

The Leeds Teaching Hospitals **NHS**  
NHS Trust

# The Liver Unit

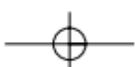
## Student Information Booklet



### Division of Medicine, Surgery & Oncology

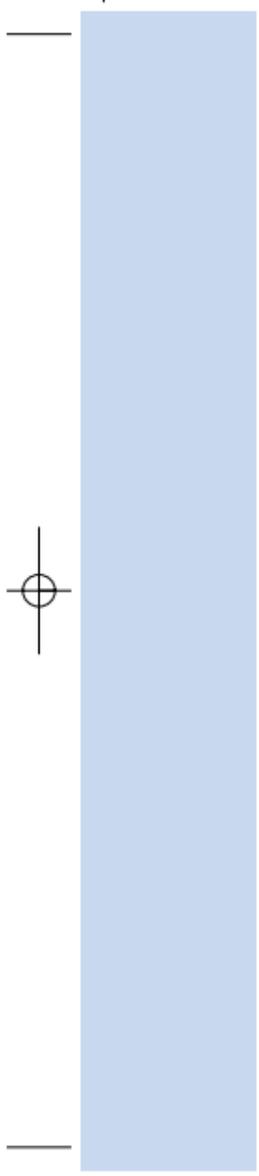
The Leeds Teaching Hospitals incorporating:

Chapel Allerton Hospital Cookridge Hospital Leeds Chest Clinic Leeds Dental Institute Seacroft Hospital  
St James's University Hospital The General Infirmary at Leeds Wharfedale Hospital



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## SECTION 1.

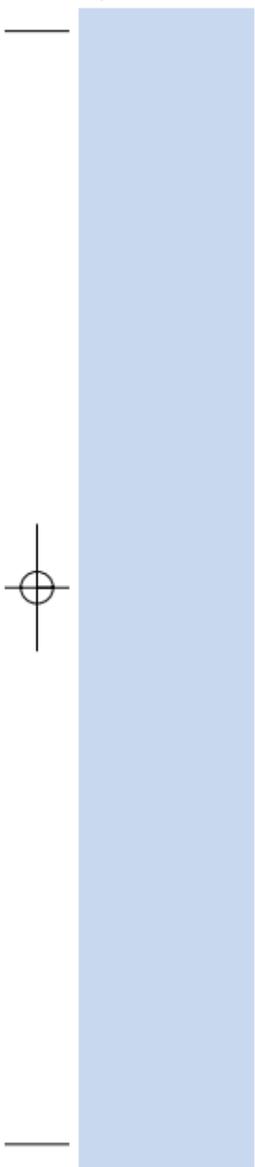
### ABBREVIATIONS.

#### ABBREVIATIONS:

AIH	=	Auto Immune Hepatitis
ALD	=	Alcoholic Liver Disease
ALT	=	Alanine-Amino Transferase
APTT	=	Activated Partial Thromboplastin Time
BM	=	Blood Sugar Monitoring
BX	=	Biopsy
C.DIFF	=	Clostridium Difficile
CAPD	=	Continuous Ambulatory Peritoneal Dialysis
CBD	=	Common Bile Duct
CF	=	Cystic Fibrosis
CMV	=	Cytomegalovirus
CPAP	=	Continuous Positive Airway Pressure
CPR	=	Cardio-Pulmonary Resuscitation
CRF	=	Chronic Renal Failure
CRP	=	C- reactive Protein
CSU	=	Catheter Specimen Urine
CT	=	Computerised Tomography
CVP	=	Central Venous Pressure
DVT	=	Deep Vein Thrombosis
ECG	=	Electrocardiogram
ECHO	=	Echocardiogram
EEG	=	Electroencephalogram
ERCP	=	Endoscopic Retrograde Cholangio Pancreatography
ESB	=	Extended Spectrum Betalactamase
FBC	=	Full Blood Count
FFP	=	Fresh Frozen Plasma
FK506	=	Tacrolimus

FOB	=	Faeces Occult Blood
GCSF	=	Granulocyte Colony Stimulating Factor
HAS	=	Human Albumin Solution.
HAV	=	Hepatitis A Virus
Hb	=	Haemoglobin
HBV	=	Hepatitis B Virus
HCV	=	Hepatitis C Virus
HDU	=	High Dependency Unit
ICU	=	Intensive Care Unit
INR	=	International Normalised Ratio
IVAB	=	Intravenous Antibiotics
IVI	=	Intravenous Infusion
K+	=	Potassium
LFT's	=	Liver Function Tests
MDT	=	Multi-disciplinary Team
MI	=	Myocardial Infarction
MRCP	=	Magnetic Resonance Cholangio Pancreatography
MRI	=	Magnetic Resonance Imaging
MRSA	=	Methicillin Resistant Staphylococcus Aureus
MSU	=	Midstream Specimen Urine
MSW	=	Medical Social Worker
Na	=	Sodium
NBM	=	Nil By Mouth
NG	=	Nasogastric feeding tube
NJ	=	Nasojejunum feeding tube
OKT3	=	Drug name, (Anti-body to T-cells)
OPA	=	Out Patients Appointment
OT	=	Occupational Therapist
PBC	=	Primary Biliary Cirrhosis
PCAS	=	Patient Controlled Analgesic System
PEEP	=	Positive End-Expiratory Pressure
PEG	=	Percutaneous Endoscopic Gastrostomy
PEJ	=	Percutaneous Endoscopic Jejunostomy

POD	=	Paracetamol Overdose
PR	=	Per Rectum
PSC	=	Primary Sclerosing Cholangitis
PT	=	Prothrombin Time
PTC	=	Percutaneous Transhepatic Cholangiogram
SED	=	Slow Efficient Dialysis
SL	=	Sublingual
SPA	=	Salt Poor Albumin
SR	=	Slow Release
SVT	=	Supraventricular Tachycardia
TCI	=	To Come In
TIPSS	=	Transjugular Intrahepatic Porto-systemic Shunt
TPN	=	Total Parenteral Nutrition
TTO's	=	To Take Out Medicines
TX	=	Transplant
U+E's	=	Urea and Electrolytes
UC	=	Ulcerative Colitis
US	=	Ultrasound Scan
UTI	=	Urinary Tract Infection
WCC	=	White Cell Count



## SECTION 2

### GLOSSARY OF TERMS

**Alpha 1 Antitrypsin Deficiency.** The liver normally produces the protein alpha-1-antitrypsin, which helps to protect the body tissues from damage. In this condition the protein is abnormal, lacks protective activity, and is not released in any appreciable amount from the liver. When lacking or not present, it causes lung disease and cirrhosis.

