Surgery of the Pancreas

By

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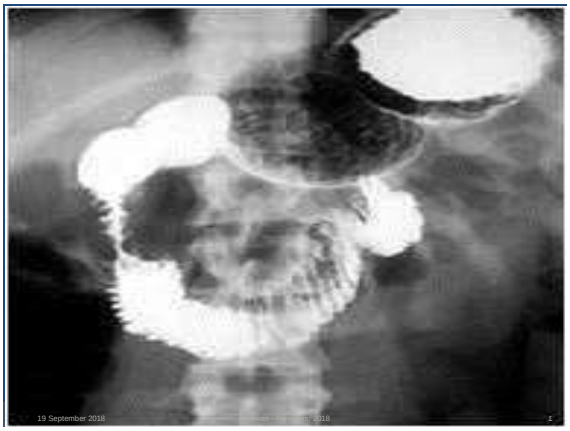
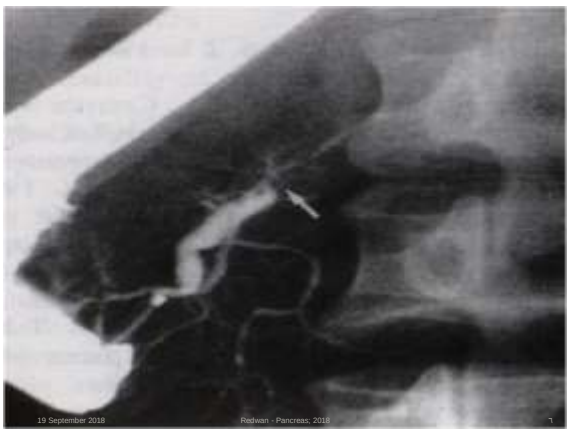
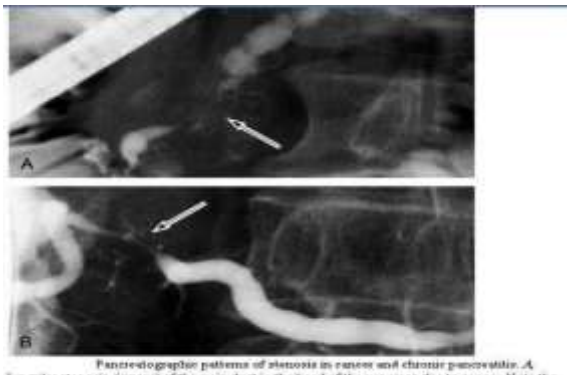
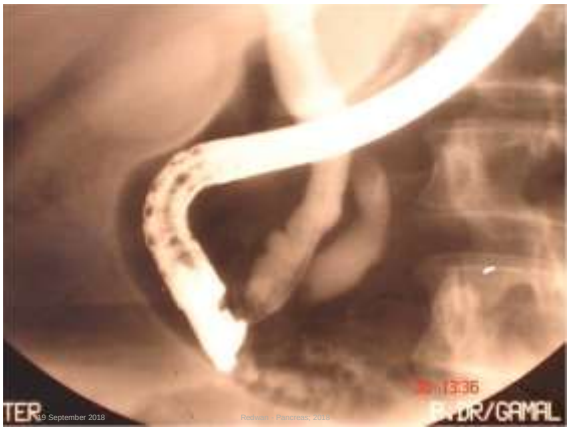
Pancreatic carcinoma

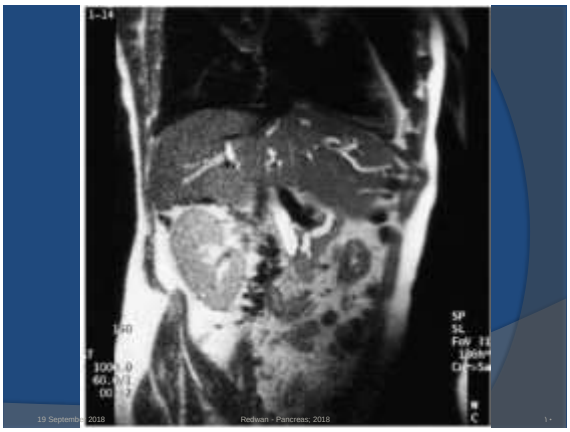


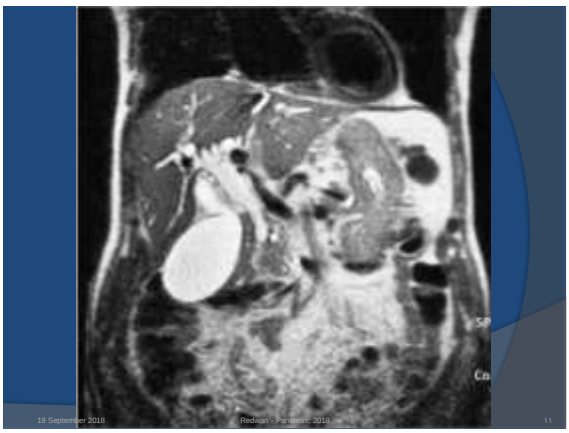


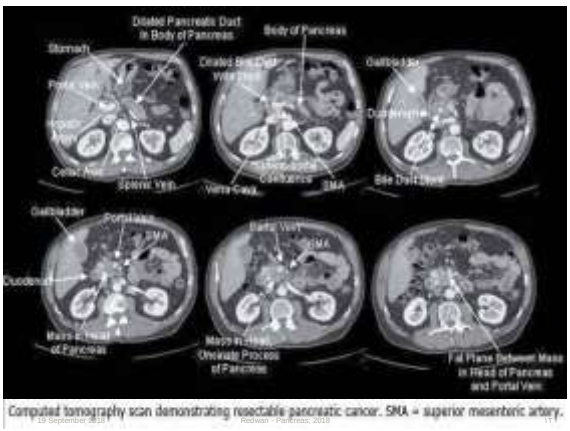


Pancreatographic patterns of stenosis in cancer and chronic pancreatitis. *A*, Irregular stenosis *(arrow)* of the main duct in the head of the pancreas due to cancer. Note the lack of branch ducts in the stenotic section. *B*, Smoothly tapered stenosis of the main duct *(arrow)* due to chronic pancreatitis. Note the presence of the main duct branches in the region of the stenosis.

