Histology guide pancreas

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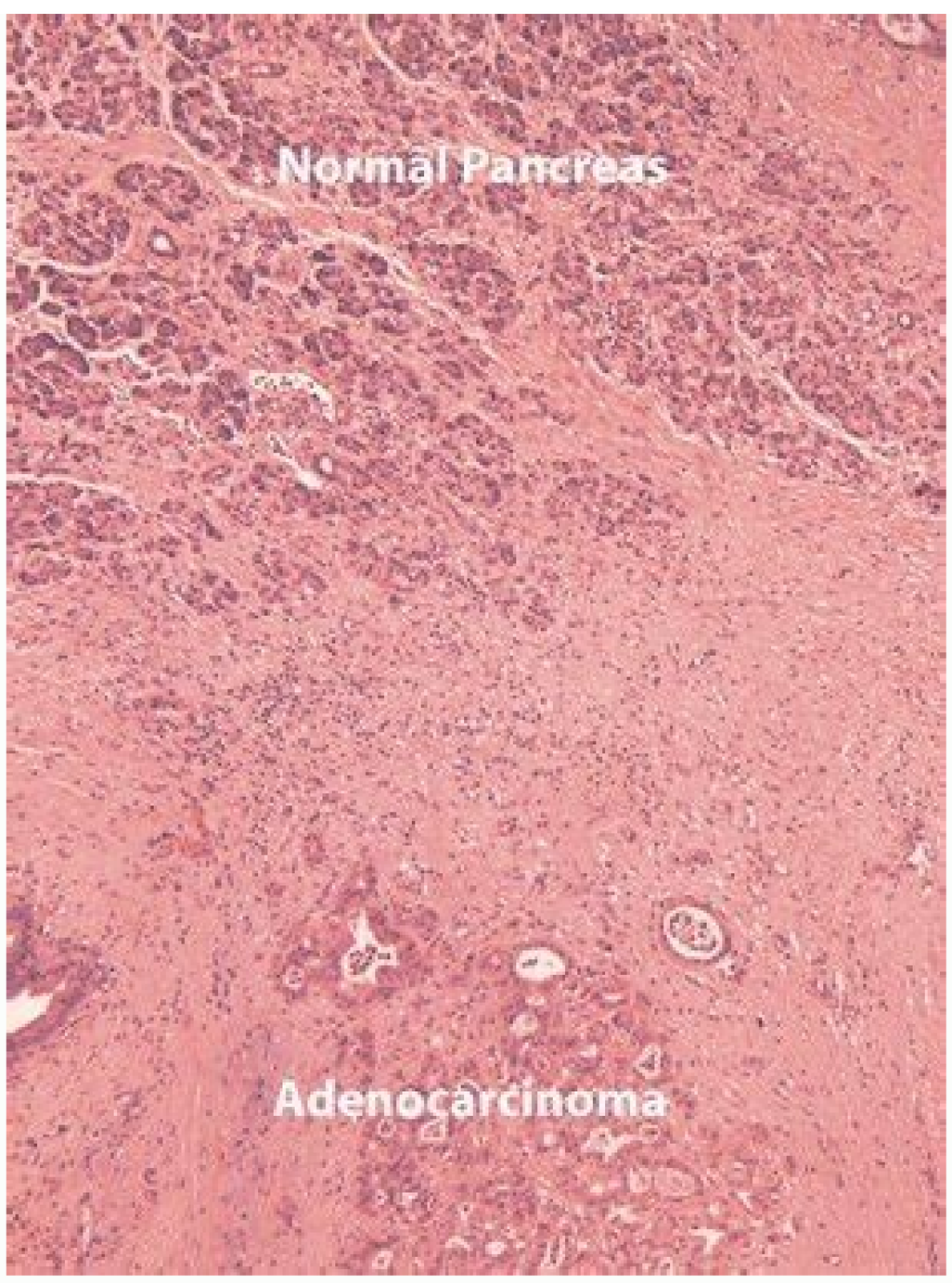

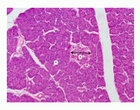

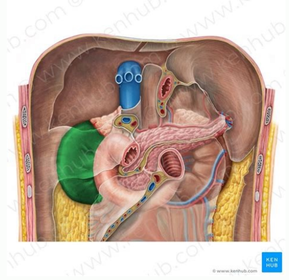

Pancreas histological structure. How to biopsy the pancreas. How to identify pancreas in histology.

