PANCREAS TRANSPLANTATION IN HUMANS
(The Present Situation)

Essay

Submitted for Partial Fulfilment of

Master Degree in General Surgery

By

Ahmed Abo El Ela Serag

M.B., B. Ch.

Supervised by

Dr. Adel Abd El Kader

Professor of General Surgery

Faculty of Medicine, Ain Shams University

Assissted in Supervision

Dr. Khaled Hosney

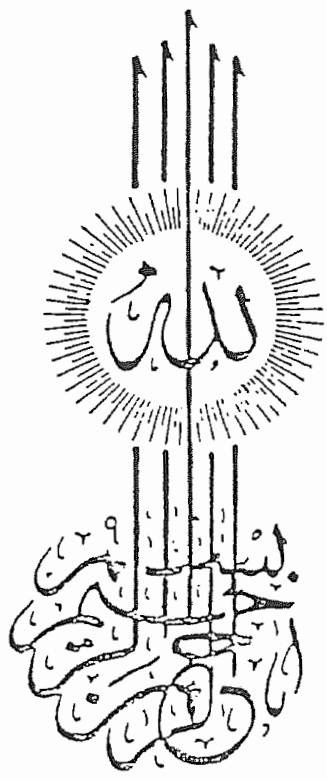
Lecturer of General Surgery

Faculty of Medicine, Ain Shams University

Faculty of Medicine

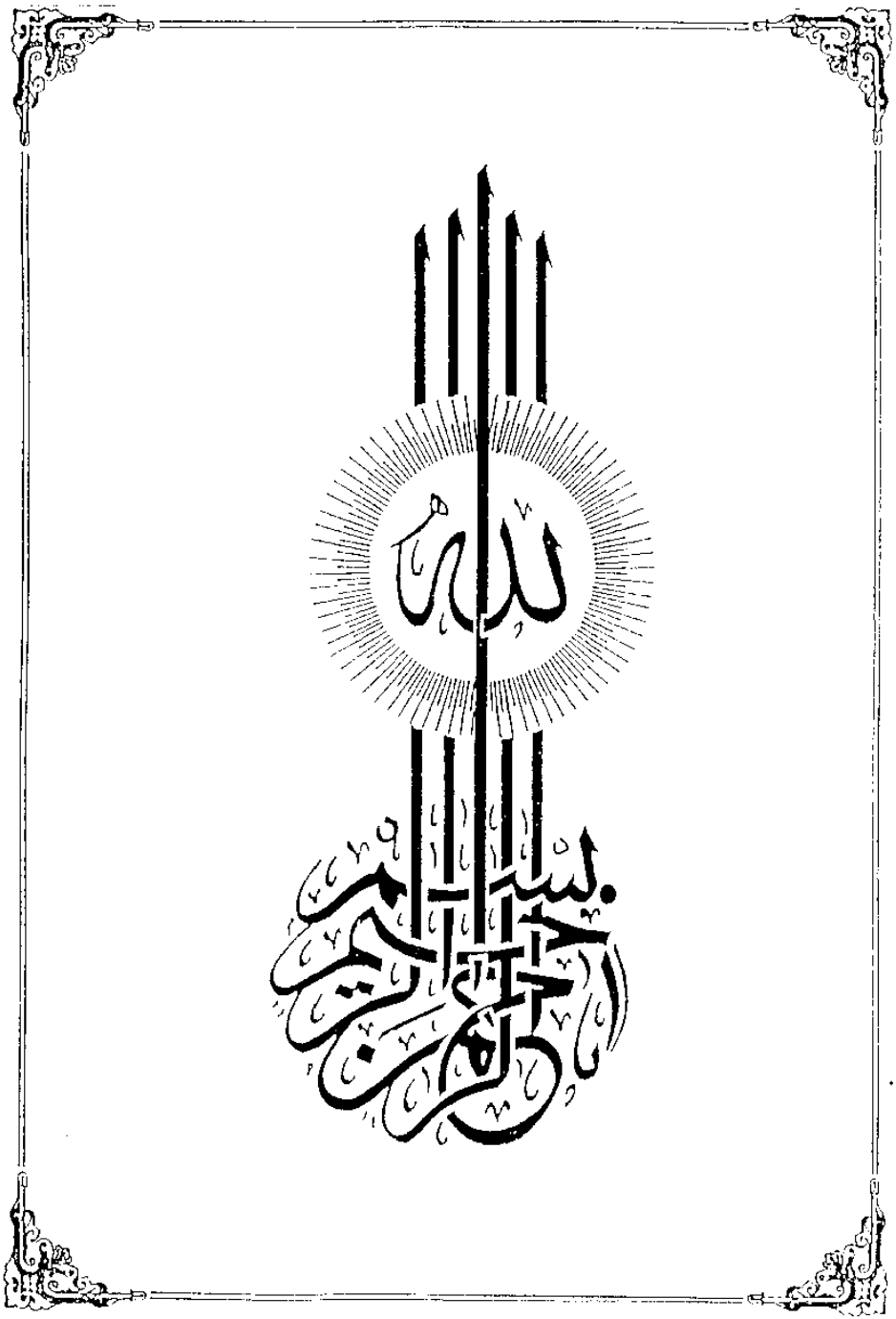
Ain Shams University

1994



قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ.

