is unique because it has two blood supplies—an artery (the hepatic artery) and a large vein (the portal vein). The normal liver receives about 75 percent of its blood supply through the portal vein and only 25 percent through the hepatic artery. But when a tumor grows in the liver, it receives almost all of its blood supply from the hepatic artery.

Chemotherapy drugs injected into the hepatic artery reach the tumor very directly, sparing most of the healthy liver tissue. Then, when the artery is blocked, the blood is no longer supplied to the tumor, while the liver continues to be supplied by blood from the portal vein. This also permits a higher concentration of the anti-cancer drugs to be in contact with the tumor for a longer period of time.

## How is the procedure performed?

Image-guided, minimally invasive procedures such as chemoembolization are most often performed by a

specially trained interventional radiologist in an interventional radiology suite or occasionally in the operating room.

X-ray images will be taken to map the path of the blood vessels feeding the tumor. Contrast material may also be used to map the path.

You may be given a medication called Allopurinol, which may help protect the kidneys from the chemotherapy and the byproducts produced by the dying tumor cells.

You may be given medications to help prevent nausea and pain, and antibiotics to help prevent infection.

You will be positioned on the examining table.

You may be connected to monitors that track your heart rate, blood pressure and pulse during the procedure.

A nurse or technologist will insert an intravenous (IV) line into a vein in your hand or arm so that sedative medication can be given intravenously. Moderate sedation may be used. As an alternative, you may receive general anesthesia.

A very small skin incision is made at the site.

Using x-ray guidance, a thin catheter is inserted through the skin and into the femoral artery, a large groin vessel, and advanced into the liver. Then a contrast material is injected through your IV and another series of x-rays will be taken.

Once the catheter is positioned in the branches of the artery that are feeding the tumor, the anti-cancer drugs and embolic agents are mixed together and injected.

Additional x-rays will be taken to confirm that the entire tumor has been treated.

At the end of the procedure, the catheter will be removed and pressure will be applied to stop any bleeding. The opening in the skin is then covered with a dressing. No sutures are needed.

You can expect to stay in bed in the recovery room for four to six hours.

Chemoembolization is usually completed within 90 minutes.

## **What will I experience during and after the procedure?**

Devices to monitor your heart rate and blood pressure will be attached to your body.

You will feel a slight pin prick when the needle is inserted into your vein for the intravenous line (IV) and when the local anesthetic is injected. Most of the sensation is at the skin incision site, which is numbed using local anesthetic. You may feel pressure when the catheter is inserted into the vein or artery.

If the procedure is done with sedation, the intravenous (IV) sedative will make you feel relaxed, sleepy and comfortable for the procedure. You may or may not remain awake, depending on how deeply you are sedated.

You may feel slight pressure when the catheter is inserted, but no serious discomfort.

As the contrast material passes through your body, you may experience a warm feeling which quickly subsides.

Most patients experience some side effects called post-embolization syndrome, including pain, nausea, vomiting and fever. Pain is the most common side effect that occurs because the blood supply to the treated area is cut off. It can readily be controlled by medications given by mouth or your IV.

You should be able to leave the hospital within 48 hours after the procedure, once your pain and nausea have subsided.

You will be sent home with prescriptions for oral antibiotics, pain medicine and medicine for nausea. It is normal for you to run a fever up to a week following the procedure. Fatigue and loss of appetite are also common and may last two weeks or longer. In general, these are all signs of a normal recuperation.

If your pain suddenly changes in degree or character, if your fever becomes suddenly higher or you notice any other unusual changes, you should contact your physician.

Your nurse will instruct you on how to use a breathing apparatus called an incentive spirometer. The purpose of this is to help you inflate your lungs so that you will not develop pneumonia.

You should be able to resume your normal activities within a week.

During the first month following the procedure, you should check in routinely to let your physician know how your recovery is progressing. You will return for a CT scan or MRI and blood tests to determine the size of the treated tumor.

If there is a tumor on both sides of the liver, commonly only part of the liver will be treated at first and after one month, you will return to the hospital for additional chemoembolization.

CT scans or MRI will be performed every three months thereafter to determine how much the tumors ultimately shrink, and to see if and when any new tumors arise in the liver. The average time before a second round of chemoembolization is necessary (because of new tumor) is between 10 and 14 months. Chemoembolization can be repeated many times over the course of many years, as long as it remains technically possible and you continue to be healthy enough to tolerate repeat procedures.

## **Who interprets the results and how do I get them?**

The interventional radiologist can advise you as to whether the procedure was a technical success when it is completed.

You will also be scheduled for additional CT or MRI exams and blood tests to determine the size of the treated tumor.

## **What are the benefits vs. risks?**

## Benefits

- In about two-thirds of cases treated, chemoembolization can stop liver tumors from growing or cause them to shrink. This benefit lasts for an average of 10 to 14 months, depending upon the type of tumor, and usually can be repeated if the cancer starts to grow again.
- Other types of therapy (tumor ablation, chemotherapy, radiation) may be used in combination with chemoembolization to control the tumor. This is all dependent on the size and location of the tumor.
- When cancer is confined to the liver, most deaths that occur are due to liver failure caused by the growing tumor, not due to the spread of cancer throughout the body. Chemoembolization can help prevent this growth of the tumor, potentially preserving liver function and a relatively normal quality of life.

## Risks

- Any procedure where the skin is penetrated carries a risk of infection. The chance of infection requiring antibiotic treatment appears to be less than one in 1,000.
- Any procedure that involves placement of a catheter inside a blood vessel carries certain risks. These risks include damage to the blood vessel, bruising or bleeding at the puncture site, and infection. However precaution is taken to mitigate these risks.
- There is always a chance that embolization material can lodge in the wrong place and deprive normal tissue of its blood supply. However, mapping the pathway of the tumor and blood supply minimizes this risk.
- There is a risk of infection after embolization, even if an antibiotic has been given.
- Because angiography is part of the procedure, there is a risk of an allergic reaction to the contrast material. The radiologic technologist will determine your allergies prior to the procedure.
- Because angiography is part of the procedure, there is a risk of kidney damage in patients with diabetes or other pre-existing kidney disease.
- Reactions to chemotherapy may include nausea, hair loss, a decrease in white blood cells, a decrease in platelets and anemia. Because chemoembolization traps most of the chemotherapy drugs in the liver, these reactions are usually mild.
- Serious complications from chemoembolization occur after about one in 20 procedures. Most major complications involve either infection in the liver or damage to the liver. Reporting indicates that approximately one in 100 procedures result in death, usually due to liver failure.
  
- Children are at an increased risk of getting a blood clot in the leg after the procedure.

## What are the limitations of Chemoembolization?

Chemoembolization is not recommended in cases of severe liver or kidney dysfunction, abnormal blood clotting, prior surgery or stenting of the bile duct, or a blockage of the bile ducts. In some cases—despite liver dysfunction—chemoembolization may be done in small amounts and in several procedures to try and minimize the effect on the normal liver.

Chemoembolization is a treatment, not a cure. Approximately 70 percent of the patients will see improvement in the liver and, depending on the type of liver cancer, it may improve survival rates and

quality of life.

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