On this section of pancreas, make sure you can identify lobules, connective tissue septa, ducts and islets of Langherans. In this magnified section of pancreas shows the secretory acini of the exocrine pancreas. Identify the secretory acini, duct, septa and blood vessels. The pancreas is the main enzyme producing accessory gland of the digestive system. It has both exocrine and endocrine functions. Exocrine Pancreas The exocrine part of the pancreas has closely packed serous acini, similar to those of the digestive glands. It secretes an enzyme rich alkaline fluid into the duodenum via the pancreatic duct. The alkaline pH is due to the presence of bicarbonate ions, and helps to neutralise the acid chyme from the stomach, as it enters the duodenum. The enzymes digest proteins, carbohydrates, lipids and nucleic acids. These enzymes include: trypsin and chymotrypsin (secreted as inactive precursors, and activated by the action of enterokinase, an enzyme secreted by the duodenal mucosa). An enzyme called CCK stimulates the release of these enzymes, from stored granules in the secretory cells of the acini. Secretin (from neuroendocrine cells in the small intestine) stimulate the release of watery alkaline secretions. The endocrine part of the pancreas, consists of isolated islands of lighter staining cells called islets of Langerhans. The secretions of the acini empty into ducts lined with a simple low cuboidal epithelium, which becomes stratified cuboidal in the larger ducts. The islets of Langerhans are clumps of secretory cells (up to around 3000) supported by reticulin fibres, and containing numerous fenestrated capillaries. There is a delicate capsule around each islet. They are paler than the surrounding exocrine cells, as they have less rER. These islets do not have an acinar organisation. The islet cells are indistinguishable from each other in sections, but in fact three secretory cells types are present: alpha - secrete glucagon, beta - secrete insulin delta - secrete somatostatin The islets are supplied by up to three arterioles, which form a branching network of fenestrated capillaries, into which the hormones are secreted. The islet is drained by about six venules, which pass between the exocrine acini to the interlobular veins. Histological diagnosis of chronic pancreatitis has classically been limited to the study of surgical specimens. Histological features of chronic pancreatitis include loss of acinar cells, presence of an irregular interlobular fibrosis, infiltration of inflammatory cells, and relative conservation of intralobular ducts and islets.1 As pancreatic biopsies are rarely done in the context of chronic pancreatitis, histological characteristics of different stages of the disease are unknown. Endoscopic ultrasound (EUS) guided fine needle aspiration (FNA) has been proved to be a safe and useful method for tissue sampling of intramural and extramural gastrointestinal lesions, including those located in the pancreas.2,3 Cytological study of material obtained by FNA allows evaluation of cellular findings suggestive of malignancy, but not tissular features of chronic pancreatitis.4,5 We have recently modified the method of recovering and processing material obtained by EUS guided pancreatic FNA to obtain tissue core specimens for histological evaluation.6The aim of our study was to analyse whether EUS guided pancreatic fine needle biopsy (FNB) allows evaluation of the histological features of chronic pancreatitis. In addition, the histological characteristics of the disease according to EUS findings were analysed.A prospective, open, consecutive study was designed. Fourteen patients (all males, mean age 59 years (range 41–81)) suffering from alcohol related chronic pancreatitis who underwent EUS-FNB for the differential diagnosis of a pancreatic mass were included over a 12 month period. All masses were located in the head of the pancreas and had a median size of 2.8 cm (range 2.1–4.4). EUS was performed under conscious sedation with midazolam and pethidine by two expert echoendoscopists using a convex array echoendoscope (Pentax FG-38UX) connected to an ultrasound equipment Hitachi-E6000. FNB was performed with a 22 G needle (Sonotip II, Mediglobe, Germany). Two to three tissue samples were obtained from each pancreatic mass and recovered into a tube containing a 10% formalin solution. Other pancreatic areas (that is, body or tail) were not punctured. Tissue sections were included in paraffin