SONOGRAPHY OF THE PANCREAS IN DIABETES MELLITUS

THESIS

Submitted for Partial Fulfilment

of Master Degree

(General Medicine)

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1984

ACKNOWLEDGEMENT

First and most of all, thanks to God.

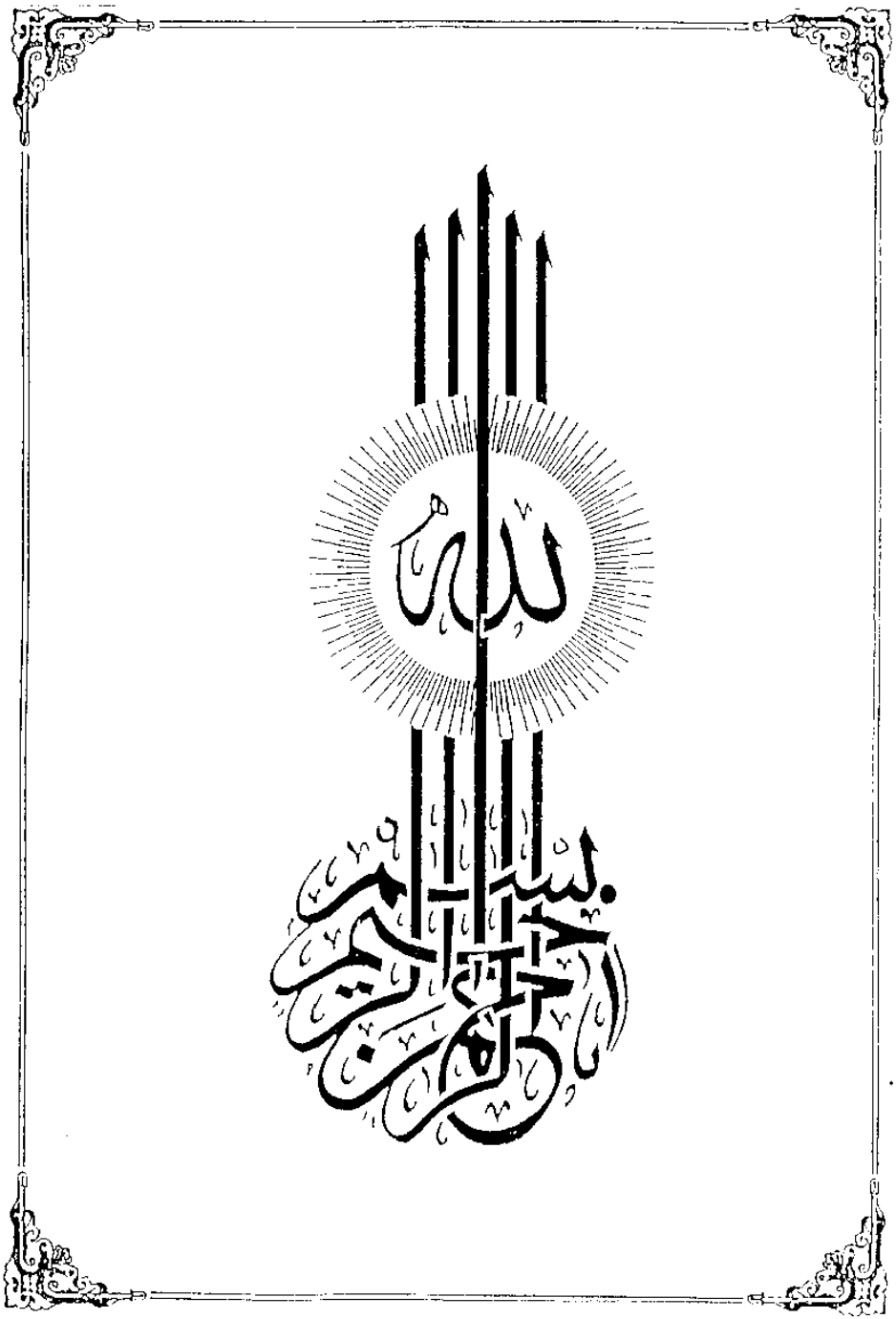
I wish to express my deepest gratitude to Prof. Dr. Yehia Z. Mohran, Professor of internal medicine, Ain Shams University for planning this work, and for his supervision and guidance.

