PANCREAS

MUSEUM CATALOGUE

Department of Pathology, University of Adelaide, 2004

PANCREAS

INTRODUCTION

The specimens in the museum focus on disorders of the exocrine pancreas, disorders that are important because of their high morbidity and mortality.

The gland is located in the retroperitoneum and is surrounded by adipose tissue. In the adult it measures approximately 20cm in length and its cut surface has a lobular appearance. In the adult the parenchyma of the pancreas often contains variable amounts of adipose tissue that may or may not be appreciated macroscopically.

The pancreas has a dual composition: an exocrine component and an endocrine component. Lobules of acini that empty into ducts form the exocrine component. The cytoplasm at the base of the acinar cells is intensely basophilic because of the abundance of granular endoplasmic reticulum, necessary for protein production. The apical cytoplasm is more eosinophilic due to its content of enzyme containing granules ready for secretion. The smaller ducts are lined by simple cuboidal epithelium that secretes bicarbonate and the larger by simple mucin secreting columnar epithelium. The exocrine secretions of course are extremely important in digestion. The endocrine component is represented by the Islets of Langerhans, rounded clusters of endocrine cells scattered amongst the exocrine glands that release their content into adjacent capillaries. The islets are composed of 4 main cell types that produce and release different hormones:

- B cells secrete insulin
- A cells secrete glucagon
- D cells secrete somatostatin
- PP cells secrete pancreatic polypeptide

Any comments on this catalogue are welcome. Please contact a member of the department.

HOW TO USE THIS CATALOGUE

This catalogue can be used as a tool to develop your knowledge, as well as provide an opportunity for revision.

It is divided into:

- Introduction and approach to specimens of the pancreas (pages 141-143).
- Index (page 144). Examples of specific diagnoses can be found via the index.
- Core and classic disease processes (pages145- 150). This gives examples and discussion of core and/or classic diseases of the pancreas. These are the specimens that students should focus on being able to identify initially. However, it depends to some extent on what you have covered in lectures and practical classes or resource sessions as to what you should know. Some of the specimens and discussion are directed more towards clinical medical students.
- Main catalogue (pages 151-157). This section covers the specimens in numerical order. Questions and/or comments accompany some of the specimens to help you expand your knowledge. In order to fit more specimens in the museum, not all of the pots are in numerical order on the shelves, and large specimens are often found on the bottom shelves.

You might find it useful to work quietly with a few friends and to have a few textbooks handy (e.g. pathology, medical, anatomy). You will also find that you can learn some anatomy and clinicopathological correlation from the specimens and information given.

You do not have to examine every single specimen in the museum. However, just as in clinical practice, you will not become proficient in diagnosing something if you have only seen one case.

Exposure to a variety of cases (specific diagnoses can be found via the index) to experience the variability in morphology will help your learning greatly. In general red and blue dots indicate basic and straightforward cases, whereas yellow dots indicate a more complex case. This is not a hard and fast rule, and you will find yellow dot specimens turning up in resource sessions/practical classes and even exams, if they represent classic pathology.

In general

- read the clinical information given
- look at the entire specimen, not just the front
- identify and orientate the organ or tissue (where possible)
- from your knowledge of pathology (which will come with time) look for relevant features to help you make the diagnosis. Of course to appreciate the abnormal you first need to have an appreciation of normal anatomy to be able to recognize and orientate the organ/tissue and the abnormalities
- make a diagnosis or differential diagnosis using any clinical information given to you – it is often relevant – sometimes the diagnosis is only made with knowledge of the clinical features. Even when you know the diagnosis, attempt to identify relevant features in the specimen and understand why this is the diagnosis.
- attempt to correlate the pathological features with the clinical features (clinico-pathological correlation) i.e. explain how the pathological features have caused the patients symptoms and signs (when relevant)
- try to answer any questions presented yourself before reading the answers.

You may prefer to look at the specimen 'blind', without reading the clinical information given first.

Remember that some of these specimens are very old, and some of the investigations and treatments mentioned may be out of date.

Limits to diagnosis on macroscopic examination

In all cases a diagnosis is given in the catalogue, sometimes it was made based on the stated clinical history and histopathological findings. In some cases the macroscopic appearance is classic and even without the clinical information and histopathological findings you should be able to make the diagnosis from the appearance, in others, it might only be possible for you to give a list of differential diagnoses or a more general diagnosis.

