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ANATOMICAL STUDY OF THE MORPHOMETRY OF PORTAL CAUDATE VEINS

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ABSTRACT

The caudate lobe is a relatively unknown part of the liver due to its location and many variations. The caudate lobe is a separate entity that is located behind the trunk of the portal vein.It constitutes the hepatic dorsal area that comprises of only segment I. Thus, this lobe can be vascularized by caudate veins (CV) born either from the right branch of the portal vein (PV),from the left branch or from both. Therefore, the work allows us to study the morphometry of caudate veins. Based on the exploitation of vascular mussels of the inferior vena cava and the portal vein after injection-corrosion of the liver, the study conducted from April 2018 to March 2019 involved 41 livers of which 30 were exploited for caudate veins. These were from fresh adult subjects, both sexes free of any hepatobilio-pancreatic pathology or trauma. The injection-corrosion parts of his vascular mussels included the hepatobasement junction and the hepatic pedicle. The PV and its right and left branches provided accessory caudate branches for the caudate lobe at the level of the hepatic hilum. Thus, for all livers, we found 102 branches cauded by accessories. The accessory caudate veins were born either from the left branch of the PV in 28 livers out of 30 (93.37%), by 1 to 4 vessels with an average distance between its branches and the portal bifurcation being 17 mm with extremes ranging from 7 to 39 mm; either from the right branch of the PV in 23 livers out of 30(76.6%), by 1 to 3 vessels with an average distance of 12.9 mm between its branches and the portal bifurcation, with extremes ranging from 9 to 18 mm. The stem of the portal vein gave branches to the caudate lobe in 11 livers on 30(36.6%),by 1 to 2 vessels whose diameter varied from 1 mm to 3 mm. We studied on 30 liver samples the anatomical variations related to CV. This is a contribution to the fundamental foundations of liver removal surgery because too little work (and often radiological) exists in Africa on the subject. However, this lack of comparative anthropometric data confirms the diversity of anatomical variations in caudate veins. On the therapeutic level these anatomical data contribute to the peri-operative safety of liver surgery.

Keywords: Caudate veins, Portal vein, Liver.
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INTRODUCTION

The caudate lobe of the liver(segment I of Couinaud), located behind the trunk of the portal vein, is a visible prominence on the underside of the liver. It is limited to the rightby the groove of the inferior vena cava, to the left by the groove of the venous ligament of Arantius, and on the inferior by the hilum of the liver [Heloury and al., 1987 ; Leguerrier , 2000].

It is a particular anatomical entity of the liver, which has always aroused the interest of anatomists and surgeons. The work of many authors, including Couinaud, has enabled us to improve the techniques of liver surgery

while at the same time modernizing it through various anatomical studies carried out at the liver level [Arora and al., 2003].

Thus, through anatomical studies [Couinaud C., 1957] and radiological studies [Denys and Al., 2002] it has made it possible to divide the liver into several functional independent segments; principle of liver segmentation.

Each segment has an arterio-portal pedicle, a drainage bile duct and a clean hepatic vein. A particular segment, the "lobus exigus" described by Adrien Van Der Spiegel later named Lobe de Spiegel by Françis Glisson is also fed by the VP. It is the smallest of the liver segments but considered the only consistent liver lobe in comparative anatomy [Trinh and al., 1992]. Despite this, more about this lobe is still unknown, which could be a contributing factor to the recurring diagnostic errors in liver imaging and functional anatomy.

This caudate lobe can be vascularized by the branches coming from either the right branch of the portal vein (RBPV), the left branch of the portal vein (LBPV), the two branches or the bifurcation of the portal trunk at the hilum. They vascularize the parts of the caudate lobe, regardless of their origin [Foucou and Al., 1983; Franceschini and Ortale, 1955]. The portal branches that vascularize the caudate lobe are numerous, small in size and vary in number (between 2 and 6). They are not satellites of the arteries and bilateral channels [Brahim, 2019; Kogure and Al., 2000].

