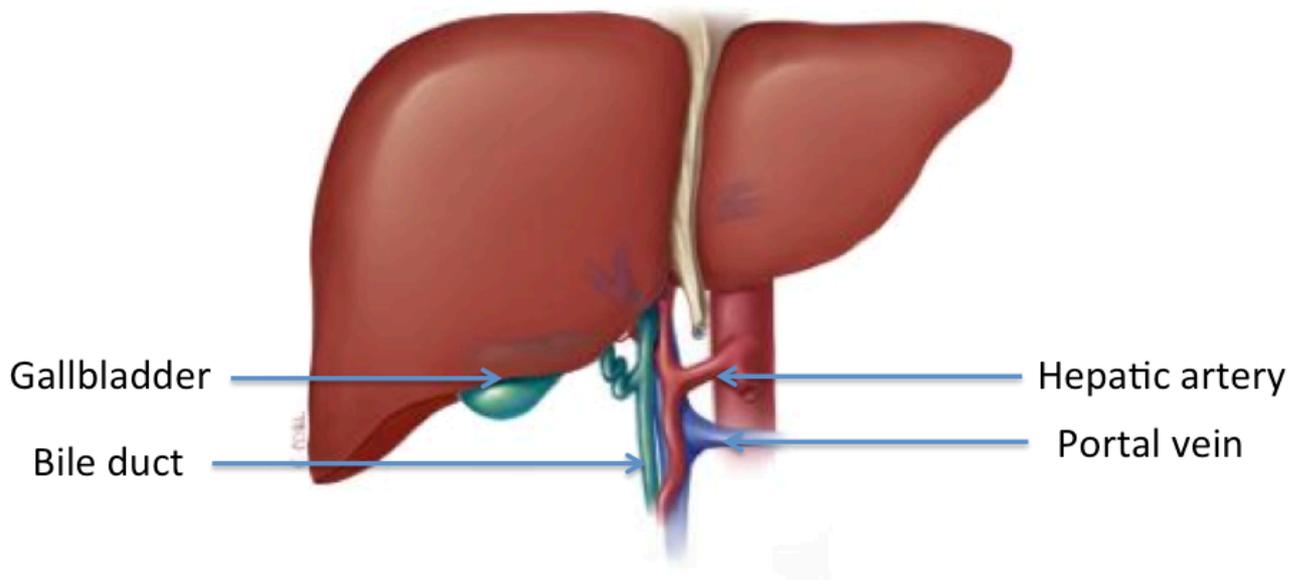


## Hepatic resection (Removal of part of the liver)



The liver is the largest solid organ in the body and is located in the upper right-quadrant of the abdomen under the rib cage. Functionally it is a major source of proteins for the body, processes much of the food we eat playing a critical role in carbohydrate and lipid metabolism. It also is an important “filter” for the removal of drugs and toxins, and helps to fight infections. The liver also produces bile that is secreted via the bile ducts into the gut. The gallbladder, although not part of the liver, is intimately associated with the inferior surface of the liver, and is connected to the main bile duct via the cystic duct. Bile is stored within the gallbladder and during eating the gallbladder contracts and secretes it into the gut to facilitate absorption of fat.

Anatomically the liver lies beneath the diaphragm and on top of the right kidney and intestines. The liver weighs approximately 2% of a person’s body weight (1.5kg). The liver is the only organ in the body that has a double blood supply. Oxygenated blood flows in from the hepatic artery and nutrient-rich blood flows through the portal vein from the gut. Blood leaves the liver through the three hepatic veins (left, middle, right) into the vena cava to return to the heart.

### How is the liver divided up?

The liver can be divided into a right and left lobe. Within each lobe the liver can be divided into segments, based on the division of the blood vessels within the liver. The segments are numbered from one to eight in Roman numerals. The left lobe is composed of segments II – IV, while the right lobe is composed of segments V-VIII. From the outside it is not possible to determine the division between the segments. Pre-operatively radiological imaging of the liver (CT, MRI, USS) is used to define the segmental anatomy, while intra-operatively USS can be used directly on the surface of the liver. The segmental anatomy of the liver provides the basis for determining the plane of transection

during liver resections.