In relation to pathology pot specimens in examinations, you may be asked

- for a diagnosis
- for a description
- about the pathogenesis of the disease
- about the predisposing factors and/or causes of the disease
- about the potential complications of the disease and how they arise
- to explain a patient's clinical symptoms and signs or investigation results in light of the pathological abnormalities present
- to describe the expected histological abnormalities in the abnormal areas

or other searching questions that we can concoct.

BASIC APPROACH TO INTERPRETATION AND DESCRIPTIONOF OF PANCREATIC PATHOLOGY SPECIMENS

Students are expected to be able to give a brief succinct description of relevant macroscopic features of a specimen using appropriate terminology, as well as to arrive at a diagnosis or differential diagnosis. Even if not asked for a description, identification of relevant features is helpful in the diagnostic process. Your descriptive skills will improve with practice.

In any aspect of medicine, one needs to approach things in a systematic manner; otherwise important points may be omitted.

- Read the clinical history, it will often provide relevant information
- Look at the front of the pot first (i.e. the one with the number and the dot), but always make sure to look at the back and sides as well.
- Identification of and description of the abnormality.
    - Decide and state whether the organ is of normal size, too small (is it atrophic?) or too large (?oedematous)
    - Is the abnormality focal or diffuse (involving the entire organ, region or tissue)?

    ### Focal lesion

    The description of a discrete or focal macroscopic lesion can incorporate a number of features.

    Size: Give an approximate measurement

    Shape

    Colour: What colour is it? Is it all one colour or is it many colours (variegated)? Does it look homogenous (all the same the whole way through)?

    Consistency: This is of course difficult when the specimen is in a pot and you are unable to touch it. But even just by looking you can get some idea: Does it look solid or firm? Pancreatic carcinoma tends to induce a florid desmoplastic response (fibrosis in and around the tumour) giving it a hard consistency.

    Margins: Are they well defined/demarcated, or irregular?

    ### Diffuse

    The main diffuse lesions of the pancreas are acute and chronic pancreatitis. When more severe, the former may be haemorrhagic in type where there is extensive haemorrhage throughout the organ. Otherwise the features of acute pancreatitis are subtle, and the diagnosis is mainly suggested by the presence of flecks of white fat necrosis in and around the organ. In chronic pancreatitis the organ tends to be fibrosed and shrunken.
- Identification of the major pathological process. In some cases it may be helpful to identify the general pathological process that the abnormality represents e.g. inflammatory or neoplastic (benign or malignant, primary or metastatic). This will be especially useful if you don't immediately know what the diagnosis is, at least you will be able to 'ball park' it. To do this it may be helpful to go through the surgical/pathological sieve.
- Identification of related lesions. By now you should have some idea of what you think the diagnosis, or at least the differential diagnosis, is. You should now think about what you know of this condition and look for, and describe, other relevant features that may confirm or refute this diagnosis e.g. is the common bile duct dilated (if present) in a specimen of carcinoma of the head of the pancreas.
- Other pathologies. Have a look at the rest of the specimen to see if there are any other abnormalities. If they are present, describe them.
- Diagnosis. State your diagnosis or differential diagnosis. Be as precise and specific as possible. Use any relevant clinical information given to help you. Sometimes a precise diagnosis is not possible but a presumptive diagnosis based on the macroscopic and/or clinical findings is. If you can't decide on one diagnosis, give a list of reasonable differential diagnoses, in order of decreasing likelihood, give a more general diagnosis (e.g. malignant tumour), or at least attempt to identify the pathological process.

INDEX: PANCREAS

CORE AND CLASSIC DISEASE PROCESSES

PANCREAS: ACUTE PANCREATITIS

CASE 24397

Clinical information
This 63-year old man was admitted with mental deterioration, anorexia, difficulty swallowing and complaining of epigastric pain. He had a past history of CVA, hypertension, gout and urinary stones. He had a markedly elevated serum calcium, and despite therapy, deteriorated and died after a cardiac arrest.

