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Interventional Radiology Treatments for Liver Cancer ***Minimally Invasive Treatments Help Cancer Patients Extend Life and Improve Quality***

Surgical removal of liver tumors offers the best chance for a cure. Unfortunately, liver tumors are often inoperable because the tumor may be too large, or has grown into major blood vessels or other vital structures. Sometimes, many small tumors are spread throughout the liver, making surgery too risky or impractical. Surgical removal is not possible for more than two-thirds of primary liver cancer patients and 90 percent of patients with secondary liver cancer.

Historically, chemotherapy drugs have been generally ineffective at curing liver cancer.

Treatments

Tumors need a blood supply, which they actively generate, to feed themselves and grow. As vascular experts, interventional radiologists are uniquely skilled in using the vascular system to deliver targeted treatments via catheter throughout the body. In treating cancer patients, interventional radiologists can attack the cancer tumor from inside the body without medicating or affecting other parts of the body by using embolization and radiofrequency heat.

Embolization is a well-established interventional radiology technique that is used to treat trauma victims with massive bleeding, to control hemorrhage after childbirth, to decrease blood loss prior to surgery and to treat tumors. In treating cancer patients, interventional radiologists use embolization to cut off the blood supply to the tumor (embolization), deliver radiation to a tumor (radioembolization), or combine this technique with chemotherapy to deliver the cancer drug directly to the tumor (chemoembolization).

Additionally, interventional radiologists can use imaging to guide them directly to the tumor through the skin to administer radiofrequency heat to “cook” and kill the cancer cells (radiofrequency ablation) or cyroablation to freeze the tumor.

Chemoembolization

Chemoembolization is a minimally invasive treatment for liver cancer that can be used when there is too much tumor to treat with radiofrequency ablation (RFA), when the tumor is in a location that cannot be treated with RFA, or in combination with RFA or other treatments.

Chemoembolization delivers a high dose of cancer-killing drug (chemotherapy) directly to the organ while depriving the tumor of its blood supply by blocking, or embolizing, the

arteries feeding the tumor. Using imaging for guidance, the interventional radiologist threads a tiny catheter up the femoral artery in the groin into the blood vessels supplying the liver tumor. The embolic agents keep the chemotherapy drug in the tumor by blocking the flow to other areas of the body. This allows for a higher dose of chemotherapy drug to be used, because less of the drug is able to circulate to the healthy cells in the body. Chemoembolization usually involves a hospital stay of two to four days. Patients typically have lower than normal energy levels for about a month afterwards.

Chemoembolization is a palliative, not a curative, treatment. It can be extremely effective in treating primary liver cancers, especially when combined with other therapies. Chemoembolization has shown promising early results with some types of metastatic tumors. Although the individual materials used in this treatment are FDA approved, the treatment itself is not approved for intra-arterial therapy of liver tumors.

Yttrium-90 Radioembolization

Radioembolization is very similar to chemoembolization but with the use of radioactive microspheres. This therapy is used to treat both primary and metastatic liver tumors.

This treatment incorporates the radioactive isotope Yttrium-90 into the embolic spheres to deliver radiation directly to the tumor. Each sphere is about the size of five red blood cells in width. These beads are injected through a catheter from the groin into the liver artery supplying the tumor. The beads become lodged within the tumor vessels where they exert their local radiation that causes cell death. This technique allows for a higher, local dose of radiation to be used, without subjecting healthy tissue in the body to the radiation. The Yttrium-90 radiates from within and, since it is administered in the hepatic artery, it can be viewed as “internal” radiation.

Radioembolization is a palliative, not a curative, treatment—but patients benefit by extending their lives and improving their quality of life. It is a relatively new therapy that has been effective in treating primary and metastatic liver cancers. It is performed as an outpatient treatment. There are fewer side effects from this treatment compared to standard cancer treatments, with the main one being fatigue for seven to 10 days.

THERMAL ABLATION TREATMENTS

Radiofrequency Ablation

For inoperable liver tumors, radiofrequency ablation (RFA) offers a nonsurgical, localized treatment that kills the tumor cells with heat, while sparing the healthy liver tissue. Thus, this treatment is much easier on the patient than systemic therapy. Radiofrequency energy can be given without affecting the patient’s overall health and most people can resume their usual activities in a few days.