and stained using the classical haematoxylin-eosin technique. Histological features evaluated were the presence of acini, ductal epithelium, fibrotic tissue (collagen), and inflammatory infiltration (fig 1). Echoendoscopic parenchymal and ductal criteria of chronic pancreatitis were evaluated. Parenchymal EUS criteria included hyperechoic foci, hyperechoic strands, lobularity, cysts, and calcifications. Ductal EUS criteria included dilation, duct irregularity, hyperechoic duct margins, visible side branches, and intraductal calcifications.7Adequate tissue samples for histological evaluation were obtained in all cases. Infiltration by inflammatory cells was observed in all tissue specimens. Samples included pancreatic acini in five cases (37.5%), with 2–13 acini in each. In the remaining nine cases (64.3%) only ductal epithelium and fibrotic tissue were observed. Biopsies including pancreatic acini were those obtained from patients with mild to moderate EUS changes of chronic pancreatitis (up to five EUS criteria). In contrast, biopsy samples from more severe cases (8–10 EUS criteria) were those showing only ductal epithelium with fibrotic components (table 1). No FNB related complications were recorded.Table 1 Histological characteristics of the pancreas depending on the number of endoscopic ultrasound (EUS) criteria of chronic pancreatitisEUS criteriaHistological findingsMild-moderate chronic pancreatitis⩽5 criteriaInflammatory infiltratePresence of aciniSevere chronic pancreatitis⩾8 criteriaInflammatory infiltrateDuctal epitheliumFibrosisIn conclusion, obtaining pancreatic tissue samples by EUS guided FNB with a 22 G needle is feasible and safe. This procedure makes it possible to evaluate histological changes of chronic pancreatitis and to exclude the development of pancreatic cancer. As a further development, EUS could allow selecting the pancreatic area to be punctured based on the intensity of the morphological changes, thus avoiding FNB limitations related to the patchy distribution of chronic pancreatitis. EUS guided FNB could be important in confirming the diagnosis of chronic pancreatitis in cases of inconclusive imaging findings. From a research point of view, pancreatic FNB could help towards a better understanding of the disease.Conflict of interest: None declared.1. Klöppel G, Maillet B. Pathology of acute and chronic pancreatitis. Pancreas 19938659–670. [PubMed] [Google Scholar]2. Rösch T. Endoscopic ultrasonography. Br J Surg 1997841329–1331. [PubMed] [Google Scholar]3. Hawes R H. Endoscopic ultrasound. Gastrointest Endosc Clin N Am 200010161–174. [PubMed] [Google Scholar]4. Ribeiro A, Vazquez-Sequeiros E, Wiersema L M.et al EUS-guided fine-needle aspiration combined with flow cytometry and immunocytochemistry in the diagnosis of lymphoma. 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[PubMed] [Google Scholar] View as Multiple Pages (default) View as Single Page Small Medium (default) Large Author: Gordana Sendić MD • Reviewer: Adrian Rad BSc (Hons) Last reviewed: July 22, 2022 Reading time: 15 minutes The pancreas is both an exocrine accessory digestive organ and a hormone secreting endocrine gland. The bulk of the pancreatic tissue is formed by the exocrine component, which consists of many serous pancreatic acini cells. These acini synthesize and secrete a variety of enzymes essential to successfully “rest and digest”. But don’t let the nirvana after a great meal fool you. While “resting” sounds really nice, the “digesting” part involves some heavy machinery. This is where the pancreas comes at play. Every day, this organ is maneuvering dangerous digestive enzymes, and one little slip up could cause its own self destruction. Talk about occupational hazard! The endocrine component is a much smaller, but equally important, portion of the pancreas. It is composed of pancreatic islets, which appear as islands of cells dispersed between the pancreatic acini. These islet cells produce and secrete hormones that regulate glucose, lipid and protein metabolism. This article will describe the histology and functions of the pancreas, including a clinically relevant condition that you have definitely heard about, called diabetes mellitus. Key facts about the histology of the pancreas Exocrine pancreas Secretory units: pancreatic acini Cells: acinar cells, centroacinar cells Products: peptidases, lipases, amylolytic enzymes, nucleolytic enzymes Endocrine pancreas Secretory units: islets of Langerhans