### **Is it true that the liver regrows following resection?**

The liver is the only organ in the body that is able to regenerate (regrow). This means that when part of the liver is removed, the volume of the remaining liver increases (hypertrophies) until it returns to the volume of the original whole liver. Bile ducts and blood vessels do not re-grow, rather the remnant liver increases in size. This normally takes up to 8 – 12 weeks following a major liver resection. Up to 70% of a healthy liver can be removed. However, in the presence of chronic liver disease or chemotherapy, a larger remnant is required, reducing the amount of liver that can be removed.

### **What is the goal of performing liver resection?**

Liver resection refers to the removal of a portion of the liver. This operation is usually done to remove various types of liver tumors, either primary (arisen within the liver) or secondary (spread to the liver from elsewhere). The principal aim of performing a liver resection is to completely remove the tumor without leaving any tumor behind. The success of liver resection depends upon the location of the tumor, the number of tumors, the amount of liver left after removal of the tumor, and the biology of the tumour.

### **What patients require a liver resection?**

Most patients who require a liver resection have metastases (secondaries) from a colorectal (bowel) cancer. Less commonly other secondary cancers from neuroendocrine tumors (like carcinoid), renal cancer or melanoma are resected. The most common primary liver cancer that is resected is hepatocellular carcinoma (HCC or Hepatoma). This is a cancer that originates in liver cells (primary), and is usually associated with underlying chronic liver disease. Primary cancers of the bile ducts, cholangiocarcinoma, are less commonly resected. There are a number of benign lesions that occur in the liver. Most don't cause any symptoms or problems and can be monitored or left alone. Sometimes it is not possible to be sure of a diagnosis and resection is undertaken to establish the diagnosis. Biopsy of the liver is not routinely recommended as it has the potential to cause bleeding and spread of the cancer.

### **How is a liver resection performed**

The most common method of removing part of the liver is by an open operation (laparotomy). In some instances it is possible to undertake the operation laparoscopically (keyhole surgery). The open technique is the preferred method for major resections particularly and in those tumors that are difficult to access. Only a minority of liver resections can be performed laparoscopically. A camera, known as a Laparoscope, connected to a high intensity light is introduced through a small incision and a further three puncture wounds are made to allow the surgical instruments to be introduced. Once the liver has been resected a small incision is made low down in the abdomen to allow the tumour to be extracted. Irrespective of the method used the principals are the same: The liver is mobilized. The vessels to the portion being resected are isolated and controlled. A cut is then made through the liver substance (parenchyma) and care is taken to seal off the blood vessels and bile ducts that pass across the plane of transection.

### **What are the potential complications?**

There are risks with all surgery. Complications occur in about 20% of cases and most are mild and easily resolved. Rare but severe complications that are specific to undergoing liver resection include;



*Bile leak* from the cut surface occurs in 5-10% of patients. This is usually self-limiting and is treated by external drainage. It may require an endoscopic procedure to decompress the bile ducts, and rarely re-operation is required.

*Bleeding* either at the time of surgery or soon after, may require blood transfusion or re-operation. In most instances it resolves without further intervention.

*Liver failure* may occur if the liver remnant is insufficient to support normal function. This is one of the most severe complications of undergoing liver surgery. Liver failure leads to progressive jaundice (yellow), ascites (fluid collection in the abdomen) and coagulopathy (abnormality in blood clotting). It may result in death if the liver is unable to regenerate in a timely manner.

*Respiratory complications* (infection, collapse, fluid collections) are not uncommon as a result of prolonged ventilator support and poor inspiratory effort post-operatively. This may require antibiotic treatment or drainage.

General risks of surgery including wound infection, deep vein thrombosis (DVT), pulmonary embolism, or development of a hernia at the incision site. There is an increased risk of post-operative complications if you are overweight or if you smoke.

### **Is there a chance of dying from this operation?**

There is a risk of dying associated with any operation. The risk of dying following a liver resection depends upon the extent of the resection, the quality of the liver and your other medical conditions. About 2 patients in every 100 undergoing liver resection will die within the peri-operative period as a result of a complication. You will be able to discuss your personal risks that apply to your surgery with the surgeon and anaesthetist prior to your operation. Because a liver resection is generally performed after a diagnosis of cancer, the risk of not having the surgery is balanced against the risks of the surgery itself.