**Alanine-Amino Transferase (ALT).** Enzyme produced by the liver during times of stress specific to the liver.

**Ascites.** Accumulation of fluid in the abdominal cavity frequently occurs in chronic liver disease.

**Auto-Immune Chronic Active Hepatitis.** Inflammation of the liver due to Auto-immune condition lasting longer than 6 months. It usually has a relapsing, remitting course. Treatment is usually with steroids and immunosuppressive drugs.

**Bilirubin.** Bilirubin is the main bile pigment in humans which, when elevated, causes the yellow discoloration of the skin called jaundice. Bilirubin is formed primarily from the breakdown of a substance called haem (found in red blood cells). It is taken up from the blood, processed, and then secreted into the bile by the liver. There is normally a small amount of bilirubin in the blood in healthy individuals. Conditions that cause increased formation of bilirubin (such as destruction of red blood cells) or decrease its removal from the blood stream (as in liver malfunction) result in an increase in the level of bilirubin in the blood. A raised bilirubin level is not usually helpful in distinguishing between different liver diseases. It is, however, generally useful as a true test of liver function since it reflects the liver's ability to take up, process, and secrete bilirubin into the bile.

**Budd-Chiari.** This is caused by hepatic vein obstruction, (usually by thrombosis or tumour). It may present with sudden epigastric pain and shock, or more insidiously with the signs of portal hypertension, jaundice and cirrhosis. It may follow the use of oral contraceptives.

**Central Pontine Myelinolysis.** Seen occasionally in malnourished alcoholics and those with severely low sodium. It occurs due to the fluctuation of serum sodium, the myelin within the pons becoming damaged causing neurological manifestations.

**Cheyne-stokes syndrome.** Breathing becomes progressively deeper and then shallower in cycles as a result of brain stem lesions or compression. If the cycle is very long the cause may be prolonged lung to brain circulation time. It is enhanced by narcotic use; causes often signify a bad prognosis.

**Cholangitis.** Infection/inflammation of the biliary tree.

**Coeliac disease.** There is a permanent intolerance to Gluten leading to villous atrophy and gastrointestinal malabsorption.

**Colitis.** Inflammation of the large bowel (Colon).

**CPAP.** This is the maintenance of a positive pressure throughout the whole respiratory cycle (inspiration and expiration), when breathing spontaneously, with the aid of a PEEP valve.

**Cytomegalovirus.** May be acquired by kissing, sexual intercourse, blood transfusion and organ transplantation. Like other herpes viruses it lies latent after acute infection for the rest of the patient's life and may reactivate at time of stress or immunocompromise.

**Cryptogenic Cirrhosis.** Cirrhosis of the liver with unknown cause.

**Diastolic.** This is the pressure of blood against the walls of the main arteries and occurs when the ventricles are relaxing and refilling and is the lowest pressure. A young adult would be expected to have a diastolic pressure of between 60 - 80mmHg.

**Delirium Tremors.** A psychosis caused by alcoholism, usually seen as a withdrawal syndrome in chronic alcoholism. Features include anxiety, tremor, sweating, vivid and terrifying visual and sensory hallucinations, often of animals and insects.

**Dysphagia.** Difficulty swallowing

**Deep Vein Thrombosis (DVT).** A formation of a clot of blood commencing in the calf. Presents as painful, swelling, redness and tenderness. Can be fatal if the clot dislodges and becomes a pulmonary embolism. Treatment: TED stockings, anti-coagulants and bed rest.

**E.C.G. (Electrocardiogram).** A recording of the electrical activity of the heart on a moving paper strip. It aids in the diagnosis of heart disease, which may produce characteristic changes in the ECG.

**E.E.G. (Electroencephalogram).** It is the electrical activity from different parts of the brain and converting it into a tracing. It is used in the diagnosis and management of epilepsy and encephalopathy.

**Endoscopy.** This is the process/procedure of passing an instrument used to obtain a view and examining the inside of the stomach and oesophagus. It is essentially a tube with a light at the end and an optical system for transmitting an image to the examiners eye.

**Encephalopathy.** Hepatic encephalopathy is a condition in which the brain function is impaired by the presence of toxic substances absorbed from the colon, which are

normally removed or detoxified by the liver. Symptoms include drowsiness, confusion, and difficulty in performing tasks and coma.

**Hepatitis.** This is inflammation of the liver caused by viruses, toxic substances or immunological abnormalities. There are a number of different forms of hepatitis. The commonest are hepatitis A, B and C of which are caused by viruses and are known as infectious hepatitis. Infection by A, B and C may be detected by appropriate blood tests.

**Haemochromatosis.** An autosomal recessive condition. Failure of regulation of iron absorption from the small bowel leads to overload, with deposition in, and damage to cells of the Liver, Heart, Pancreas and pituitary.

**Haematuria.** Blood in the urine, which usually occurs with kidney lesions or severe coagulation disorders such as haemophilia or an overdose of anticoagulants.

**Haematoma.** This is a large bruise caused by infiltration of blood onto the subcutaneous or muscle tissue.

**Haemoptysis.** Coughing up of blood. There may be slight streaking of the mucus with blood or there may be expectoration of frank blood.

**Haemorrhage.** This is the loss of blood from a ruptured blood vessel. The bleeding may be external or internal. The amount of blood loss will depend on the size of the vessel(s), whether an artery or vein has been ruptured and the effectiveness of the body's clotting mechanisms.

**Hypoxia.** This means that the supply of oxygen available to the tissues is insufficient to meet cellular needs for normal metabolism.

**Hyper/Hypo Glycaemia.** Implies an abnormality in the blood glucose concentration, hyper being high and hypo being low.

