Radiofrequency Ablation of Kidney Tumors

What is Radiofrequency Ablation of Kidney Tumors?

Radiofrequency ablation, sometimes referred to as RFA, is a minimally invasive treatment for cancer. It is an image-guided technique that heats and destroys cancer cells.

In radiofrequency ablation, imaging techniques such as ultrasound, computed tomography (CT) or magnetic resonance imaging (MRI) are used to help guide a needle electrode into a cancerous tumor. High-frequency electrical currents are then passed through the electrode, creating heat that destroys the abnormal cells.

Drawing of a 4-prong needle electrode. An electric current has caused heat around the tip.

What are some common uses of the procedure?

Radiofrequency ablation is used to treat renal cell carcinoma (kidney tumors).

Radiofrequency ablation is a viable and effective treatment option if you:

- have one kidney.
- have other medical conditions which might prevent surgery.
- are older and might have difficulty with surgery or postsurgical recovery.
- have tumors of less than four centimeters in size.
- have a familial predisposition (family history) to multiple kidney tumors.

RFA may also be used pre-operatively to decrease blood loss during surgery.

How should I prepare?

You will likely be instructed not to eat or drink anything after midnight before your procedure. Your doctor will tell you which medications you may take in the morning.

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.

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

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 (www.RadiologyInfo.org/en/safety/) for more information about pregnancy and x-rays.

You should plan to have a relative or friend drive you home after your procedure.

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

What does the equipment look like?

In this procedure, computed tomography (CT), needle electrodes, an electrical generator and grounding pads may be used.

There are two types of needle electrodes: simple straight needles and a straight, hollow needle that contains several retractable electrodes that extend when needed.

The radiofrequency generator produces electrical currents in the range of radiofrequency waves. It is connected by insulated wires to the needle electrodes and to grounding pads that are placed on the patient's back or thigh.

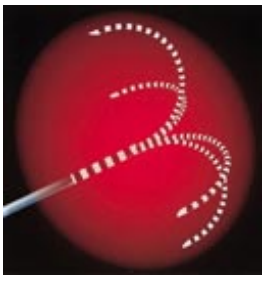
Drawing illustrates heat around the needle electrode.

The CT scanner is typically a large, box-like machine with a hole, or short tunnel, in the center. You will lie on a narrow examination table that slides into and out of this tunnel. Rotating around you, the x-ray tube and electronic x-ray detectors are located opposite each other in a ring, called a gantry. The computer workstation that processes the imaging information is located in a separate control room, where the technologist operates the scanner and monitors your examination.

Other equipment that may be used during the procedure includes an intravenous line (IV) and equipment that monitors your heart beat and blood pressure.

How does the procedure work?

Radiofrequency ablation works by passing electrical currents in the range of radiofrequency waves between the needle electrode and the grounding pads placed on the patient's skin. These currents create heat around the electrode, which when directed into the tumor, heats and destroys the cancer cells. At the same time, heat from radiofrequency energy closes small blood vessels and lessens the risk of bleeding. The dead tumor cells are gradually replaced by scar tissue that shrinks over time.



Drawing depicts how the heat

Ultrasound, computed tomography or magnetic resonance imaging may be used to help the physician guide the needle electrode into the tumor.

expands into the surrounding needles to form a thermal sphere.

How is the procedure performed?

Image-guided, minimally invasive procedures such as radiofrequency ablation are most often performed by a specially trained interventional radiologist in an interventional radiology suite or occasionally in the operating room.

Radiofrequency ablation is often done on an outpatient basis.

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 sedation medication can be given intravenously.

The area where the electrodes are to be inserted will be sterilized and covered with a surgical drape.

Your physician will numb the area with a local anesthetic.

A very small nick is made in the skin at the site.

If multiple electrodes are needed, then multiple nicks may be made.

Radiofrequency ablation is performed using one of the following methods:

- Surgically.
- Percutaneous, in which needle electrodes are inserted through the skin and into the site of the tumor.

Using imaging-guidance, your physician will insert the needle electrode through the skin and advance it to the site of the tumor.

Once the needle electrode is in place, radiofrequency energy is applied. For a large tumor, it may be necessary to do multiple ablations by repositioning the needle electrode into different parts of the tumor to ensure no tumor tissue is left behind.

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

Each radiofrequency ablation takes about 10 to 30 minutes, with additional time required if multiple ablations are performed. The entire procedure is usually completed within one to three hours.

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.

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

Pain immediately following radiofrequency ablation can be controlled by pain medication given through your IV or by injection. Afterward any mild discomfort you experience can be controlled by oral pain medications. Patients may feel nauseous, but this can also be relieved by medication.

You will remain in the recovery room until you are completely awake and ready to return home.

Your intravenous line will be removed.

You should be able to resume your usual activities within a few days.

Only about ten percent of patients will still have pain a week following radiofrequency ablation.

Who interprets the results and how do I get them?

Computed tomography (CT) or magnetic resonance imaging (MRI) of the kidneys is performed within a few hours to a week following radiofrequency ablation. A radiologist will interpret these CT or MRI scans to detect any complications and to ensure that all of the tumor tissue has been destroyed.

Your interventional radiologist may recommend a follow-up visit after your procedure or treatment is complete.

The visit may include a physical check-up, imaging procedure(s) and blood or other lab tests. During your follow-up visit, you may discuss with your doctor any changes or side effects you have experienced since your procedure or treatment.

What are the benefits vs. risks?

Benefits

- RFA is a relatively quick procedure and recovery is rapid so that chemotherapy may be resumed almost immediately in patients who need it.
- Radiofrequency ablation is less expensive than other treatment options.
- No surgical incision is needed—only a small nick in the skin that does not have to be stitched closed.
- Unlike surgical treatment, this procedure allows the kidney to be preserved.
- It does not have an effect on blood pressure.
- It may or may not have an effect on renal function depending on how large an area needs to be treated.

Risks

- Severe pain after RFA is uncommon, but may last a few days and require a narcotic to provide relief.
- 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.
- There is always a slight chance of cancer from exposure to radiation. However, the benefit of this treatment outweighs the risk.
- Women should always inform their physician and x-ray or CT technologist if there is any possibility that they are pregnant. See the Safety page (www.RadiologyInfo.org/en/safety/) for more information about pregnancy and x-rays.

What are the limitations of Radiofrequency Ablation of Kidney Tumors?

Research indicates that RFA is very effective for small tumors. Because it has only recently begun to be used for kidney tumors, research is limited. Complete treatment of the tumor may require more than one session in some cases. Long term effectiveness at five and 10 years are available in only a limited number of patients. Some studies suggest that long term tumor control may be better with surgical resection of the tumor. Because the tumor is destroyed inside the body, CT or MR scans are needed to watch for tumor recurrence over many years.