Selective internal radiation therapy (SIRT)

This leaflet explains more about SIRT, including the benefits, risks and alternatives, and what you can expect when you come to hospital. If you have any further questions, please speak to a doctor or nurse caring for you.

What is selective internal radiation therapy (SIRT)?
SIRT is a targeted internal radiation treatment for liver cancer. Tiny radioactive particles (microspheres) of Yttrium-90 are delivered directly into your liver tumour via the artery (blood vessel) that supplies blood to the liver. The microspheres lodge in the small blood vessels of the tumour, reducing its blood supply. The radiation released from the microspheres destroys the tumour cells. SIRT is also known as radioembolisation.

Why should I have SIRT?
Your doctors feel that the tumour in your liver isn't treatable with surgery. SIRT is therefore being offered as an alternative option.

To ensure SIRT is a suitable treatment option for you, your doctor will arrange tests to check your liver function and the blood flow to your liver. Whilst SIRT will not cure your cancer it may extend survival and improve your quality of life. The overall aim of the treatment is to slow the growth rate of your tumour, reduce any symptoms associated with your tumour and possibly shrink the size of your tumour. This may then allow for further treatment, such as surgery, chemotherapy and radiofrequency ablation.

What are the risks?
Some of the risks and side effects of SIRT are related to the procedure, whilst others are the unwanted effects of the radiation.

1. Procedural risks:

Risks related to having an angiogram (a diagnostic procedure where x-ray camera and dye are used to show blood flow in your arteries)
You will have two angiograms as part of your SIRT treatment.

Minor risks include:
- A small bruise or marble-sized lump which may form at the groin site used to access your arteries. This can occur up to 48 hours after the procedure. You should follow the post-procedure advice given to you in terms of reducing your normal activity, and let your doctor or nurse know if you notice any bleeding or additional swelling at the site.
- Local damage to a blood vessel or infection at the groin site. If this occurs, you will be offered treatment with antibiotics to clear the infection.
Rare risks include:
- Allergic reaction and/or reduced kidney function as a result of the iodine contained within the special dye (contrast agent) used to highlight your blood vessels on an x-ray. The staff looking after you during the procedure are well trained in managing allergic reactions. You should ensure, however, that you tell the doctors and nurses looking after you about any allergies (including food allergies) that you have. We will check how well your kidneys are working before the procedure so that we can take steps to protect them if necessary.

Very rare risks include:
- False aneurysm, following the angiogram. This is where the blood is contained by the surrounding tissue due to a leaking artery. A small number of patients develop this following an angiogram. The blood-filled cavity will eventually either thrombose (clot) enough to seal the leak, or rupture and flow freely into and between layers of other tissues. A false aneurysm can be treated by compression, an injection of thrombin (which causes it to clot and disappear) or by surgery to repair the leak in the artery.

Risks related to embolisation (blocking the small vessels supplying blood to the tumour)
Typically these are flu-like symptoms and are considered to be the body’s response to tumour-cell death. Symptoms are usually mild to moderate and disappear shortly after treatment. They may include:
- fever
- abdominal pain
- nausea, vomiting, diarrhoea and loss of appetite
- fatigue.

If you experience any of these symptoms, you can usually ease them by taking the anti-sickness medication, paracetamol and/or other pain-relieving medicine prescribed for you. Symptoms generally lessen within 48 hours. If you experience them for more than seven days, you should seek support from your doctor or clinical nurse specialist.

2. Side effects of radiation
Even after all the careful initial assessments, there is still a risk that a small number of the radioactive particles could be delivered to your lungs and/or digestive tract. This could possibly result in long-lasting or permanent side effects, including:

- irritation to your digestive tract (gut) which can cause chronic pain, nausea, vomiting, ulcers, bleeding or pancreatitis (swelling of your pancreas). This will be treated with anti-ulcer medication and steroids.
- lung damage, which may cause shortness of breath and a cough. This will be treated with steroids.
- cholecystitis (inflammation of the gallbladder). Normally this will get better on its own, requiring no treatment. If symptoms continue, removal of the gallbladder may be necessary.
- inflammation to healthy liver tissue, which may cause deterioration in liver function. This can appear weeks after you have been exposed to radiation. You will have regular blood tests to monitor how well your liver is working so that we can detect any problems promptly. Should this occur, you will be treated with steroids.
Are there any alternatives?
Sometimes, shrinkage of liver tumours can be achieved without an operation using the following methods:

- **Chemo-embolisation:** This is a combination of chemotherapy drugs and a synthetic material called an embolic agent. This is placed inside the blood vessels that supply blood to your tumour, and has the effect of trapping the chemotherapy inside the tumour.
- **Percutaneous ethanol injection:** This is where pure alcohol is injected into your tumour to kill the diseased cells.
- **Chemotherapy:** This where drugs used to kill cancer cells are given via a drip into a vein in your hand or arm.
- **Sorafenib (or other tyrosine kinase inhibitor drugs):** This is a type of chemotherapy that you take as a tablet by mouth.
- **Palliative care:** After fully discussing all your treatment options with your referring consultant, you may decide you prefer not to have any active treatment. Alternatively, you may be advised that active treatment will not help you. In either of these cases, you will be referred for palliative care near your home. This supports you and helps to ease your symptoms, but it will not cure you. You can also have palliative care with some treatments.

