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ACUTE PANCREATITIS

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The principal register in Europe providing advice and research in inherited pancreatic disorders.

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ACUTE PANCREATITIS

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INTRODUCTION

This booklet is one of a series on pancreatic disorders written by Professor Neoptolemos. Its aim is to provide you, the patient, with useful information on the particular pancreatic problem you are suffering from, the procedures and tests you may need to undergo, and helpful advice on coping successfully with the problem. If you require any further information or advice or are unsure about anything, your doctor will be able to help.

WHAT IS THE PANCREAS?

The pancreas is a solid gland measuring 20-25cm in length, 4-6cm in width and 3-4cm in depth. It is firmly attached in the back of the abdominal cavity behind the stomach. The pancreas is divided into 5 parts – the head, the uncinate process, the neck, the body and the tail. The head of the gland is closely attached to the duodenum which is the first part of the small intestine into which the stomach empties liquids and partially digested food. The head of the gland is situated just to the right of the midline of the abdomen and below the right rib-cage.

The uncinate process is an extension of the lower part of the head of the gland which surrounds important blood vessels. The body and tail of the pancreas lie at an angle so that the tail of the pancreas is situated beneath the extreme edge of the left rib cage. The tail of the gland is closely attached to the central part of the spleen with which it shares a common blood supply. Running behind the neck and uncinate process are many important blood vessels which supply the liver, the rest of the gut organs and the kidneys, including the aorta (an artery) which takes all the blood to the lower abdomen and legs, and the inferior vena cava (a vein) which returns blood from these areas.

WHAT DOES THE PANCREAS DO?

The pancreas does two important things:

- It makes enzymes which are necessary to digest food in the intestines
- It produces insulin to enable every part of the body to use glucose (sugar).

1. DIGESTION

Food is partly broken down by the acid and churning action of the stomach. After 1-2 hours food is slowly released into the duodenum through a valve called the pylorus. Here, and as it moves along the rest of the small bowel, the food is broken down into tiny particles. Nutrients are absorbed by the small intestine and used for energy and maintaining strong muscles and bones. Unwanted material passes into the large bowel (colon) and after 24 hours or so is excreted as stool via the rectum and anus.

Digestion of food which consists of carbohydrates (e.g. glucose), proteins (e.g. meat) and fat (e.g. butter) is not possible without the pancreas. Groups of glands in the pancreas (called acini) make 30 or so different enzymes each of which is responsible for breaking down clumps of different types of

food into small particles for absorption. These enzymes are collected from the small glands in the pancreas into small ducts and finally into the main pancreatic duct to be released into the duodenum.

The enzymes when they are first made in the acini are not active (otherwise they would digest the pancreas as well!). When they pass into the duodenum however, they are made active by the juice of the duodenum. The main enzymes are called amylase for digesting carbohydrates, trypsin for digesting proteins and lipase for digesting fats.

Digestion is also assisted by enzymes made and released by the salivary glands (amylase), tongue (lipase), stomach (pepsin and lipase) and small intestine (peptidases).

The digestion of fat is very special. Fat needs to be dispersed before the pancreatic enzymes can properly break it down. This dispersion of fats is made by bile acids which are present in bile produced by the gall bladder. Bile acids act in exactly the same way as detergents which are used to wash up greasy dishes. Therefore, both bile acids and pancreatic enzymes are needed for fat digestion. If there are not enough pancreatic enzymes, fat is not digested and the stools (bowel motions) become pale and greasy. These greasy stools may become difficult to flush away from the toilet and may give off a strong offensive smell. Doctors call this **steatorrhoea**, which is a way of saying fatty stool.

2. INSULIN AND GLUCOSE METABOLISM

All the cells of the body use glucose as a source of energy in order to maintain their different functions (e.g. electrical activity of the brain and contraction of the heart and muscles). Sugar comes directly from digestion or is made in the liver from concentrated forms of sugar (glycogen). The level of sugar in the blood is kept constant by special control mechanisms involving hormones. There are many different types of hormones each with a specific task. Hormones act as messengers and work like a key opening the lock of a door.