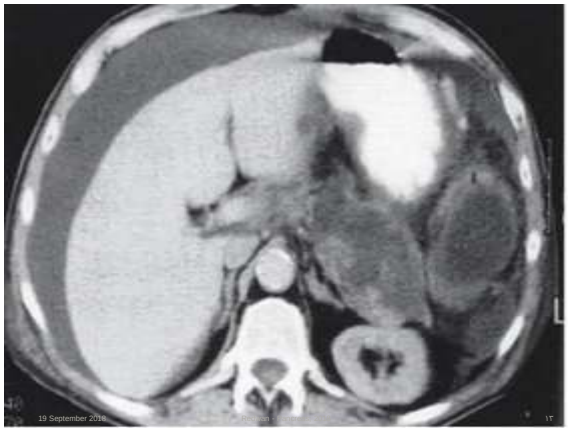








Computed tomography scan demonstrating resectable pancreatic cancer. SMA = superior mesenteric artery.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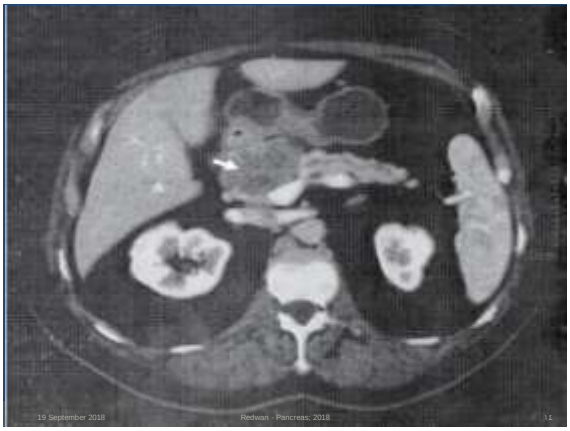
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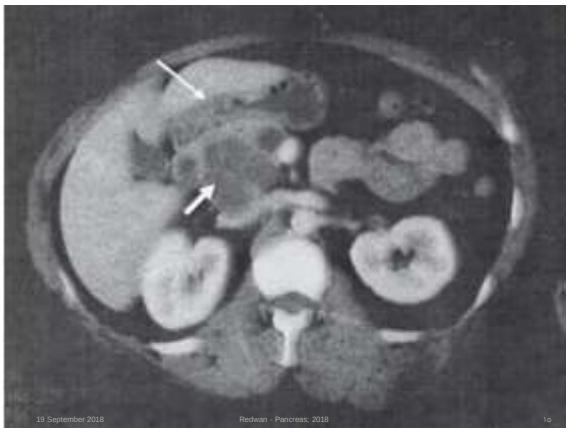
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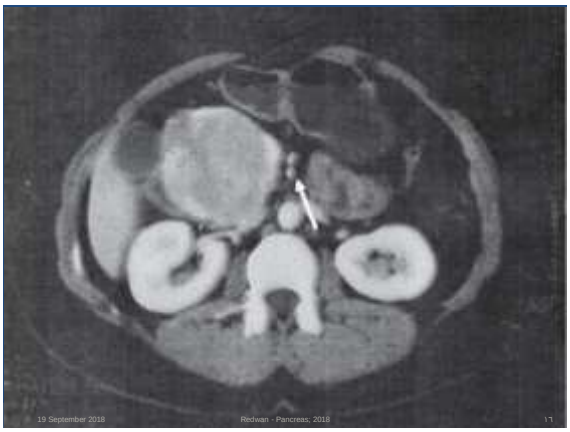
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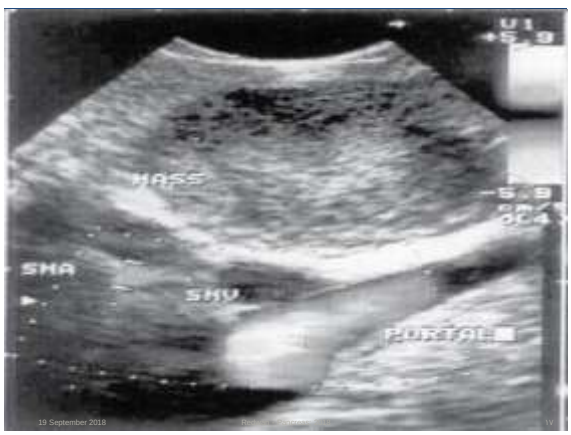
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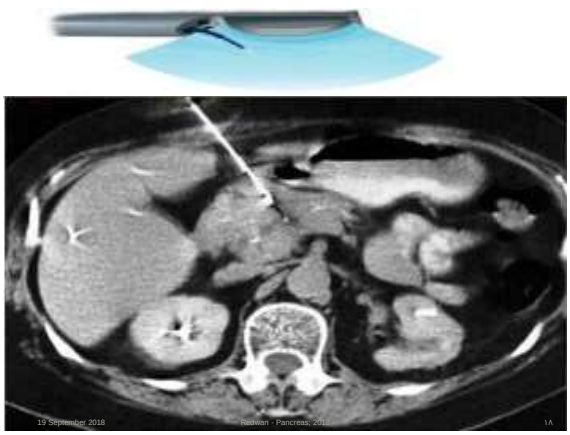
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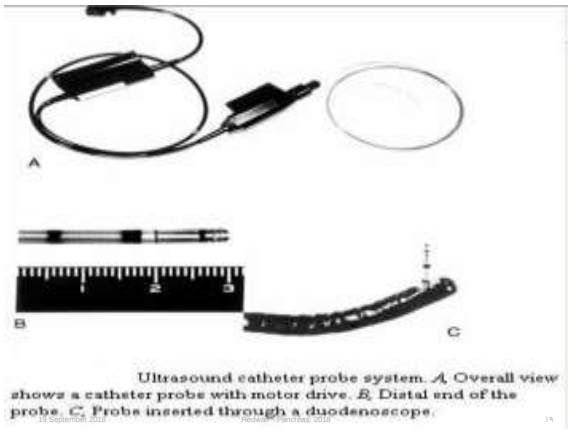
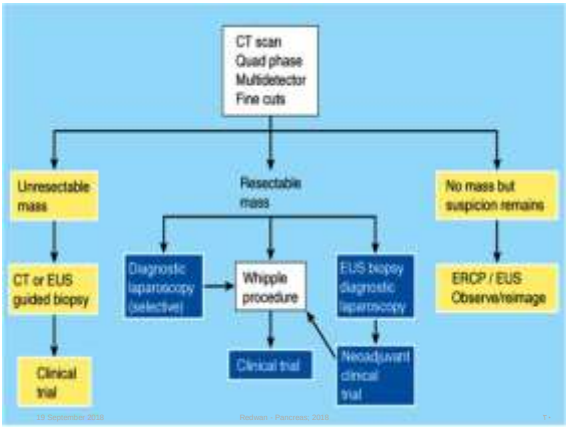
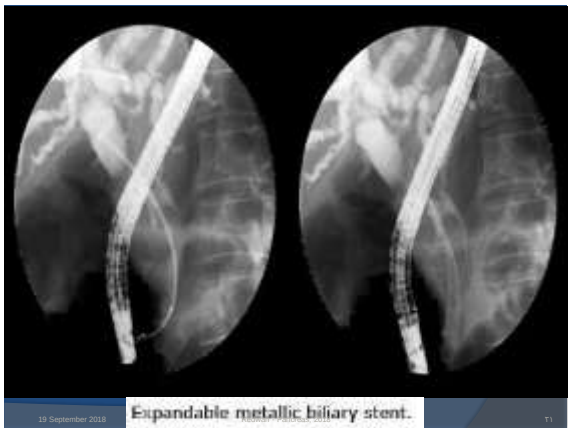
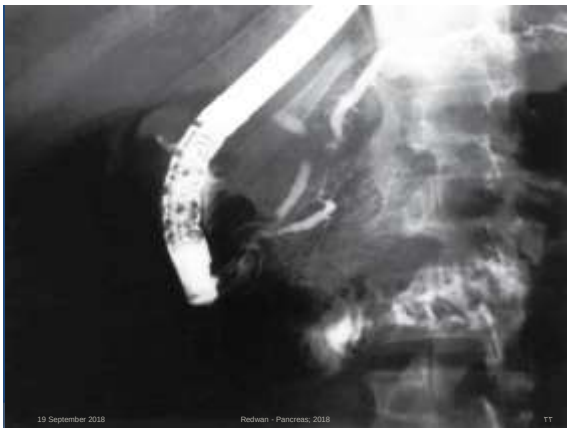


