



Oxford University Hospitals
NHS Foundation Trust

ABOUT LIVER RESECTION

Surgical removal of
part of the liver

A guide for patients
and relatives



This booklet has been written to provide information about the operation called a liver resection. This is a major operation and involves removal of a part of the liver. Information about the benefits and risks will help you make an informed decision about the operation.

It is important to remember that each person is different. This booklet cannot replace the professional advice and expertise of a doctor who is familiar with your condition. If you have questions that this booklet does not cover, please discuss them with your surgeon or cancer nurse specialist.

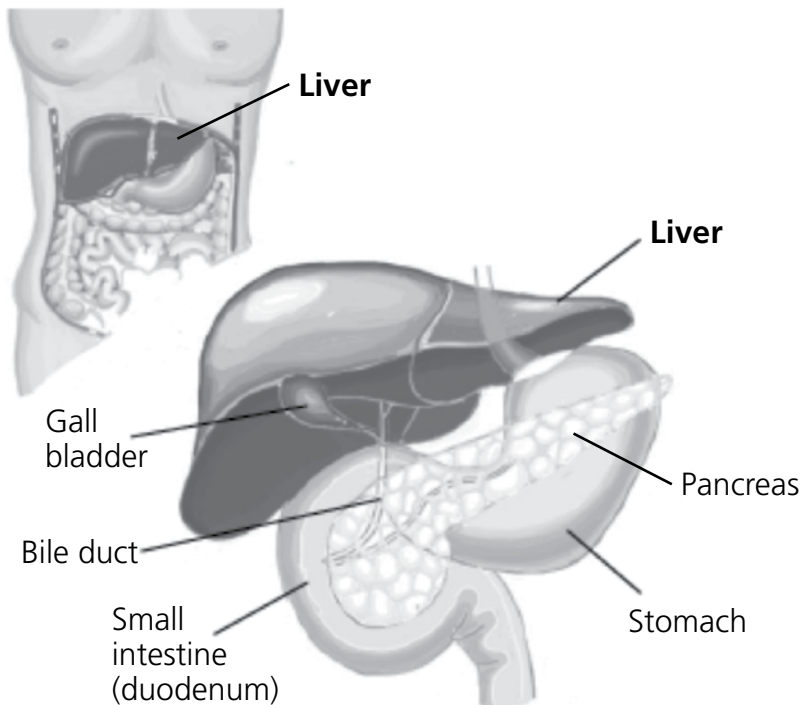
What is the liver?

The liver is a large organ which lies on the right side of the upper abdomen, under the rib cage. It has many functions related to body metabolism (chemical processes within the body) and is very important to health. One of its functions is to produce yellow-green fluid called bile. Bile flows down a tube called the bile duct to the intestine, where it mixes with food and helps digestion.

The gall bladder is a small sac attached to the side of the bile duct. The gall bladder stores excess bile and pushes it down the bile duct in to the intestine, ready for when it is needed for digestion.

The liver has right and left lobes (sections). An artery (hepatic artery) and a vein (portal vein) carry blood to the liver. Blood from the liver flows through the hepatic veins back to the heart.

The liver and its location in the body



What is liver resection?

Liver resection is the removal of part of the liver during an operation.

The body can cope with removal of up to two-thirds of the liver.

The liver also has the ability to grow back. Within 3 months of your operation, the remainder of your liver will have grown back to near normal size.

The operation is named depending on which portion of liver is being removed. For example, removal of the right side of the liver is called right hemi-hepatectomy. Since the gall bladder is located on the right side of the liver, it is often removed with a right hemi-hepatectomy.

Liver operations can sometimes be carried out using keyhole surgery. The surgical team at Oxford specialises in these procedures. With keyhole surgery, instruments are inserted through small cuts in the abdomen.

The surgeon can see what is happening through a narrow camera, which is also inserted into the abdomen. This avoids making a large cut on your abdomen, meaning you should have a quicker recovery from the operation. If this type of operation is suitable for you, your surgeon will discuss it in more detail.

When is liver resection recommended?

The most common reason for carrying out a liver resection is to treat cancer that has spread to the liver from a primary cancer in another part of the body.