I wish also to express my gratitude to prof. Dr. M. Awadalla Sallam, Professor of internal medicine, Ain Shams University for the valuable time he offered me, and for his sincere encouragement and kind help.

I wish also to express my gratitude to Dr. Hoda El Tayeb, lecturer of internal medicine, Ain Shams University for the great effort she made to accomplish this work.

Lastly, I wish to express my gratitude to everyone who helped in a way or another to complete this thesis.

Abdou A.A. Fares



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Introduction

I

INTRODUCTION

Diabetes mellitus is one of the oldest medical problems. Descriptions of the disease were made 3000 years ago in Egypt in the Ebers papyrus. (Watkins, 1982)

About 2000 years ago, the Romans Aretaeus and Celsus described the disease and gave the name diabetes (= siphon) mellitus (= honey or sweet). Its association with gangrene was mentioned by the Arab Avicenna. Dodson, at the end of the 18 th century demonstrated that the sweetness of the urine was due to sugar. (Cahill, 1975)

The use of pulse echo technique during the war time for detection of submarines provided the basis for diagnostic ultrasound. The pulse generator produces a brief electrical pulse that is sent to a transducer containing a piezoelectrical material which converts the electrical pulse to a sound wave. Conversely, a sound pulse (echo) received by a transducer is converted back to an electrical pulse which is displayed on the oscilloscope. The frequancies used in diagnostic ultrasound are in the range of one to ten Megahertz. The ultrasound demonstration of solid lesions of the pancreas was first mentioned in 1964 by Holmes and in 1969 by Blaunstein. (Vay and Patrick, 1978)

Ultrasound has found an established place in the investigations of pancreatic diseases. Although assessment of acute

and chronic pancreatitis and tumours were successfully carried out in most patients, almost nothing is published in the literature about the sonographic picture of the pancreas in diabetes mellitus.

Aim of the work:

The aim of this work is to study the sonographic picture of the pancreas in diabetic patients. Pancreatic morphology, dimensions, echogenecity, as well as serum amylase, liver function tests, and others will be done. The results will be correlated with each other.

Review Of Literature

ANATOMY OF THE PANCREAS

"Gray's Anatomy" :

The pancreas is a compound racemose gland. It is formed from the head, neck, body, and the tail. It is situated across the posterior abdominal wall, at the back of the epigastrium and the left hypochondrium. Its length varies from 12 to 15 cms. , its breadth is about 4 cms. , its thickness is about 1.5 - 2.5 cms. being greater at its right extremity and along its upper border. Its weight varies from 60 to 110 grams but may reach up to 170 grams.

The head:

it is flattened from before backwards, filling the duodenal curve. Anteriorly, it is crossed near its left border by the superior mesenteric vesseles, its lower end is crossed by the transverse colon and its mesoclon. Behind, it is related to the inferior vena cava (I.V.C.) , left renal vein, right crus of the diaphrgm, and the aorta. the common bile duct descends behind between it and the duodenum, and the superior pancreaticoduodenal artery descends anteriorly between the pancreas and the duodenum.

The neck :

It is 2.5 cms long, passes upwards, forwards, and to

the left having the first part of duodenum above it, and termination of the fourth part below it. It lies infront of the beginning of the portal vein. It is grooved on the right by the gastroduodenal artery and the superior pancreaticoduodenal artery. The pylorus lies above it.

The body and tail:

they are prismatic in shape having three surfaces: anterior, posterior, and inferior. The anterior surface is somewhat concave It is covered by the posterior surface of the stomach, separated from it by the lesser sac.

The posterior surface is separated from the vertebral column by the aorta, the splenic vein, the left kidney and its vesseles, the left suprarenal gland, the pillars of the diaphragm, and the origin of the superior mesenteric artery.

