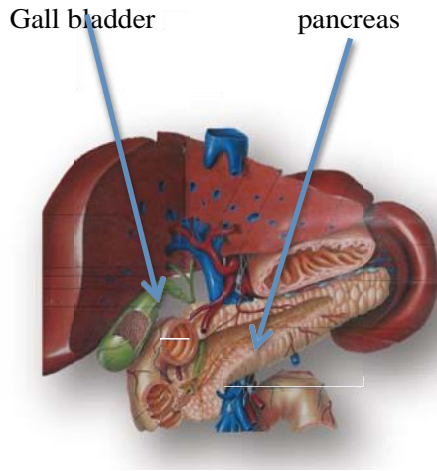


# WHAT'S WRONG WITH MY PANCREAS?

## CHRONIC PANCREATITIS

This is a patient information booklet detailing practical information about pancreas in general & specific information about chronic pancreatitis. Its aim is to provide the patient & his or her family with useful information on this particular pancreatic problem, the procedures and tests you may need to undergo, various treatment approaches available with risks involved and helpful advice on coping successfully with the problem. If you require any further information or advice or are unsure about anything, Dr. D.R. Kulkarni or your own doctor will be able to help.

## What Is Pancreas?



The pancreas is a solid gland 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 ribcage. 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 & splenic blood vessels.

Running behind the neck and uncinat 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. The **splenic vein** runs immediately under the tail and body of the pancreas and joins with the **portal vein** that runs immediately under the neck of the pancreas.

In short, pancreas is a centrally located and very precariously connected to or is in very close contact with most of the important structures in the abdomen. Hence diseases affecting pancreas can inadvertently involve any one or more of these structures. Hence patients with pancreatic problems may not necessarily have pancreatic complaints, but can present with unrelated complaints.

Running along the length of the pancreas within its center is the **main pancreatic duct**, which empties pancreatic juice into the duodenum. Also running through the middle of the head of the pancreas is the **main bile duct, which** also empties into the duodenum. (The main bile duct

carries bile from the liver where it is made and also from the **gallbladder** where it is stored). In most people the pancreatic duct and bile duct join together just before they open into the duodenum through a large fleshy nipple called the **ampulla of Vater** (after the person who described this).

Surrounding the openings of each of these ducts are small muscles that control the release of pancreatic juice and bile and thus act as valves (also called sphincters). There is also a valve that regulates the pancreatic juice and bile together and this sits in the ampulla. This common valve is called the **sphincter of Oddi**, also named after the man who described this.

About one in ten people have two separate pancreatic ducts, one that opens as normal through the ampulla of Vater and the other through a smaller nipple (called as papilla). For this reason the ampulla of Vater is sometimes called the major papilla and the other smaller opening is called the minor papilla. The pancreatic duct that opens through the minor papilla is called the **accessory pancreatic duct** (normally this joins the main pancreatic duct rather than opening separately into the duodenum).

## What Does The Pancreas Do?

The pancreas does two important things:

- It makes enzymes, which are necessary to digest food in the intestines.

Food consists of carbohydrates (e.g. glucose), proteins (e.g. meat) and fat (e.g. butter). Pancreas secretes different **enzymes, which** are responsible for breaking down clumps of different types of food into small particles for absorption. (process of digestion) The main enzymes include amylase for digesting carbohydrates, trypsin for digesting proteins and lipase for digesting fats.

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.

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** (fatty stool.)

**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 liver and stored in 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 the main bile duct becomes blocked, then the bile cannot get into the duodenum & fat cannot be properly digested.

When the common opening is blocked, the bile made by the liver cannot go into the bowel it goes into the blood and out through the kidneys into the urine. This results in the eyes and skin becoming yellow and is known as jaundice. As the bile is in the urine this now becomes dark in color. Because the flow of bile is blocked (or obstructed), doctors call this condition **obstructive jaundice**. As the bile duct goes through the head of the pancreas, jaundice can be caused by disease of the pancreas (such as pancreatitis or cancer).

- Pancreas produces insulin to enable every part of the body to use glucose (sugar).

Insulin is a hormone made in special groups of cells called **islets of Langerhans, which** are dispersed throughout the pancreatic gland. It helps the cells of the body to use glucose as a source of energy in order to maintain their different functions. In absence of insulin, sugar instead of entering the cells of the body, stays in the blood leading to harmfully high concentrations. (Diabetes mellitus)

A large proportion 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 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).

### **What Happens To Pancreatic Function In Pancreatic Diseases? I**

f pancreatic duct outflow is blocked due to any reason; gradually pancreatic duct enlarges in any size due to backpressure. Eventually the increased pressure within the duct starts taking

toll on the pancreatic enzyme secretion, which drops and affects the digestion of food and absorption of nutrients, thereby affecting a persons weight and overall health. The insulin production is not immediately affected but over a period it will also drop thereby causing sugar diabetes in the patient.

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.

### **Which Are Common Diseases Of Pancreas?**

[Acute Pancreatitis](#)  
[Chronic Pancreatitis](#)  
[Pseudo cyst](#)

[Pancreatic fistula](#)

[Cancer of pancreas](#)

[Cystic tumors](#)

[Neuroendocrine tumors](#)

### **What Special Investigations Are Done When A Problem Is Suspected With The Pancreas?**

You **may** need to do some tests to find out more about your particular problem. Perhaps you've already undergone one or more of them.

You may be advised to have certain blood tests like complete blood count, blood urea, creatinine, [liver function tests](#) (bilirubin, liver enzymes like SGOT, SGPT, Alkaline phosphatase, gamma GT, albumin), amylase, lipase, calcium, and parathormone. In case of acute pancreatic problems you will be advised to get admitted and all these tests will then be done in-house.

Similarly diagnosis of pancreatic problems requires radiological imaging studies of abdomen like [Ultrasonography](#), [CT scan](#), [MRI](#) or further interventions like gastrointestinal endoscopy, [ERCP](#), [PTHC](#) or [EUS](#). It quite often so happens that patient is advised these investigations in a sequential manner and not at one go. This does take time but considering the cost of these investigations it is always better to ask for the next investigation only if it is absolutely

necessary. Unfortunately in a small group of patients one cannot reach a diagnosis in spite of all this effort.