Your specialists, including your liver surgeon, the radiologist (X-ray doctor) and oncologist (cancer chemotherapy specialist), have reviewed the results of your tests and believe that it may be possible to remove the cancer completely.

The operation is also used to treat cancers which start in the liver, the bile duct or the gall bladder. It may occasionally be needed for benign (non-cancerous) liver problems, such as liver cysts.

Occasionally, it is not possible to be absolutely sure about what is causing the problem with your liver. You may have been advised to have the operation to remove an abnormality, as this may be the best way to make a definite diagnosis.

What alternative treatments are available?

- **Chemotherapy**

If you have cancer, chemotherapy can shrink the cancer or delay its growth, but is not an alternative treatment which offers a cure.

Chemotherapy involves regular injections (into one of your veins) and/or tablets of one or more drugs over a period of 3-6 months. Your oncologist (cancer chemotherapy specialist) will answer any questions you have about this.

- **Microwave ablation**

Microwave ablation is a procedure which uses heat from microwave energy to destroy cancer cells. It can be used to treat cancer that has spread (metastasised) to the liver from other parts of the body, usually from the colon or rectum. Only tumours of a certain size and in a certain location are considered suitable for microwave ablation treatment.

This procedure is carried out by a radiologist and takes 15-45 minutes. It can be carried out under general anaesthetic (where you are asleep) during open abdominal surgery (where a larger cut is made on the abdomen), or by using keyhole surgery, or by using a needle through the skin and into the tumour.

Microwave ablation could potentially destroy all cancer cells, especially in small metastases (approximately less than 3cm lesions). However, as there is no sample to look at under a microscope after the ablation (unlike after open or keyhole liver surgery), there is a risk of some cancer cells remaining after microwave ablation. To assess this risk, people who receive microwave ablation are scanned afterwards much more often. If the cancer is found to have returned, a further ablation might be possible.

There is a multi-centre clinical trial looking at the outcomes of liver surgery compared to microwave ablation for colorectal metastases in the UK. Oxford is one of the centres taking part.

- **Selective internal radiation therapy (SIRT)**

Selective internal radiation therapy (SIRT) is used to treat cancers of the liver. It is generally used with cancers that cannot be treated surgically. The treatment involves injecting microspheres (tiny beads) of radioactive material into the arteries which supply the tumour. These microspheres are carried into the tumour in the bloodstream, where they can destroy tumour cells by releasing radiation directly into the tumour.

- **Stereotactic body radiotherapy (SBRT)**

Stereotactic body radiotherapy (SBRT) is a new procedure for treating liver cancer. It uses high doses of radiation delivered to a precise target within the liver. This helps to avoid damaging healthy tissue nearby.

The treatment is given in either a single treatment session or up to approximately five treatment sessions (each session is called a 'fraction').

- **Portal vein embolisation**

Portal vein embolisation (PVE) is a procedure which is carried out in the Radiology department. It assists with the treatment of cancer of the liver. PVE is carried out when liver cancer is suitable for surgical removal, but the remaining liver would be too small to work well afterwards. It can be done 4 to 5 weeks before the operation.

PVE works by blocking the blood flow to the affected part of the liver from the bowel (portal venous flow). The blood flow from the bowel to the liver is then redirected to the healthy part of the liver, which is expected to remain after surgery. The aim of this procedure is to shrink the part of the liver affected with cancer, whilst allowing the remaining healthy liver to grow bigger.

- **Staged liver surgery**

Sometimes after PVE, the healthy part of the liver that is going to remain after surgery does not grow enough to carry out the liver surgery safely. If this happens, your surgeon may offer a two-step operation called an ALPPS procedure (associated liver partitioning and portal vein ligation for staged liver surgery).

In the first stage, your surgeon will tie off a branch of the portal vein that supplies the section of liver to be removed.

The liver will be divided completely, in preparation for removal of the area affected by the tumour. However, the surgeon will not remove this part. Instead, the affected part of the liver will be left in place and still supplied with blood from the hepatic artery. This means it will still be able to work.

The blood flow from the portal vein is then increased to the healthy part of the liver, which enables it to grow.

