HAEMODYNAMIC STUDY OF PORTAL VEIN AND HEPATIC ARTERY FLOW AFTER SURGICAL MANAGEMENT OF PORTAL HYPERTENSION

Thesis
Submitted For Partial Fulfillment Of The
Medical Doctorate Degree in General Surgery
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2013

دراسة التغيرات الديناميكيه فى سريان الدم بالوريد البابى والشريان الكبدى فى المرضى المصابين بارتفاع الضغط فى الوريد البابى بعد التدخل الجراحى

رسالة مقدمة من

الطبيب / عبدالفتاح مرسي سعيد محمد
توطئة للحصول على درجة الدكتوراه فى الجراحة العامة

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Acknowledgement

بسم الله الرحمن الرحيم

بداية نحمد الله الذي هدانا لهذا وما كنا لنهتدي لولا أن هدانا الله.

*It gives me the greatest proud and glory to express my deepest gratitude and sincerest thanks to **Prof. Dr. Osama Abbas Mohammed El Kattan,** Professor of General Surgery, Faculty of Medicine, Al-Azhar University, for his comments, ideas, and constructive criticism. He gave me privilege to work under his supervision and valuable advices.*

*Words are not enough to express my greatest thanks and deepest appreciations to **Prof. Dr. Amr Mahmmoud Zayed,** Professor of Radio-Diagnosis, Faculty of Medicine, Al-Azhar University, for his sustained and uncut support throughout this essay.*

*Very special thanks and very great proud should be offered to **Dr. Mohammed Sobhy Taemma,** Assistant professor of General surgery, Faculty of Medicine, Al-Azhar University, for his effective and useful guideness and support through this essay.*

I would like to thank all my professors, colleagues and staff of general surgery, Faculty of medicine, Al-Azhar University for their assistance and kind care

Abd El Fattah Morsy

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Introduction

Upper gastrointestinal bleeding is one of the common admissions to surgical wards. It can be life threatening if not managed appropriately and expediently. The mortality rate ranges from 10% to over 50% depending on the cause of bleeding and associated risk factors. One of the most common cause is variceal bleeding secondary to portal hypertension. The in-hospital mortality rate for the first bleed is in the region of 50%, and worst in the re-bleeding cases. Early re-bleeding occurs in 30% to 50% of patients, usually within the first five days after initial bleeding. **(Chin and Lucien, 2004).**

Hypertension with the portal vein and its tributaries may accompany hepatic disease or disturbance in the anatomy of the extrahepatic vascular system. As a consequence of this elevated pressure, congestion of collateral pathways is established and may be manifested by esophagogastric varices, ascites, hypersplenism, or encephalopathy **(Brunicardi et al., 2010).**

Portal hypertension is usually classified as presinusoidal, sinusoidal or postsinusoidal based on the anatomic location of the increased resistance of the portal flow (**Boyer and Henderson, 1996).** This classification does not take into account the considerable overlap between the presinusoidal and sinusoidal component of portal hypertension in different histologic types of cirrhosis. Another approach is based on the site of the underlying lesion into pre-hepatic, intra-hepatic and post-hepatic. The classification into cirrhotic and non-cirrhotic is simple, incomplete and carries a prognostic value; noncirrhotics have usually less morbidity and mortality than cirrhotics **(Westbay and Williams, 1985).**

Cirrhosis accounts for more than 90% of the cases in developed countries; however, schistosomiasis is very common cause of portal hypertension in South America and North Africa (**Bosch and Garcia-Pagan, 2000).**

Schistosomiasis is an endemic disease in many countries in Africa, South America and South East Asia. Liver involvement with schistosomiasis causes fibrosis and portal hypertension. World wide schistosomiasis accounts for more cases of portal hypertension than any other type of intrinsic liver disease **(Salam, et al., 1990).**

Doppler ultrasonography is a noninvasive technique for assessment of portal venous patency, direction of portal flow, and shunt patency status. Because of its noninvasiveness, Doppler ultrasonography has become a standard for the evaluation of most patients with chronic liver disease **(Layton and Rikker, 2008).**

The most effective nonshunt operation is extensive esophagogastric devascularization combined with esophageal transection and splenectomy. The Sugiura procedure preserves the coronary and paraesophageal veins to maintain a portosystemic collateral pathway and thus discourage re-formation of varices **(Layton and Rikker, 2008).**

AIM OF THE WORK

The aim of the present work is a comparative study between haemodynamic changes of portal vein and hepatic artery flow before and after surgical management of chronic liver diseases with portal hypertension by using the color doppler ultrasonography to prove whether or not the hepatic flow and perfusion will be affected by surgery, laboratory investigation changes, the clinical applications of these changes and detection of best procedures of surgery.