### Chronic Pancreatitis

This section deals with the particular problem you have with your pancreas – “Chronic Pancreatitis”. So what is it, what causes it, and how can it be treated?

#### What Is Chronic Pancreatitis?

This refers to a continuous ongoing low-grade inflammation of the pancreas. Because of the continuous inflammation, scar tissue develops within the pancreas. At first this may result in loss of part of the enzyme producing part of the pancreas. After a variable period of time (which could be after some weeks or months but is usually after many years), the insulin-making part of the pancreas may become destroyed.

For reasons that are not understood, many patients with chronic pancreatitis develop **calcium** deposits in the pancreas tissue and may form calcium stones in the pancreatic tissue & main pancreatic duct or its side branches. Blockage of the ducts by scar tissue (stricture) or stones will stop enzymes being delivered to the gut and impair digestion. The pancreatic duct may enlarge if it is blocked.

## What Causes Chronic Pancreatitis?

**The cause of chronic pancreatitis is usually due to alcohol drinking in seven out of ten individuals.** In three out of ten people there are other causes such as narrowing of the pancreatic duct and hereditary causes. In many cases, the cause remains unknown. If alcohol is thought to be the cause, it is essential that **all alcohol drinking be stopped.**

Other conditions that have been linked to pancreatitis are:

- Autoimmune problems (when the immune system attacks the body)
- Blockage of the pancreatic duct due to various reasons like trauma, Pancreas divisum (congenital anatomical problem) or Annular pancreas (congenital anatomical problem) or Abnormal joining of pancreatic & bile duct (congenital anatomical problem)
- Heredity or genetic problems
- High blood calcium levels (hypercalcemia)
- High parathyroid hormone levels due to any cause (hyperparathyroidism)
- Tropical pancreatitis

## **What Causes Chronic Pancreatitis In Children?**

In children, especially from southern states of India chronic pancreatitis is usually due to malnutrition & certain food grains. It can also be due to genetic issues or congenital anatomical problems.

## **Alcohol**

### **Who Can Develop Alcoholic Pancreatitis?**

Most commonly, the disease develops in patients whose alcohol ingestion is habitual over 5-15 years. Alcoholics are usually admitted with an acute exacerbation of chronic pancreatitis. Occasionally, however, acute pancreatitis can develop in a patient with a weekend binging habit, or a sole large alcohol load can precipitate a first attack. Nevertheless, the alcoholic who imbibes routinely remains the rule rather than the exception.

### **How Does Alcohol Cause Pancreatitis?**

It is not known how alcohol causes acute pancreatitis, though many theories are postulated. Also, there is no universally accepted explanation for why certain alcoholics are more predisposed to developing acute pancreatitis than others who ingest similar quantities. Suffice to say some

people have a pancreas, which is more 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) and have actually developed chronic pancreatitis, which leads to intermittent acute attacks.

**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.**

#### **Is It Mandatory To Stop Alcohol For Patients With Alcoholic Pancreatitis?**

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.

#### **Narrowing Of The Pancreatic Duct**

There are many different reasons why the pancreatic duct becomes narrowed like

inflammation, stone, tumor, previous recurrent acute attacks for which cause is not found, immune system disorders (autoimmune), previous surgery or trauma. 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**

This is actually a developmental variation. The pancreas develops as two separate buds from the intestinal tube during embryological development of the fetus in the womb. Each bud has 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 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. This may eventually lead to chronic (or continuous)

pancreatitis. Although controversial, the presence of stenotic minor papillae and accessory pancreatic duct are additional risk factors that together contribute to the development of pancreatitis through an obstructive mechanism.

The treatment involves enlarging the narrowed pancreatic duct opening and can be done endoscopically (**endoscopic sphincterotomy**). Previously an open operation used to be performed for the same purpose that involves opening the duodenum (**trans-duodenal sphincteroplasty**). The operation enlarges both the biliary and pancreatic sphincters. With availability of endoscopic skills it is rarely done now.

If the pancreatic duct is very distended with chronic disease, it can be drained into a piece of bowel and the operation is called a **pancreato-jejunostomy**. If the head of the pancreas is damaged by the pancreatitis sometimes it may be necessary to remove a part of the pancreas

### Annular Pancreas

This is another developmental variation & 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 (beginning of small intestine). This can cause an obstruction to the flow of food in very young babies & is relieved by operation called **duodeno-duodenostomy**.

Alternatively the flow of pancreatic juice along the pancreatic duct may be hindered leading to acute pancreatitis. Recurrent attacks can cause finally chronic pancreatitis. This may be difficult to recognize but once it is, surgery is required. The type of surgery will depend on the exact nature of the pancreatic duct blockage.

### **Sphincter Of Oddi Dysfunction (Sod)**

There is a valve in ampulla that regulates flow of pancreatic juice and bile together. This common valve is called the **sphincter of Oddi**. Abnormal pressures in this valve due to malfunction can lead to acute pancreatitis by causing increased pancreatic ductal pressures.

### **Trauma**

Blunt injury to the abdomen may cause trivial injury to the duct, which heals with scarring

causing obstruction in the duct leading to chronic pancreatitis or recurrent attacks of mild acute pancreatitis.

### **Autoimmune Pancreatitis**

This is a rare condition. The actual cause of the condition is not known. In the pancreas of this condition there are many cells of the type that make antibodies and other cells involved with immunity. This is why it is called autoimmune pancreatitis. It is like one's own immune system active against its organs.

The diagnosis is extremely difficult to make. It requires high degree of clinical suspicion accompanied by special blood tests (level of special antibodies called IgG4 in blood), radiological imaging (CT scan) and biopsy of pancreas.

It is usually in young people who also suffer from inflammatory bowel disease. There is often obstructive jaundice and a swelling in the head of the pancreas. It is therefore often confused with chronic pancreatitis or a tumor in the head of the pancreas. In fact the correct diagnosis is usually only made after major surgery to remove the head of the pancreas (Whipple operation). The condition will respond to a course of steroids and pancreas enzyme supplements if diagnosed properly.