Describe the specimen
The specimen consists of the pancreas cut longitudinally with a portion of duodenum. The pancreas is somewhat oedematous with many areas of fat necrosis lying between the lobules and in the adjacent retroperitoneal fat. There is associated antemortem thrombus in the splenic and superior mesenteric veins.

What is the diagnosis?
Acute pancreatitis

What might the cause of this patient's acute pancreatitis be?
Acute pancreatitis can occasionally be associated with hypercalcaemia. The cause of the latter in this patient is unknown but it may well have been responsible for his mental deterioration, anorexia and possibly even the renal stones, though these may have been associated with his hyperuricaemia.

CASE 18880

Clinical information
The patient was a man aged 73 who suffered from a sudden onset of left-sided abdominal pain that radiated through to his back. There was associated vomiting. On examination he had tenderness with guarding in the epigastrium. He later developed glycosuria, became profoundly shocked and died 4 days later. At post-mortem four small calculi were found lodged in the ampulla of Vater.

Describe the specimen
The specimen consists of a longitudinal section of pancreas together with a section of spleen and a portion of greater omentum. The pancreas is markedly haemorrhagic and necrotic with the lobular architecture being effaced. There are many scattered pale areas of fat necrosis in the pancreas, surrounding retroperitoneal fat and omental tissue. The spleen is somewhat enlarged. Probable antemortem thrombus is present in the splenic vein near its hilum.

What is the diagnosis?
Acute haemorrhagic pancreatitis

What are the causes of acute pancreatitis? What is the pathogenesis of acute pancreatitis?
The commonest causes or associations are alcoholism and obstruction of pancreatic drainage by a gallstone in the ampulla of Vater. Others include obstruction of the pancreatic duct system by other causes such as tumours, a variety of medications, a variety of infections including mumps, hypercalcaemia, trauma, inherited types and acute ischaemia e.g. in shock or vasculitis. Some cases are idiopathic.
The disease is essentially due to inappropriate activation of digestive enzymes within the pancreas itself. The reasons for this are unclear but probably include variable combinations of pancreatic duct

obstruction leading to build up of lipase (secreted in an active form) that initiates fat necrosis and which is followed by a cascade of further injury and inflammation with activation of other enzymes; primary toxic injury to acinar cells; abnormal spasm of the sphincter of Oddi; and defective intracellular transport of proenzymes. Lipases lead to necrosis of fat and calcium may precipitate in situ with the released fatty acids. With more severe disease, proteolytic destruction of vessels and pancreatic cells leads to extensive parenchymal necrosis with haemorrhage.

Comment

Acute pancreatitis may vary in severity. Macroscopically the changes of early or mild pancreatitis include oedema and fat necrosis, the latter seen as scattered pale flecks in the adipose tissue in and around the pancreas and sometimes more widely in omentum and mesentery. In more severe cases there is extensive parenchymal necrosis and haemorrhage (haemorrhagic pancreatitis).

PANCREAS: CHRONIC PANCREATITIS

CASE 19540

Clinical information
A man aged 83 had recurrent abdominal pain after meals, located to the left of the umbilicus moving across to the right, made worse by fatty foods and often succeeded by vomiting. He used to be a heavy drinker but was now moderate. Barium meal showed a hiatus hernia. He had mild diabetes controlled with chlorpropamide. He was finally admitted with a hemiplegia, developed pneumonia and died.

Describe the specimen
The specimen consists of the pancreas sectioned longitudinally. The gland appears small and there is some loss of lobular architecture suggesting fibrosis, particularly in the head and tail.

What is the diagnosis?
Pancreatic fibrosis in keeping with chronic pancreatitis

What is the pathogenesis of chronic pancreatitis?
Chronic pancreatitis is a condition in which there is ongoing chronic inflammation and destruction of pancreatic tissue with variable replacement by fibrosis. There may be calcification. The organ becomes small and scarred. Islets of Langerhans are relatively spared until the later stages of the disease. The commonest cause is long-term alcohol abuse. Longstanding obstruction of the pancreatic ducts by tumour, stones or thick secretions in cystic fibrosis is another cause, some cases are hereditary and others idiopathic. Some cases develop from recurrent episodes of acute pancreatitis. The pathogenesis is not well understood. Chronic obstruction of the ducts with accumulation of secretions may lead to pressure atrophy and inflammation. Injury by toxins and activated enzymes may also be involved.