Hormones are made in different places, are then secreted into the blood and will work on cells at many different sites. Insulin is a hormone which unlocks a special 'door' in the cells of the body to allow glucose to pass in to the cells. If insulin is lacking, then sugar diabetes develops. Instead of entering the cells of the body, the sugar stays in the blood which is very harmful at high concentrations. Insulin is made in special groups of cells called islets of Langerhans which are dispersed throughout the pancreas gland. Most of the islets (pronounced 'eye-lets') are in the tail of the gland. Most of the pancreas can be removed but there are usually enough islets remaining to make insulin sufficient to prevent sugar diabetes (also called diabetes mellitus) from occurring. As you are probably aware, diabetes can be treated by taking regular injections of insulin, which can be taken from the pancreas of animals (e.g. pork insulin) or made by genetic engineering (so called 'human' insulin).

Enzyme production and insulin production are independent. Because digestive enzymes and insulin are made by different parts of the pancreas, a problem with enzyme production does not mean necessarily that there will be a problem with insulin production. Similarly, if there is a problem with insulin production, this does not mean necessarily that there will be a problem with enzyme production.

Assuming that the pancreas was normal to begin with, increasing loss of the pancreas gland (by disease or surgery) usually results in more loss of enzyme production before there is obvious loss of insulin production. Another way of saying this, is that the insulin 'reserve' is much more than the enzyme 'reserve' of the pancreas.

SPECIAL INVESTIGATIONS FOR PROBLEMS WITH THE PANCREAS

Your doctor may need to do some tests to find out more about your particular problem. Perhaps you've already undergone one or more of them. The next section describes what these tests are, how and why they are done, and how they can help your doctor to treat your problem.

I. ULTRASONOGRAPHY OR ULTRASOUND (US) SCAN:

This is a simple, painless and relatively quick investigation which can be used to obtain a 'picture' of the inside of the abdomen. The only preparation needed is for you to avoid eating for 6-8 hours prior to the test, as any fluid or food which is taken by mouth can obscure the pictures produced. Pictures are made using harmless sound waves. These waves bounce off interfaces between dense and less dense structures. The sound waves will not cross solid areas (such as bone) or areas containing air or other gas. Usually only a fairly simple picture of the pancreas, liver, bile ducts and gallbladder can be obtained.

The test is performed while you lie fully awake on a simple couch. A special jelly, a bit like Vaseline is used to enable the 'probe', which produces and collects the sound waves, to be moved over the skin of the abdomen. The radiologist (or his assistant called a radiographer) moves the probe around and looks at a TV screen while this is done to see what pictures are being made. Although sound waves are generated during the procedure these cannot be heard.

II. COMPUTERISED TOMOGRAPHY (CT SCAN)

This is more complex and time consuming than an ultrasound scan but produces excellent pictures of the pancreas and other abdominal structures. As with ultrasound you need to avoid eating for 6-8 hours beforehand and is performed while you are fully awake.

You lie on a special couch attached to the CT scanner which looks like a large 'doughnut'. A CT scan uses X-rays which are emitted and collected through 360°. The couch is made to move through the doughnut as the X-rays are then put together by a computer to produce the pictures at different levels of the abdomen.

In order to make it easier to interpret the structures in the abdomen, you will be asked to swallow a liquid (or 'contrast'). This fills the stomach and the intestines. Another injection of a different contrast ('dye') is given into a vein (usually in the arm) during the second half of the procedure. This helps to show up the blood vessels.

An MRI scan is similar to a CT scan but uses magnetic resonance to image the pancreas instead of X-rays.

III. ERCP

This is a special investigation for taking pictures of the bile ducts and pancreatic duct. It provides complementary and usually essential information to that given by ultrasound or CT. The full name of ERCP is rather a mouthful: endoscopic retrograde cholangiopancreatography! It involves inserting a special flexible telescope (the duodenoscope) into the mouth, down the gullet and into the stomach and then into the duodenum opposite the opening of the bile duct and pancreatic duct. A small tube (cannula) is then pushed into the opening (ampulla of Vater) and contrast ('dye') is injected into the ducts. You lie on an X-ray table to enable pictures of the ducts to be taken while the contrast is injected. Sometimes it is necessary to cut a small part of the opening using an electric current passed down a needle which has been inserted into the telescope to permit the cannula to go into the ducts properly.

If your doctor decides you should have an ERCP it is essential that you don't eat or drink anything for at least 8 hours before the test.

Usually a plastic tube is put into a vein of the right forearm or the back of the hand before you go to the X-ray department. You may need a drip of intravenous fluids and be given one or more antibiotics in the drip.