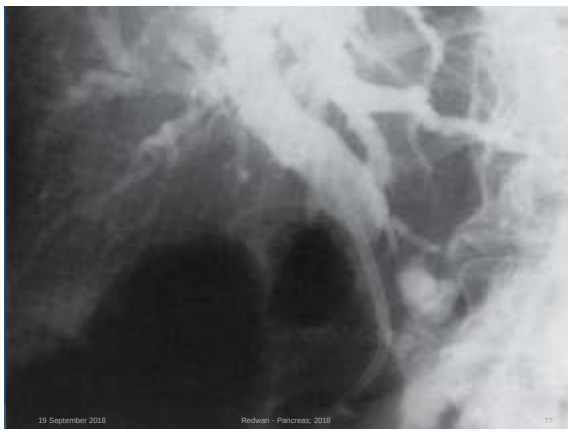
Ultrasound catheter probe system. *A*, Overall view shows a catheter probe with motor drive. *B*, Distal end of the probe. *C*, Probe inserted through a duodenoscope.



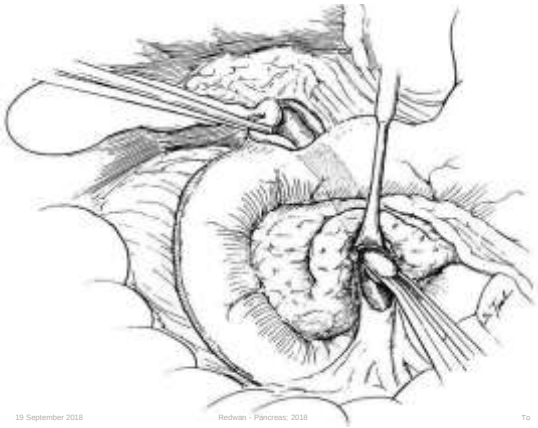


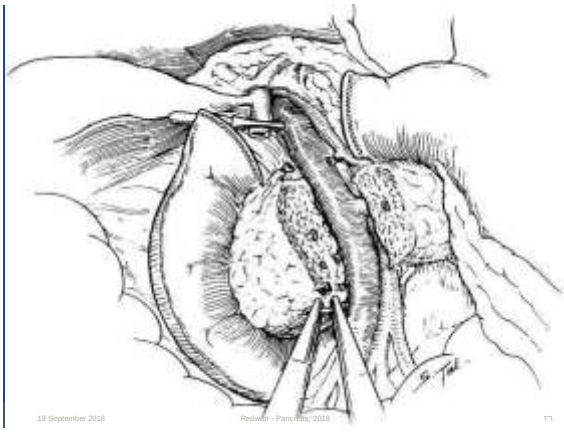
Expandable metallic biliary stent.

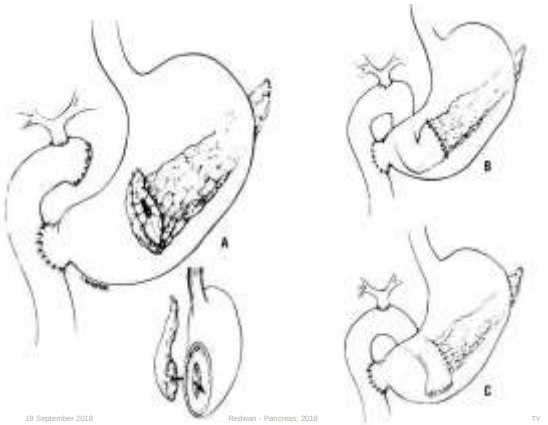


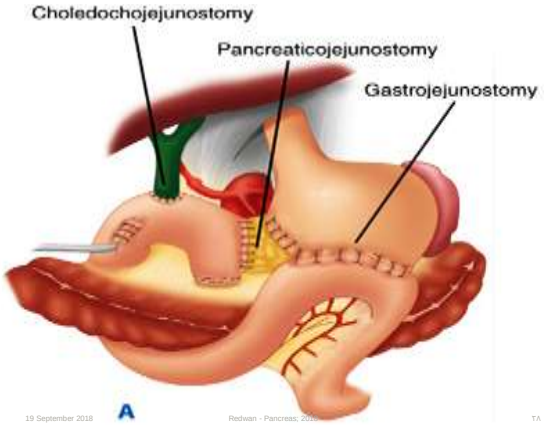


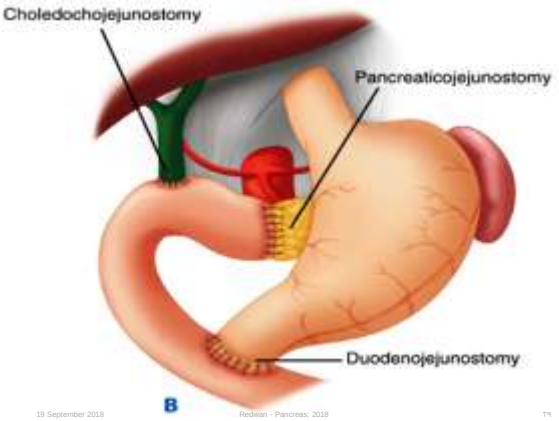
Liver metastases identified at diagnostic laparoscopy.