ANATOMY OF THE HEPATIC ARTERY AND PORTAL VENOUS SYSTEM

The liver is a unique organ in that it has a dual blood supply: portal venous and hepatic arterial. Hepatic blood flow averages 1500 mL/minute, which represents about 25% of the cardiac output. The portal vein contributes two thirds of the total hepatic blood flow, whereas hepatic arterial perfusion accounts for more than half of the liver's oxygen supply **(Sicklick et al., 2012).**

Blood from these two sources mingles in the blood sinusoids of the liver parenchyma and is drained by tributaries of the hepatic veins. These veins open into the inferior vena cava (**Skandalakis et al., 2009).**

The hepatic artery, portal vein, and intrahepatic bile ducts are arranged in a lobar pattern with dichotomous branching into segment vessels that, in turn, divide into area vessels. Because of their similar distribution, the terminology of the three systems is much the same (**Skandalakis et al., 2009).**

Hepatic Artery

The hepatic artery, representing high-flow oxygenated systemic arterial flow **(Sicklick et al., 2012).**

The celiac trunk originates directly off the aorta just below the aortic diaphragmatic hiatus and gives off three branches: the splenic artery, the left gastric artery, and the common hepatic artery (**de Franchis, 2010).**

A number of smaller perihepatic arteries derived from the inferior phrenic and the gastroduodenal arteries also supply the liver. These vessels are important sources of collateral blood flow in the event of occlusion of the main hepatic arterial inflow. In the case of ligation of the right or left hepatic artery, intrahepatic collaterals almost immediately provide for nutrient blood flow **(Sicklick et al., 2012).**

Proper Hepatic Artery

The common description of the arterial supply to the liver and biliary tree is present only about 60% of the time (Fig. 1). The common hepatic artery passes forward and to the right along the superior border of the pancreas and runs along the right side of the lesser omentum, where it ascends toward the hepatic hilum lying anterior to the portal vein and to the left of the bile duct. At the point that the common hepatic artery begins to head superiorly toward the hepatic hilum, it gives off the gastroduodenal artery, followed by the supraduodenal artery and then the right gastric artery. The common hepatic artery beyond the takeoff of the gastroduodenal artery is called the *proper hepatic artery* and divides into right and left branches at the hilum **(Sicklick et al., 2012).**

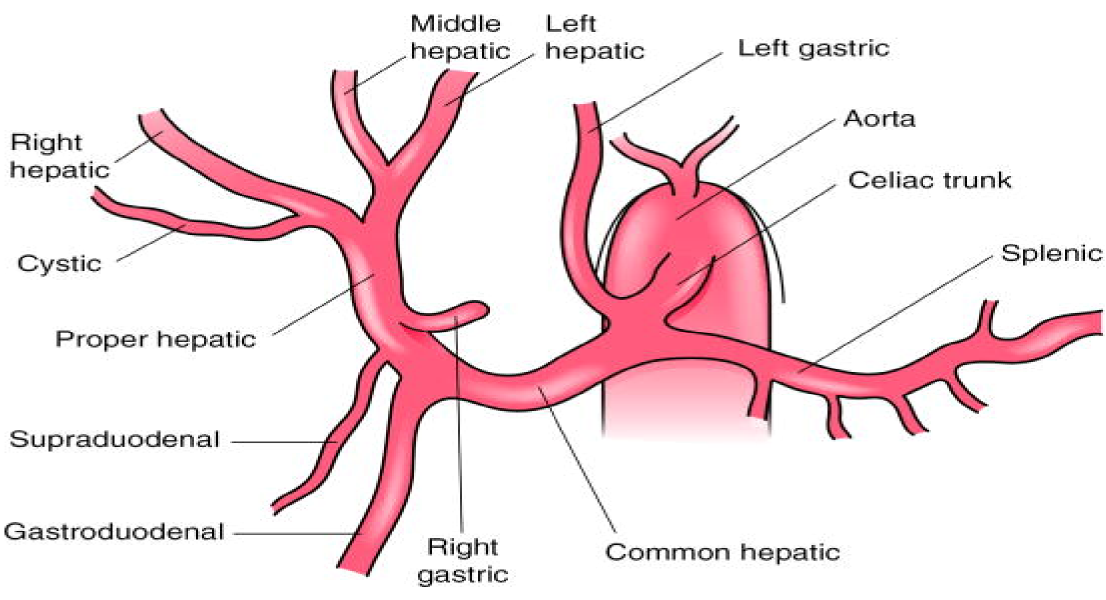

Figure (1): The most common anatomy of the celiac axis and hepatic arterial system is demonstrated **(Blumgart and Hann, 2000).**

Right Hepatic Artery

The right hepatic (lobar) artery passes to the right, usually posterior to the hepatic duct but occasionally anterior to it. The cystic artery generally arises from the right hepatic in the hepatocystic triangle located between the cystic duct and the common hepatic duct (**Skandalakis et al., 2009).**

The right hepatic artery bifurcates to form the anterior and posterior segment arteries. This division may take place within the liver or extrahepatically in the porta. The segment arteries divide, in turn, into superior and inferior area arteries that run with and are, generally, inferior to the bile ducts serving the same area **(Filipponi et al., 2000).**

The anterior segmental branch of the right hepatic artery is more tortuous than the posterior segmental branch. After passing downward toward the neck of the gallbladder, it turns abruptly upward to accompany the bile duct of the anterior segment. In the downward part of its course near the gallbladder fossa, the anterior segment branch can be vulnerable to injury during operative procedures on the gallbladder (**Skandalakis et al., 2009).**

Left Hepatic Artery

The left hepatic artery is shorter than the right because the right and left hepatic arteries arise to the left of the interlobar (median) fissure. The left hepatic artery ended at its bifurcation into medial and lateral segmental arteries (**Skandalakis et al., 2009).**