You will be asked to sign a consent form agreeing to this procedure because it is complicated. Normally you are taken on a trolley to the X-ray department and, after being checked by a nurse, asked to move onto the X-ray table. You will be asked to lie on your left side with your left arm behind your back and be given a throat spray of local anaesthetic. This taste awful but the feeling quickly goes, and it will stop any coughing during the procedure. A second spray may then be given under the tongue, which contains a substance to help the ampulla of Vater open up during the procedure. At this stage you are given a strong sedative by injection.

This is enough to make most patients very sleepy but not fully unconscious. It is very important that you are as relaxed as possible before and during the procedure. The telescope is easily passed into the mouth and stomach. There is then a strange sensation as air is introduced into the stomach. Belching should be avoided as the air helps the endoscopist to pass the tip of the telescope into the duodenum. Most patients usually do not remember anything of the procedure. The results may be explained to you or a relative on the ward but the best time to discuss the findings is at the next out-patient visit or the next day on the ward. If you are an out-patient, full details will also be sent to your GP. The results are not always easy to interpret and are usually combined with other tests to provide an overall diagnosis. It is always necessary for a friend or relative to drive you home if you have had an ERCP as an out-patient because it takes several hours of the effects of the drugs to wear off.

Is ERCP safe? ERCP is safe with no complications in about 95% of cases. There are occasionally complications from ERCP however, the most common of which are abdominal pain, acute pancreatitis, biliary infection and bleeding. It will be necessary to keep you in hospital overnight if there has been a complication. In most cases, the complications improve, and patients are soon discharged. Very occasionally the complication is serious, and death may result in a very small proportion of cases. For these reasons, an ERCP must be:

- Performed by a specialist
- Performed for a good reason

IV. ENDOLUMINAL ULTRASOUND (EUS)

This is an endoscopic procedure rather like ERCP. Instead of x-ray pictures of the pancreas and bile ducts, EUS takes pictures by ultrasound. There are no complications with this procedure.

V. NEEDLE BIOPSY

Occasionally a small piece of tissue from the pancreas needs to be taken to help make a diagnosis. This can be done during ERCP, an ultrasound scan or a CT scan. During the latter procedures, local anaesthetic is injected into the skin. A fine needle is then introduced and its tip positioned using pictures from the scan before any tissue is taken.

Is needle biopsy safe? This is perhaps surprisingly safe but complications such as bleeding or acute pancreatitis can occur, but only very occasionally.

TESTS FOR SUGAR DIABETES

The urine can be tested for sugar using a simple technique of dipping a special strip of paper into a sample. Depending on the amount of sugar, it changes colour (normally there is no sugar in the urine). Urine testing is often used as a screening test.

More precise tests involve measuring the actual glucose level in the blood by taking a blood sample from an arm vein. The blood glucose level can also be measured using another special paper strip dipped into a drop of blood obtained by pricking the pulp end of a finger tip. This latter method (and sometimes urine testing) is used by patients who are known diabetics to adjust their own insulin requirements.

A patient who is thought to be developing diabetes can be tested by a glucose intolerance test. This involves taking a glucose drink following an overnight fast and then measuring the blood glucose level from blood samples taken over the next 2-3 hours.

TESTS FOR PANCREATIC ENZYME PRODUCTION

These tests are not as accurate as determining blood glucose levels because many factors are involved in the digestion of food by pancreatic enzymes. Few patients actually require such a test since the clinical outcome is the most important factor. This means that if a patient has greasy stools and is losing weight, then pancreatic enzyme supplements (tablets or capsules) are required. The number of tablets or capsules will be increased by the doctor, or the patient will be instructed by the doctor to do so until the symptoms disappear.

Nevertheless, confirmatory tests are usually required. None of these tests is ideal and different institutions use different tests. The precise details of these are not required but may include the following:

a) Faecal Elastase Test: Elastase is one of the enzymes produced by the pancreas to digest protein. There is always a small extra amount produced which means that it can be measured in the stool. The extra amount of elastase produced is related to the amount of normal pancreatic function. The faecal elastase test is used for screening and monitoring. More complicated tests may also need to be used.

b) PLT or Pancreato-Lauryl Test: A standard meal is taken following an overnight fast along with a test 'food' (with PLT). One or more blood tests or a urine test is then made to see if the test 'food' has been digested (by the pancreatic enzymes) and then absorbed.

c) Triolein breath test: This is a more specific test for fat digestion and absorption and is fairly simple to perform. Triolein is a fat which contains a minute trace of radioactive carbon. The amount of fat metabolised is determined by taking a simple breath test at a fixed time following ingestion of a small amount of triolein.