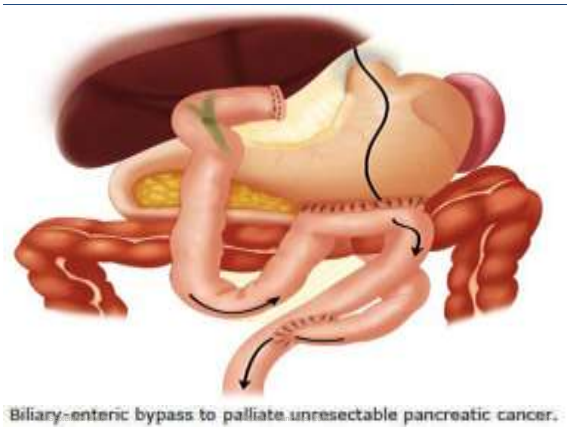






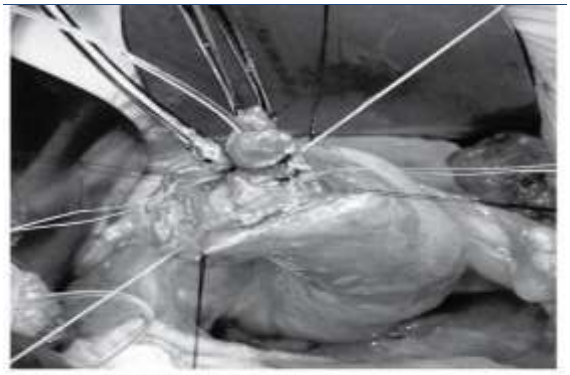






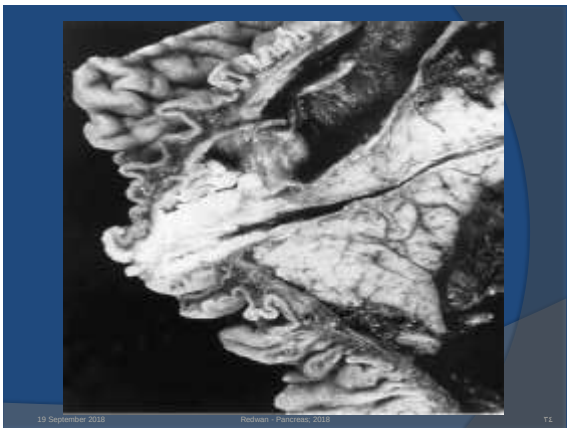
Biliary-enteric bypass to palliate unresectable pancreatic cancer.

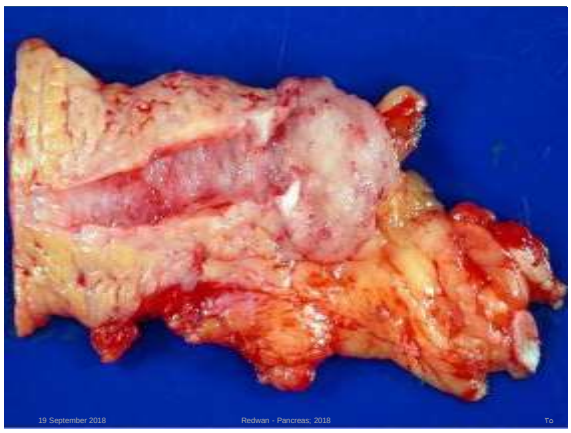
Early stage of the local resection of an ampullary carcinoid tumor. Stent is in the pancreatic duct and traction on the tumor is provided by an Allis clamp



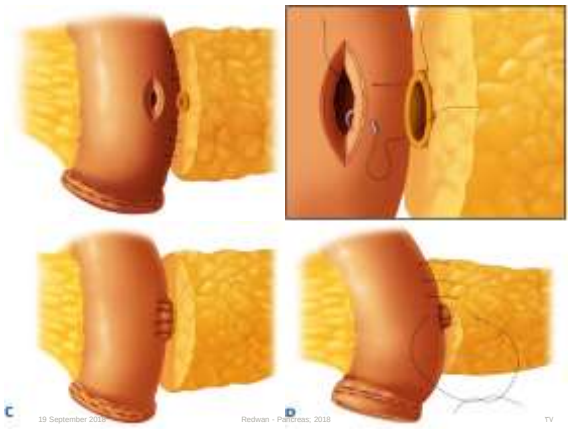
The ampullary tumor is dissected free centripetally in a submucosal plane.

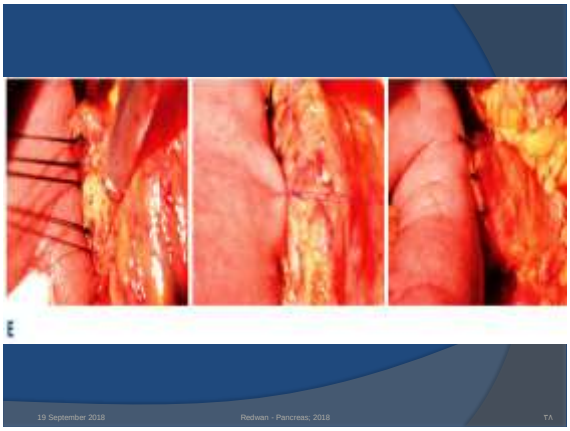
Anastomosis of the bile duct and pancreatic duct to the duodenal wall following local resection of an ampullary tumor.