Cells: A (alpha), B (beta), D (delta), PP (pancreatic polypeptide) cells Products: insulin, glucagon, somatostatin Distinguishing histological features Presence of islets of Langerhans Beginning of intercalated ducts within acini Clinical information Diabetes mellitus The pancreas is a large, mixed gland composed of five parts: the head, uncinate process, neck, body and tail. The location of the pancreas is mostly retroperitoneal, except for the tail. This organ extends from the C-shaped curve of the duodenum, passes behind the stomach and finishes at the hilum of the spleen. Several pancreatic ducts extend throughout the pancreas, emptying the pancreatic contents inside the duodenum. If you want to find out more about the gross anatomy of this organ before diving into its histology, take a look below: The pancreas is covered by a thin capsule made of loose connective tissue. The parenchyma consists of pancreatic acini and sparsely scattered pancreatic islets surrounded by stroma of loose connective tissue. Interlobular connective tissue septa project from the capsule into the pancreatic parenchyma, organising it into lobules. The interlobular septa house the interlobular ducts, blood vessels, nerves, and lamellar (Pacinian) corpuscles, which are special types of sensory receptors. The exocrine component of the pancreas makes up about 98% of the pancreatic tissue. It is comprised of densely packed serous acinar (tubuloacinar) glands. These glands are called pancreatic acini, which represent the secretory units of the pancreas. They are formed out of simple epithelium. Each pancreatic acinus consists of pyramidal-shaped acinar cells, which have a broad basal portion and a narrow apical surface that surround a small central lumen. These acinar cells are serous secretory cells that produce digestive enzymes. Their secretory function is attested by the presence of abundant rough endoplasmic reticulum and Golgi apparatus. Seen under a microscope, their basal cytoplasm is largely basophilic, with distinct acidophilic zymogen granules in their apical poles. Zymogen granules are large secretory organelles in which acinar cells store their inactive enzymes, called zymogens or proenzymes. Upon stimulation, the zymogens are activated and the acinar cells release their secretions by way of exocytosis. During exocytosis, the granules merge with the cell membrane and expel their contents into the lumen of the acinus. Once synthesized, the pancreatic secretions leave the acini via the intercalated ducts. The latter are short ducts with a small lumen that start within the acini. The initial, intra-acinar portion of the intercalated duct is lined by simple squamous epithelial cells called centroacinar cells, which signify the beginning of the ductal system of the exocrine pancreas. These pancreatic cells contain a centrally placed, flat nucleus and appear lightly stained with hematoxylin and eosin (H&E). Centroacinar cells are continued by simple, low cuboidal ductal cells that line the extra-acinar portion of the intercalated ducts which extends outside the acinus. Intercalated ducts drain into intralobular ducts, which are lined by simple, low columnar epithelium. In turn, the intralobular ducts flow into the larger caliber interlobular ducts, which are located within the interlobular connective tissue septa. These are also lined by low columnar epithelium that becomes taller and more stratified as the size of the ducts increases. The interlobular ducts drain into the main pancreatic duct (of Wirsung), or sometimes into the accessory pancreatic duct (of Santorini). These ducts are lined by the high columnar epithelial cells that are most often stratified. The main pancreatic duct travels from the tail to the head of the pancreas, collecting secretions from all the interlobular ducts along the way. It merges with the gallbladder’s (common) bile duct to form the hepatopancreatic ampulla (of Vater), which empties into the descending part of the duodenum at the major duodenal papilla. This papilla is surrounded by a thickened smooth muscle layer called the sphincter of ampulla (hepatopancreatic sphincter of Oddi). This controls the flow of both the pancreatic secretions and bile into the duodenum. The accessory pancreatic duct (of Santorini), when present, drains the head of the pancreas and empties into the duodenum through the minor duodenal papilla. Pancreatic cells secrete about 1.5 L of fluid each day. The presence of acidic