d) Faecal fat test: This is an excellent way of determining fat digestion but involves collecting stools for 1-3 days. As you can imagine this is not popular with either patients or the laboratory staff who have to make the measurement. (At the same time pancreatic enzymes present in the stool can also be measured).

e) Secretin test: This is performed in specialist units and is very accurate (like the faecal fat test). After an overnight fast a special tube is passed through the nose into the stomach and the farthest part

of the duodenum. The tube has two separate 'pipes' which drain fluid from the stomach and duodenum. The fluid from the duodenum contains the pancreatic enzymes and bicarbonate. Following the first 30-40 minutes an injection into a vein is given to stimulate the pancreas to produce enzymes and bicarbonate. The injection contains the hormones CCK-PZ (cholecystokinin-pancreozymin) and secretin. Further collections of fluid are then made to see how well the pancreas has been stimulated. The whole test lasts 3-4 hours and is carried out as an out-patient procedure.

ACUTE PANCREATITIS

This section of the booklet deals with the particular problem you have with your pancreas – "acute pancreatitis". So what is it, what causes it, and how can it be treated?

WHAT IS ACUTE PANCREATITIS?

This is an inflammation of the pancreas. It develops very suddenly and, in the majority of patients (about 75%) improves steadily with good hospital treatment over the course of a week or so. A blood sample usually shows the presence of a large amount of amylase (a pancreatic enzyme) in the blood. There are many causes of acute pancreatitis, and it can affect people of any age. Once a patient has recovered from an attack of acute pancreatitis, they are perfectly well and there is usually no permanent damage to the pancreas.

It is very important to find out the cause of acute pancreatitis, which must then be dealt with otherwise further attacks may follow. If more than one attack of acute pancreatitis occurs, it is called recurrent acute pancreatitis.

CAUSES OF ACUTE PANCREATITIS

SOME CAUSES OF ACUTE PANCREATITIS	
Common causes	Unusual causes
Gallstones	Mumps
Sensitivity to alcohol	Hyperlipidaemia (too much fat in the blood)
	Narrowing of the pancreatic duct
	Pancreas divisum
	Annular pancreas
	Surgery
	Trauma
	Idiopathic
	Hereditary

GALLSTONES

This is by far the commonest cause of acute pancreatitis in Europe. Because gallstones affect women more commonly than men, acute pancreatitis **usually** affects women and even teenagers. Not all patients with known gallstones however develop acute pancreatitis – the figure is about 1 in 15 only. Gallstones cause acute pancreatitis because they pass into the bile duct and temporarily block the

opening into the duodenum at the point where it is joined by the pancreatic duct (see the diagram on page 6).

In severe cases, patients may benefit from an emergency ERCP and cutting the lower end of the bile duct. This cutting is called 'endoscopic sphincterotomy' and makes the opening of the lower bile duct bigger which allows any stones to pass through into the duodenum without causing blockage.
Once symptoms have improved the best way to prevent further attacks of acute pancreatitis is to have the gallbladder removed ('cholecystectomy'). This operation is now done best by keyhole surgery – so called laparoscopic cholecystectomy or 'lap chole' – under a general anaesthetic.

Elderly patients may not be suitable for a general anaesthetic. An alternative to a 'lap-chole' is to cut the lower end of the bile duct during ERCP. This cutting (endoscopic sphincterotomy) causes complications in about 10% of cases and very occasionally a patient dies as a result. This risk is worth taking in an elderly patient who cannot have a 'lap-chole'. On the other hand, the risk of endoscopic sphincterotomy complications may be too high in younger patients when a 'lap-chole' is safer.

ALCOHOL

This is the second commonest cause of acute pancreatitis in Europe overall although in some parts of Europe, it is a commoner cause than gallstones.

It is not known how alcohol causes acute pancreatitis. Some people have a pancreas which is sensitive to the effects of alcohol. These people develop attacks of acute pancreatitis a few hours or 1-2 days after they have been drinking alcohol. Often the sensitivity only develops after they have been drinking for several years. Such people may only be drinking a moderate amount of alcohol (not 'heavy' drinkers).

Other people who are much heavier drinkers may never develop acute pancreatitis but instead develop liver cirrhosis. Some patients who drink alcohol in moderate amounts never develop either acute pancreatitis or liver cirrhosis.

If alcohol is the cause of your acute pancreatitis, it is essential that you stop all future alcohol drinking. Non-alcoholic drinks mimicking wine or beer are now reasonable substitutes. Low-alcoholic (LA) drinks should also be avoided however.