**Hypertension.** This is a condition in which there is a sustained elevation of the arterial blood pressure. The level at which the normal blood pressure becomes abnormally high is not firmly established. Reading above 160/95mmHg is termed definite hypertension. Sustained hypertension is a serious condition, elevation in the blood pressure results in vascular disease.

**Hypotension.** Abnormally low blood pressure below 100/60mmHg. Usually secondary to either low blood volume, shock or possibly due to some medications.

**Insulin Dependant Diabetes Mellitus.(IDDM).** This is where a person who suffers with diabetes mellitus requires insulin to control their glucose levels. Insulin is prescribed for the individual whose plasma glucose cannot be controlled at acceptable levels despite weight control and adherence to dietary regulation and for the treatment of ketoacidosis.

**International Normalised Ratio.(INR).** This is the time it takes for coagulation following the addition of thromboplastins and calcium to the specimen. The INR is designed to produce consistent results in all laboratories regardless of reagents used.

**Liver Function Tests. (LFT's).** Blood tests that reflect liver function.

**Linton Tube.** A Linton tube is used in the treatment of bleeding oesophageal varices. The tube has 3 lumens. One lumen is for oesophageal drainage. A second lumen ends in a balloon that lies within the stomach. The third lumen opens into the stomach to permit gastric drainage.

**Minnesota Tube.** Designed to do the same job as the Linton Tube. The difference between the two is that the Minnesota Tube has oesophageal and gastric balloons.

**Nasogastric Tube.** A nasogastric tube is passed when a patient is unable to take fluids and food by mouth. The tube is a fine bore tube, which is passed via the nasal cavity directly into the stomach. A specially prepared solution of essential nutrients is introduced into the stomach. This method of feeding a patient is known as enteral feeding.

**Non A Non B.** Hepatitis of unknown cause thought to be viral but not hepatitis A, B, C, or D.

**Mid Stream Urine.(MSU).** The collection of a sample of urine. The patient is encouraged to collect the mid stream of their urine in a kidney dish so a sample can be sent for analysis.

**Melaena.** The passage of a black, tarry stool containing blood pigments, due to bleeding from the upper gastrointestinal tract.

**Oesophageal Varices.** These are veins within the oesophagus which have become engorged and tortuous, their walls are weak and predisposed to rupture. Varices develop when the flow of blood from the portal vein to the liver is resisted. The resistance of blood flow causes a rise in pressure within the portal vein system causing portal hypertension. The increased pressure causes a back up of blood in the veins causing them to become large and bulbous.

**Oedema.** Oedema can be defined as an accumulation of interstitial fluid volume in excess of the normal. It may be local or generalised and may be associated with either an increase or decrease in intravascular volume.

**Pancreatitis.** Inflammation of the pancreas, which may be associated with gallstones or alcoholism. There are two classifications:

**Acute-**sudden illness with severe pain in the upper abdomen and lower back, and higher serum amylase (> 1000).

**Chronic-**pain is less severe and relapses for periods;

chronic pancreatitis may lead to pancreatic failure causing diabetes mellitus.

The pain patients suffer is caused by the release of the digestive enzyme TRYPSIN instead of its inactive precursor TRYPSINOGEN. The trypsin begins to digest the pancreatic cells, the resulting pain often requires opiates such as pethidine.

**Pleural Effusion.** This is a collection of fluid in the pleural space. Usually resolved by insertion of a chest drain or aspiration by needle performed by medical staff either under ultrasound guidance or general aspiration.

**Portal Hypertension.** A state in which pressure in the hepatic vein is increased due to the bloods' inability to pass through the fibrotic tissue present in patients with liver cirrhosis. This condition may result in splenomegaly and ascites.

**Primary Biliary Cirrhosis.(PBC).** A slowly developing liver disease in which wide spread destruction of the intrahepatic bile ducts causes cirrhosis of the liver. The cause is unknown, and usually occurs in middleaged women, it is thought to be genetic.

**Primary Schlorising Cholangitis.(PSC).** Often associated with crohns disease or ulcerative colitis. Chronic inflammation of the intra and extrahepatic bile ducts.

**Pulmonary Embolism.(PE).** This is the obstruction of the pulmonary artery by blood clot, thus preventing blood flow to lung tissue.

**Pneumonia.** This is the inflammation of the lung caused by infection. The alveoli fill with pus and affected lung tissue becomes solid, a process known as consolidation. Symptoms include shortness of breath, chest pain and expectoration of green sputum.

**Rigor.** A violent attack of shivering or shaking as a result of a high temperature.

**Sigmoidoscopy.** This is the examination of the sigmoid colon and rectum. An instrument called a sigmoidoscope is inserted into the anus in order to detect colitis or tumour.

**Stoma.** An artificial opening resulting in an ileostomy, colostomy or tracheostomy.

**Splenomegaly.** This is the enlargement of the spleen.

**Systolic.** This is the pressure in the arteries when the left ventricle is fully contracted. It corresponds to the 1st Kortokoff sound. A young adult would be expected to have a systolic pressure of between 110 to 130mmHg.

**Urea and Electrolytes.(U+Es).** A blood test that measures the electrolytes within the circulating blood. The usual components include Sodium, Potassium, Bicarbonate, Urea and Creatinine.

**Wilson's Disease.** This recessively inherited disorder of copper metabolism leads to deposition in Liver and Brain causing cirrhosis and basal ganglia destruction.

## SECTION 3 INVESTIGATIONS :- PRE/POST NURSING CARE

### ANGIOGRAM.

Contrast is injected into the blood stream through the femoral artery. The dye goes into the liver. An x-ray is taken to detect any abnormalities.

#### **Complications:**

These include bleeding, anaphylaxis, a false aneurysm & arterial dissection.

#### Preparation :-

Consent.  
Recent blood results.  
Venous access.  
Gown.  
Clear fluids 6 hours prior.

#### Post care :-

Depends on size of catheter.

Puncture

Site	Size	Lying flat	Sat up	Observations.
Right	3F	1 hour	1 1/4 hour	Pulse & BP recorded 1/2 hourly for 2 hours, then 1 hourly for 2 hours.
Left	4F	1 hour	3 hours	
Femoral	5F	1 hour	3 hours	Inspect puncture site every 15 mins. for first hour then 30 mins. for two hours.
Brachial	6F	1 hour	3 hours	
Jugular	7F	2 hours	4 hours	
Radial	8F	2 hours	4 hours	
	9F	2 hours	4 hours	
	10F	2 hours	4 hours	

## BONE SCAN.

This procedure is primarily used on the liver unit to detect bone metastases. A patient has an IV injection of a Radio labeled isotope, which is taken up by the bones, approximately 3 hours later the patient is then scanned with a gamma camera and an image of the bones is taken.