Some of these branches are superficial (supplying the surface of the caudate lobe); others penetrate the parenchyma.

Our work, initiated since 2005, implemented in 2006 based on the exploitation of vascular mussels after injection-corrosion of the portal vein and recently revisited on the same basis associated with the liver-junction cellar,will allow us to clarify the morphometry of the caudate veins of the door trunk.

MATERIALS AND METHODS

From 2005 to 2006, we used samples with the hepatobasement junction and the hepatic pedicle.

The study involved 39 livers (after 41 samples) of which 30 were mined for CV. These were parts from fresh adult subjects, of both sexes, and free of any pathology or hepato-pancreato-biliary trauma.

The samples were taken (during forensic autopsies) at the Bichat pavilion of the Laboratory of Anatomy and Pathological Cytology of the Aristide Le Dantec Hospital in Dakar.

The parts used in our laboratory to make the molds, consisted of 41 livers of which only 30 were used for CV. To opt for these Pieces, we used conventional instruments for dissection, catheterization, ligature; and for our measuring tools, we find: double compass with metal tip, centimeter-flexible, protractor, double decimetre, Kirschner pins and photographic equipment. Having oriented each piece, we studied in each the following :Cl

- The number of main caudate veins and accessories,
- VC diameter,
- The distance between the different branches and the portal bifurcation.

RESULTS

The caudate lobe or dorsal area [Kamina, 2006] is a relatively unknown part of the liver due to its locationand many variations. The portal vein and its right and left branches provided accessory caudate branches for the caudate lobe in the hepatic hilum.

For all livers, we found 102 branches cauded by accessories. These vessels were present

in all rooms with an average of 3 branches per liver (Figure 1).

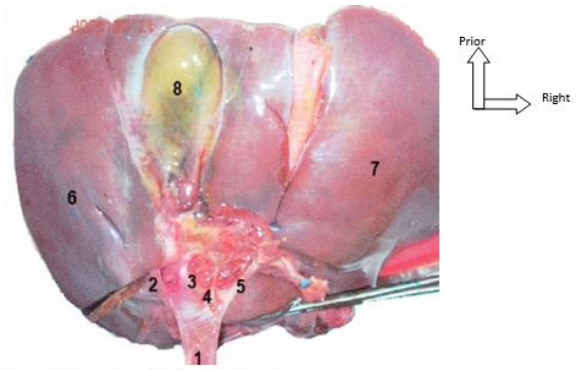

Figure 1 : Lower view of the liver after dissection
1- Portal Vein Trunk
2- Right Lateral Vein
3- Right Paramedia Vein
4- Accessory caudate limb from left portal vein
5- Left branch of portal vein
6- Right lobe of liver
7- Left lobe of liver
8- Gallbladder

The overall diameter of these branches ranged from less than 1 mm to 5 mm. The accessory caudate branches were born either from the left branch of the portal vein in 28 livers out of 30 (93.37 %) by 1 to 4 vessels, or from the right branch of the portal vein in 23 livers out of 30 or 76.6 % per 1-3 vessels (Figure 2).

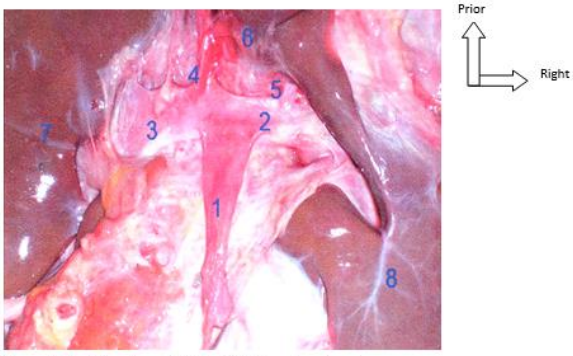

Figure 2 : Posterior view of the hepatic hilum after dissection
1- Portal Vein Trunk
2- Right Portal Vein Branch (BDVP)
3- Left Portal Vein Branch (BGVP)
4- Ancillary Caudate Branch from BGVP
5- Ancillary Caudate Branch from OCAE
6- Caudate lobe
7- Left lobe of liver
8- Right lobe of liver

Their diameter varied from 1 mm to 5 mm for the branches of the right and left portal veins. The stem of the portal vein gave branches to the caudate lobe in 11 livers out of 30 or 36.6% by 1 to 2 vessels with a diameter of 1 mm to 3 mm (Figure 3).