MUMPS

Children may occasionally develop acute pancreatitis if they develop mumps which is a viral infection. Sometimes children will have a high amylase level in the blood due to the virus affecting the salivary glands in the neck. This might cause some confusion at first to the doctors looking after the child. A simple ultrasound scan of the pancreas helps to make the diagnosis or rule-out the possibility of pancreatitis. Mumps-associated pancreatitis usually resolves and does not recur.

HYPERLIPIDAEMIA

This refers to an excessive level of lipids (particles of fat) in the blood. Lipids are essential to life and need to be transported by the blood from one tissue to another. Certain individuals have unusually high lipid levels in the blood and this can cause acute pancreatitis. Patients who drink a large amount of alcohol can also develop hyperlipidaemia. Not all lipids are the same and it is only a certain pattern of lipids which is associated with acute pancreatitis. For example, individuals who have a high blood

cholesterol level are predisposed to heart disease and a high blood pressure but are not usually predisposed to developing acute pancreatitis.

Hyperlipidaemia is not a common cause of acute pancreatitis – it accounts for no more than 5% of cases. The diagnosis is made by measuring blood lipid levels at the time of an attack of acute pancreatitis. At other times, the blood lipid levels may be normal.
Treatment involves adopting a low-fat diet. Occasionally special drugs need to be taken which can lower the level of abnormal lipids in the blood.

NARROWING OF THE PANCREATIC DUCT

There are many different reasons why the pancreatic duct becomes narrowed. For this reason, it is important not only to show that the pancreatic duct is narrow but also the cause for this. Surgery is often required to deal with pancreatic duct narrowing.

PANCREAS DIVISUM

The pancreas develops as two separate buds from the intestinal tube during embryological development of the foetus in the womb. These buds each have a separate pancreatic duct. The two buds eventually combine together before birth to form a solid single organ. When this occurs, the separate pancreatic ducts also combine. In about 5-10% of healthy individuals, the pancreatic tissue combines but the two pancreatic ducts remain divided and they empty separately into the duodenum. This situation is called pancreas divisum because the pancreatic ducts remain divided.

Pancreas divisum is not harmful in the vast majority of cases. Very occasionally one of the ducts becomes narrowed and this can result in recurrent attacks of acute pancreatitis. Sometimes this may eventually lead to chronic (or continuous) pancreatitis.

The treatment involves enlarging the narrowed pancreatic duct opening and sometimes removing a part of the pancreas.

ANNULAR PANCREAS

This is an extremely rare cause of acute pancreatitis which often affects small children but which can affect adults. The problem arises during embryological development of the two pancreatic buds as described above (see pancreas divisum). In simple terms, the head of the pancreas becomes partly or totally wrapped around the duodenum. This can cause an obstruction to the flow of food in very young babies. Alternatively, the flow of pancreatic juice along the pancreatic duct may be hindered leading to acute pancreatitis. This may be difficult to recognise but once it is, surgery is required.

TRAUMA

Any major blunt trauma to the abdomen may cause acute pancreatitis.

SURGERY

This is also another rare cause of acute pancreatitis. Surgery performed to organs which lie near the pancreas such as the stomach or kidneys can cause acute pancreatitis. For reasons we do not understand, surgery to organs well away from the pancreas (such as the prostate gland, heart and brain) can also cause acute pancreatitis.

IDIOPATHIC

This is a loosely applied term used by doctors to mean "the cause is specific to an individual person" – in other words the cause is not known for certain. Many patients initially diagnosed as 'idiopathic' turn out to have a known cause – such as tiny gallstones missed by routine investigations. There are lots of other possible reasons for an initial diagnosis of idiopathic pancreatitis such as certain types of drugs, for which there is no convincing evidence. Patients with idiopathic acute pancreatitis pose a problem because if the specific cause is not known, then no specific treatment can be given. In this case, it is important that the search for a cause should be thorough. Ultimately, the doctor has to guess as to the likely causes and advise the patient appropriately.

PREGNANCY

A small number of women develop acute pancreatitis during pregnancy. The cause is not the pregnancy itself but another underlying reason. Investigation nearly always shows that the cause is due to gallstones because in some women pregnancy speeds-up the development of gallstones.

DOES ACUTE PANCREATITIS RUN IN FAMILIES?