## Hypercalcemia

Hypercalcemia means increased blood levels of calcium. There are various causes of having high blood calcium levels. This triggers or activates the pancreatic enzymes before they are secreted in the intestines and leads self-destruction of pancreas & an attack or recurrent attacks of acute pancreatitis. The treatment involves control of calcium levels along with treatment of pancreatitis.

Often this condition is associated with another hormonal problem called hyperparathyroidism. In this the blood levels of parathormone (PTH—hormone secreted by parathyroid gland in the body) is high due to various reasons most commonly a hormone-secreting tumor in the gland). These patients have a tendency to form calcium containing stones or deposits in organs like pancreas & kidney. These stones cause duct blockage & eventually chronic 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 genetic defects. Not that it changes the treatment. These patients may present with single (1<sup>st</sup>) attack to a consultant or with repeated attacks with few investigations to a specialized HPB unit or with chronic pancreatitis to a specialist in pancreas.

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. These patients require a battery of investigations, which are done sequentially over a period, ruling out initially the common causes and those causes, which are indicated by the complete clinical picture. Only when common causes are ruled out tests are done for remaining. This is a tedious, time consuming, expensive process and tests the patience of patient & doctor alike. Ultimately, the doctor has to at time guess as to the likely cause (gut feeling) and advise the patient appropriately or council accordingly.

The pancreatitis can begin in children or young adults and is referred to as **juvenile-onset idiopathic pancreatitis**. Alternatively it may first begin in older adults and is referred to as **late-onset idiopathic pancreatitis**.

## Genetic Changes

There may be a genetic basis to the pancreatitis. This often involves an alteration to a gene called **SPINK-1** or an alteration to a gene called the **cystic fibrosis gene**, which is also called the CFTR gene. Inheritance in pancreatitis is explained in more detail below

## Does Chronic Pancreatitis Run In Families?

**In general, the answer is NO** as it is mainly due to alcohol. Nevertheless alcohol is not the problem in one in three patients and in these cases there may be a genetic basis for the pancreatitis. Therefore, although it is quite rare, it is possible for **pancreatitis to run in families** and falls into two types: hereditary pancreatitis and some forms of idiopathic pancreatitis.

## Inherited Pancreatitis

Inherited pancreatitis occurs because they have an altered gene, which predisposes to pancreatitis.

### What Are Genes?

Each person has exactly the same number of genes as every other person. The total number of

genes is 30,000. Genes are in the nucleus of each cell of the body. Genes are like the blueprints in a factory. These blueprints (or genes) enable the cell to make proteins which then organize the two other types of basic molecule (carbohydrates and fats) to create particular types of cell and hence the different organs (such as liver, arms and legs and so on).

In the cells of different organs only some of the 30,000 genes in the nucleus are selected for use. This number varies from 6,000 to 10,000 genes in any particular cell. The different combination of genes used as blueprints for making proteins is how the human body can be organized in such a complicated way (compared to a simple worm that has only 900genes).

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.

#### **What Is Mutation?**

An alteration in a gene that gives rise to a disease is often referred to as a **mutation** (this is a Latin word that simply means ‘changed’). Patients and their families with inherited pancreatitis require

the care of a specialist surgeon, pediatrician or gastroenterologist and genetic counseling.

#### **What Is Hereditary Pancreatitis?**

In this there is a tiny variation in the **cationic trypsinogen gene**.

#### **What Is Trypsinogen Gene And Its Function?**

The trypsinogen gene provides the blueprint to make a protein called trypsinogen. Trypsinogen is not active in any way and it is quite harmless. During a meal trypsinogen is secreted into the main pancreatic duct and then into the duodenum. Trypsinogen is then made very active by the removal of a protective cap at one end of the molecule. Once this cap has been removed it is now called **trypsin**, which is also an enzyme and is now very active.

#### **What Goes Wrong In Hereditary Pancreatitis?**

What happens in hereditary pancreatitis is that the protective cap of trypsinogen is removed in the pancreas. This unfortunately results in active trypsin in the pancreas. This activation occurs before it has had a chance to be secreted into the duodenum. This activated trypsin then begins to attack other proteins actually within the pancreas and causes acute pancreatitis. Affected individuals tend to develop pancreatitis as children, adolescents or young adults. There may

be other members of the family with sugar diabetes.

The gene is officially called the **PRSS1 gene** and the two commonest alterations (or gene mutations) are called **R122H** and **N29I**. There are however 20 or so different mutations that have been discovered.

**Does every family member get affected (penetrance)?**

Not all members of the family will be affected in the same way. On average only half the individuals will carry the altered gene. Either the father or the mother can pass on the altered gene and only one altered gene needs to be passed on to cause pancreatitis. The technical term for this kind of inherited disease is **autosomal dominant**. ('Autosomal' refers to the fact that is not linked to the sex genes and 'dominant' means that the altered gene is stronger than the normal gene). 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 will not be affected at all. We call this **80% penetrance** because the disease will only 'penetrate' into 80% of people with altered gene.

**Is There Any Test For Gene Mutations In Pancreatitis?**

The presence of the gene can be tested for by a single blood test. Genetic counseling 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**

Up to half of all patients with idiopathic pancreatitis have inherited one of two other altered genes that can trigger pancreatitis. One is called SPINK-1 and the other is called CFTR.

In order to protect the pancreas against accidental conversion of trypsinogen to trypsin, humans have been equipped with a safety mechanism called **SPINK-1**. This is a special enzyme that destroys any active trypsin in the pancreas and hence stops pancreatitis from occurring. Unfortunately some individuals have an alteration in SPINK-1 (**N34S mutation**), **which** destroys the safety mechanism.

About one in fifty people have this mutation but less than 1% of these people ever get acute pancreatitis. In other words this altered gene has less than 1% penetrance, or **very low penetrance**. This means that there is some other reason as well for the pancreatitis. This means that even though this mutation was inherited from either the mother or the father, the parents are usually not affected. Also this means that the disease is very unlikely to be passed on to the children even though there is a fifty-fifty chance that this mutation will be passed on to them.