### **Complications:**

very rarely anaphylaxis.

### Preparation:

consent.  
IV access.

### Post care:

Urine may be radioactive for 24 hours, check with department.

## COLONOSCOPY.

This involves passing a fiberoptic camera via the anus to examine the rectum and colon.

### **Complications:**

bleeding (rupture to varices/polyps).  
enhanced encephalopathy from sedation.

### Preparation:

bloods, (FBC, clotting, group and save).  
consent.

Endoscopy check list.

patient must have Klean prep of 4 sachets starting from after lunch the day before. Ask the patient to observe for stool running clear which will determine how much Klean prep is required. The patient should have either clear fluids

or a low residual diet, ask the department.  
NBM from 12 midnight.  
IV access.  
white gown.  
notes and x-rays to accompany patient.

Post care:  
as for Endoscopy.

### COMPUTERISED TOMOGRAPHY SCAN. (CT).

CT is a method of radiography, which displays the body in cross sections.

Preparation:

Dependant on anatomy scanned by CT

\* Clear fluids six hours prior,

\* Nil by mouth six hours prior.

The patient may have to drink a contrast, Gastrograffin the evening before a CT scan.

Ring the CT department or check the investigations book.

Post care

None for simple CT scan, if invasive procedure carried out check with department.

### ECHO CARDIOGRAM.

All patients pre Liver Transplant have an ECHO.

The test involves an ultrasound of the heart, looking at the heart valves and at the strength of the pump.

There are no complications, **porters must be arranged to take patients to the department.**

## ENDOSCOPY.

This involves passing a fiberoptic camera into the upper GI tract to allow the examination of the oesophagus/stomach and duodenum.

**Complications:**

bleeding, (rupture to varices).  
poor swallowing post procedure.  
enhanced encephalopathy from sedation.

Preparation:

bloods, (FBC, clotting, group and save).  
consent.  
endoscopy check list.  
reassure patient.  
patient must have IV access.  
NBM from 12 midnight if procedure am and NBM 6am if procedure pm.  
white gown.

Post care:

check BP, SPO2, pulse 1/2 hourly for 2 hours.  
if sedated, nurse in recovery position with cot-sides in place.  
O2 saturations must be monitored continuously until patient is awake.  
Annexate (Flumazenil) may be given to reverse the effects of Midazolam ( sedative.)

## ENDOSCOPIC RETROGRADE CHOLANGIO PANCREATOGRAPHY. (ERCP).

A test to examine the bile ducts and pancreatic ducts. It is a modified form of endoscopy which requires the use of Xrays. This test is performed to find out if there is a blockage or narrowing of the ducts. If so, a stent can be inserted.

**Complications:**

Pancreatitis.  
Biliary sepsis.  
Perforation of bile duct.

Preparation:

Bloods (FBC, Clotting, U + Es, LFT's, Group + Save).  
Consent.  
Antibiotics.  
Check List.  
Intravenous Access.  
Fast 12 Midnight.

Post care:

Check BP, SPO2, pulse 1/2 hourly for 2 hours.  
IV antibiotics.  
If sedated nurse in recovery position with cot sides.  
Observe for signs of pain or/& vomiting, which may indicate pancreatitis.

## EXERCISE ECG.

The test involves the patient doing exercise on a treadmill while being attached to an ECG. Blood pressure is monitored continuously.

**Complications:**

Hypo or Hypertension  
Angina  
Arrhythmia

Preparations:-

Medications must be checked prior to test as some drugs may need to be stopped, e.g Betablockers such as atenolol  
Notes and xrays must accompany the patient.

No post nursing care required.

## LIVER BIOPSY.

Only real method of diagnosis of liver disease and post transplant rejection. Needle aspiration of a piece of liver tissue obtained for histological investigations. It is a high risk procedure for complications. Can be undertaken at the bedside on the ward or in the Ultrasound/Xray Departments.

### **Complications:**

Intrahepatic bleeding from biopsy site is a serious life threatening complication.

Pain – sometimes is referred to the Right Shoulder Tip.

Infection.

Pneumothorax.

Haemothorax.

Death.

### Preparation:

Bloods, (FBC, clotting, U + Es, LFT's, Group + Save).

Consent.

Patient with abnormal clotting may require Fresh Frozen Plasma or Platelets.

Reassure patient.

May need to be NBM if having transjugular biopsy.

### Post biopsy care:

BP + Pulse 1/4 hourly for 2 hours, 1/2 hourly for 2 hours, hourly for 2 hours.

Check biopsy site every time observations performed.

Strict bed rest for 6 hrs.

Give analgesia if required.

Transjugular liver biopsy and ultrasound guided liver biopsy may be carried out on patients with abnormal clotting.

## PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY. (PTC)

Procedure which allows an x-ray of the bile duct. Local anaesthetic is applied to the upper right side of the abdomen. A needle is passed into the liver. Dye is injected into the bile duct in the liver. X-rays are taken to detect any abnormalities.

### **Complications:**

Bleeding, sepsis & biliary perforation/peritonitis.

### Preparation:-

Nil by mouth, six hours prior.

Recent blood results.

Consent form.

Intravenous antibiotics.

### Post care:-

Observations, follow liver biopsy guidelines.

## SIGMOIDOSCOPY.

A fiberoptic examination in which an endoscope is passed via the anus to examine the distal sigmoid colon.

### **Complications:**

Perforation of bowel.

### Preparation:

consent.

bloods (clotting & FBC).

endoscopy check list.

clear fluids 12 hours prior to examination.

phosphate enema 1/2 hour prior to procedure.

IV access.