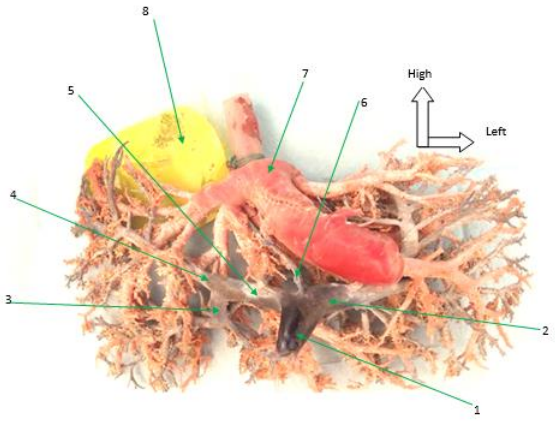

Figure 3 : Posterior view of a casting of the hepato-cave junction and portal trunk and the vena cava showing accessory caudate veins

1. The portal vein trunk
2. Left portal vein
3. Right Paramedic Vein
4. Right Lateral Vein
5. Right portal vein
6. Caudate Lobe Vein
7. The inferior vena cava
8. Identification Record

DISCUSSION

Héloury and al. [1987] mentions 52.28% caudal vein accessory (CVA) on the left branch of the portal trunk, 26.14% VAC on the bifurcation, 18.95% CVA on the right

branch and 2.63% CVA on the same trunk. Laux and Rapp [1953] found 91% CVA on the MPMO, 25% CVA on the OPDB and 40% at the portal trunk bifurcation. Our although partial work for CVA confirms the work of the aforementioned authors as well as those of Kumon [2017], Maslhoui [2007], Franceschini and Ortale [1955] and Foucou and al. [1983] who observe more CVA on the LBPV than on the RBPV and on the bifurcation of the portal trunk.

According to Kumon [2007] "any branch that arises from the bifurcation is considered to be a main branch of the caudate lobe".

Yan and al. [2014] regains an average distance of 5.82 mm from the portal bifurcation (with extremes ranging from 3.76 to 7.88 mm) for the collateral branches that are born on the LBPV. However on the right this average distance is 3.69 mm with extremes ranging from 2.4 to 4.98 mm. Bernades and al. [2007] finds a caudate branch for the segment. I which stands out at the junction of the PV in 24% of cases. The LBPV in 84% of cases emits 2 branches cauded for the segment I (S I) and only one branch in the other 16% of cases. The RBVP in 44% of cases gave 2 CV for segment. I and only one branch in also 44% of cases. In the remaining 12% of cases the right branch of the PV gives no important collateral branches for the S.I. Thus, the S.I was vascularized on average by 3.4 veins with extremes between 2 to 5 veins from the two branches of the PV and/or its bifurcation. Mizumoto and al. [1988] showed in his work that he described an average of 1 to 6 caudate branches with an average of 3.7 in 32 cases.

Conclusion

The objective of our work was to study anatomical variations in the biometrics of caudate veins and their numbers in relation to portal birfurcation. So we studied on 30 liver samples the biometry of caudate veins. This is a contribution to the fundamental foundations of liver removal surgery because too little work (and often radiological) exists in Africa on the subject.

However, this lack of comparative anthropometric data from our work confirms the diversity of anatomical variations about caudate vein and contributes to classification statistics. On the therapeutic level these anatomical data contribute to the per-operative safety of liver surgery.

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