صَدَقَ اللهُ الْعَظِيمُ
البقرة - ٣٢-



ACKNOWLEDGEMENT

I wish to express my sincere thanks and deepest gratitude to Prof. Dr. **Adel Abd** El Kader, Professor of General Surgery, Faculty of Medicine, Ain Shams University, For his supervision, constant encouragement and invaluable advice throughout this work.

I am greatly indebted to Dr. **Khaled Hosney**, Lecturer of General Surgery, Faculty of Medicine, Ain Shams University, for providing the initial stimulus which aroused my interest in this subject, and for his supervision, great-help, continuous guidance, constant encouragement and invaluable suggestions during this work.

I would like to thank every one who helped me during the preparation of this work.

Contents

Anatomy of the Pancreas

CHAPTER 1

ANATOMY OF THE PANCREAS

Introduction:

The name pancreas is derived from the Greek "pan" (all) and "Kreas" (flesh). It was originally thought to act as a cushion for the stomach.

(Charles and Russel; 1992)

It is a compound gland whose exocrine part secretes a number of different enzymes that break down proteins, carbohydrates and fats in the alkaline medium of the duodenum. The endocrine part consists of minute islands (islets) of cells which are not connected with the duct system but secrete insulin and glucagon directly into the blood stream for the control of blood sugar level.

(Romanes; 1989).

EMBRYOLOGY

The pancreas develops as two separate buds, (Figure 1) each an outgrowth of the dudenal endoderm. The ventral bud grows into the ventral mesogastrium in common with the outgrowth of the bile duct. The dorsal bud grows independently from a separate duct into the dorsal mesogastrium. The duodenal portion of the gut subsequently rotates and becomes adherent to the posterior abdominal wall.

The duodenal portion together with the pancreatic outgrowth, finally lie behind the peritoneum. Because of the unequal growth of the duodenal wall and the rotation of the duodenal loop to the right, the ventral pancreas becomes below and to the right of the dorsal pancreas. The two pancreatic buds fuse together and their ducts anastomose. The main pancreatic duct become formed distally by the distal part of the duct of the dorsal pancreas and proximally by the duct of the ventral pancreas which opens in common with the common bile duct into the duodenum. (Volk and Allen; 1986)

MACROSCOPICALY

The gland is of soft consistency and its surface is finely lobulated. In shape the gland resembles the upper end of a thick walking stick or a hook, lying sideways with the handle or hook on the right and turned downwards. The gland weighs approximatley 80 gm, and it is about 15 cm in length. (Charles and Russel; 1992)

RELATIONS OF THE PANCREAS

The pancreas lies immediately behind the peritoneum of the posterior abdominal wall, the transverse mesocolm is attached to its anterior surface just above the inferior border, thus most of the gland lies in the supracolic compartment (in the lesser sac, forming part of the stomach

bed) but a narrow strip along its inferior border lies in the infra colic compartment. Its broad right extremity (the head) is connected to the main part or the body by a slightly constricted neck, (Figure 2) its narrow left extremity forms the tail. (Williams et al., 1989). The expanded head lies in the concavity of the duodenum overlapping its descending and horizontal parts. The head is anterior to the inferior vena cava, to the bile duct which grooves its superiolateral part, and to the aorta where its inferomedial extension (uncinate process) passes posterior to the superior mesentric vessels. The head is crossed anteriorly by the transverse colon or its mesocolon and superiorly by the first 2-3 cm of the duodenum, and join the body anterior to the formation of the portal vein, (Figure 3). The body passes to the left across the aorta, the left crus of the diaphragm, psoas major muscle, and the left renal vessels and kideny. (Figure 4) The body of the pancreas lies posterior to the omental bursa and stomach. The splenic artery runs a tortous course along its upper margin. The splenic vein lies within a groove along the posterior surface of the gland and is joined by the inferior and superior mesentric veins (Romans; 1989). The tail of the pancreas passes forward from the anterior surface of the left kideny at the level of the hilum. Accompanied by the splenic artery, vien and lymphatic it lies within the two layers of the lienorenal ligament and thus touches the hilum

of the spleen. (McMinn; 1990).

DUCTAL SYSTEM

The duct of wirsung, the major pancreatic duct, (Figure 5) begins in the tail, lying nearer to the posterior than anterior surface. It takes its origin from confluence of numerous small ducts of the lobules crossing the gland. They forming a herring bone pattern enter the main duct almost at a right angle. The duct traverse the body and reaches the neck where it turns downwards and backwards and approaches the common bile duct or joins it as it courses through the parenchyma of the pancreas. Both ducts form a short dilated hepatopancreatic ampulla, which empties into the major duodenal papilla (Papilla of vater) (Figure 6) situated at the junction of the medial and posterior walls of the duodenum about 8 to 10 cm distal to the pylorus. The ampulla varies from 1.5 to 4.5 mm in width, and from 1 to 14 mm in length. Usually the 2 ducts do not unite untill they arrive close the major papilla. At times they enter separately into the duodenum. The ampulla is surrounded by the sphincter of oddi, which is presumed to pervent reflux of bile into the pancreas or pancreatic secretion into the biliary system.