Post-care:

1/2 hourly BP, pulse for 2 hours.  
check for rectal bleeding

### **TIPSS. (Transjugular Intrahepatic Portosystemic Shunting.)**

TIPSS are performed by catheterising the internal jugular vein and passing a cannula through the right atrium to the inferior vena cava to the hepatic vein. A metal transjugular biopsy needle is passed into the portal vein. A wire is passed to the portal vein and is then withdrawn. This wire joins the hepatic vein to the portal vein. A stent is passed over the wire and balloon inflated.

TIPSS is performed to lower the portal pressure, thus making a bleed from oesophageal varices less likely.

**Complications:**

Bleeding, sepsis, heart failure & encephalopathy.

Preparation :-

Nil by mouth six hours prior (midnight).  
Recent blood results.  
Consent form.  
Intravenous access.  
Pre-operative checklist.  
Gown.

Post care:-

Observations, follow liver biopsy guidelines.

## TIPPSAGRAM.

An ultrasound and doppler often performed 48 hours after TIPSS to check blood flow.

## ULTRASOUND.

An ultrasound examination enables the radiographer to obtain a picture of the body without the use of x-rays, using high frequency sound waves. These waves are transmitted through the body and reflected by internal organs. A Doppler uses a similar method to examine blood vessels and the flow within them.

### Preparation Pre-Transplant.

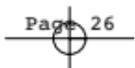
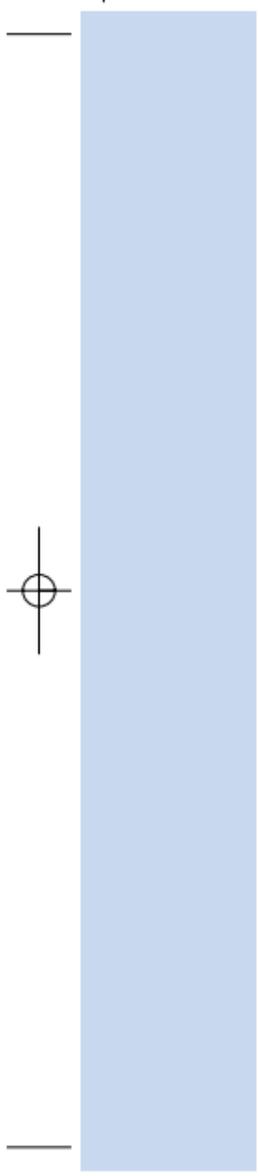
1. Abdominal ultrasound including liver & kidneys.  
\* Drink only clear fluids six hours prior to test.
2. Pelvic ultrasound.  
\*Full bladder required for clearer picture

### Preparation Post – Transplant

Can eat and drink unless otherwise stated by department.

### Post care.

No post care for simple ultrasound, if any invasive procedure performed during ultrasound check with department.



## SECTION 4. COMMON DRUGS

AZATHIOPRINE  
CYCLOSPORIN (Neoral)  
DOPAMINE  
FLUCANAZOLE  
GLYPRESSIN  
HEPARIN  
LACTULOSE  
LANSOPRAZOLE  
METRONIDAZOLE  
MYCOPHENOLATE  
OCTREOTIDE  
ONDANSETRON  
PARVOLEX  
PREDNISOLONE  
PROPANOLOL  
RANITIDINE  
SEPTRIN (Co-trimoxazole)  
TACROLIMUS (Prograf)  
URSODEOXYCHOLIC ACID

## AZATHIOPRINE

- Azathioprine is a cytotoxic drug, which causes immunosuppression by killing dividing cells (lymphocytes)
- The predominant toxic effect is myelosuppression (bone marrow suppression)

### SIDE EFFECTS

#### Common

Bone marrow suppression  
Dizziness  
Vomiting

#### Rare

Hair loss  
Arrhythmia's  
Hypotension

### INTERACTIONS

**Allopurinol** enhancement of effect with increased toxicity (reduce does of Azathioprine when given with Allopurinol).

Some reports of interaction with **Rifampicin** (transplants possibly rejected)

## CYCLOSPORIN (Neoral)

- Cyclosporin is a fungal metabolite and potent immunosuppressant.
- It blocks T-cell proliferation (T cells are part of white blood cells in the immune system).
- However it affects all immune responses indiscriminately.
- The only way of controlling its immunosuppressive action is by varying the dose; at the time of transplant high doses are required but once a graft is established, the dose can be decreased to allow useful protective immune responses while maintaining adequate suppression of the residual response to the grafted tissue.

**SIDE EFFECTS**Common

Nephrotoxic  
Tremors  
Headaches

Rare

Convulsions  
Hyperkalaemia

**INTERACTIONS**

**Grapefruit juice** increases plasma cyclosporin concentration.

**Anti-epileptics** reduce plasma cyclosporin concentrations.

**Oral contraceptives** cause increase in plasma cyclosporin concentration.

**DOPAMINE**

- Dopamine comes from a family of drugs known as Inotropic sympathomimetics

- It is a cardiac stimulant, which acts on beta-receptors in cardiac muscle increasing contractility with little effect on rate

- Low doses of Dopamine induce vasodilatation and increase renal perfusion (thereby useful in renal failure)

- Higher doses (more than 5 micrograms per kg per minute) lead to vasoconstriction

**SIDE EFFECTS**Common

Nausea  
Peripheral vasoconstriction  
Vomiting

Rare

Tachycardia

## INTERACTIONS

None Known.

## FLUCANAZOLE

- Flucanazole is a triazole anti-fungal
- It is used on the liver unit as a prophylactic treatment to prevent fungal infections such as candidiasis.

### SIDE EFFECTS

#### Common

Nausea  
Flatulence  
Diarrhoea

#### Rare

Rash  
Abnormal LFT's  
Angioedema

### INTERACTIONS

The effect of Flucanazole may be reduced by **Rifampicin**

Flucanazole may increase the plasma concentration of **Cyclosporin**

Flucanazole may increase the effect of **Warfarin**

Flucanazole may increase the plasma concentration of **Phenytoin**

Flucanazole may increase the risk of hypoglycaemia with **gliclazide and glibenclamide**.

## GLYPRESSIN

- It is used on the Liver unit in the treatment of bleeding varices

- When injected into the bloodstream the active ingredient Terlipressin acetate is slowly broken down to release a substance called Vasopressin which has the same actions as anti-diuretic hormone (ADH) which is produced naturally in the body.

