# Introduction

# Irreversible electroporation (IRE) is a minimally invasive technique used in the treatment of primary liver cancer.

A number of electrodes, in the form of long needles, are placed around the tumour by using ultrasound or CT guidance. The distance between the electrodes is confirmed by imaging to ensure that the electrodes are correctly placed parallel to one another and that sufficient current flow would be generated to ensure small pores are created in the cell membrane to damage the cancer cells. A generator delivers pulses of high-voltage direct current in time with your heart beat. Electrodes are repositioned under imaging guidance to extend the zone of electroporation until the entire tumour and an appropriate margin have been treated This can be performed percutaneously (through the skin), laparoscopically (using key-hole instruments through small incisions) or at the time of open surgery (laparotomy). The decision regarding the approach is principally determined by the location of the tumour to be treated.

Irreversible electroporation, like surgical resection, is a curative treatment. IRE is an effective treatment option if you;

* are not a good candidate for surgery because your tumour is difficult to reach.
* have other medical conditions that make surgery especially risky.
* would not have enough liver tissue left for the organ to function adequately following the surgical removal of a tumour.
* have liver tumours that have not responded to [chemotherapy](https://www.radiologyinfo.org/en/glossary/glossary.cfm?gid=290) or that have recurred after being removed surgically.
* you have several small liver tumours that are too spread out to be removed surgically.

# What does the equipment look like?

A number of electrodes, in the form of long needles, are placed around the tumour These are attached to an IRE generator that produces strong electrical fields. The needles are localised around the tumour using either ultrasound (USS) or CT guidance.

How does the procedure work?

# Short pulsed but very strong electrical fields damage the cell membranes causing the contents of the cells to leak out leaving them irreversibly damaged.

# What happens first?

Before admission for IRE you will require blood tests and an Anaesthetic assessment

You will be either admitted to the ward the night before or the morning of your procedure. You are not to eat anything for six hours or drink anything for two hours before the procedure. If there is concern regarding dehydration an intravenous (IV) drip will be placed in your arm.

When you are called for your procedure you will be asked to put on a hospital gown. You will also be required to remove your underwear and jewellery.

The procedure is performed under a general anaesthetic. You can bring any glasses, hearing aids, or dentures with you. Glasses are removed just prior to the anaesthetic; dentures are removed once you are asleep.

A clip placed on your finger will measure your pulse and oxygen level during the procedure. You will be put to sleep under a general anaesthetic by the Anaesthetist.

The procedure is done by either an Interventional Radiologist (a specialist in x-ray guided procedures) or Liver Surgeon. They will explain the procedure to you. Please ask questions at this time so that you understand what is going to happen.

**What is the procedure like?**

The procedure takes up to two hours and if done percutaneously takes place in the CT scanning suite in the Radiology Department.

If the procedure is being done

laparoscopically or by open surgery, then it will take place in the operating theatre. You will be taken to the procedure room by nursing staff, and assisted onto the procedure table and positioned lying flat

While you are asleep the electrodes will be positioned around the tumour using ultrasound or CT guidance. The IRE generator will deliver the pulses of electricity to destroy the tumour.

**What happens after the procedure?**

You will wake up in the recovery room and once comfortable be transferred to the ward and remain in bed for a couple of hours.

 You will be given medications to help prevent or reduce pain and nausea.

You may eat and drink as tolerated

You will remain in hospital for the night following the procedure. You will have bloods taken the following morning at the team will review you and decide timing for discharge.

**What will I feel after IRE?**

You may experience the following symptoms (all related to cancer cell death) immediately after the procedure and for up to a week after the procedure.

* **Pain:** You should report any sudden increases in pain, pain that persists after you have received medication, or pain in an area other than the area that was treated. Medication is available.
* **Fever / chills:** Notify your nurse if you have chills or feel as if you have a fever. If you have a fever, a blood sample may be taken to rule out infection. You may require additional antibiotics.

* **Nausea / vomiting / abdominal bloating:** Notify your nurse if you experience nausea or vomiting. Medication is available. Abdominal bloating (cause by gas) should resolve within a week. Your diet will be resumed slowly and as tolerated.
* **Lethargy / tiredness:** Can last for several weeks following the procedure. You should take plenty of rest and slowly resume your usual activities.

**What happens once I return home?**

After your discharge you may still experience some discomfort and nausea / abdominal bloating. If any of these symptoms worsen, notify your doctor.

If you experience any of the following symptoms in the first three weeks after your procedure must inform your Specialist:

* Fever (temperature greater than 38C)
* Increasing pain
* Worsening nausea

**What follow-up will I have?**

A follow-up CT scan will be done six weeks after the IRE to see how the cancer has responded. This will be reviewed by the liver specialists. Depending upon the result of this, you may be seen locally at your hospital, or brought back to an outpatient clinic at Auckland City Hospital to discuss the results and any further investigations or treatments.

**Irreversible electroporation**

**(IRE)**

### Patient Information