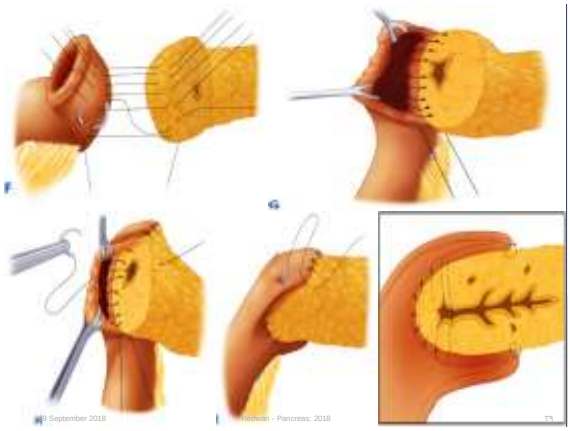


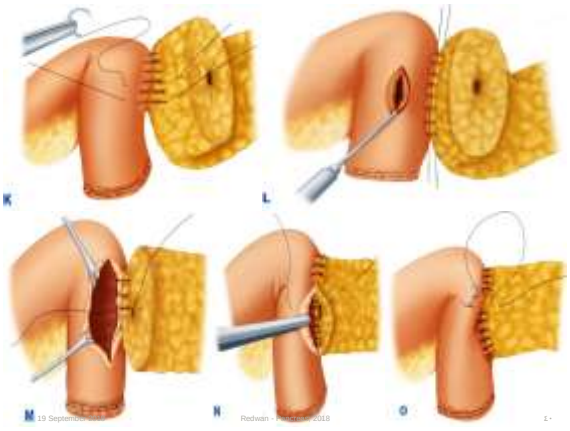


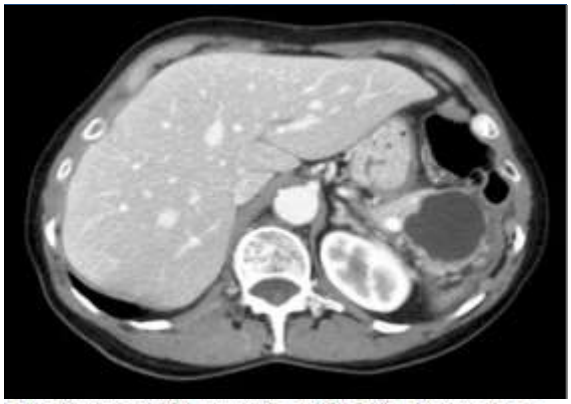
Techniques for pancreaticojejunostomy. A to D. Duct-to-mucosa, end-to-side. E. Intraoperative photographs of end-to-side pancreaticojejunostomy. F to J. End-to-end invagination. K to O. End-to-side invagination.



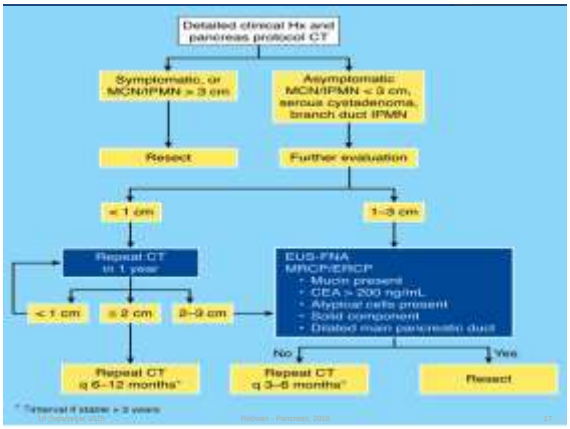


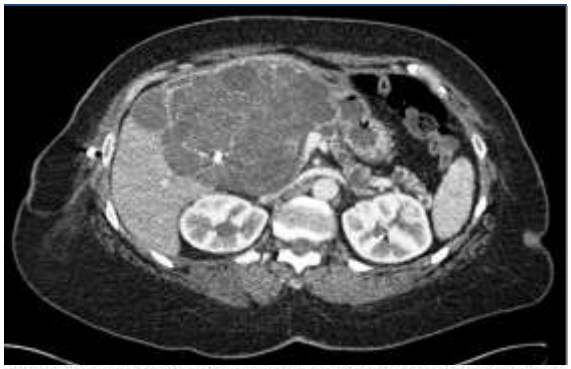




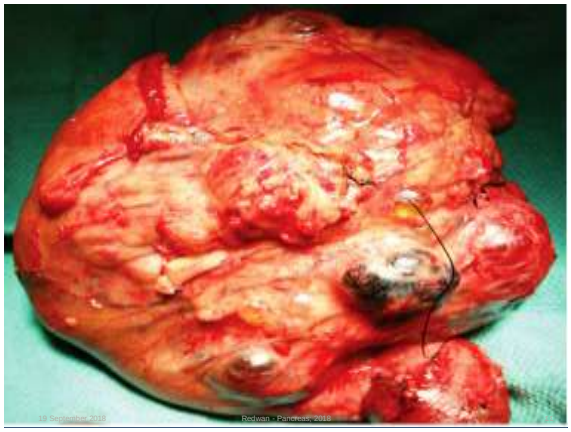


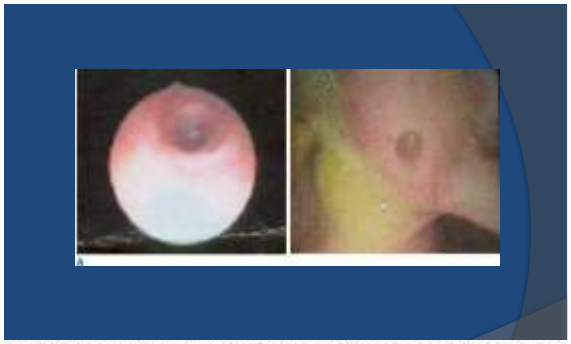
Mucinous cystic neoplasm in tail of pancreas.



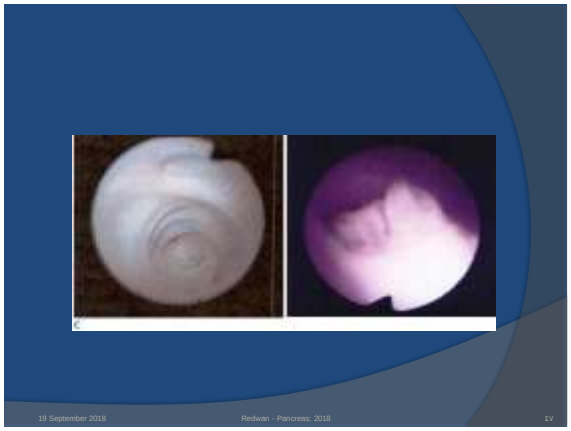


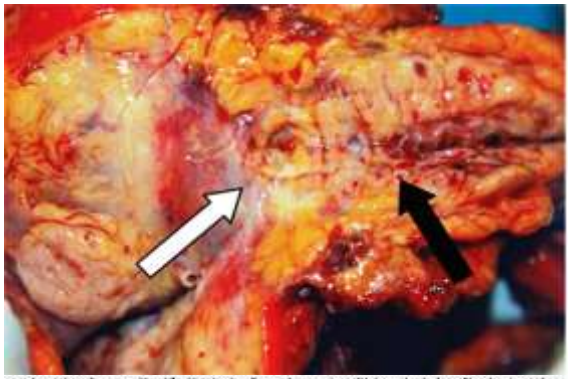
Computed tomography appearance of massive multiseptated serous cystadenoma in head of pancreas with central stellate scar (left) and resected specimen (right).



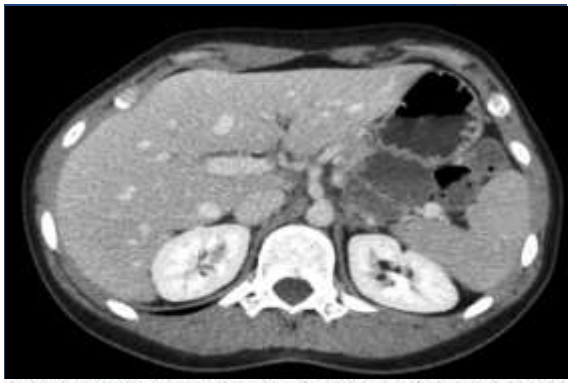


Intraductal papillary mucinous neoplasm (IPMN). A. Examples of "fish-eye deformity" of IPMN. Mucin is seen extruding from the ampulla. B. Mucin coming from pancreatic duct when neck of pancreas is transected during Whipple procedure (left). Intraoperative pancreatic ductoscopy to assess the pancreatic tail (right). C. Views of pancreatic duct during ductoscopy; normal (left) and IPMN (right).

