

Chemoembolization

This procedure is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What is Chemoembolization?

Chemoembolization is a way of delivering cancer treatment directly to a tumor. The liver is the most common part of the body for chemoembolization to be used, although it can be done in other areas. Under x-ray guidance, a small catheter is inserted into an artery in the groin. The catheter's tip is threaded into the artery in the liver that supplies blood flow to the tumor.

Chemotherapy is injected through the catheter into the tumor and mixed with particles that embolize or block the flow of blood to the diseased tissue.

Chemoembolization works to attack the cancer in two ways. First, it delivers a very high concentration of chemotherapy 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, depriving it of oxygen and nutrients, and trapping the drugs at the tumor site to enable them to be more effective.

What are some common uses of the procedure?

Chemoembolization is most beneficial to patients whose disease is limited to the liver, whether the tumor began in the liver or spread to it (metastasized) from another organ. Some success has been demonstrated with patients whose cancer has spread to other areas. Cancers that may be treated by chemoembolization include:

- Hepatoma (primary liver cancer)
- Metastasis (spread) to the liver from:
 - colon cancer
 - carcinoid
 - islet cell tumors of the pancreas
 - ocular melanoma
 - sarcomas
 - a primary tumor in another part 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 or radiation.

How should I prepare for the procedure?

Several days before the procedure you will have an office consultation with the physician who will be performing the procedure—an interventional radiologist. You will have blood drawn at the hospital or at a local clinic to learn how well your liver and kidneys are functioning and whether your blood clots normally. Staff also will advise you if there is to be a change in your medication schedule; be sure the physician is aware of all the medications you take regularly, particularly those that affect clotting, such as blood thinners like Coumadin. You will be admitted to the hospital the day before or the morning of the procedure.

What does the equipment look like?

The x-ray equipment and catheters are the same as those used for catheter angiography. Several materials can be used to embolize the arteries feeding the tumor, but the most common are oil and a plastic particle made from polyvinyl alcohol (PVA).

How does the procedure work?

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.

Tumors, like all tissues, depend on a steady supply of oxygen and nutrients carried by the blood. Once the blood supply is cut off by embolization and the chemotherapy begins its work, the tissue begins to break down and, in successful cases, the tumor dies. It will appear as a scar or dead area on subsequent computed tomography (CT) scans or magnetic resonance imaging (MRI). Over time it may grow smaller.

How is the procedure performed?

The first step is to obtain x-ray pictures showing the arteries to the liver and the tumor by performing angiography. A sedative will be injected through an intravenous (IV) line to relax you. The radiologist will numb an area of the groin with a local anesthetic. A thin catheter is introduced through a very small incision into the femoral artery, a large groin vessel, and guided by TV monitoring into the arteries feeding the liver. Then contrast material is injected and a series of x-rays are taken allowing even tiny thread-like vessels to be seen. The catheter is then guided into the branches feeding the tumor and the chemoembolic material is injected. Repeated x-ray pictures will be taken to confirm that the tumor has been completely treated.

At the end of the procedure, the interventional radiologist removes the catheter and pressure will be applied to the groin area for a short time to prevent bleeding from the site of catheter insertion. You can expect to stay in bed for six to eight hours afterward.

What will I experience during the procedure?

In some instances, you will be admitted to the hospital on the day before your procedure, although commonly you will come to the hospital the day of the procedure. An intravenous (IV) line will be started and you will receive intravenous fluids. This helps to protect your kidneys during chemoembolization. In some cases, you may be given a medication called Allopurinol, which may help protect the kidneys from the chemotherapy and the products produced by the dying tumor cells. Your nurse

will instruct you in 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. Prior to the procedure, you will be given additional medications to prevent nausea and pain, and antibiotics to prevent infection.

The sedative will make you feel relaxed and sleepy and you may nod off for brief periods, but generally will remain awake throughout the procedure. You may feel slight pressure when the catheter is inserted but no serious discomfort. Most patients experience some side effects after chemoembolization. This is called post-embolization syndrome and consists of pain, nausea, vomiting and fever. Pain is the most common side effect and occurs because the blood supply to the treated area is cut off. It can readily be controlled by oral or intravenous medication. Most patients leave the hospital within 24 to 48 hours of the procedure, after their pain and nausea have subsided.

You will be sent home with prescriptions for oral antibiotics, pain medicine and medicine for nausea. Fevers may occur normally for up to a week after the procedure. Fatigue and loss of appetite are common for two weeks and may last 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 than it had been or you notice any other unusual changes, it is important to let your physician know right away. Most patients can resume their normal activities within a week.

During the first month following the procedure, it is important to check in routinely to let the 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 and how well the chemoembolization worked. If there is 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 are usually done after the completion of the chemoembolization therapy.

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 embolization was a technical success when the procedure is completed and schedule your return for additional procedures or for follow-up scans.

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.
- 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

- There is always a chance that embolization material can lodge in the wrong place and deprive normal tissue of its blood supply.
- 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 contrast material.
- 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.

What are the limitations of Chemoembolization?

Chemoembolization is not recommended in cases where severe liver or kidney dysfunction, abnormal blood clotting or a blockage of the bile ducts exists. 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.

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