The other pancreatic duct (duct of santorini) orginates in the upper anterior portion of the head. It runs upward in front of the main duct to which it is connected by

communicating duct in 33% to 90% of the cases. Eventually, it opens by way of the minor papilla into the duodenum, 2 cm above and slightly ventral to the major duodenal papilla. Both ducts may fuse and form a common channel outside the duodenum. In 10% of the cases the main duct drains into the accessory papilla and has no connection with common bile duct. As stated, the duct of wirsung is the major duct in 90% of the cases and drains the bulk of the pancreatic parenchyma. Only a small upper anterior portion of the head is drained into acessory duct. In about 9% of cases, the duct of santorini is the major pancreatic duct. Occasstionally, additional small accessory ducts may enter the duodenum or the common bile duct. (Williams; 1989)

ARTERIAL SUPPLY

In general, the blood supply is greatest to the head of the pancreas, less to the body and tail and least to the neck. (John et al., 1983)

The blood supply of the pancreas is derived chiefly from the splenic artery (Figure 7) which supplies the neck, body and tail. The splenic artery is the largest branch of coeliac trunk. Its pancreatic branches are numerous small vessels supplying the neck, body and tail. They are derived from the splenic artery as it runs along the upper border of the

pancreas. (Williams et al., 1989)

The head is supplied by the superior and inferior pancreaticoduodenal arteries. The superior pancreaticoduodenal arteries are the terminal branches of the gastroduodenal artery. They are usually two in number, the anterior one descends infront of a groove between the duodenum and the head of the pancreas where it anastomoses with the anterior division of the inferior pancraticoduodenal artery. The posterior one runs downwards and to the back of the head and end by anstomosing with the posterior division of the inferior pancreaticoduodenal artery. The inferior pancreaticoduodenal artery is a branch from the superior mesentric artery which arises from the front of the aorta one centimeter below the coeliac trunk. Usually, it divides at once into anterior and posterior branches, that anastomose with branches of the superior pancraticoduodenal artery. Both branches supply the head of the pancreas including its uncinate process and the adjoining part of the duodenum. (Williams et al., 1989)

VENOUS DRAINAGE

The venous drainage of the pancreas follows the course of arteries quite closely, but the veins lie superficial to their arterial counterparts.

Venous return is drained by numerous small veins into the splenic vein and in the case of the head by the superior pancreaticoduodenal vein into the portal vein and by the inferior pancreaticoduodenal vein into the superior mesentric vien. (Mc minn; 1990).

The portal vien is about 8 cm long and start at the level of the second lumbar vertebra from the union of the superior mesentric and splenic vein infront of the inferior vena cava and behind the neck of the pancreas. Among its many tributaries is the superior pancreaticoduodenal vein which drains the head and neck of the pancreas.

(Williams et al., 1989).

LYMPHATIC DRAINAGE

Lymphatics from the pancreas follow the course of the arteries. To the left of the neck, the pancreas drains into the retropancreatic nodes. The head drains from upper part into the celiac group and from its lower part and uncinate process into the superior mesentric group of pancreatic lymph nodes. (Mc minn 1990)

NERVE SUPPLY

Parasympathetic vagal fibres which are capable of stimulating exocrine secretion, reach the gland mainly from the posterior vagal trunk and coeliac plexus, but as with the gall bladder, hormonal control is more important than the neural.

Sympathetic vasoconstrictor impulses are derived from the spinal cord segments T_6 - 10 via splanchnic nerves and coeliac plexus, the post ganglionic fibres running to the gland with its blood vessels. As with other viscera, pain fibres accompany the sympathetic supply so that the pancreatic pain may radiate in the distribution of thoracic dermatomes 6-10. (Romanes; 1989)

EXPOSUR AND PALPATION

In order to inspect and palpate the pancreas, there are three different surgical approaches:

1. The hepatic flexure of the colon is mobilized downward and medially by dividing its attachement to the duodenum and the anterior aspects of the pancreatic head, The periotonium lateral to the seond part of the duodeunum is incised, then the duodenum and pancreatic head are elevated by blunt dissection. "Kocher's maneouvre" from the posterior parietal structures.

2. Limited visualization of the superior part of the body of the pancreas may be obtained by opening an avascular part of the lesser omentum and retracting the lesser curvature of the stomach inferiorly. Adequate visualization of the body can be done by a larger opening in the gastrocolic omentum, retracting the transverse colon and mesocolon inferiorly and the great curvature of the stomach superiorly. By extending the opening to the right into the pyloric region, the neck of the pancreas can be visualized. By extending this opening to the left and dividing the splenic ligament, the tail of the pancreas can be visualized.

3. Downward and medial retraction of the dome of the spleen and dividing the lienorenal ligament allow the spleen, splenic vessels and tail of the pancreas to be mobilized en-bloc allowing inspection of the posterior aspect of the body and tail of the pancreas. (Moossa and Stabille; 1988)