A PATIENT'S GUIDE TO ABLATION THERAPY

THE DIVISION OF VASCULAR/INTERVENTIONAL RADIOLOGY
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Treatment options for patients with cancer continue to expand, providing effective forms of therapy, while at the same time decreasing their side effects. One emerging treatment option is tumor ablation. With this form of treatment individual tumors are destroyed using heat (radiofrequency ablation), cold (cryoablation) or chemical agents (percutaneous ethanol instillation). Ablative therapy is most often performed for tumors involving the liver, kidney, lung and painful tumors of bone. The goal of ablative therapy is complete tumor destruction.

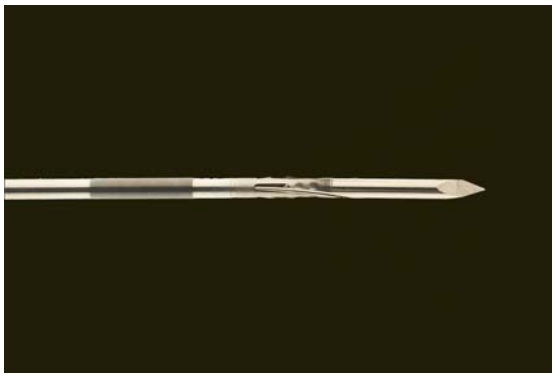
The liver is the site of cancers that originate from both liver cells, hepatocellular carcinoma, and from tumors arising from distant sites (most often colon) and traveling (metastasizing) to the liver. The most effective treatment of tumors originating in or metastasizing to the liver is surgery, in which the involved portion of the liver is removed. Unfortunately many patients are not candidates for surgical treatment because of the number or location of the disease, or because overall health does not permit extensive surgery. Ablative therapy is an alternative to surgical resection and appropriate primarily for patients with four or fewer tumors limited to the liver. For patients with greater numbers of tumors, or tumors involving multiple organs, other forms of therapy such as chemotherapy are more effective.

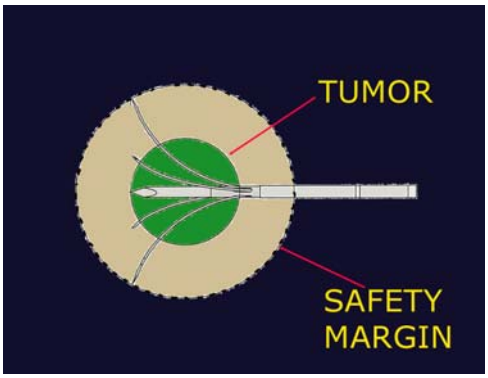
RADIOFREQUENCY ABLATION

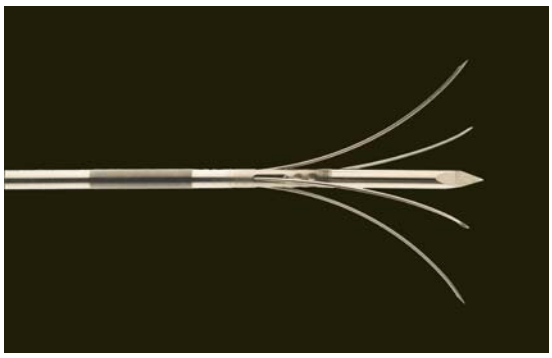
Radiofrequency ablation relies on the generation of heat to destroy the tumor. Exposure of both normal and cancer cells to heat above 122 degrees F causes the cells to die. With

radiofrequency ablation, cells are exposed to temperatures up to 230 degrees F for periods of up to 14 minutes, resulting in cellular destruction.