In general, the answer is NO. Because acute pancreatitis is common and there are many causes of this, simply by chance two or more members of a family may suffer from acute pancreatitis. For example, it wold not be surprising if a mother and her adult daughter both developed gallstones and that both developed an attack of acute pancreatitis.

There are two main groups of patients in whom pancreatitis can be inherited. This happens because they have a gene which predisposes to pancreatitis. Each person has exactly the same number of genes as every other person. There are 100,000 genes in every cell of the body but only 10,000 genes are selected for use in any particular cell. Genes are always in pairs, so that one set comes from the mother and one set comes from the father. There are tiny variations in each gene. These tiny variations are essential to make every person an individual. Occasionally a tiny variation in a gene can give rise to a disease condition. Patients and their families require the care of a specialist surgeon, paediatrician or gastroenterologist and counselling from a geneticist.

Hereditary Pancreatitis

In this type there is a tiny variation in the cationic trypsinogen gene (which makes trypsin and is used to digest protein) results in an active trypsin in the pancreas. This activation occurs before it has had a chance to be secreted into the duodenum. The gene is officially called the PRSS1 gene and the two commonest alterations (or gene mutations) are called R122H and N29I. Affected individuals tend to develop pancreatitis as children, adolescents or young adults. There may be other members of the family with sugar diabetes. Not all members of the family will be affected in the same way. On average only half the individuals will carry the altered gene. This is called a dominant mutation. This means that half the children of an affected parent will have the gene passed on to them. Even then, some members of the family (about 20%) with the altered gene (or mutation) will not be affected at all. The presence of the gene can be tested for by a single blood test. Genetic counselling is required before any tests can be performed. Some families with Hereditary Pancreatitis have a normal set of PRSSI genes. This means that another gene is affected and scientists are trying to find out which one this is.

Idiopathic Pancreatitis

Some patients have an alteration in the gene that causes cystic fibrosis (the CFTR gene). One in 20 of the normal population has a CFTR gene mutation but only a tiny handful has idiopathic pancreatitis. Individuals with cystic fibrosis disease have both of the CFTR genes altered. We do not understand why

some people with only one CFTR gene mutation develop pancreatitis. Scientists are trying to find out why this happens.

In these rare forms of pancreatitis, the symptoms begin as acute pancreatitis and progress to chronic pancreatitis. This also applies to several other causes of acute pancreatitis but gallstones never cause chronic pancreatitis.

SEVERE PANCREATITIS AND ITS COMPLICATIONS

We do not know why some patients develop severe pancreatitis. Once this occurs, then the chances of complications and death are high. Because we still do not understand all the factors responsible for causing the various complications, treatment is sometimes not successful and patients can unfortunately die. For these reasons, it is important that patients with severe pancreatitis are looked after by specialists if this is at all possible.

Severe pancreatitis places a stress on all the main organs of the body: the heart, lungs, kidneys, other gut organs, the brain and the peripheral vasculature (the blood vessels that nourish all the organs). Patients who are elderly are less capable of coping with these stresses. Equally, for reasons we do not understand, some young people also cannot cope with the stresses, and death will occur despite every effort on the part of those caring for them.

TREATMENT OF SEVERE PANCREATITIS

At first, patients will be transferred to a High Dependency Unit (HDU) for intensive monitoring and given intravenous fluids and oxygen by mask. If the cause is due to gallstones, an ERCP and endoscopic sphincterotomy may be performed (see pages 12 and 17). Most patients recover from acute pancreatitis but some require to be transferred to an Intensive Therapy Unit (ITU). This is necessary for assisted ventilation of the lungs and to treat kidney failure by dialysis.

One or more CT or MRI scans may be necessary to assess the state of the pancreas. There may be severe death of the tissue (necrosis) of the pancreas or tissues surrounding the pancreas. If the necrosis is extensive or if there is evidence of infection of the necrosis, then surgery will be needed. The timing of the surgery and the extent of surgery are extremely difficult decisions to make even for experienced pancreatic surgeons. Once it is decided to operate for severe necrosis, the likelihood of success is anywhere between 50% and 80%, but this depends very much on individual cases.

The procedure used for removing extensive pancreatic dead tissue (necrosis) is called a 'necrosectomy'. The procedures that are used include the following:

Open Necrosectomy**:** This requires a large operation to remove dead pancreatic tissue. For several weeks (or longer) tubes are left behind to wash out and drain small pieces of dead tissue. More than one operation may be necessary.

Minimally Invasive Necrosectomy: It may be possible to remove dead pancreatic tissue using "keyhole" surgery. The advantage is that the success rate may be better in very ill and elderly patients compared to open necrosectomy.