How can I prepare for SIRT?
We will send you a letter inviting you to discuss the procedure with the team responsible for your SIRT treatment. The team consists of interventional radiologists (doctors who uses x-rays to diagnose and treat illnesses), nuclear medicine physicians, physicists and a clinical nurse specialist. They will ask you about your medical history and physical health, perform a physical examination and arrange for blood tests to be taken. The doctor will also discuss the risks and benefits of SIRT and explain the other tests needed to make sure the treatment is suitable and safe for you. You will be given an opportunity to ask the doctor any questions you may have.

We need to know about any medicines you are taking or have been given, even if it is one you have bought yourself over the counter. Please let the doctor know if you are allergic to any medicines or foods. If you are taking any antiplatelet medicines (such as aspirin or clopidogrel) you may need to stop them temporarily before you have the procedure. If you are taking any anticoagulant medicines (such as warfarin or rivaroxaban) you may be asked to alter the dose or to temporarily change to another medicine before the procedure. If you have diabetes, you may need to alter the dose of your diabetes medicines. We will discuss this fully with you in person. Although all of the procedures are carried out on an outpatient basis (meaning that you do not have to stay in hospital overnight) they require several visits to our hospitals. You should also bear in mind that your follow-up visits may span several months. Our leaflet, *Your outpatient stay at Guy’s/St Thomas’* gives more information about what to expect from your visit.

Giving my consent (permission)
We want to involve you in all decisions about your care and treatment. If you decide to go ahead, you will be asked to sign a consent form. This states that you agree to have the treatment and you understand what it involves. You should receive the leaflet, *Helping you decide: our consent policy*, which gives you more information. If you do not, please ask a member of staff caring for you for a copy.
What happens during SIRT?

SIRT requires two separate procedures:

1. **Preparation stage (first angiogram)**

The first stage is known as a ‘pre-planning angiogram’ and it is performed in the interventional radiology department. The purpose of the angiogram is to assess and prepare your liver for the SIRT.

An angiogram is a diagnostic procedure where a catheter (long thin tube) is inserted into an artery in your groin to inject a special dye called ‘contrast agent’ directly into the blood vessels of your abdomen. An x-ray camera is then used to assess the blood flow and map the blood vessels within your liver. You will be given a local anaesthetic in your groin, but will be awake throughout the procedure. Most patients also have a conscious sedation. This is where two medications are given through a cannula (small flexible plastic tube inserted into a vein) to relax you and ease your pain. Conscious sedation may cause you to forget most of the procedure afterwards, however you will be awake enough during the procedure to breathe for yourself and communicate with the staff.

You should receive a copy of our leaflet, *Having an angiogram*, which gives detailed information on the procedure, how to prepare for it and what to expect afterwards. If you have not received a copy, please ask your clinical nurse specialist.

During the angiogram your interventional radiologist may block (embolise) some of the blood vessels from the liver that are communicating with blood vessels leading to other areas of your digestive tract (such as the stomach or intestine). This is to reduce the chance of the radioactive microspheres travelling to these areas.

The final part of this procedure is to check how the microspheres behave when injected into your liver, and ensure that the amount of blood that flows from the liver to the lungs is small enough for treatment with SIRT to be safe for you. In order to check this, we will give you a small amount of macro aggregated albumin (shorter-lasting radioactive spheres, similar in size to those used in SIRT) through the catheter in your groin. You will then be transferred to the nuclear medicine department where a special camera called a gamma camera is able to take pictures of where the macro aggregated albumin is in your liver. This part of the procedure can take up to one hour.

The angiogram is normally done on an outpatient basis. You will be observed for two to four hours following the procedure and may then return home following the advice given to you. While you are being observed, your doctors will review the x-ray and nuclear medicine images. If results show that SIRT is suitable, you will be asked to return two weeks later to receive the radiation treatment. If results show that SIRT is not suitable for you at this time we will discuss this with you and let your referring consultant know so that they can discuss other treatment options with you.

2. **Delivery of the treatment (second angiogram)**

If SIRT is suitable for you, you will be invited to come in for a second angiogram two weeks after your pre-planning angiogram. The purpose of the angiogram this time is to give the SIRT. The preparation and procedure is identical to the pre-planning angiogram. You will again be asked to come to the interventional radiology department. The nurses will check your blood test results, and ask you to change into a gown. Please remember to follow the preparation instructions given in the leaflet, *Having an angiogram*. 
The nuclear medicine physician and physicist will administer the microspheres into your liver through the catheter in your groin. The interventional radiologist may also insert contrast dye to ensure that the catheter has not moved during the procedure and that the treatment reaches precisely the right place. The whole procedure will take about 60 minutes. Once the delivery is complete, the catheter will be removed. Once the catheter is removed from your groin, the interventional radiologist will either compress the puncture wound where the catheter was inserted for around 10 minutes, or use a special plug (closure device) to stop the bleeding.