PANCREAS: HAEMOCHROMATOSIS

CASE 50183/83B

Clinical information
The patient was a man aged 56 with alcoholic cirrhosis.

Describe the specimen
The specimen of the pancreas shows the organ to be a rich russet brown.

What is the diagnosis?
Haemochromatosis

Comment
This discolouration is due to a massive accumulation of haemosiderin within the pancreatic tissue. The accumulation of iron within the pancreas is damaging and gradually the pancreas becomes replaced by fibrous tissue. The islets of Langerhans and exocrine tissue are both lost and so the patient may develop diabetes and malabsorption. In this patient it was not established whether the haemochromatosis was primary or secondary.

Pancreatic haemochromatosis results from total body iron overload, as occurs in hereditary (primary) haemochromatosis, a not uncommon autosomal recessive disorder where there is increased absorption of iron from the gut, or in patients who have iron overload for other reasons e.g. numerous blood transfusions or ineffective erythropoiesis (secondary haemochromatosis).

With systemic iron overload, iron deposition can also occur in the
- liver -> cirrhosis and hepatocellular carcinoma
- heart -> cardiomyopathy, arrhythmias and heart failure
- skin -> pigmentation
- joints -> inflammation, deposition of calcium pyrophosphate -> arthritis
- testes -> impotence, loss of libido
- adrenals, thyroid

Affected organs are also often pigmented.

PANCREAS: CARCINOMA

CASE 15983

Clinical information
A man aged 37 became breathless which led to x-ray and thoracotomy for a left upper lobe neoplasm. Biopsy suggested a seminoma. Because the lesion was inoperable it was irradiated and he returned to work. Twelve months later he became jaundiced and the liver was irradiated over a period of 4 months. He was admitted with ascites and multiple spider naevi were noted on the chest and abdomen. Liver function tests were normal. Continuous abdominal paracentesis was performed but he became more jaundiced and died 3 weeks later.

Describe the specimen
The specimen consists of the pancreas cut longitudinally together with the duodenum. In the head of the pancreas is an ill-defined, infiltrating mass measuring 6cm in maximum dimension that has destroyed the lobular architecture of the pancreas and has invaded through the muscularis externa of the duodenum into submucosa and mucosa leading to ulceration in the second part. The main pancreatic duct is not obviously dilated. Seen through the bottom of the specimen is an enlarged pale lymph node and the common bile duct that does not appear dilated.

What is the diagnosis?
Carcinoma of the head of the pancreas

Describe the features expected to be seen on a histological section through the lesion.
- Malignant cells: enlarged pleomorphic nuclei and prominent nucleoli, frequent mitoses
- Glandular differentiation: the malignant cells attempt to form glandular/ductal structures
- Invasion and destruction of pancreatic tissue
- Extensive fibrosis and chronic inflammation within and around the tumour: desmoplastic response

Carcinoma of the pancreas is classically associated with Trousseau's syndrome/sign. What is Trousseau's syndrome/sign?
This refers to the development of one of more venous thromboses by the patient, thought to be due to the release of procoagulant factors by the tumour or surrounding inflammatory cells. (See case 22432). It may occur with other malignancies also.

Comment
At post-mortem there were metastases in the para-aortic and lesser omental nodes, and several metastases in the lungs. The primary tumour was considered to be this one in the head of the pancreas. No comment was made on the state of the liver or the cause of the ascites but presumably the latter was due to peritoneal metastases.

Most pancreatic carcinomas arise in the head of the gland, others in the body or tail. They arise from and show features of the ductal epithelium, thus are more precisely known as ductal adenocarcinomas of the pancreas. These tumours are usually schirrous or fibrous, due to their induction of a florid desmoplastic response.

Other pancreatic tumours include serous and mucinous cystic neoplasms and endocrine tumours (as well as a variety of others). Some of the endocrine tumours have features of cells of the islets of Langerhan's (traditionally known as islet cell tumours), though others (e.g. carcinoids) appear to arise from neuroendocrine cells (part of the diffuse neuroendocrine system) associated with the pancreatic ducts.