### **How long will I be in hospital?**

Most patients will be in hospital between 5 and 10 days. At the time of discharge you will be mobilizing independently, eating and drinking a reasonable diet and able to undertake most self cares. It normally takes approximately 3 months to get back to your normal activities. This is very individual and it may take longer.

### **What happens before the operation?**

This very much depends on upon the reason that you require a liver resection. You would have undergone imaging of your liver, CT or MRI, to stage the extent of the disease, and had a number of blood tests and other investigations to determine your suitability for the operation. Prior to being scheduled for theatre the findings of these investigations will be discussed with you, and the various treatment options outlined. Once you have agreed to proceed with surgery, you will be asked to complete an anaesthetic questioner. This will be passed onto the anaesthetist that will be looking after you during the operation. Depending upon your medical status you may require an appointment to see the anaesthetist in person or be sent for other investigations. You will need to have bloods taken immediately prior to your proposed date of surgery to ensure that blood is available in the event that you require a blood transfusion. You will be given specific instructions about when to stop eating and drinking, please follow these carefully as otherwise this may pose an anaesthetic risk and we may have



ADAM BARTLETT

to cancel your surgery. You should bath or shower before coming to hospital as you normally would. You do not need to shave any of the abdominal hair. You should take all your normal medication even on the day of surgery with a small amount of water. If you are on any medication that affects blood clotting you need to let the surgeon know well in advance of your surgery, as they may need to be stopped.

### **What happens when I arrive at the hospital?**

You will be seen by the nursing staff and taken to your room. You will be asked to change into a theatre gown. The surgeon and anaesthetist will visit you and answer any questions that you have. You will be asked to sign a consent form, and the surgeon will mark the operative site with indelible ink to avoid any potential confusion. You will be taken into the operating room by a nurse who will with you until you are asleep.

### **What happens after the operation?**

You will be woken in the operating room after the operation has been completed, and taken into the recovery area. You will have an intravenous line in you arm and usually a larger central line in the jugular vein in your neck that are attached to fluid, and enables the staff to give you medication. A small cannula will be in the radial artery in your wrist that is used to monitor your blood pressure continuously. You will have an oxygen mask over your mouth that will administer supplemental oxygen. Rarely you will have a feeding tube in your nose that passes into your stomach to allow feed to be administered post-operatively. Often a drain will be left in your abdomen to drain any fluid that may collect off the cut surface, and this will remain in for 2-3 days. You will have a catheter in your urinary bladder to monitor your kidney function, and this is removed usually on day 2 or 3. You will be able to eat and drink as soon as you are hungry after the procedure. It is very important in the first 24 hours after your operation that we are able to monitor your condition closely. For this reason you will more than likely be cared for in a High Dependency Unit (HDU). There are a number of checks that will be routinely performed, over this time including throughout the night.

### **How much pain will I experience post-operatively?**

Most people experience moderate pain, which is readily, controlled using a combination of treatments. The anaesthetist will have a discussion with you prior to the operation regarding how your pain will be controlled. It is our usual practice to combine local nerve blocks (intra-thecal, epidural or wound catheters) with systemic analgesia (intravenous or oral painkillers). You will be given patient controlled analgesia (PCA) post-operatively which allows you to control the administration of the painkillers. Once you are tolerating a reasonable diet, the PCA will be removed and you will be given oral painkillers as required. You will experience some pain/discomfort from your wounds, especially on movement, and you will need to communicate the severity of the discomfort to the medical staff looking after you so that the medication can be optimized to your needs. At the time of discharge you will be given a supply of painkillers and post-operative instructions on what to take when. After about 14 days most patients are only requiring minimal analgesia to control their pain.