chyme, fats and proteins in the duodenum stimulates enteroendocrine (APUD) cells of the small intestine to release secretin and cholecystokinin (CCK) into the bloodstream. These intestinal hormones are the primary regulators of pancreatic secretions. In addition to this hormonal mechanism, the activity of the exocrine pancreas is also regulated by parasympathetic innervation via the vagus nerve. Secretin and CCK work in unison to induce the secretion of pancreatic juice or fluid. The majority of pancreatic fluid is comprised of water with large amounts of sodium and bicarbonate ions. This highly alkaline fluid is secreted by the centroacinar and intercalated ductal cells in response to secretin. This response serves to neutralize the acidity of the duodenum and form an optimal environment for the activity of pancreatic enzymes. Pancreatic enzymes represent the active ingredient of the pancreatic fluid. They are produced, stored and secreted by acinar cells in response to CCK. Pancreatic enzymes are extremely potent and can digest any type of macromolecule, hence they are secreted in the aforementioned inactive forms (proenzymes). These enzymes are divided based on the specific substance they normally digest: Substrates and products of pancreatic enzymes Proteolytic endopeptidases (trypsinogen, chymotrypsinogen) Substrates: proteins Products: amino acids Proteolytic exopeptidases (procarboxypeptidase, proaminopeptidase) Substrates: proteins Products: amino acids Amylolytic enzymes (alpha-amylase) Substrates: carbohydrates Products: glucose Lipases Substrates: triglycerides Products: fatty acids Nucleolytic enzymes (deoxyribonuclease and ribonuclease) Substrates: nucleic acids Products: mononucleotides Pancreatic enzymes only get activated inside the duodenum under the influence of a proteolytic enzyme called enterokinase, which is secreted by the duodenal mucosa. Enterokinase first transforms trypsinogen into the extremely potent trypsin. Once active, trypsin catalyzes a cascade of activation of all the other pancreatic enzymes. The requirement of an alkaline environment and the segregation of enterokinase in the duodenum prevents the undesired activation of these enzymes within the pancreas. Expand your knowledge about the pancreas with the following resources: Pancreas Explore study unit Pancreatic duct system Explore study unit The endocrine component makes up about 2% of the pancreas, which is represented by about 1-2 million pancreatic islets (of Langerhans). They are dispersed throughout the exocrine component of the pancreas, most of them being located in the tail region. These islets are demarcated from the rest of the parenchyma by a delicate sheath of reticular fibers. The pancreatic parenchyma, especially its ducts, consist of several types of epithelial tissue. Ease your learning and start recgonizing the main types of epithelial tissue using Kenhub's labelling exercises and quizzes! Pancreatic Islets are spherical clusters of polygonal endocrine cells. On a pancreas histological slide stained with H&E, they appear as large, pale-staining cells enveloped by intensely staining, basophilic pancreatic acini. The cells of the islets are connected to each other with desmosomes and gap junctions, forming bands or cords of cells. Pancreatic islets are permeated by many fenestrated capillaries, which allow quick entry of pancreatic hormones into the blood. There are four main types of cells in the pancreatic islets: B (beta) cells - these cells secrete insulin and constitute about 70% of the islet cells. They are most commonly located in the central part of the islet. B cells contain many secretory granules which possess a dark center with crystallized insulin, surrounded by a wide pale halo. A (alpha) cells - these cells secrete glucagon and constitute 15-20% of the islet cells. They are usually larger than B cells and most commonly located peripherally in the islet. Their granules are more uniform in size, with a larger dark center surrounded by a thinner halo compared to B cells. The granules are filled with glucagon. D (delta) cells - these cells secrete somatostatin and constitute 5-10% of the islet cells. They are located diffusely throughout the islet but most commonly in the periphery. D cells contain larger secretory granules compared to A and B cells. PP (pancreatic polypeptide) cells - these cells secrete pancreatic polypeptide and constitute

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