**Will I feel any pain?**
The local anaesthetic injection used to numb your groin may sting for a few seconds at the beginning. However, we aim to make the procedure as pain-free as possible. As described above, you will have a conscious sedation to help you to relax and feel comfortable. You may feel a warm sensation for a few seconds when the dye is injected and you may feel as though you are passing urine. Many patients feel slight to moderate discomfort soon after the injection of the microspheres, and you may develop pain when small vessels to your tumour start to block off (embolise). If you become uncomfortable, please tell the nurse so that you can be given pain relief.

**What happens after the treatment?**
You will be transferred from the theatre to a recovery area within the interventional radiology department where you can rest and recover from the sedation. You will be asked to lie flat in bed for two to four hours to avoid bleeding from the wound in your groin. We will need to monitor your blood pressure and heart rate frequently, so equipment will be attached to one of your arms.

You may experience some pain and nausea, but you will be offered some strong painkillers and anti-sickness medication to relieve these. After the period of observation you may be discharged home to the care of a responsible adult (friend or family). If you experience more severe symptoms, you may have to stay in hospital overnight so that we can make sure you are comfortable and that your symptoms are well controlled.

Before you go home, the nuclear medicine physicists will measure the radiation levels in your body. Following SIRT treatment, the radiation field outside your body is considered low enough to not be harmful to others. However, as a precaution, they will advise you on any additional measures you need to take in order to protect people with whom you come into close contact.

You will also be asked to have a post-therapy scan to measure the uptake of the SIRT in your liver tumour. Your clinical nurse specialist will advise you on the time for this.

**What do I need to do after I go home?**
Before you leave hospital, your clinical nurse specialist will give you additional advice on how to look after yourself. You will be given painkillers and anti-sickness tablets to take home with you and you will be advised to rest. You may resume daily activities 24 hours after treatment, but you should not do any physical exercise or heavy lifting (greater than 4.5 kilos/10 pounds) for at least three days.

Your temperature may be slightly raised and you may suffer from flu-like symptoms for up to a week. If your fever lasts longer than a week you should visit your GP, a local A&E department, or contact your clinical nurse specialist immediately, as this might be a sign of infection.
Returning to work
Generally, patients that have no symptoms prior to the procedure recover more quickly. The type of work you do should be taken into consideration when deciding when to return. Your consultant and clinical nurse specialist will discuss this with you.

Will I have a follow-up appointment?
You will be given two appointments for four weeks following the treatment. The first appointment will be for a scan to assess your body’s response to treatment. The second appointment will be with the team responsible for your SIRT therapy to check on your progress and discuss results.

You will be asked to have a blood test every fortnight for six weeks. This is to check what effect the therapy has had on your blood cells, kidney and liver function. For convenience this will be arranged with your GP. Your clinical nurse specialist will contact you three days after your treatment and on receipt of each of the blood test results to answer questions and offer any necessary support,

You should tell any nurse, doctor or pharmacist that you visit, that you have been treated with SIRT.

Further treatments
Only one lobe of the liver is treated at a time. If you have tumours in both lobes you may need a second treatment. This will be determined and discussed with you at your four-week post-therapy appointment.

Useful sources of information
Macmillan Cancer Support Helpline: 0808 808 0000, 9am to 8pm, Monday to Friday
www.macmillan.org.uk

The British Liver Trust: 0800 652 7330, 10am to 4.30pm, Monday to Friday
www.britishlivertrust.org.uk

Contact us
If you have any questions or concerns about SIRT, please call one of the following numbers (Monday to Friday, 9am to 5pm):

Clinical nurse specialist  020 7188 6304
                      07917 087 528
Nuclear medicine physicists  020 7188 3802
Interventional radiology  020 7188 5477

For more information leaflets on conditions, procedures, treatments and services offered at our hospitals, please visit www.guysandstthomas.nhs.uk/leaflets
Pharmacy Medicines Helpline
If you have any questions or concerns about your medicines, please speak to the staff caring for you or call our helpline. t: 020 7188 8748 9am to 5pm, Monday to Friday

Patient Advice and Liaison Service (PALS)
To make comments or raise concerns about the Trust’s services, please contact PALS. Ask a member of staff to direct you to the PALS office or: e: 020 7188 8801 at St Thomas’
t: 020 7188 8803 at Guy’s  e: pals@gstt.nhs.uk

Language Support Services
If you need an interpreter or information about your care in a different language or format, please get in touch using the following contact details. t: 020 7188 8815  fax: 020 7188 5953

NHS 111
Offers medical help and advice from fully trained advisers supported by experienced nurses and paramedics. Available over the phone 24 hours a day. t: 111

NHS Choices
Provides online information and guidance on all aspects of health and healthcare, to help you make choices about your health. w: www.nhs.uk

Become a member of your local hospitals, and help shape our future
Membership is free and it is completely up to you how much you get involved. To become a member of our Foundation Trust, you need to be 18 years of age or over, live in Lambeth, Southwark, Lewisham, Wandsworth or Westminster or have been a patient at either hospital in the last five years. To join: t: 0848 143 4017  e: members@gstt.nhs.uk  w: www.guysandstthomas.nhs.uk