Some patients have an alteration in the gene that causes **cystic fibrosis, known as the CFTR gene**. This gene provides the blueprint that makes a protein also called CFTR. This protein regulates the passage (or conductance)

of small molecules through the outer surface (or membrane) of the cell. An alteration in both genes (the one from the mother and the one from the father) causes the disease called cystic fibrosis. For all of these reasons the full name of the gene is the cystic fibrosis transmembrane conductance regulator 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. People with idiopathic pancreatitis only have one CFTR gene mutation (either from the mother or from the father). This type of genetic disease is therefore called **autosomal recessive**. 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 usually progress to chronic pancreatitis. Most patients are actually never investigated for these rare causes for want of facility, lack of knowledge or awareness and high cost of investigations. They directly come to pancreatic surgeon with full-blown chronic pancreatitis. This also applies to a number of other causes of acute pancreatitis but gallstones never cause chronic pancreatitis.

### **Tropical Pancreatitis (Chronic Calcific Pancreatitis)**

### What Are The Symptoms & Signs?

The main symptoms of chronic pancreatitis are **pain, weight loss, poor digestion, and sugar diabetes**. There are no specific signs of chronic pancreatitis. Usually patients are emaciated due to malnutrition & have tenderness in the epigastrium.

There are many causes for abdominal pain so that it is essential to establish a diagnosis of chronic pancreatitis by investigation.

### How Is Chronic Pancreatitis Confirmed?

There is no specific blood test for chronic pancreatitis the way it is in acute pancreatitis. This makes the diagnosis difficult and expensive. The diagnosis is usually achieved by imaging studies like [USG](#), [CT scan](#), [MRI](#), [MRCP](#), [EUS](#), and [ERCP](#). However in some cases all these tests are also not sufficient especially earlier in the course of illness. Sometimes special tests (**PANCREATIC FUNCTION TESTS**) are performed to assess the pancreatic function in patients suspected to have chronic pancreatitis.

## Tests For Pancreatic Enzyme Production

These tests are not very accurate; very few patients actually require them and different institutions use different tests. They are available in specialist pancreas units. These include:

### Fecal Elastase Test

Elastase is one of the enzymes produced by the pancreas to digest protein. There is always a small extra amount produced which can be measured in the stool. The extra amount of elastase produced is related to the amount of normal pancreatic function. The fecal elastase test is used for screening and monitoring. More complicated tests may also need to be used if the final diagnosis is not clear.

### 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.

### 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 metabolized is determined by taking a simple breath test at a fixed time following ingestion of a small amount of triolein.

#### Fecal fat test

This is a good 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. (Pancreatic enzymes present in the stool can be measured simultaneously.)

#### Secretin test

This is performed in only a few very specialist pancreas units and is very accurate (like the fecal 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 usually carried out as an outpatient procedure.

### **Tests For Sugar Diabetes Or Diabetes Mellitus**

Urine for sugar using a simple technique of dipping a special strip of paper into a sample. Depending on the amount of sugar, it changes color (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 fingertip.

A patient who is thought to be developing diabetes can be tested by a glucose tolerance 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.

Glycosylated Hemoglobin test is a special method of checking a patient's blood sugar control over previous three months. A blood sample can be provided for this at any time of the day irrespective of fasting status.

Sometimes there is confusion between chronic pancreatitis and pancreatic cancer. These patients require **Tumor Markers** & **Biopsy** to reach the diagnosis. Similarly patients with autoimmune or idiopathic or hereditary pancreatitis require special tests to find the cause of pancreatitis. (See above)

### **What Is The Treatment For Chronic Pancreatitis?**

Many patients can be treated by medical treatment only, but a few will require surgery.

1. Stop all alcohol drinking if this is the cause. If a patient works in an alcohol related industry such as a brewery or bar or pub, a change of employment is recommended. A change of lifestyle is often very helpful. Attendance at a drug addiction unit also can be very helpful.
2. Ideally smokers need to stop smoking altogether. Smoking can lead to pancreatic cancer especially in-patient with chronic pancreatitis.
3. Pancreatic enzyme supplements prescribed by specialist help digestion and may reduce the pain.

4. If sugar diabetes is present, then insulin treatment will be required.
5. Mild pain-relieving tablets are acceptable. However they are not without side effects like hyperacidity and constipation, but worst is dependence or addiction. It is sometimes suggested that the nerves of the pancreas responsible for taking the sensation of pain to the brain should be destroyed. This may involve an injection into the back to destroy the nerves around the pancreas. Most pancreatic surgeons do not recommend this, as any effect is short-lived and can make any further surgery very difficult.
6. There may be severe weight loss and even malnutrition despite attempts to take adequate amounts of pancreas enzyme supplements at home. To correct this it may be necessary to have a prolonged period of in-hospital treatment. In this case both the nutrition and pain teams will become involved. If you have sugar diabetes the diabetic team will also become involved.
7. **Keeping your weight up during the illness can be very difficult.** At all times you will be encouraged to eat by mouth and drink what fluids you can. The

nutritionist who will advise on specific diet & other ways to improve your calorie intake will see you.

This includes the insertion of an **NG tube** into the stomach (**naso-gastric tube**) and giving you a continuous liquid diet down this tube. If you are unable to tolerate the NG tube a narrow tube will be inserted into the small bowel (jejunum) using a flexible endoscope. This is like regular endoscopy and is done with local anesthetic spray to the back of the throat and intravenous sedation. The tube is called an **NJ tube or naso-jejunal tube** and the feeding with a liquid diet slowly dripped in using this tube is called **naso-jejunal feeding**.

Alternatively you may be fed with a **PEG tube** (percutaneous endoscopic gastrostomy). A PEG tube is inserted using a flexible endoscope, inflating the stomach with air and pushing a guide wire through the skin into the stomach. A permanent feeding tube is then passed over the guide wire into the stomach. With a PEG tube you can eat and drink as much as you feel like. Any extra calories can then be given using a liquid diet dripped into the PEG tube. You may well

be sent home with the PEG tube still present.