In this procedure, the interventional radiologist guides a small needle through the skin into the tumor. From the tip of the needle, radiofrequency energy (similar to microwaves) is transmitted to the tip of the needle, where it produces heat in the tissues. The dead tumor tissue shrinks and slowly forms a scar. The FDA has approved RFA for the treatment of liver tumors.

Efficacy

In a small number of cases, RFA can extend patients' lives, but it is generally palliative. Depending on the size of the tumor, RFA can shrink or kill the tumor, extending the patient's survival time and greatly improving their quality of life while living with cancer.

Because it is a local treatment that does not harm healthy tissue, the treatment can be repeated as often as needed to keep patients comfortable. It is a very safe procedure, with complication rates on the order of two to three percent, and has been available since the late 1990s.

By decreasing the size of a large mass, or treating new tumors in the liver as they arise, the pain and other debilitating symptoms caused by the tumors are relieved. While the tumors themselves may not be painful, when they press against nerves or interfere with vital organs, they can cause pain. RFA is effective for small to medium-sized tumors and emerging new technologies should allow the treatment of larger cancers in the future.

More Facts on RFA

- Is most effective when all the cancer is localized in the liver
- Can be used to treat primary liver cancer and tumors that have metastasized (spread) from other areas in the body to the liver
- Usually does not require general anesthesia
- Is well tolerated—most patients can resume their normal routine the next day and may feel tired for a few days
- Can be repeated if necessary
- May be combined with other treatment options
- Can relieve pain and suffering for many cancer patients

Cryoablation

Cryoablation is similar to RFA in that the energy is delivered directly into the tumor by a probe that is inserted through the skin. But rather than killing the tumor with heat, cryoablation uses an extremely cold gas to freeze it. This technique has been used for many years by surgeons in the operating room, but in the last few years, the needles have become small enough to be used by interventional radiologists through a small nick in the skin, without the need for an operation. The "ice ball" that is created around the needle grows in size and destroys the frozen tumor cells.

Prevalence of Liver Cancer

Primary Liver Cancer

- According to the American Cancer Society, about 18,500 cases of primary liver cancer are diagnosed each year. The most common form is hepatocellular carcinoma (HCC). This is a tumor that begins in the main cells of the liver (hepatocytes). Primary liver cancer is twice as common in men as in women.
- HCC most frequently occurs in those who have a form of liver disease called cirrhosis. Cirrhosis occurs when the liver becomes diseased and develops scarring, usually over a period of years. The liver attempts to repair, or regenerate

itself. This process can lead to the formation of tumors. In the United States, the most common causes of cirrhosis are chronic infection with the liver virus hepatitis B or C or alcohol abuse.

- The incidence of primary hepatocellular carcinoma is on the rise worldwide, because of the increase of hepatitis C.

Metastatic Liver Cancer

- Cancer may spread from any part of the body to the liver. There the cancer cells may grow for months or years before they are detected. One of the most common sources of metastatic liver cancer is from tumors of the colon and rectum. About 140,000 people in the United States are diagnosed with colon cancer each year, and roughly half of these patients will develop tumors in their liver at some time. About one in 10 of these patients will have a chance for a cure by having the liver tumors removed surgically.
- Patients with other types of cancer also are at risk for liver cancer. The liver serves as a way-station for cancer cells that circulate through the bloodstream. These cells may grow and form tumors in the liver. It is estimated that as many as 70 percent of all people with uncontrolled cancer will eventually develop secondary liver tumors, or metastases (tumors formed by primary cancer cells that have spread from other cancer sites).

About Interventional Radiologists

Interventional radiologists are doctors who specialize in minimally invasive, targeted treatments that have less risk, less pain and less recovery time compared to open surgery. They use their expertise in interpreting X-rays, ultrasound, MRI and other diagnostic imaging studies to understand, visualize and diagnose the full scope of the disease's pathology and to map out the procedure tailored to the individual patient. Then during the procedure, they image as they go to guide tiny instruments, such as catheters, through blood vessels or skin, to treat diseases at the site of the illness nonsurgically.

Interventional radiology is a recognized medical specialty by the American Board of Medical Specialties. Interventional radiologists complete preliminary training in Diagnostic Radiology and advanced training in Vascular and Interventional Radiology. The American Board of Radiology certifies their specialized training.

For Further Information

For more information on minimally invasive cancer treatments or interventional radiology, visit the SIR Web site at www.SIRweb.org.

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