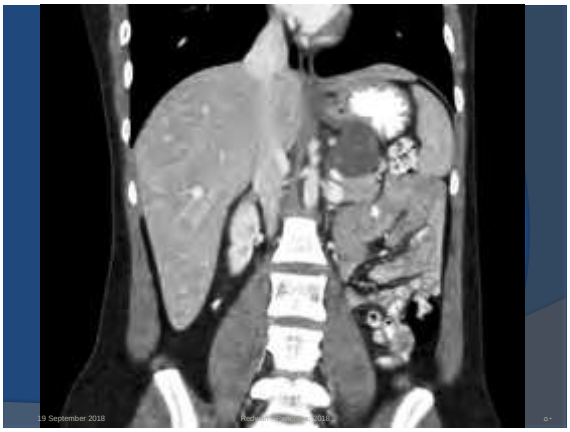


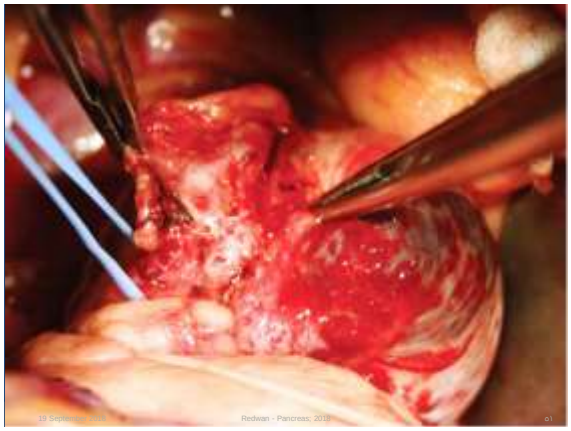


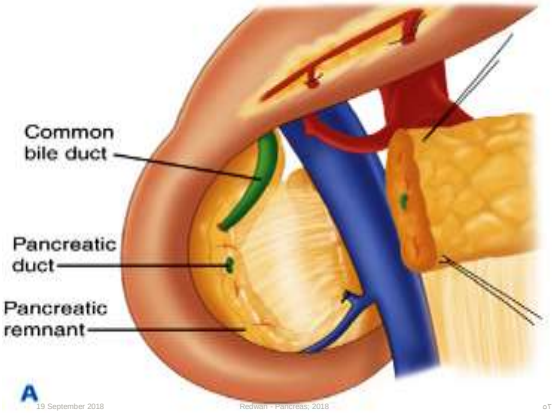
Operative specimen of pancreas with multifocal intraductal papillary mucinous neoplasms (black arrow) and a focus of invasive adenocarcinoma (white arrow).

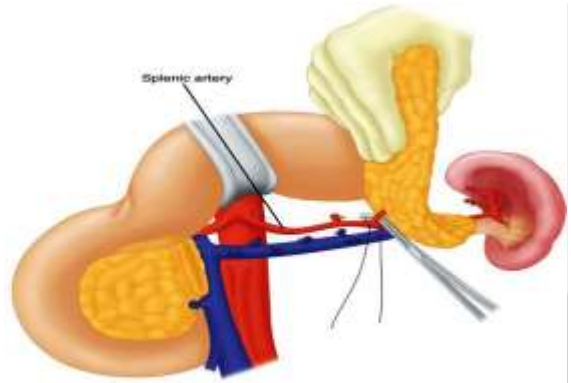


Abdominal computed tomographic scan of a 25-year-old woman demonstrating a well-circumscribed cystic lesion with septation in body/tail of pancreas. At surgery, the tumor was adherent to the splenic artery. Pathologic diagnosis was solid-pseudopapillary carcinoma.

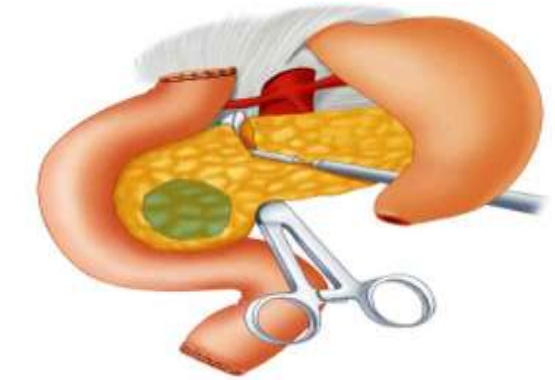




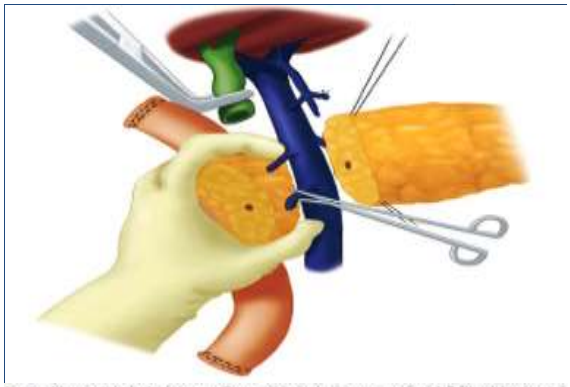




Distal (spleen-sparing) pancreatectomy. A distal pancreatectomy for chronic pancreatitis is usually performed with en bloc splenectomy. In the presence of minimal inflammation, a spleen-sparing version can be performed, as shown here.



Division of the pancreatic neck. The pancreatic neck is separated from the anterior surface of the portal vein and then divided. If there is no tumor involvement, the neck of the pancreas will separate from the vein easily. A large, blunt-tipped clamp is a safe instrument to use for this dissection.