Failure to survive a severe attack of acute pancreatitis despite all the treatment on ITU and surgery is due to the inability of the different organs to cope with the stress of acute pancreatitis. In young people, even though the heart and lungs respond to drugs and ventilation and the kidney function is

replaced by dialysis, the peripheral vasculature becomes unresponsive to drugs. The blood pressure then falls and it becomes impossible to keep the patient alive.

On the whole, most patients tend to survive an attack of severe acute pancreatitis although this may take several months of treatment in hospital. Despite an overall improvement at a later stage, localised complications may develop, which are principally a pseudocyst or an abscess (see below).

> Pseudocyst: (Pronounced 'Sue-doe-cyst') This is a cystic swelling which lies in the pancreas or next to the pancreas and which contains high concentrations of pancreatic enzymes. Often pseudocysts disappear without any specific treatment. If a pseudocyst remains or enlarges, it may cause nausea, vomiting, pain and weight loss, in which case, treatment is necessary. There are different ways to treat large pseudocysts but usually the most appropriate method is by surgery. Sometimes it is possible to insert a tube into the pseudocyst under local anaesthetic in the X-ray department and drain the fluid away without surgery. Another treatment is by endoscopy.
>
> Pancreatic Abscess: A collection of pus may develop in or near the pancreas during or after an attack of severe pancreatitis. The treatment is usually successful and may require surgery or just drainage with a tube inserted under local anaesthetic in the X-ray department.

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WHAT CAN I EAT?

For a few weeks after an attack of acute pancreatitis you should eat at regular intervals. It is usually better to take four or five snacks a day than a full meal. If you have gallstones, and for some reason your gall bladder has not been removed, avoid fatty foods such as butter, eggs, fried foods, sausages and bacon. Following removal of your gall bladder you are free to eat anything you wish. You will have a very healthy appetite and you may put on more weight than you would otherwise, unless care is taken to avoid excess calories.

LIVING WITHOUT A PANCREAS

There are some patients who have had either their pancreas removed or who still have pancreatic tissue but which is not functioning at all. Both types of patient are perfectly able to lead a normal life provided they take regular enzyme supplements and insulin injections.

PANCREATIC ENZYME SUPPLEMENTS

There are many preparations available. These preparations differ considerably in their effectiveness of action. The better preparations consist of capsules containing scores of small granules. The enzyme preparations can also be divided into two types depending upon their strength of action: regular and high dose. The capsules need to be taken during each meal and with any snack. Requirements vary enormously from patient to patient: typically 20-30 high-dose capsules per day are required but this can be lower or much higher. The requirements vary greatly from patient to patient partly because of the different level of secretion by any functioning pancreas and partly because there are still some enzymes secreted by the salivary glands, tongue, stomach and small intestines but which also varies greatly from person-to-person.

In a few cases of children and adults with cystic fibrosis, a serious problem with the large bowel (colon) has been reported. This condition is called fibrosing colonopathy and causes narrowing of the bowel. It seems to be related to the use of a particular acid-resistant coating of the enzyme preparations (called

methacrylic copolymer). The problem does not arise with preparations without this covering. The latter preparations are therefore recommended. The ingredients are always listed on the pack leaflet or label. Once patients are accustomed to taking enzyme supplements, they are usually allowed to adjust the number they take themselves to suit their own individual needs

INSULIN

There are many types of insulin available including human insulin obtained by genetic engineering. Precise dosing and frequency of injections is an individual matter. Being under the care of a diabetic specialist is obviously important in the first instance.

GASTRIC ACID SUPPRESSING TABLETS

Medication of this sort is often prescribed to be taken once or twice a day. Pancreatic juice normally counters the acid of the stomach. In the absence of the pancreas, there may be excess acid which can cause dyspepsia. There is also some evidence that taking this type of medication helps the action of pancreatic enzyme supplements which means that fewer capsules are required each day.

LIVING WITHOUT A SPLEEN

Pancreatic surgery sometimes necessitates removal of the spleen. This is much more of a problem in children than in adults. Without the spleen there is a small but real risk of developing a serious infection caused by certain bacteria especially pneumococcus. All children and adults without a spleen therefore require regular pneumococcal vaccination. All patients should also receive vaccination for meningococcus groups A and B, and children less than 4 years old require Haemophilus influenzae type b vaccination. Children may also need to take a daily antibiotic. Since the risk is much less in adults, daily antibiotics are not prescribed usually. Nevertheless if any infection develops, then appropriate antibiotics (such as penicillin or erythromycin) must be taken over-and-above any other types of antibiotic that are required.