Radiofrequency ablation makes use of sound waves to interact with molecules in the tumor, causing them to vibrate and generate heat. This energy is delivered through a needle that is







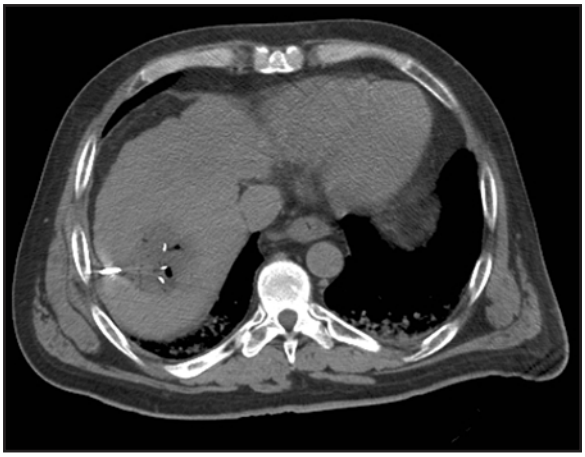
The needle used for radiofrequency ablation is seen in the photograph on the left. On the right the needle is deployed in a tumor with a margin of liver which will also be ablated to assure destruction of the entire tumor.

placed in the tumor using the precise guidance provided by ultrasound, CT, or magnetic resonance imaging. This guidance limits treatment to the tumor, and a small amount of normal tissue surrounding the tumor, to achieve complete tumor destruction. Because the treatment is limited to the tumor, while sparing the majority of the normal liver, side effects are minimized.

The decision as to whether radiofrequency ablation is an appropriate treatment option is based on a recent CT or MR

scan. In most instances this treatment is reserved for patients with four or fewer tumors less than two and one half inches in diameter and with the disease limited to the liver. Choice of this form of treatment is based on discussion between you and your oncologist, surgical oncologist and interventional radiologist performing the procedure.

If radiofrequency ablation is chosen as your treatment , depending on your overall state of health, you will be admitted to the hospital, either on the day before or the day of the procedure. In general, to minimize procedural discomfort, the ablation is performed under general anesthesia. In some instances the procedure is performed under what is called conscious sedation or light sleep. Following the procedure you will go to an anesthesia recovery room for a short period of time

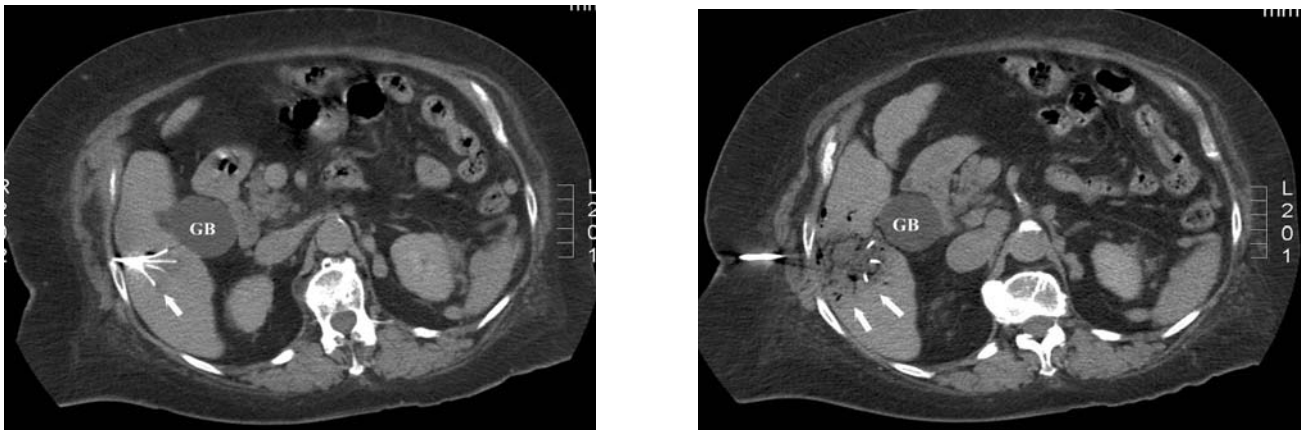


These images taken in a CT scanner demonstrate the precise guidance provided by CT for placement of the radiofrequency ablation needle into the tumor in this patient's liver.

and then your hospital room, where you will stay overnight for observation. Most patients will remain in the hospital for 24 or 48 hours following the procedure.