- Vasopressin acts on the walls of the blood vessels, causing them to narrow and restricting the blood flow to the veins so that bleeding is reduced.

- Given for a maximum of **72 hours** (unless otherwise stated by medical staff).

#### **SIDE EFFECTS**

##### Common

Headache  
Sweating  
Nausea  
Abdominal pain

##### Rare

Anginal blocks  
Peripheral ischaemia

#### **INTERACTIONS**

None known.

## **HEPARIN**

- Heparin is an anticoagulant used to prevent and aid in the dispersion of blood clots.

- All patients post transplant commence I.V. Heparin at 150 units/hour. This is to prevent clots forming in the vascular anastomosis in the new liver.

- It is started when the PT is less than 20 and discontinued on day 6 post transplant (Liver biopsy may be performed on day 7).

#### **SIDE EFFECTS**

##### Common

Bleeding/bruising

##### Rare

Alopecia

Aching bones

Rash

#### **INTERACTIONS**

**Aspirin:** -Aspirin may increase the anti-coagulant effect of heparin and must not be taken together.

## **LACTULOSE**

• Lactulose is an osmotic laxative used for the treatment of constipation, which may precipitate Hepatic Encephalopathy. Aim for 2-3 soft stools per day.

• It reduces the pH of the bowel making it a hostile environment for nitrogen producing bacteria.

• This lower pH also draws nitrogen into the bowel where it can be excreted.

#### **SIDE EFFECTS**

##### Common

Flatulence

Stomach cramps

##### Rare

Nausea

Abdominal distension

Diarrhoea

#### **INTERACTIONS**

None known.

## **LANSOPRAZOLE (Zoton)**

• Lansoprazole is a proton pump inhibitor antacid.

- It inhibits gastric acid by blocking the hydrogen - potassium adenosine triphosphatase enzyme system (proton pump) of the gastric parietal cell.

- It is effective as a short term treatment for gastric /duodenal ulcers and gastro oesophageal reflux and acid related dyspepsia.

#### **SIDE EFFECTS**

##### Common

Headaches  
Diarrhoea  
Pruritis

##### Rare

Liver dysfunction  
Anaphylaxis  
Bruising

#### **INTERACTIONS**

Lansoprazole accelerates metabolism of **oral contraceptives**

**Sucralfate** reduces absorption of Lansoprazole

Lansoprazole may enhance effects of **Warfarin**.

## **METRONIDAZOLE**

- Metronidazole is an anti-microbial drug with high activity against anaerobic bacteria and protozoa

- It is used on the liver unit for gut decontamination in hepatic encephalopathy

- It is also used for the treatment of clostridium difficile

- It is used for surgical prophylaxis post transplant for 48 hours.

**SIDE EFFECTS**Common

Nausea

Vomiting

RarePeripheral  
neuropathy  
Dizziness**INTERACTIONS**Metronidazole may increase effect of **oral anticoagulants**Metronidazole may increase effect of **phenytoin****MYCOPHENOLATE MOFETIL**

- Mycophenolate is a cytotoxic drug, which has a more selective mode of action than that of Azathioprine.

- It is used for the prophylaxis of acute rejection when used in combination with cyclosporin and corticosteroids.

**SIDE EFFECTS**Common

Neutropenia

Nausea

Diarrhoea

Risk of opportunistic  
infections greaterRare

Renal damage

Hepatitis

Gingivitis

Allergy

**INTERACTIONS****Cholestyramine (Questran)** reduces absorption of mycophenolate.**Antacids** reduce the absorption of mycophenolate.**Antivirals** may cause higher plasma concentrations of mycophenolate.

## OCTREOTIDE (Sandostatin)

• Octreotide is an analogue of the hypothalamic release inhibiting hormone somatostatin

• It is used for the treatment of variceal bleeding

### SIDE EFFECTS

#### Common

Anorexia  
Nausea  
Bloating

#### Rare

Hepatitis  
Altered LFT's  
Alopecia

### INTERACTIONS

Octreotide may reduce **insulin and antidiabetic** drug requirements in Diabetes Mellitus

Causes a reduced plasma concentration of **Cyclosporin**

## ONDANSETRON

• Ondansetron is a specific (5HT<sub>3</sub>) serotonin antagonist. It has a valuable role in the management of patients receiving cytotoxics or post surgical patients who are unable to tolerate or whose nausea and vomiting is not controlled by less expensive drugs.

• Ondansetron may also be used for the treatment of pruritis.

### SIDE EFFECTS

#### Common

Constipation  
Headache.

#### Rare

Warm feeling in head

### INTERACTIONS

None known.

## PARVOLEX (N- Acetylcysteine)

- N-Acetylcysteine is a derivative of the naturally occurring amino acid L-cysteine.

- It is used in the treatment of Paracetamol overdose. On the Liver Unit it is often used for many other problems e.g. post transplant, decompensated ALD, Acute Liver Failure.

- Glutathione in the Liver inactivates toxins by conjugation. When the liver is in distress glutathione levels are reduced. Acetylcysteine protects the liver by restoring glutathione levels or by acting as an alternative substrate for toxins (particularly the toxic paracetamol metabolite).

### SIDE EFFECTS

#### Common

Nausea  
Rash  
Flushing

#### Rare

Respiratory distress  
Puffy eyes

### INTERACTIONS

None known.

## PREDNISOLONE

- Prednisolone is a powerful corticosteroid.

- It is used in Transplant patients for its anti-inflammatory properties.

- Prednisolone is not usually given in viral hepatitis (e.g. HCV, HBV) post transplant.

### **SIDE EFFECTS**

#### Common

Indigestion  
Acne  
Osteoporosis  
Hypertension  
Diabetes  
Adrenal insufficiency

#### Rare

Weight gain  
Mood changes  
Muscle weakness

### **INTERACTIONS**

**Anti-epileptics:** - These can reduce the effects of prednisolone.

**Insulin and anti-diabetic drugs:** - Prednisolone reduces the actions of these drugs.

**Anti-hypertensive drugs** :- Prednisolone may reduce the effect of anti-hypertensive drugs.

## **PROPRANOLOL**

• Is a beta-blocker used for the treatment of portal hypertension, which causes varices.

