CHAPTER 2

SURGICAL ANATOMY OF THE LIVER

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2.1. Introduction

The exterior morphology of the liver and the intrahepatic ramifications of its vasculature has been a subject for study throughout the ages. From historical data, which Stieda refers to, images of the liver come into light during the Babylonian era, i.e., 4-5000 B.C. [1].

One of the first reports concerning the study of the liver and its vessels anatomy is the monograph of Glisson in 1654 [2]. Through his famous Tables, Glisson was able to depict the course and the arrangement of the vessels of the liver (fig. 2.1b, 2.1c). We should not forget that his work constitutes the basic preliminary study on which our further knowledge has been supported on the anatomy of the liver.

Since then, lots of works have been published, mainly referring to the Glissonian system. Hyrtl (1873), Rex (1888), Goldsmith and Woodburn (1957), Hjortsjo (1948-1956), Elias and Petty (1952), Healey and Schroy (1954), Gans (1955) and Couinaud (1953-1957) are some of the people that have advanced our knowledge on the liver anatomy [3, 4, 5, 6, 7, 8, 9, 10, 11].

2.2. Embryology

Embryologically, the liver originates from a diverticulum of the fetal gastric tube [12, 13]. We distinguish a head, which is going to be differentiated to the hepatic parenchyma and the intrahepatic biliary ducts, as well as an abdominal part, which will form the gallbladder and the extrahepatic biliary vessels. Almost just after its formation, the part of the hepatic diverticulum protrudes cells in the visceral mesoblast. Those rapidly proliferating cells, form a mass that occupies a space between the pericardial cavity and the omphalo-enteric pedicle of the omphalic vesicle. From the beginning, the hepatic diverticulum is next to the pair of omphalo-enteric or vitelline veins, which extend parallel to the enteric tube. The afore mentioned veins give bran-
ches to the mass of the proliferating hepatic cells and, with anastomosis between themselves, form the sinusoids of the liver, which give the spongy aspect to the hepatic parenchyma. Therefore, in an embryo of 5 mm, the liver consists of a semilunar mass, which is found and grows upwards and towards the abdominal cavity from the gut. The two lateral extensions of the initially semilunar liver come in contact with the omphalo-enteric or vitelline veins, which they finally get enclosed within.

At the beginning of the embryonic life of the cye- 
ma, there are three vein systems (pairs), [3] i.e.: 1st the pair of Omphalic veins, originating from the chorion; 2nd the pair of Omphalo-enteric or Vitelline veins, originating from the omphalic vesicle and 3rd the pair of Cardinal veins, originating from the body of the foetus. The latter extrude in the sinus venosus of the fetal heart from a common stem, called duct of Cuvier (fig. 2.1). The continuously enlarging liver obviously largely affects the final formation of both the umbilical and the vitelline veins, from which finally the system of the Portal vein as well as the Hepatic veins originate.

The pair of the Vitelline veins follows the umbilical duct and enters the body of the foetus, in a capital course, parallel to its enteric tube and finally extruding in the sinus venosus. During the 4th fetal week, the medium part of the vitelline veins develops -both within the vitelline veins and within the liver- multiple anastomoses, which consist later the sinusoids of the liver. Upon the developmental evolution, the vitelline veins form more anastomoses, especially three bearing particular significance. The first is formed capillary and within the liver. The second-median is formed out of the liver and below the duodenum and the third one is sited caudally to the other two and above the duode- num. The latter two form a kind of ring around the duodenum, the remaining part of which after the evolu- tion, has the shape of an S and forms the Portal vein, which meets the Upper Mesenteric and the Splenic vein (fig. 2.2).

The capital part of the vitelline veins -found between the sinusoids and the sinus venosus- and, especially, the branches -originating from the remaining stem of the right vitelline vein- consist the Hepatic veins. The Umbilical veins, bringing blood from the placenta through the umbilical cord, extrude in the si- nus venosus. As the liver grows laterally, the umbilical veins come rapidly in contact with it and their blood, finding a shorter course, enters directly the heart through the hepatic sinusoid. When all the blood of the umbilical veins enters the liver, and this happens in a foetus of 6 mm, the whole right and the central part of the umbilical veins become atrophic and they soon disappear. In the 7 mm foetus, the remaining distal part of the left umbilical vein is already large enough and remains like that until birth, when it occupies the free end of the falciform ligament and post-foetally forms the round ligament.

Due to the fact that the initial course through the right vitelline vein within the liver is larger than the left one, the blood from the left umbilical vein follows this easier larger course towards the heart. But, as the right lobe of the liver increases, the length of the haem- atic course increases continuously, thus forming a diagonal haematic flow, independent of the flow of the hepatic sinusoid towards the heart. This diagonal course is the so called duct venosus, which represents the direct haematic course between the placenta and the heart, bypassing at a certain degree the sinusoid of the liver. Thus, the left umbilical vein from one part, sends through the venous duct blood directly to the heart and, from the other, sends and receives an anastomotic branch towards the portal vein (fig. 2.2).

The foetus receives blood from its mother through