Recovery from the procedure is rapid. Following the procedure you can expect to experience some discomfort at the site of insertion of the ablation needle. It is not uncommon to experience some fatigue, muscle ache and possibly low grade fever (up to 102 degrees) for the first several days following the procedure, after which full recovery is rapid.

As with any procedure there are risks involved. Liver injury in the form of bleeding or leakage of liver fluid (bile) is experienced in 2 out of 100 patients (2%). Infection of the treated area is seen in 1/100 (1%) patients. When introducing heat into the liver there is a risk of heat damage to surrounding organs such as the gall bladder or bowel. While this risk can be minimized by treatment planning, it cannot be eliminated and is experienced in 2/100 (2%) patients.



These images from a CT scan during ablation shows the ablation needle expanded in the tumor (left-arrow). On the right, the area of tumor destruction is easily seen. The gall bladder is seen adjacent to the tumor (GB) and is at risk for damage during the procedure.

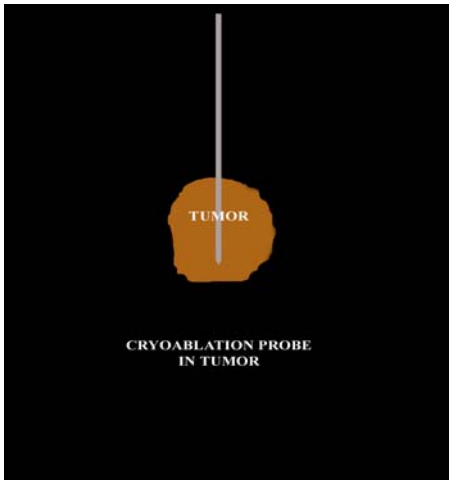
Since the lung surrounds the liver there is the danger of lung injury or collapse during the procedure. This would be immediately recognized and treated during the procedure .

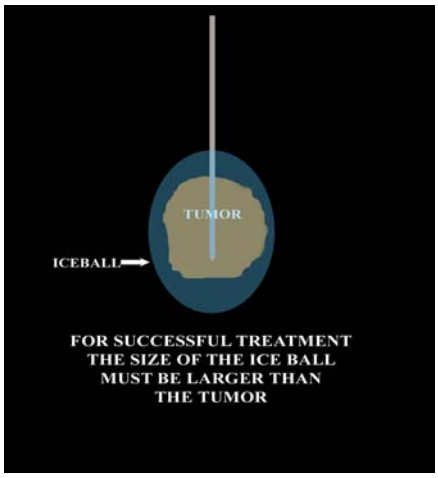
The results of the procedure are judged by a CT or MR scan of the liver performed 1 month following the ablation. Treatment is successful if all of the tumor is destroyed. Success is influenced by tumor size, as larger tumors are more difficult to completely eradicate than smaller ones. Occasionally tumor location adjacent to flowing blood prevents generation of sufficient temperatures to destroy the entire tumor. If there is evidence that the initial treatment did not destroy all of the tumor, the procedure may be repeated. Since the procedure destroys very little normal liver, it is safe to repeat the procedure until the desired result is obtained. In addition, radiofrequency ablation does not interfere with future surgical procedures or other types of therapy. Continued monitoring will take place with CT or MR at 3 months, 6 months and then every six months to detect any recurrence of disease.

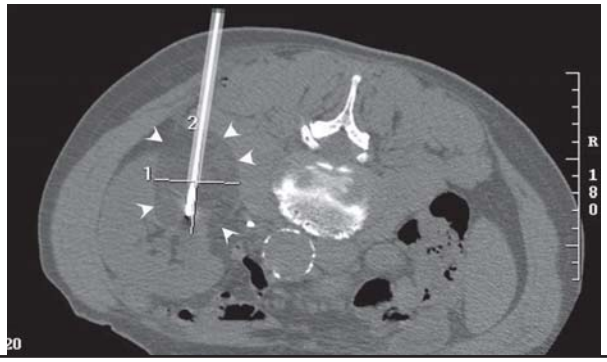
Radiofrequency ablation is increasingly being used for tumors outside the liver. Success has been reported in treating tumors arising in the kidney, lungs and bone.

