

What is Radiofrequency Ablation of Kidney Tumours?

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 and computed tomography (CT) are used to help guide a needle electrode into a cancerous tumour. High-frequency electrical currents are then passed through the electrode, creating heat that destroys the abnormal cells.

What are some common uses of the procedure?

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

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 post surgical recovery.
- have tumours of less than four centimetres in size.
- have a familial predisposition (family history) to multiple kidney tumours.

How should I prepare?

You may 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 must tell the doctor about:-

- All medication that you are taking, including anti-platelet drugs and anticoagulants. These are medicines that affect the way your blood clots. Listed below are some drugs that the doctor will need to be informed about if you have been prescribed them.

- Warfarin, Aspirin, Enoxaparin, Dalteparin, Tinzaparin, Bemiparin, Fondaparinux, Danaparoid, Coumarins, Acenocoumarol, Phenindione, Lepirudin, Bivalirudin, Argatroban, Dabigatran, Rivaroxaban, Clopidogrel, Dipyridamole, GP IIb/IIIa inhibitors, Abciximab, Eptifibatide, Tirofiban and Plasugrel.
- Any allergies which you may have - especially to local anaesthetic, general anaesthetic or to contrast materials (x-ray dye).
- Women should always inform their doctor if there is any possibility that they are pregnant.
- The Radiologist will need to know if you have a hereditary bleeding abnormality or abnormal bleeding history after minor procedures such as dental extraction and further tests to assess your blood may be needed.

Your doctor may advise you to stop taking aspirin, non-steroidal anti-inflammatory drugs (NSAIDs) or a blood thinner 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.

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. Sometimes an ultrasound machine is used in conjunction with CT.

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.

The CT scanner is typically a large, box like machine with a hole in the centre. You will lie on a narrow examination table that slides into and out of this hole. 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 room, where the radiographer 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 tumour, heats and destroys the cancer cells. Because healthy kidney tissue is better able to withstand heat, radiofrequency ablation is able to destroy a tumour and only a small rim of normal tissue around the edges of the tumour. At the same time, heat from radiofrequency energy closes small blood vessels and lessens the risk of bleeding. The dead tumour cells are gradually replaced by scar tissue that shrinks over time.

Ultrasound or computed tomography imaging may be used to help the doctor guide the needle electrode into the tumour.

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 x-ray interventional radiology CT suite or occasionally in the operating theatre. It is commonly performed under sedation but can be performed under a general anaesthetic.

You will be positioned on the CT table.

You will be connected to equipment which monitors your heart rate, blood pressure and pulse during the procedure.

A needle will be inserted 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.

The radiologist will numb the area with a local anaesthetic.

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 normally performed percutaneously

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

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

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

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 bed for 4 to 6 hours after the procedure. Most patients are discharged home the following day.

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

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

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.
- 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 medication 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 a risk of xx damage to structures other than tumour. In most cases, an area of normal-appearing kidney tissue around the tumour will be targeted as it is known that this area may contain microscopic tumour cells that may not be visible on a scan. This reduces the risk of recurrence. However, there is always a small risk of excessive injury or loss of the kidney itself resulting in a change in your renal function. Other structures adjacent to the kidney may also be damaged, such as bowel or blood vessels and cause a bowel perforation or bleeding. Such damage is usually apparent on the post-procedure scan and can be dealt with promptly usually with percutaneous techniques but very occasionally surgery.
- With any use of sedation or general anaesthetic, there are some risks involved but all doctors and nurses involved have appropriate training in their use and the actual incidence of such risks are minimal. For further information about the risks involved in the general anaesthesia you should consult an anaesthetist.

- There is a risk of an allergic reaction to the dye used when CT scans are obtained. All the staff are trained in dealing with such a situation and medicines used to treat the reaction are kept within the X-ray rooms themselves.
- There is a risk of recurrence of the tumour after an RFA procedure. The exact risk varies from patient to patient and follow-up scans (usually at 3 monthly intervals to begin with) to examine the ablated area will be undertaken.
- There is a chance the whole tumour will not be able to be treated in a single RFA procedure. The exact risk varies from patient to patient and follow-up scans to examine the ablated area will be undertaken. Further treatments can then be performed.

A copy of the consent form is enclosed.

What are the limitations of Radiofrequency Ablation of Kidney Tumours?

Research indicates that RFA is very effective for small tumours. Because it has only recently begun to be used for kidney tumours, research is limited. Long term effectiveness at five and 10 years are available in only a limited number of patients.

For further information contact:-

Radiology Nurses on:- 01633 - 234327
Radiology Department, Royal Gwent Hospital

Modified with thanks from © The Royal College of Radiologists, May 2008

British Society of Interventional Radiology (BSIR) and the Clinical Radiology Patients' Liaison Group (CRPLG) of the Royal College of Radiologists.

Radiology Info.org - a link from the BSIR website.