The second stage of ALPPS is usually carried out 6-10 days after stage one. This stage involves removing the affected part of the liver.

You will need a general anaesthetic for both stages. You will usually stay in hospital between both operations, although you may be able to spend a few days at home.

Your surgeon may recommend an ALPPS procedure instead of trying PVE first. We will talk with you about this, if it is recommended.

What are the benefits of surgery?

The operation aims to completely remove the cancer and give you the best chance of a cure. The other non-surgical treatments help to delay the progress of the cancer, but are unlikely to cure it.

Will surgery improve my chance of survival?

Without surgery, very few people with cancer involving the liver survive for more than 5 years. A successful operation can improve your chance of long-term survival by 25%-45%.

Despite a successful operation, there is a risk of the liver tumour recurring. This happens in at least two-thirds of people. The chance of the cancer recurring depends on the type of tumour that you have. If you wish, your surgeon can discuss the likely outcomes in your case.

What are the risks and possible complications?

The operation is a major procedure with associated risks. However, the operation has become much safer over the years. At specialised centres such as Oxford, where a large number of these procedures are carried out by specialist surgeons, 98 out of 100 people will survive the operation. Your surgeon will discuss the specific risks with you.

Possible complications include:

- those related to general anaesthesia, such as chest infection and possibly needing support on a breathing machine (ventilator) in the intensive care unit
- bleeding during or after the operation, which may require blood transfusions or a further operation

- wound infection

- blood clots forming in the legs

- bile leak

After your operation, bile may leak from the cut surface of your liver. Your surgeon may leave a drain tube in the area of the operation, to drain out any fluid that collects inside. If you develop leakage of bile this is likely to heal on its own, but may need further operations to stop the leakage.

- jaundice

You may develop yellowing of your eyes and skin after the operation. This is due to excess bile, which the remaining liver is unable to cope with.

Another symptom of jaundice is a build-up of excess fluid in the abdomen and legs. This problem is temporary until the liver grows and recovers normal function.

The risk of you developing jaundice depends on the amount of your liver that is left behind and how well it functions.

What anaesthetic will I have?

Our normal anaesthetic technique for this procedure is a combination of general and epidural anaesthesia. During general anaesthesia you are completely asleep and will have a tube put into your windpipe to help your breathing. Although this is done very gently, you are likely to have a sore throat after the operation.

You may also have a narrow tube called a catheter for giving you pain medication infusions placed into your back (epidural) or near your wound (local anaesthetic infusion). An epidural and a local anaesthetic infusion are ways of blocking the signal from the nerves in the area of the operation.

Before you go to sleep with the general anaesthetic, the anaesthetist will place the catheter in your back, next to your spinal cord nerves, or into the area around the wound. The anaesthetic will be given through this catheter during the operation and it will remain in place for 3-5 days after the operation.

Both the epidural and the local anaesthetic infusion will help you to breathe deeply, which can be difficult if you are in a lot of pain. You will also be able to sit and walk around more comfortably.

These types of pain relief are very safe. The chance of any permanent nerve damage from an epidural is very rare; less than 1 in 10,000.

Your anaesthetist is also responsible for replacing fluids and blood during the operation. About 1 in 6 people will need blood transfusions during or after this type of operation.

You will meet the anaesthetist and can ask any questions on the day of the operation.

What if surgical removal of the cancer is not possible?

Sometimes, problems are discovered during the operation that could not be identified before surgery. This includes spread of the cancer to other areas of the liver or to other parts of the body. Such findings occur in 1 or 2 in 10 people.

If the cancer has spread but is still just within the liver, it may be possible to remove all the cancer by removing more of your liver than was planned. We may use ultrasound or other forms of imaging during your operation, to try to identify any other small tumours that we can safely remove.

Surgery will not be helpful if all the cancer cannot be removed. If this happens your surgeon will not remove any of the cancer.

How do I prepare for surgery?

If you are a smoker, try to stop smoking as soon as you know that you need an operation. It will also help your recovery if you are able to increase your activity levels and take part in some gentle exercise before you come in to hospital for your operation.

You will need to arrange for additional help at home whilst you recover, particularly if you live alone.