CRYOABLATION

Cryoablation is another form of the ablative therapy. Like radiofrequency ablation, it is appropriate for patients with limited disease who are not surgical candidates. With cryoablation the tumor is frozen, resulting in cell death. Cryotherapy is a technique in which an ice ball with subzero temperatures is created by circulating liquid nitrogen in a probe that is directly inserted into the tumor. As with other ablative therapies precise guidance for the procedure is provided by CT, MR or ultrasound scanning. Cryoablation has been employed to destroy cancerous growths in the liver, kidney, prostate, lung and bone.



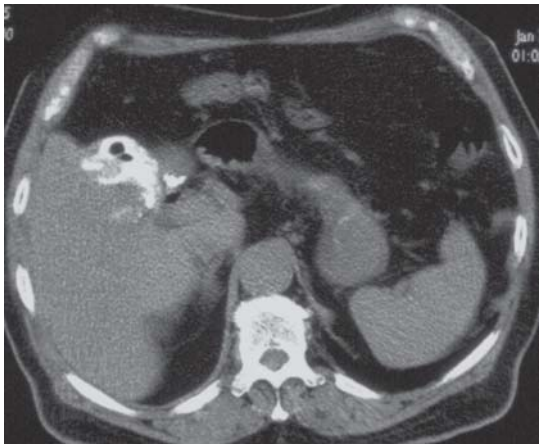


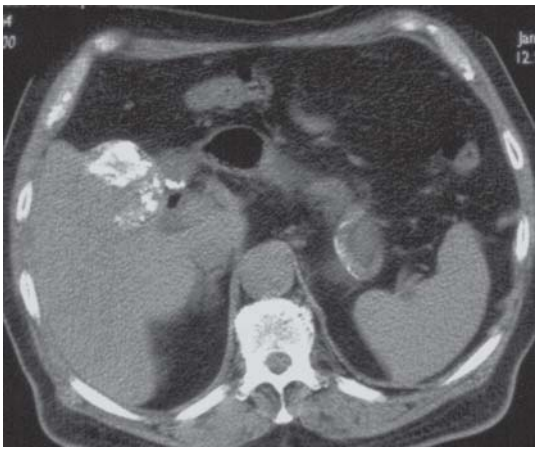


A cryotherapy probe is precisely placed in the tumor using ultrasound or CT guidance (top left). Circulating liquid nitrogen within the probe creates an iceball which surrounds the tumor destroying the tumor cells (top right). The CT scan at the bottom shows a cryoablation probe placed in a tumor in the kidney. The iceball is seen inside the arrows.

PERCUTANEOUS ETHANOL INSTILLATION

Instillation of absolute alcohol (called percutaneous ethanol instillation- PEI) directly into a tumor is another form of ablative therapy. Alcohol destroys cells on contact through destruction of their lining membranes. It is most often chosen for treating tumors in the liver. It is an alternative to radiofrequency or cryoablation. When compared to radiofrequency ablation, it requires more treatment sessions and is slightly less effective. It is most often employed in conjunction with radiofrequency ablation to enhance the success of the procedure. The choice of treatment is influenced by the size, location and type of tumor as well as the preference of the treating physician.





Using CT guidance ethanol mixed with x-ray dye is instilled in a liver tumor. The treated tumor is seen in the CT scans as the white areas in the images.

These exciting therapies continue to expand the arsenal of treatments for patients with cancer. Successful therapy involves selecting the optimal treatment for the individual patient. This is best accomplished by a team of physicians including your oncologist/oncologic surgeon and interventional radiologist who offer the entire gamut of treatment options, are familiar with your condition, and together will select the appropriate treatment from an ever expanding arsenal of treatment alternatives.

The treatments described are most often performed by interventional radiologists. These radiologists have specialized training in the use of image guidance to perform minimally invasive procedures which are often better tolerated by patients than many traditional approaches. Our department provides a team of interventional radiologists, interventional radiology nurses and physician's assistants, all with extensive experience in these procedures and dedicated to providing leading edge treatment for patients with cancer.

For additional information on ablative therapy or interventional radiology please contact
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