The inferior surface is narrow, and lies above the duodenojejunal flexure and some coils of jejunum, its left extremity rests on the splenic flexure of the colon. The superior border of the body is blunt and flat to the right and narrow and sharp to the left. Its right extremity is related to the caeliac axis from which the hepatic artery courses to right just above the pancreas while the splenic branch runs in a groove along this border to the left.

The tail:

It is narrow, it extends to the left to the lower part of inner aspect of the spleen.

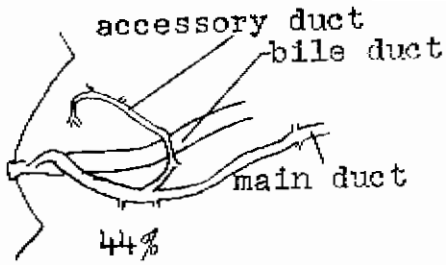
The pancreatic duct:

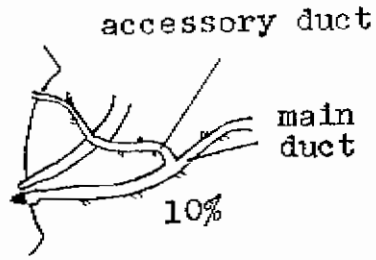
It extends from left to right transversely. It is formed by the junction of the small ductules in the tail, as it runs towards the head it reveives more ductules and its diameter increases. As it reaches the neck, it turns obliquely downwards, backwards, to the right and it comes in relation with the common bile duct. It leaves the head and passes obliquely through the duodenal wall and terminates by an orifice common with the common bile duct upon the summit of an elevated papilla situated at the inner side of the second part of duodenum 8 - 10 cms. below the pylorus.

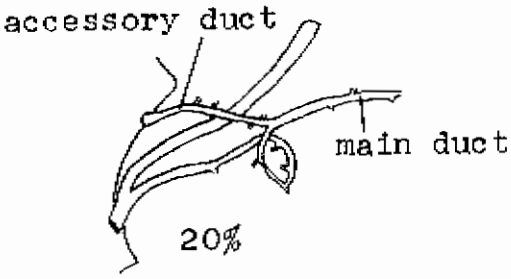
Variations in connection of pancreatic duct with the duodenum:

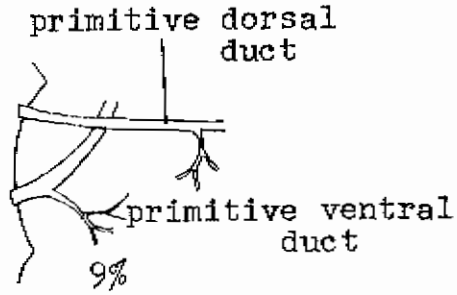
(Grant's Atlas) : (See Fig)

In about 9% the primitive dorsal duct persists, usually quite unconnected with the primitive ventral duct. In about 44% the accessory duct loses its connection with the duodenum, or in 8% ends blindly at the duodenum, or in 9% retains only a negligibly small opening into the duodenum. In about 10%, the accessory duct is large enough to relieve an obstructed main duct, and in 20% it could probably substitute for it. In









Variations in the connection of pancreatic duct with duodenum

(Grant's Atlas,1972)

about 5% the bile and main pancreatic ducts open separately on the duodenal papilla.

Blood supply of the pancreas (Gray's Anatomy)

The arteries of the pancreas are derived from the splenic artery, superior pancreaticoduodenal artery from the gastroduodenal artery which is a branch of the hepatic artery, and inferior pancreaticoduodenal artery from the superior mesenteric artery.

Its veins open into the splenic, superior mesenteric and portal vein.

Lymph capillaries commence around the acini, the lymph vesseles follow the course of the blood vesseles, to end in the pancreaticosplenic nodules, but some of them end in the lymph nodes along the panceaticoduodenal vesseles and others in the superior mesenteric group of pre - aortic nodes.

Nerve supply of the pancreas:

Its nerves are derived from the vagus and the splanch nic nerves, reaching it through the splenic plexus. The islets receive rich cholinergic innervation supplying their vascular beds with vasomotor fibers.