You will be given an appointment at the Pre-operative Assessment clinic before your operation. This is to check you are fit enough to safely have the operation. You will have a chest X-ray, an electrocardiogram (ECG) to check your heart, and blood tests. The appointment will be approximately 2 hours long.

Please bring a list of your medication with you, including any off the shelf or herbal remedies you might use. Our team will give you further instructions and explain what you can expect when you come in for your operation.

You will be given some written information about our Enhanced Recovery After Surgery programme (ERAS), which explains how the team caring for you will help you to recover as quickly as possible.

Getting you moving and back to your normal diet as soon as possible after your operation can help reduce the chance of complications and the length of time you may need to stay in hospital.

What happens after the operation?

After you return from the operating theatre recovery room you will need to be cared for in the Churchill Overnight Recovery Unit (CORU) or the Churchill Intensive Care Unit (CICU) if you are having a major liver resection. The operation will only go ahead if there is an available bed on the unit you need to go to.

When you are well enough, you will return to the specialist ward, usually the day after surgery. You will be able to start eating within 2-3 days.

It is important that you get out of bed and move about as soon as possible. Our physiotherapist will help you with breathing exercises. These are important to help prevent a chest infection.

How long will I be in hospital?

You are likely to be able to go home 3-7 days after the operation, but it may be earlier than this if you have had keyhole surgery. The ward nursing staff will give you painkillers to take at home, if needed.

You will have a follow-up appointment in the Surgical Outpatient clinic, but please telephone your clinical nurse specialist if you have any concerns after you have left hospital.

When can I return to normal activities?

For the first few weeks after the operation you will find movement and activity difficult and you are likely to need help. You may also feel low in mood, but this will get better. It is important to keep as active as possible, but also to rest. You are likely to be back to your normal activities after 2-3 months and there are usually no restrictions on activities after this time.

Will I need any other treatment for my cancer?

Sometimes survival rate can be improved by combining other treatments with surgery, such as chemotherapy. We will discuss the option of chemotherapy with you. You may see an oncologist, who specialises in the medical treatment of cancers with chemotherapy.

Whether you receive chemotherapy or not after your operation, you will be regularly followed up, either at the Liver Clinic at the Churchill Hospital, at your local hospital, or both.

What are long-term consequences of the operation?

There are few long-term consequences of liver resection.

You may have some numbness around the surgical scar. This is from having to divide small nerves when cutting muscles.

Occasionally, a type of hernia called an incisional hernia may develop around the scar. This is caused by a weakness in the wall of the abdominal muscles. It usually doesn't need any treatment, but if it causes pain or becomes too large an operation may be needed to treat it.

There should be no permanent effects on your lifestyle or diet after this surgery.

Symptoms to look out for

Call your GP or specialist nurse if you develop any of the following symptoms:

- a high temperature
- a sharp or persistent pain
- being sick or not being able to eat as you would normally
- becoming jaundiced (yellowing of your skin and eyes)
- your wound becomes red and painful or has a smelly discharge.

Further information

Cancer Research UK

Website: www.cancerresearchuk.org/cancer-help

Macmillan Cancer Support

Website: www.macmillan.org.uk

Tel: 0808 808 00 00

Maggie's Cancer Centre (Oxford)

Tel: 01865 751 882

Website: www.maggiescentres.org/oxford

Useful contact numbers:

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| Oxford University Hospitals' Switchboard | 0300 304 7777 |
| Hepatobiliary Team Secretary | 01865 235 668 |
| Specialist Cancer Nurses and Specialist Dietitian (or call the switchboard and ask for bleep 1386/1891) | 01865 235 130 |
| Pre-operative Assessment clinic (John Radcliffe Hospital) | 01865 857 635 |
| Pre-operative Assessment clinic (Churchill Hospital) | 01865 226 982/3 |
| Oxford Upper GI Ward (Churchill Hospital) | 01865 235 061 |
| Intensive Care Unit (Churchill Hospital) | 01865 235 084 |
| Churchill Overnight Recovery Unit | 01865 235 127 |



If you need an interpreter or would like this information leaflet in another format, such as Easy Read, large print, Braille, audio, electronically or another language, please speak to the department where you are being seen. You will find their contact details on your appointment letter.

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