8. Sometimes extra feeding has to be given straight into a vein and is called **Parenteral feeding**. This can be done by inserting a long catheter (tube) into a vein in one of the arms and then the tip is pushed into one of the large veins close to the heart (this is called a **PIC line**). If the arm veins are collapsed then a catheter will need to be pushed into one of the neck veins and then the tip is pushed towards the large veins near the heart. This is sometime called **TPN or total parenteral nutrition**.

### Who Is Advised Surgery In Chronic Pancreatitis?

This is necessary if the pain becomes severe and cannot be properly treated by simple painkillers or if there are complications of chronic pancreatitis. **Not all patients with pain and all complications require a surgery. There can be different views regarding treatment amongst specialists treating the patients.**

## What Are Complications Of Chronic Panreatitis?

### Biliary obstruction

Obstruction of the bile duct is quite common. This happens because the pancreatitis in the head of the pancreas can press on the bile duct and cause it to become partly blocked. This causes jaundice. The blockage may be temporarily treated by inserting a stent endoscopically or percutaneously. Occasional very carefully selected patient may be able to avoid a surgery due to long-term biliary stents and dilatation.

The narrowing (or stricture) is ‘bypassed’ using a special small bowel channel. (Small intestine is joined to the bile duct) This operation is called a **hepatico-jejunostomy** or **choledocho-jejunostomy**. Sometimes a very simple bypass is created by joining the bile duct directly onto the duodenum and is called **choledocho-duodenostomy**. ‘Choledodocho’ is two words (from Greek and Latin) meaning bile (chole) and duct (docho), whilst ‘hepato’ refers to the bile duct as it leaves the liver. Usually this is accompanied by a pancreatic drainage procedure of some sort, usually head coring.

Often patients will have both biliary & duodenal obstruction along with pancreatic pain &/or a mass in head. These patients require more

extensive resectional surgery wherein the entire disease bearing area including pancreatic head, obstructed portion of bile duct, entire duodenum is removed & structures reconstructed. This is called Whipple's operation.

### **Duodenal obstruction**

Obstruction of the duodenum is also quite common. This happens because the pancreatitis in the head of the pancreas can press on the duodenum and cause it to become partly blocked. This causes a feeling of sickness (nausea) and vomiting after food. This will obviously contribute to weight loss. The narrowing (or stricture) is 'bypassed' connecting the small bowel to the stomach. This operation is called a **gastro-jejunostomy** or **gastric bypass**.

As mentioned before often patients will have both biliary & duodenal obstruction along with pancreatic pain &/or a mass in head. These patients require more extensive resectional surgery wherein the entire disease bearing area including pancreatic head, obstructed portion of bile duct, entire duodenum is removed & structures reconstructed. This is called Whipple's operation.

## **Pseudo cyst:**

### **What is a pseudo cyst?**

(Pronounced ‘Sue-doe-cyst’) This is a cystic (filled with liquid) swelling which lies in the pancreas or next to the pancreas and which contains high concentrations of pancreatic enzymes.

### **How does a pseudo cyst form in chronic pancreatitis?**

In chronic pancreatitis, often the duct ruptures under pressure, leaking the juice into the peripancreatic area. This gets walled off due to intense inflammatory reaction and forms cystic collection & this is pseudo cyst.

Pseudo cysts associated with acute pancreatitis often disappear without any specific treatment. However those with chronic pancreatitis don’t because they usually communicate with the duct.

### **What are the complaints for patient?**

If a pseudo cyst remains or enlarges, it may cause nausea, vomiting, pain and weight loss, in which case, treatment is necessary. Occasionally patient can have bleeding within the pseudo cyst or the cyst can rupture spontaneously causing severe acute pain in the abdomen & shock like

symptoms (fainting & sweating) and signs (drop in blood pressure).

Rarely pseudo cyst ruptures into a loop of intestine or stomach spontaneously and drain off leaving no mark. (Lucky, isn't it!!!). But it can rupture into peritoneal or pleural (chest) cavity leading to abdominal distension or discomfort in breathing respectively (MORE COMPLICATION).

#### **What is the treatment for pseudo cyst?**

There are different ways to treat large pseudo cysts. Sometimes it is possible to insert a tube into the pseudo cyst under local anesthetic in the X-ray department and drain the fluid away without surgery. This is called **external drainage** or **percutaneous drainage**. However this can lead to infection or formation of continuously discharging track called external pancreatic fistula. Hence not really recommended for patients with chronic pancreatitis.

The pseudo cyst can be drained internally by **endoscopic stenting** into the stomach or by stenting the pancreatic duct or just placing a tube into the duct, draining the cyst into duodenum.

Often the most appropriate method is surgery. The operation of **pseudocyst-jejunostomy** drains the pseudo cyst into a specially created small

bowel channel. The operation of **pseudocystgastrostomy** drains the pseudo cyst into the stomach.

Rarely one requires a resection of pancreas, head or body & tail, depending on location of cyst. However it is avoided as much as possible to preserve maximum amount of functioning pancreas.

### **Pancreatic Fistula**

The term ‘fistula’ is an old medical term meaning an abnormal connection between one surface and another. When there is a connection between the pancreatic duct and the skin this is known as an **external pancreatic fistula**. This happens naturally as part of the treatment (surgery or percutaneous drainage) of many patients with extensive pancreatic necrosis. Similarly it can occur after percutaneous drainage of pseudo cyst of chronic pancreatitis.

As the enzymes reach the skin they now become activated by skin bacteria. This causes the skin to become raw and can be very sore. A special bag needs to be placed on the skin to keep the fluid away from the skin, although this is often not entirely successful.

External pancreatic fistulas with chronic pancreatitis are difficult to dry up spontaneously

because most often there is an obstruction in the pancreatic duct proximally. Similarly use of **octreotide injections** to reduce pancreatic secretions will not much help.

It is necessary in such cases to encourage closure of the fistula by **pancreatic stenting** or sometimes a surgery is required. The surgery may involve joining an isolated segment of intestine to the fistula tract – Fistulojejunostomy, or removal of portion of pancreas—pancreatectomy.