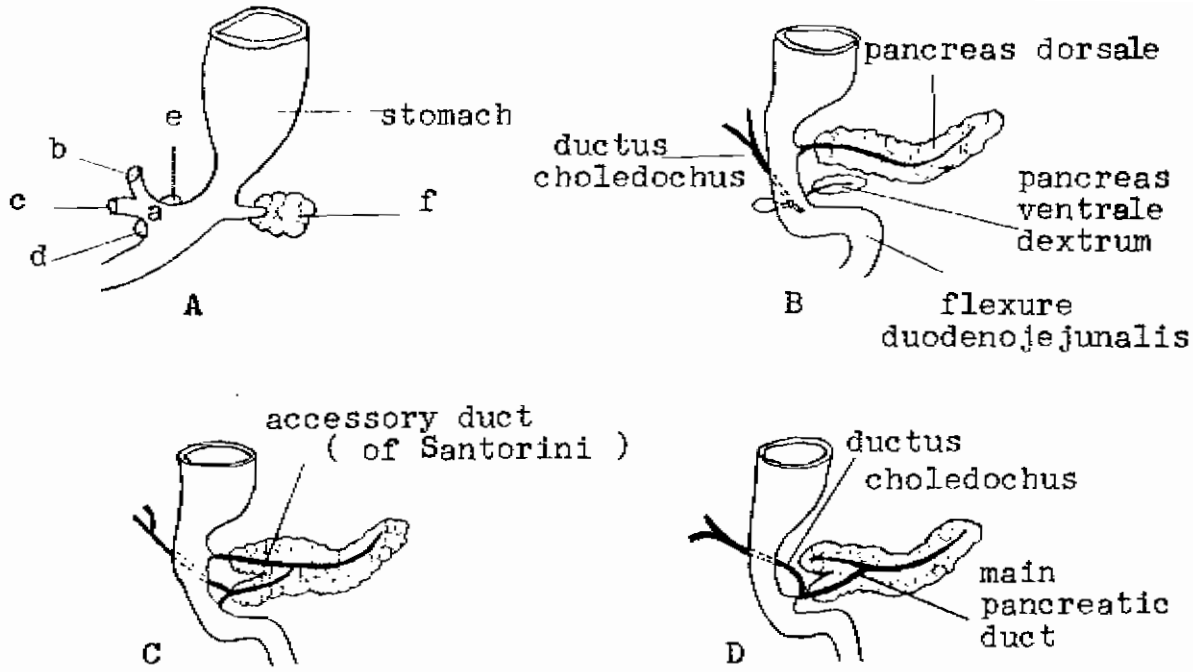
Surface anatomy:

The head lies within the curve of the duodenum. The neck lies in the transpyloric plane, behind the pylorus. The body passes obliquely to the left and slightly upwards for about 10 cms. Its left part lying a little above the transpyloric plane. The tail lies a little above and to the left of the intersection of the transpyloric and the left lateral planes.

EMBRYOLOGY OF THE PANCREAS

Kiernnan et al, (1980) :

Normally, at about the fourth week of gestation, two outpouchings occur along the foregut of the 3 - 4 mm embryo. There is one dorsal and one ventral outpouching. The former matures into the body and tail of the pancreas, while the latter which is at first in form of two small buds which then unite will form the head and the neck of the pancreas. Gastric rotation, along with duodenal and common bile duct growth and elongation, brings the ventral bud in a rotatory sweep to the embryo's right, then dorsally, and then to the left. The ventral bud which is nestled against its dorsal counterpart by the eighth week of gestation, contains the major exo-



Diagragmatic development of pancreas. A, early pancreatic buds: a,common bile duct - b, hepatic duct - c, cystic duct - d, right and e, left ventral pancreatic anlagen - f, dorsal pancreas and its duct . B,C,D, normal migration of ventral anlage to fuse with dorsal anlage, and establishment of pancreatic duct of of Wirsung, which empties through duodenal papilla in common with ductus choledochus. (Kiernan et al, 1980)