Removal of the spleen sometimes causes the number of platelets in the blood to increase. This increases the risk of developing unwanted blood clots. Regular blood tests are therefore needed. If the number of platelets in the blood rises excessively, it is common practice to prescribe low-dose aspirin which reduces the risk of undesirable clotting.

CAN I DRINK ALCOHOL?

Alcohol is not recommended for patients who have **recurrent acute pancreatitis** and should be avoided in patients for whom the cause of their acute pancreatitis is alcohol.

If alcohol is not the cause of your acute pancreatitis you may drink alcohol if you wish. Indeed certain drinks such as English beer or stout are a good source of calories, iron and vitamins.

The recommended intake for healthy adults should be no more than 14 units per week for women and no more than 21 units per week for men. A unit of alcohol is equivalent to a half-pint of regular beer or lager, a small glass of table wine, or a single measure of spirit.

DOCTORS DEALING WITH PANCREATIC DISEASE THAT YOU MAY MEET

All surgeons are called 'Mr' and other medically qualified doctors are called 'Dr'. Either may be called 'Professor' if they work for a University. Senior doctors are called 'consultants' and the junior doctors are called house officers, senior house officer, registrar and senior registrar. In University departments, they are also called 'lecturer' (registrar or senior registrar) and 'senior lecturer' or 'reader' (consultants).

- General physician:
  A consultant medical doctor who works in a hospital and who is broadly specialised including 'gut' problems.
- General surgeon:
  A consultant surgeon who works in a hospital and who is broadly specialised including 'gut' problems.
- Gastroenterologist:
  A physician who is highly specialised in 'gut' problems and is usually an 'endoscopist'.
- Endocrinologist:
  A physician who is highly specialised in glandular problems including glandular problems including sugar diabetes.
- Specialist surgeon:
  A general surgeon who is highly specialised – a so called PB-specialist is a pancreato-biliary surgeon.
- Endoscopist:
  This may be a gastroenterologist or a surgeon who is able to undertake endoscopy (examination of the stomach or bowel using a flexible telescope). A few endoscopists can also perform ERCP, a specialist form of endoscopy that examines the bile ducts and pancreatic ducts.
- Radiologist:
  A consultant who only specialises in taking X-rays and scans of various sorts at the request of other specialists. A few radiologists are also expert endoscopists.
- Paediatrician:
  A consultant who specialises in the care of children and who may be called to investigate a pancreatic problem in young children or teenagers.
- Geneticist:
  A consultant who specialises in diseases which may be inherited. This is the only type of consultant who is properly qualified to provide counselling in cases where pancreatitis may run in families.
- Dietician:
  This is a specialist who is not a doctor but is an expert in advising on various types of diet

USEFUL ORGANISATIONS

Pancreatitis Supporters Network

This is a support group which has members throughout the UK. The Network provides information and support to patients with pancreatitis and their relatives. This is a registered charity. For further information, write to

Mr Jim Armour
Chairman, Pancreatitis Supporters Network
PO Box 8938
Birmingham
B13 9FW
Tel. 0121 449 0667

Pancreatic Society of Great Britain and Ireland

This is a professional organisation of specialist doctors involved in the care of patients with pancreatic disease. The Society is allied to the European Pancreatic Club and the International Association of Pancreatology. For further information, write to: Mr R Charnley, Secretary, Pancreatic Society of Great Britain and Ireland, Department of Surgery, Freeman Hospital, Newcastle-upon-Tyne, NE7 7DN.

Pancreas Research Fund

Specifically supports clinical and basic research of diseases of the pancreas. Write to: Pancreas Research Fund, Department of Surgery, Royal Liverpool University Hospital, Daulby Street, Liverpool, L69 3QA.

Digestive Disorders Foundation

3 St Andrew's Place
London
NW1 4LB
Tel : 0171 486 0341

EUROPAC

European Register for Familial Pancreas Cancer and Hereditary Pancreatitis. The principal register in Europe providing advice and research in inherited pancreatic disorders. Write to: EUROPAC Co-ordinator, Department of Clinical Services, Alder Hey Children's Hospital, Eaton Road, Liverpool, L12 2AP.

europac@liv.ac.uk
http://www.liv.ac.uk/surgery/europac.html