When there is a connection between the pancreatic duct and some other surface in the body this is called an **internal fistula**. An example is when pancreatic fluid leaks into the abdomen to cause **pancreatic ascites** (see below). If the pancreatic fluid leaks into the chest cavity this is called a **pleural fistula**. This fluid as such is not harmful, as the enzymes in the pancreatic juice are not activated.

This would again necessitate **pancreatic stenting** or sometimes a surgery is required. A stent insertion is difficult in such patients with internal or external fistulas because it necessitates negotiating the stent across a stricture, then going across the defect and then often placing the stent in very small diameter distal duct. This can fail even in the hands of very experienced endoscopist or can introduce infection. Therefore one should always be prepared for an emergency

surgery when a pancreatic stenting is planned. In even more exceptional circumstances surgery is needed to control the fistula such as using a small bowel channel to drain the fistula internally. This operation is called a **Roux-en- Y fistulo-jejunostomy**. Occasionally a portion of pancreas, depending on the site of leakage in the pancreatic duct needs removal (pancreatectomy). More often than less it is the distal portion.

### **Ascites**

(Pronounced ‘ass-eye-teas’). This refers to the build up of straw colored fluid in the abdomen. This sometimes follows portal vein thrombosis. Because of the pressure in the venous collaterals not all of the fluid that should be returned to the liver can be. This fluid therefore accumulates in the abdomen.

Normally this condition will slowly improve but sometimes you will need treatment with a special water tablet (called **spironolactone**) and tablets or injections (often using a drug called **octreotide**) to reduce the pressure in the varices and venous collaterals. In addition you may need to be admitted to hospital to drain the fluid by inserting a tube into the abdomen (usually in the X-ray department) under local anesthetic. This type of drainage is called an **ascitic tap**.

If the ascites is still a problem you may need surgery to drain the fluid from the abdomen into one of the veins in your neck or leg. The fluid then becomes part of the normal blood circulating around the body.

Another rare cause of ascites is specifically called **pancreatic ascites**. This is because the fluid instead of being straw colored is white and contains a large amount of pancreatic juice. The pancreatic fluid escapes from the main pancreatic duct because of direct damage to the duct by the pancreatitis or indirectly by a small hole in a pancreatic pseudo cyst. This is therefore called an internal pancreatic fistula (see above).

Dealing with pancreatic ascites can be very complicated depending on all of the other things that may be causing it such as a pseudo cyst. Thus the treatment may be simple, needing only an **ascitic tap**, it may be necessary to use **pancreatic stenting** or **octreotide injections** to reduce pancreatic secretions or a **pseudocyst-jejunostomy** if there is also a pseudo cyst (see above). It may be necessary to combine one or more of these operations with a **pancreatic resection** if there is also long standing pain.

### **Splenic vein thrombosis**

A thrombus simply means blood clot. In chronic pancreatitis it is quite common for the splenic

vein to become blocked off because of a clot. This is because the pancreatitis irritates the splenic vein to cause the clot. Sometimes the clot and blockage of the splenic vein becomes permanent and you are now at risk of **venous bleeding** (bleeding from the system of veins). Splenic vein clot is not removed and patient is treated only if he or she develops varices and bleeding. The treatment of venous bleeding is described below.

### **Portal vein thrombosis**

This is an unusual complication of chronic pancreatitis. The pancreatitis irritates the portal vein to cause a clot. The clot can extend into nearby splenic vein or mesenteric vein. There is a risk that the clot and blockage of the portal vein will become permanent and cause **venous bleeding** (bleeding from the system of veins) or a build of fluid in the abdomen (**ascites**). The treatment of venous bleeding and ascites is described below.

Can the clot be removed from portal vein?  
It may be possible to clear the clot (also called a **thrombectomy**) in the portal vein using a procedure performed in the X-ray department. Usually using local anesthetic (but sometimes requiring a general anesthetic) a wire is pushed through the skin and into one of the branches of the portal vein within the liver. The guide wire is

then advanced towards and through the blood clot. A special miniature wire basket is then used to try and retrieve the blood clot. The full name of this procedure is percutaneous trans hepatic portal venous thrombectomy or just **percutaneous thrombectomy**.

If this is not successful then it may be possible to insert a tube through the clot to keep the vein open using the same guide wire. This is known as percutaneous trans hepatic portal venous stenting or just **percutaneous venous stenting**. If stenting is successful then your doctors may decide to give you long-term aspirin (which prevents the platelets that cause a clot from sticking together) or warfarin (which keeps the blood thin). There is a special way of checking if there is blood flow through the portal vein using ultrasonic waves (similar to that used by submarines). This test is called **duplex scanning** and is performed in the X-ray department. This is similar to a normal ultrasound examination.

### **Venous bleeding:**

#### **Why patients have bleeding after venous thrombosis?**

If there is permanent splenic vein thrombosis and/or portal vein thrombosis and /or mesenteric vein thrombosis then the blood pressure will build up in the tiny vessels that normally drain

into these big veins. The tiny veins now become much larger and are called **venous collaterals**. These slowly increase in size over some months or years and become tortuous. These are then referred to as **varices** (similar to varicose veins in the legs, but now inside the abdomen).

The varices may appear in the stomach and in the lower gullet and rarely in the duodenum or jejunum. There is a small but real danger that bleeding may occur from rupture of one of these varices. For this reason it is important that you maintain close contact with your consultant in outpatients.

#### **Can the varices be treated?**

From time to time the consultant will organize for you to have an **endoscopy of the gullet and duodenum** to see if the varices have enlarged. If the varices are large then they can be injected with medicines called sclerosing agent, using the endoscope – this is called **endoscopic sclerotherapy (EST)** or ligated using special endoscopic bands – this is called **endoscopic variceal ligation (EVL)**.

If bleeding does occur you will need to come to hospital as an emergency – usually there is vomiting of blood. In this situation you will be admitted to ICU, given intravenous fluids & blood transfusion. You will also be given

injections or a continuous infusion of special drugs that will reduce the pressure in the varices. This will then be followed by endoscopic sclerotherapy. These measures are usually successful.