### **SIDE EFFECTS**

#### Common

Lethargy/fatigue  
Cold hands and feet

#### Rare

Nausea  
Nightmares  
Fainting  
Dry eyes

### **INTERACTIONS**

**Indomethacin and NSAID's:** These may reduce the anti-hypertensive effect of Propranolol.

## RANITIDINE

- Ranitidine is a H<sub>2</sub> antagonist, which neutralises acid in the stomach.
- It is used in the prevention and treatment of stomach and duodenal ulcers and gastrointestinal bleeding.

### SIDE EFFECTS

#### Common

Headaches  
Diarrhoea

#### Rare

Dizziness  
Rash  
Bradycardia/  
AV block

### INTERACTIONS

None known

## CO-TRIMOXAZOLE (SEPTRIN)

- It is an antibacterial drug, which is a combination of Trimethoprim and Sulphamethoxazole.
- All post Liver Transplant patients start Septrin as a prophylactic measure against pneumocystis pneumonia.
- It is commenced on Day 10-post transplant and is taken on alternate days for a 3-month period.

### SIDE EFFECTS

#### Common

Nausea/vomiting  
Rash/itching

#### Rare

Diarrhoea  
Headache  
Sore tongue

### INTERACTIONS

None known.

## TACROLIMUS (PROGRAF)

• Tacrolimus is a macrolide immunosuppressant.

• Although not chemically related to cyclosporin it has a similar mode of action by also blocking T-cell proliferation.

### SIDE EFFECTS

#### Common

Nephrotoxic (more so than Cyclosporin)  
Tremor  
Headache  
Diabetes

#### Rare

Hypertrichosis  
Cardiomyopathy  
Convulsions

### INTERACTIONS

**Ibuprofen** increases the risk of nephrotoxicity.

**Erythromycin** increases plasma tacrolimus concentrations.

Efficacy of **oral contraceptives** possibly decreased.

**Omeprazole** increases plasma tacrolimus concentrations.

**Grapefruit juice.**

## URSODEOXYCHOLIC ACID

- Ursodeoxycholic acid is a hydrophilic bile acid
- It improves bile flow within the biliary system
- It is a treatment for pruritis (itching)

### **SIDE EFFECTS**

Common

Rare

Pruritis

Diarrhoea

### **INTERACTIONS**

**Antacids** may reduce absorption of Ursodeoxycholic Acid.

**Cholestyramine** may reduce absorption of ursodeoxcholic acid and should not be given at the same time.

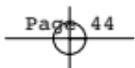
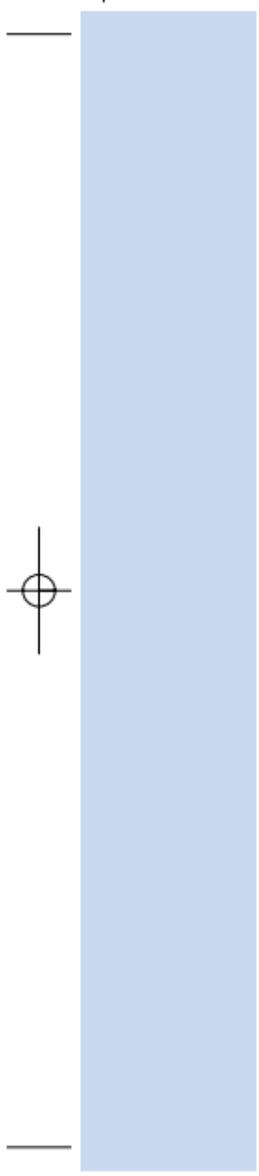
## SECTION 5

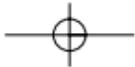
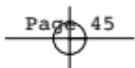
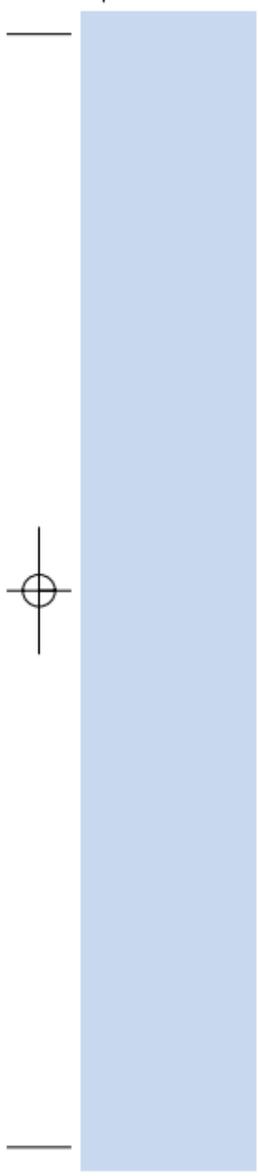
### NORMAL BLOOD RESULTS

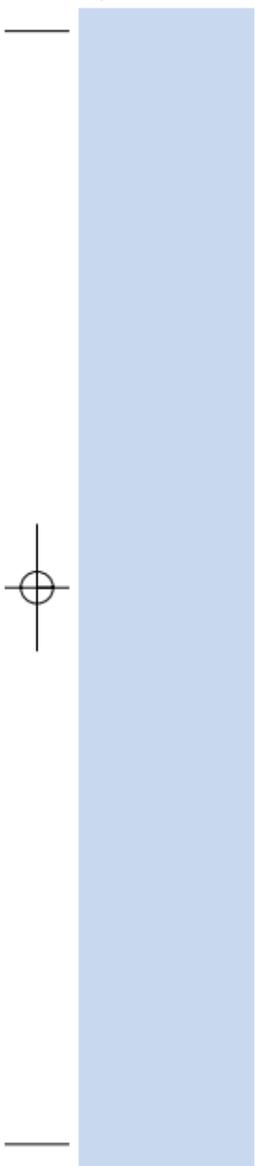
SODIUM		135 - 146 mmol.l-1.	
POTASSIUM		3.5 - 5.0 "	
UREA		2.2 - 7.7 "	
CREATININE		70 - 120 "	
BICARBONATE		20 - 30 "	U+E's
GLUCOSE		4.5 - 5.6 mmol.l-1.	BIOCHEMISTRY
CALCIUM		2.2 - 2.67 mmol.l-1.	YELLOW/ORANGE
PHOSPHATE		0.8 - 1.4 "	TUBE
AMYLASE		60 - 160 U/dl.	
.....			
ALBUMIN		37 - 49 g.l-1.	
ALT		5 - 30 U.l-1.	LFT's
ALK PHOS		25 - 115 U.l-1.	BIOCHEMISTRY
BILIRUBIN		3 - 15 mmol.l-1.	YELLOW/ORANGE
			TUBE
.....			
PROTHROMBIN			
TIME		13 - 16 secs.	
THROMBIN TIME		18 - 20 secs.	CLOTTING
FIBERINOGEN		1.5 - 4.0.	HAEMATOLOGY
APTT		35 - 45 secs.	LIGHT BLUE TUBE
.....			
Hb	male	13.5 - 18 g/dL.	
	female	12 - 16. "	
WBC	male	4.0 - 11.0.	
	female	4.0 - 11.0.	FULL BLOOD COUNT
PLATELETS			HAEMATOLOGY
	male	150 - 400 x 10/L.	PURPLE TUBE
	female	150 - 400 x 10/L.	
RBC	male	4.5 - 6.6 million/mm3.	
	Female	4.0 - 5.8 "	
.....			