### **What will need to be done to care for my wound?**

The operation is usually performed through an incision that is like a reversed "L" in the right upper quadrant of your abdomen. The skin is re-approximated using dissolvable sutures that do not need to be removed post-operatively. Steri-strips (thin white tape) are placed along the incision, and a waterproof dressing is placed over. The dressing will be left undisturbed for at least 3 days post-operatively to dry and avoid contamination. You will be able to shower each day as the dressing is



ADAM BARTLETT

waterproof. Once the dressing has been taken down by your surgeon and it appears clean and dry the wound will be left without a dressing and you can shower as normal, taking care not to use any strong soaps or creams around the area. It may be that your wound leaks some darkish fluid or looks a little inflamed. This is not unusual and the staff will observe it closely.

Occasionally stitches or staples will be used to close the skin. These will need to be removed after 10 days, and can be done by the district nurse.

It is ok to use Bio-oil on the incisions after the first week to help reduce scar prominence.

### **How long will it take to recover from the anaesthetic?**

Whilst most of the effects of anaesthesia wear off in a few hours, it is common to have poor concentration and memory for a few days thereafter. After any major operation it takes some time to get back to feeling yourself again. Once all the tubes and drains have been removed it is not uncommon to feel easily tired and emotionally upset. This is normal and as time passes you will begin to feel more like yourself again. Try to be patient with yourself and allow yourself some time to get over your operation.

### **When can I return to normal activities?**

You will be expected to transfer, with assistance, to a chair the day following your operation. Most patients are walking short distances around the ward by the second day. The physiotherapist will visit you on the ward and assist in getting you mobile and give you some simple exercises that will help. The quicker you mobilise the easier it is to get moving. It becomes easier as the various tubes and lines are removed. Upon discharge from the hospital you can return to normal physical and sexual activities when you feel comfortable. You should avoid heavy lifting and vigorous exercises for at least six weeks following the operation. It is normal to feel tired after surgery, so take some rest, two or three times a day, and try to get a good nights sleep.

### **Will I need chemotherapy afterwards?**

That will depend upon the reason for undertaking liver resection and the outcome of the surgery. Chemotherapy is usually given prior to and after liver resection for patients with colorectal (bowel) cancer. Many of the other cancers are treated by surgery alone. Your case will be discussed with an oncologist (medical cancer specialist).

### **When can I start driving?**

You should not drive for at least four weeks post-resection. Before driving you should ensure that you could perform a full emergency stop, have the strength and capability to control the car, and be able to respond quickly to any situation that may occur. Please be aware that driving whilst unfit may invalidate your insurance, and you should check with the conditions of your insurance policy as they do vary

### **When can I return to work?**

You can return to work as soon as you feel up to it. This will depend on how you are feeling and the type of work that you do. If you have a relatively sedentary job then you may feel ready to return within 3-4 weeks. If you are involved in manual labor or heavy lifting you need to avoid straining for at least 6 weeks.



### **What can I eat?**

You can resume eating and drinking immediately following the operation. It is not unusual to lose your appetite. It will recover, as you get better. Fluids are often better tolerated than solids, and it is often recommended that you try soft foods before resuming a normal diet. The dietician will visit you on the ward to give you advice about your diet and will prescribe supplement drinks if you need them. Once at home, there are no dietary restrictions, and you should try and eat a balanced healthy diet. You should avoid alcohol for at least six weeks post-operatively to allow the liver to regenerate.

### **When will my bowel movements return to normal?**

It may take three or four days to have a normal bowel movement. If you have not had a bowel movement three days after surgery, you will be commenced on a mild laxative. Alternatively Alpine tea, prune juice or kiwifruit may be equally effective. Once at home, you should monitor your bowels as you may require laxatives for some weeks as a result of the painkillers that you are taking.

### **When should I seek help?**

If you have concerns then either ring the surgeon directly or the hospital for advice. If it is medical emergency then dial 111 for an ambulance to take you to an acute hospital. You should let us know if you have a discharge of blood or pus coming from your wounds, develop a fever over 38.5 ° C, vomiting or diarrhea, inability to have a bowel movement after four days, have persistent pain not relieved with your prescribed painkillers or persistent abdominal distension (bloating of your tummy), develop increasing pain or swelling around your wounds or become jaundiced (yellowing of the eyes or skin).