### **Will surgery be required for variceal bleeding?**

Very occasionally the bleeding will keep recurring and in this case surgery is required. The operation will involve removal of the spleen and disconnection of the varices from the stomach. This operation is called **gastric devascularisation and splenectomy**.

### **Are there novel nonsurgical options?**

Occasionally a stent is introduced across the hepatic and portal veins (TIPSS) draining the blood from portal circulation into main system thereby decreasing blood pressure in varices and stops bleeding. Few carefully selected patients require a surgically created shunt to drain the blood and stop recurrent bleeding.

### **Arterial bleeding:**

#### **Why does it occur?**

This can sometimes happen during the natural course of chronic pancreatitis because the

pancreatitis or leaked juices cause an irritation and erosion of the outer wall of an artery near the pancreas. This can especially occur in the wall of a pseudo cyst.

### **What is a pseudo aneurism?**

Sometimes this may cause a pulsating sac to be created next to the artery. This is called **pseudo aneurysm** (pronounced ‘Sue-doe an-new-rism’). This is very likely to bleed with serious consequences. In either case it is important to block off the small gap in the artery responsible. Your doctors are however prepared for this.

### **What is done for arterial bleeding?**

If this does occur whether you are in the ward, in HDU or in ITU you will be taken immediately to the X-ray department. You will be placed on an X-ray table, the skin cleansed with antiseptic and covered with sterile gowns. Under local anesthetic a tube will be inserted into the artery in either the left or right groin (called an **arterial catheter**). ‘Dye’ (or contrast) is then injected into the catheter to see where it goes using an X-ray television screen. The catheter can be guided to the exact place where the bleeding is taking place (this is called **selective arteriography**). The bleeding will then be stopped by injecting special metal coils and glues into the catheter (this is called **embolization**). The whole procedure is

called **selective arterial embolization** and is highly successful. Arterial embolization can sometimes result in decrease or stoppage in blood supply of small or large segment of intestine supplied by it. This can cause perforation or gangrene of the intestine and would require a surgery for the same.

### **Will surgery be required?**

Only rarely is it necessary to try to stop the bleeding with **open surgery** and is only performed if the selective arteriography has not identified the source of bleeding or if the selective arterial embolization has failed.

### **Colonic or small intestinal narrowing (stricture)**

Continuous inflammation in the peripancreatic area can cause arterial thrombosis (blockade) of the nearby intestine over a period. This gradual reduction in the blood supply doesn't cause bowel gangrene but definitely leads ulceration in intestinal walls, which heal, with scarring leading to narrowing of lumen. Colonic narrowing may be treated by endoscopic dilatation or a surgery. Small intestinal obstruction invariably requires a surgery.

## Does Chronic Pancreatitis Lead To Cancer?

Unfortunately it does appear that some patients with chronic pancreatitis are more likely to develop pancreatic cancer, as they become older. ***The risk is greatest amongst smokers.*** The risk appears to increase with age and with the duration of symptoms. The risk is lowest in those under 30 years old and highest in those over 70 years of age. The overall risk is increased about twenty times in patients with ordinary chronic pancreatitis compared to the general population.

The overall risk in those with hereditary pancreatitis is about seventy times in patients compared to the general population. It is recommended by the International Association of Pancreatology that all patients with hereditary pancreatitis be under the care of a specialist pancreas center. Patients with hereditary pancreatitis will receive advice at their specialist center on the best form of screening for pancreatic cancer so that it can be detected early. Screening will not normally commence before the age of 40 years as the cancer nearly always occur after that age. These risk factors of smoking and inheritance are ‘independent’ and therefore **all patients are recommended not to smoke – at all.**

## Severe Pain

Once it is necessary to be taking strong painkillers on a regular basis, then surgery will be required. Similarly whenever there is documented obstruction, surgery is best option for relieving pain. A **pain team** will always be involved to help obtain the best kind of pain relief.

*If you drink alcohol then you must stop - as good pain control is not possible if you continue to do so.*

The chances of achieving a good result following surgery for pain are at least 80% in the first instance. There is, however, no guarantee of success and some patients may develop a recurrence of pain sometime after surgery. This may necessitate further surgery or use of other means of decreasing pain. For these reasons, it is essential that the patient and relatives and friends remain committed to addressing all the social problems as well as the medical problems involved. Patience, faith in treating doctors and optimism is the key elements.

In properly selected patients, surgery more often than not would at least result in decreasing reduction in pain medication and improve quality of life for patient.

The underlying disease process will largely dictate the choice of operation. Some operations can be relatively simple – for example removal of a single pancreatic stone, enlarging a narrowing of the pancreatic duct or performing an internal drainage operation for a dilated pancreatic duct. In principle, however, a resection of part of the pancreas (**partial pancreatectomy**) will be required if there has been severe pain.

Operations have become more ‘conservative’ in recent years. This means that **only** the affected pancreas tissue is removed and that other nearby organs such as the duodenum, stomach and spleen are left untouched. **This is so-called “designer-pancreatic surgery”**. This type of surgery is particularly demanding and requires a specialist pancreatic surgeon to undertake the procedure.

Although it is nearly always intended to preserve the spleen, this may prove excessively difficult at operation when it becomes necessary for reasons of immediate safety to the patient to remove the spleen (**splenectomy**).

In addition to relieving pain, the principal aims of designer-pancreatic surgery are to improve drainage of the pancreas, reduce the risk of developing diabetes (diabetes mellitus), and maintain important normal anatomy.

### **Coeliac plexus nerve block**

The nerves from the pancreas collect just behind the pancreas in a thick bundle called the coeliac plexus (coeliac is pronounced ‘see-lee-ack’). These nerves can be injected using a long needle and local anesthetic in the X-ray department or using a needle with the endoscope during EUS (see above).

If a local anesthetic is used this may improve the pain, usually for a few weeks. It is also possible to block the nerves permanently using special chemicals (called sclerosants) such as concentrated alcohol. Unfortunately the pain relief only lasts for a few weeks or months and causes severe damage to surrounding tissues. This includes the pancreas itself, major veins and major arteries. If surgery on the pancreas is then needed it will be more dangerous and may not be possible. For these reasons permanent coeliac plexus block is *not recommended* till very late.