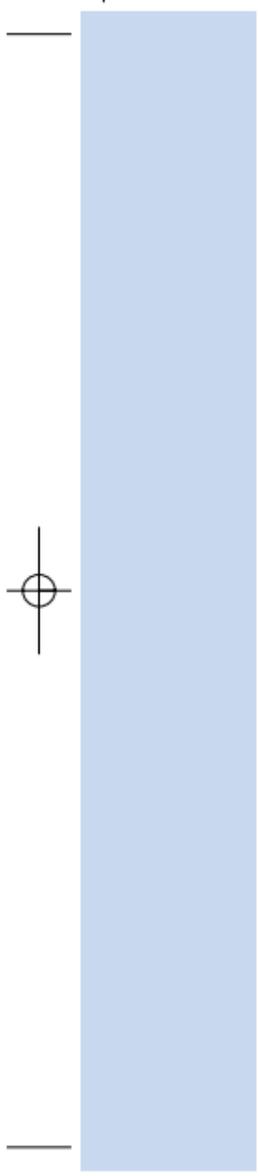
ARTERIAL PCO2	4.8 - 6.1 kPa (36 - 46mmHg).	BLOOD GASES BIOCHEMISTRY
ARTERIAL PO2	10 - 13 kPa (75 - 100mmHg).	PULSATOR TUBE
GROUP + SAVE	TRANSFUSION	PINK TUBE.
CYCLOSPORIN & TACROLIMUS	IMMUNOLOGY	PURPLE TUBE.
VANCOMYCIN LEVELS	MICROBIOLOGY	RED TUBE.
CMV status	VIROLOGY	RED TUBE.
HEPATITIS status	MICROBIOLOGY	RED TUBE.

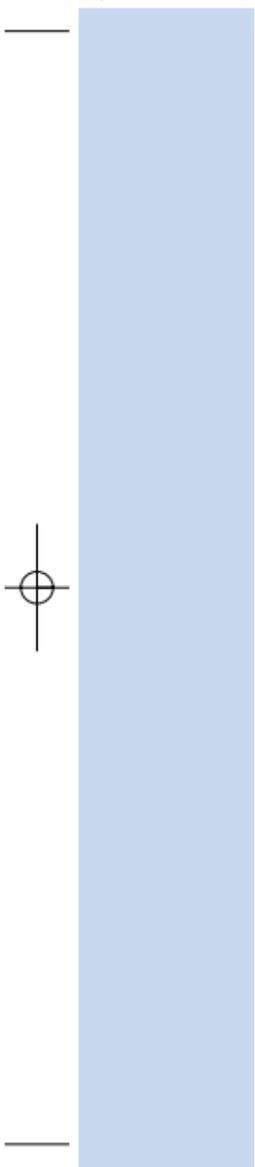
## SECTION 6 NOTES

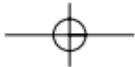
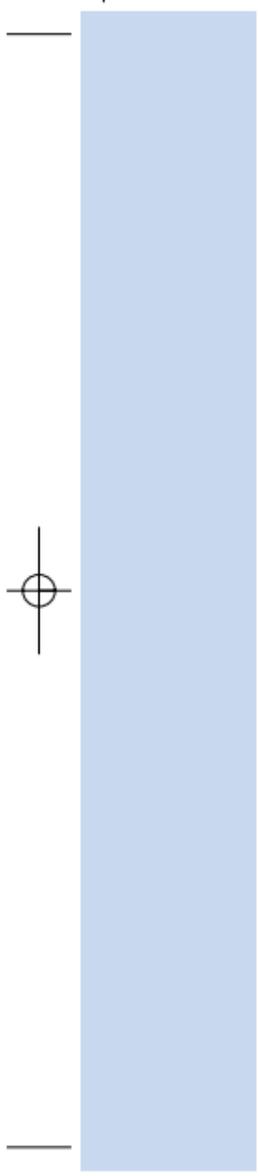


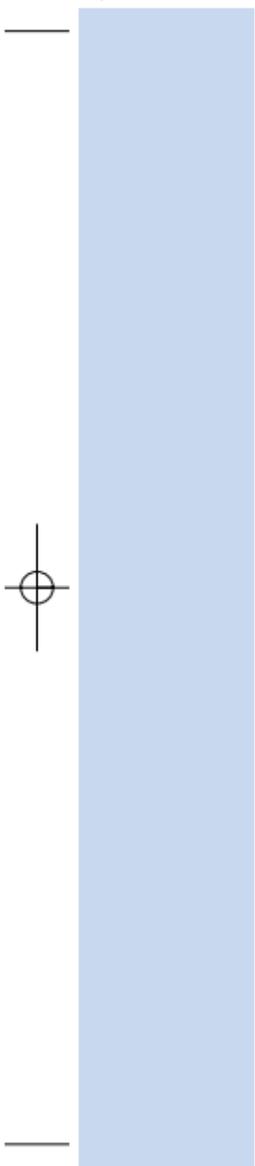


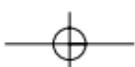












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