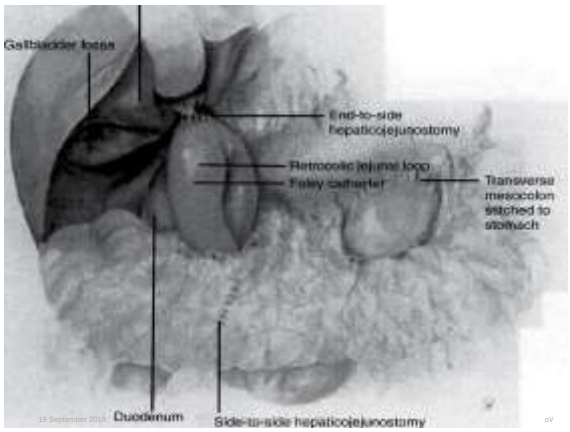


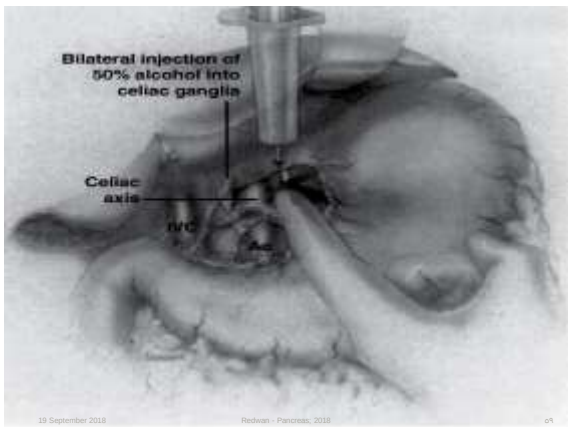
Dissection of the pancreatic head and uncinate process. The pancreatic head and uncinate process are dissected off of the right lateral aspect of the superior mesenteric vein and portal vein by ligating the fragile venous branches.

Palliation of inoperable disease

This is aimed at relief of:

- jaundice and pruritus;
- vomiting due to duodenal obstruction;
- pain.

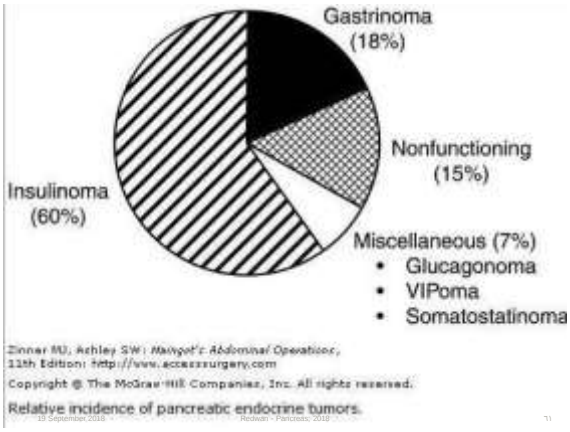




Tumours of the endocrine pancreas

Pancreatic endocrine tumours may be benign or malignant. Compared with pancreatic adenocarcinoma, endocrine tumours, even when malignant, are slow-growing and many metastasize only to regional lymph nodes. Hence curative surgical excision is possible in a significant proportion of patients. Normal islet cells also synthesize the protein chromogranin along with specific peptide hormones. Elevated plasma levels of chromogranin or neurone-specific enolase are thus useful markers for pancreatic endocrine tumours. The important clinical syndromes associated with overproduction of hormones by pancreatic islet cell tumours are:

- insulinoma — hyperinsulinism (autonomous hypoglycaemia);
- overproduction of gastrin with intractable ulceration — gastrinoma (Zollinger Ellison syndrome).



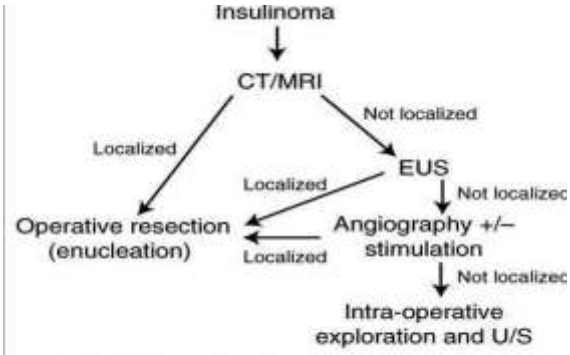
Zinner MJ, Ashley SW: *Maingot's Abdominal Operations*, 11th Edition: http://www.accessurgery.com

Relative incidence of pancreatic endocrine tumors.

Hyperinsulinism

This may be caused by:

- B-cell neoplasia (insulinoma), most common endocrine tumour;
- B-cell hyperplasia/microadenomatosis, rare, occurs in infants.



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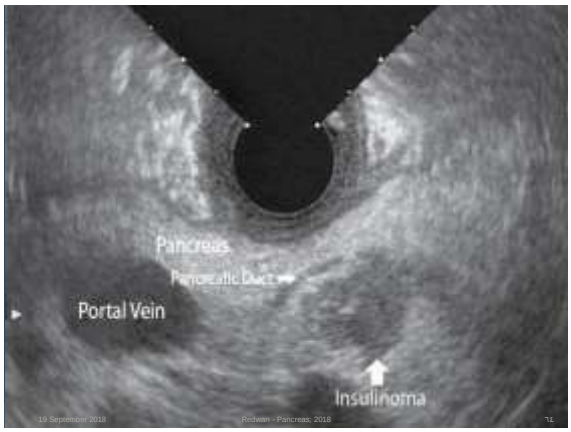
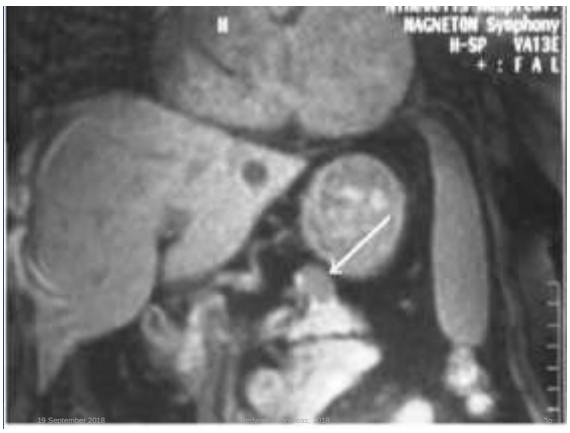
Localization of insulinomas. EUS = endoscopic ultrasound.





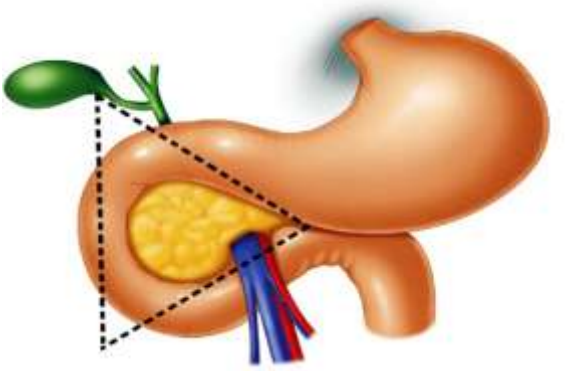
Gastrinoma (Zollinger–Ellison syndrome)

Recurrent ulcerators, persistent perforators, and bleeders unto death

Zollinger–Ellison syndrome should be considered in any patient with:

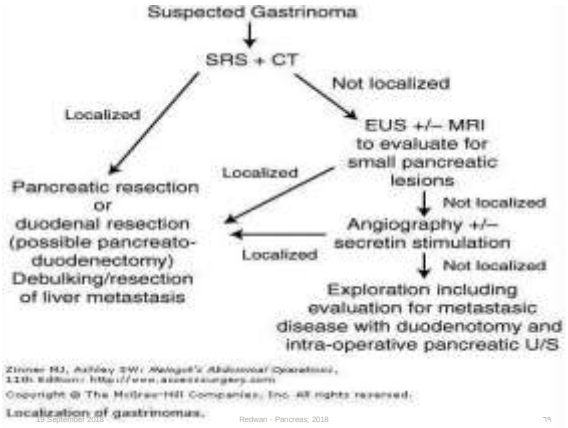
- severe peptic ulcer disease refractory to medical therapy, including eradication of *Helicobacter pylori*;
- multiple peptic ulcers or ulcers in unusual locations such as the distal duodenum or jejunum;
- recurrent peptic ulcer disease following an acid reducing operation;
- peptic ulcer disease in association with a strong family history of ulcer disease or MEN1; or
- peptic ulcer disease in association with any other component of MEN1 (e.g. hypercalcaemia).

The upper GI endoscopy usually shows large gastric mucosal folds and diffuse inflammation or frank ulceration distal to the duodenal bulb and barium contrast radiology may demonstrate ulcers in the distal duodenum and upper gastrointestinal tract. The diagnosis is confirmed by radioimmunoassay of fasting plasma. A basal gastrin level greater than 100 pg/ml, strongly supports the diagnosis



Passaro's triangle. The typical location of a gastrinoma is described by this anatomic region, including the head of the pancreas, duodenum, and the lymphatic tissue posterior and superior to the duodenum, as originally described by E. Passaro.

Table 42–4. Causes of Hypergastrinemia
High gastric acid output
Gastric outlet obstruction
G-cell hyperplasia
Incomplete antrectomy
Gastrinoma
Low gastric acid output
H_2 receptor antagonists
Proton pump inhibitors
Prior acid-reducing procedure
Atrophic gastritis
Achlorhydria
Pernicious anemia
Renal failure



Zinner MJ, Ashley SW: Maingot's Abdominal Operations, 11th Edition: http://www.accessurgery.com

Localization of gastrinomas.

Vipoma (Werner–Morrison syndrome, pancreatic cholera)

The syndrome of watery diarrhoea, hypokalaemia and achlorhydria in association with an islet cell tumour of the pancreas was initially described by Werner and Morrison in 1958. A number of hormones have been identified in these tumours but vasoactive intestinal polypeptide (VIP) is now known to be the causative agent in the majority of cases. VIP stimulates pancreatic, intestinal and gallbladder water and electrolyte secretions as well as pancreatic enzyme secretion and secretion of potassium by the colonic mucosa. VIP inhibits absorption of water and electrolytes in the small intestine and colon and also inhibits acid and pepsin secretion in the stomach.

Glucagonoma

Glucagonoma is a very rare tumour arising from the A-cell of the pancreatic islet. It gives rise to a characteristic syndrome consisting of severe skin rash, weight loss, diabetes mellitus, deep venous thrombosis, anaemia and hypoaminoacidaemia. Glucagonoma is considerably more common in females and is a disease of middle age. The majority of tumours (60–70%) have already metastasized at the time of diagnosis, predominantly to the liver. The typical skin rash consists of necrolytic migratory erythema with symmetrical erythematosus lesions that have crusted erosions and involve the perineum, groin, thighs, buttocks and lower limbs. The systemic manifestations include weight loss, weakness, lethargy and hyperglycaemia due to the metabolic and catabolic effects of high plasma glucagon levels.

Somatostatinoma

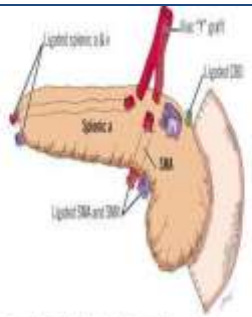
This is a very rare somatostatin-secreting tumour which occurs mostly in middle-aged predominantly female patients in the pancreas or the duodenum. Over 80% of the tumours have metastasized to the liver at the time of diagnosis. Most tumours produce other hormones such as VIP, pancreatic polypeptide, gastrin, calcitonin or cortisol. The clinical syndrome is often non-specific. Abdominal pain is the most common presenting symptom and this may relate to the high prevalence of gallstones. Other symptoms and signs include diarrhoea, diabetes mellitus (25%), weight loss, anorexia, hypochlorhydria, steatorrhoea and anaemia. Symptoms not related to excessive somatostatin levels are present in some patients, e.g., tachycardia, flushing, hypertension, hypokalaemia and hypoglycaemia.

Multiple endocrine neoplasia type 1 syndrome (MEN1; MEA1 Wermer's syndrome)

MEN1 syndrome is inherited as an autosomal dominant disorder but exhibits considerable phenotypic variability. The pancreas, parathyroid glands and pituitary are involved in all patients. The pancreas is inevitably involved, with diffuse islet cell disease consisting of micronodular and macronodular hyperplasia and often with multiple tumours secreting multiple peptide hormones. Hyperparathyroidism is present in 85% of cases, with hyperplasia of all four glands, in sharp contrast with the very low incidence of parathyroid hyperplasia in isolated primary hyperparathyroidism. Pancreatic abnormalities occur in the vast majority of MEN1 patients, with non-B-cell tumours (especially gastrinoma) being most common.

Multiple endocrine neoplasia type 2 syndrome (MEN2; MEA2; Sipple's syndrome)

This is inherited as an autosomal dominant and is not associated with pancreatic disease. It consists of hyperparathyroidism, medullary carcinoma of the thyroid gland and phaeochromocytoma. MEN2b is a variant, also inherited as an autosomal dominant but unlike MEN2, has a very low incidence of parathyroid disease. It is characterized by multiple mucosal neuromas, intestinal ganglioneuromatosis leading to megacolon and constipation, a Marfanoid habitus and characteristic facies (thickened lips and alae nasi), in association with the medullary carcinoma of the thyroid and phaeochromocytoma.



Donor pancreas prepared by splenectomy and ligation of splenic and superior mesenteric arteries (SMA) and veins (SMV). Duodenal stump secured with Lembert nonabsorbable suture. CBD, common bile duct; PV, portal vein. (Modified from Chauvin HZ, Kittur DS. Pancreas transplantation. In Cameron JL. Current Surgical Therapy (8th ed). St. Louis: Mosby, 1998, pp. 539-542; with permission).

Simultaneous pancreas-kidney (SPK) transplantation utilizing enteroenterostomy. (Modified from Chauvin HZ, Kittur DS. Pancreas transplantation. In Cameron JL. Current Surgical Therapy (8th ed). St. Louis: Mosby, 1998, pp. 539-542; with permission).