### **Bilateral Thoracoscopic Sympathectomy (BITS)**

This procedure involves cutting the pain nerves from the pancreas as they travel through the chest towards the spinal cord in the spinal canal. The operation is done using fine instruments and telescopes using general anesthetic and is simple and safe to perform. This is a ‘keyhole’ surgery.

The operation is most successful in patients with rather moderate pain but the pain returns in most patients after about 12 months. In some cases in which surgery has failed to control pain even though the entire pancreas has been removed it may be helpful to undergo this operation.

### **Major Pancreatic Surgery**

#### **Peustow Procedure**

In this operation no tissue is removed but the dilated main pancreatic duct is drained into the small bowel. This operation is used if the pancreas is not badly affected apart from obstruction to the pancreatic duct.

#### **Frey's Procedure**

This is almost identical to the Peustow operation but some tissue is removed from the head of the pancreas. The cut end of the pancreas is joined to intestine to drain the pancreatic juice.

#### **Whipple's Operation**

This operation is suggested if there is associated obstruction of surrounding organs like bile duct & duodenum, if there is a mass in head of pancreas or if there is concern about the presence of a small cancer. Part of the stomach is removed

along with the pylorus, the duodenum and the head of the pancreas with lower part of bile duct. The cut end of pancreas & bile duct are joined to small intestine, so is the stomach.

### **Left Pancreatectomy**

In this operation the left part of the pancreas is removed. This operation is performed if the head and neck of the pancreas are completely normal. The spleen is normally preserved, but may need to be removed sometimes.

### **Conservative Total Pancreatectomy**

In this operation 95% of the pancreas is removed. A small amount of pancreas tissue is preserved near the duodenum to maintain its blood supply. The spleen is also preserved if possible. This operation is performed if the whole of the pancreas is badly affected.

Designer total pancreatectomy may be necessary especially if there has been previous pancreatic surgery, if the patient already has sugar diabetes and in exceptional circumstances there is concern regarding the possibility of cancer in very high-risk individuals.

**There are many more possible variations in the pancreatic surgery depending on the need of the situation.**

## After My Operation

Following the operation it is common practice for you to be cared for on a special ward that has a high ratio of nurses to patients, has provision for expert anesthetic care and has good monitoring facilities. The type of units and their names may vary from hospital to hospital.

Typically you will be cared for in a Post-Operative Critical Care unit **for** intensive monitoring for the first 24 hours. Following this you will be transferred to a High Dependency Unit (**HDU**) for several days until your condition has improved sufficiently for you to be returned to the regular **ward**. If there are serious complications you may need to be transferred to the Intensive Therapy Unit (**ITU**) but this is usually not necessary as most complications can be dealt with on the HDU or just the regular ward.

For the first few days you will only be able to drink fluids but the amount will increase from day to day. After six or seven days a light diet will gradually be introduced. In the absence of any major complications you would expect to be in hospital for two to three weeks.

You will feel quite weak after the surgery. Your strength will gradually improve although this is

likely to take 6-12 months before you feel one hundred percent. It may be necessary for you to take some pancreas enzyme tablets to help your digestion during the recovery period (see below). You will feel and look quite normal. Unless you have had a total pancreatectomy you will not become diabetic. You will be able to drink and eat all the foods that you normally would.

### What Can I Eat?

You should eat at regular intervals. It is usually better to take four or five snacks a day than a full meal. (**MULTIPLE SMALL MEALS**). Avoid fatty foods such as butter, eggs, fried foods, sausages and bacon.

It is likely that you will need pancreas enzyme supplements (see below) and even insulin if you have developed sugar diabetes (see below).

### Can I Drink Alcohol?

Alcohol is not recommended for patients who have **chronic pancreatitis**. If alcohol is not the cause of your pancreatitis you may drink alcohol if you wish.

A **unit of alcohol** is 100mls of 10% alcohol (by volume) equivalent to a half-pint of regular beer or lager, a regular glass of table wine. The **recommended intake for healthy adults** should

be no more than 21 units per week for women and no more than 28 units per week for men.

### 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.

### 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. (**MULTIPLE SMALL MEALS**) 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.

If you have had extensive pancreatic necrosis it is likely that you will need pancreas enzyme supplements (see below) and even insulin if you have developed sugar diabetes (see below).

## **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 influenza type b** vaccination. Children will also need to take a daily antibiotic. The risk is much less in adults, but nevertheless daily antibiotics are usually prescribed. 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.

**Above information will help you to make an informed decision but it cannot replace the professional advice and expertise of a doctor who is familiar with your condition. You may have questions that are not covered; you should discuss these with your surgeon. You must remember every individual is different.**

### **Doctors Dealing With Pancreatic Disease That You May Meet**

**Dietician:** This is a specialist who is not a doctor but is an expert in advising on various types of diet.

**Endocrinologist:** A physician who is highly specialized in glandular problems including sugar diabetes.

**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 and EUS, which are specialist forms of endoscopy that examine the biliary and pancreatic ducts and the pancreas

**Gastroenterologist:** A physician who is highly specialized in ‘gut’ problems and is also usually an ‘endoscopist’.

**General physician:** A consultant medical doctor who works in a hospital and who is broadly specialized including ‘gut’ problems.

**General surgeon:** A consultant surgeon who works in a hospital and who is broadly specialized including ‘gut’ problems.

**Geneticist:** A consultant who specializes in diseases which may be inherited and may be able to provide additional help to that normally given by your other specialist doctors.

**Nutrition team:** A team of specialist doctors and nurses involved in providing specialist nutritional support, including the insertion of venous access lines and special stomach tubes to help patients who are unable to eat properly.

**Pediatrician:** A consultant who specializes in the care of children and who may be called to investigate a pancreatic problem in young children or teenagers.

**Pain team:** A team of specialist doctors who specialize in providing special treatment measures and support for patients who are experiencing difficulties in pain control.

**Radiologist:** A consultant who specializes in taking X-rays and scans of various sorts at the request of other specialists.

**Specialist surgeon:** A general surgeon who is highly specialized – a so-called PB-specialist is a pancreato-biliary surgeon.