Anatomical and Radiographic study of the Portal and Hepatic Veins in Ovis Aries and Capras Hircus

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Summary
The main purpose of this study was to convey a more precise explanation of the intrahepatic pattern of the tributaries of portal and hepatic veins in sheep and goats. Also to give broad information on the portal and hepatic vein and there topographic relation that may give a useful base for the hepatic segmentation, aiming to provide a correct base for surgical procedures and liver transplantation. Twelve livers collected from adult sheep and goats of both sexes. The portal and hepatic veins were studied by using cross dissection, corrosion cast and radiographic examination. Subject of this investigation show the portal vein of the sheep is slightly narrower than that of the goat. Also the pattern of intrahepatic branches of portal vein in sheep is similar to that of goat, on reaching the portal hepatic, gave of a right dorsal interlobular branch and then terminate into a right ventral interlobular and left interlobular branches, the right dorsal interlobular branch was short and large, supplied the caudate process and right dorsal hepatic lobe. The right ventral interlobular branch is distributed only in the ventral part of the right lobe, while the left branch was long and narrow, supplied the left and quadrate lobes as well as the papillary process, However the caudate process receives the separate branch from the parotid vein in goat. Moreover, the study revealed that the hepatic veins in sheep and goats can be classified into two groups; large and small, the work also shows that there are (3-4) large hepatic veins in sheep, while in goats usually gives off a left large branch and two smaller right and intermediate branches, and in both animals the hepatic vein, pour in the caudal vena cava independently, the veins of the left, right and intermediate lobes empty themselves close to each other, while of these of the caudate and papillary processes open separately and a way from hepatic veins.

Keywords: Anatomical, Radiographic, Portal hepatic vein, Sheep, Goat.

Introduction
The liver is the largest gland in the body. The blood passes through liver sinusoids and finally leaves the liver by way of hepatic veins those drain into the vena cava. The liver sinusoids remove bacteria and other particulate matter those might enter the blood from the gastrointestinal tract. On the other hand the liver occupies a unique position with respect to the venous blood from the portal vein, which drain the blood or the gastrointestinal tract through the liver before entering the circulation. Portal vein is the main afferent vessel and supplies most of the blood to the liver (1 and 2).

The parenchymal distribution of the both the portal and hepatic veins in domestic animals have been studied in camel (3), in buffalo (4), in pig (5), in goats (6) and in sheep (7). The outcome of this investigation may served as guide for successful study to be able distinguish the portal and hepatic veins in the liver at autopsy and know the tributaries to the portal and hepatic vein and its branches in the liver to be able to diagnose a portosystemic shunt on venography and locate it at surgery (8 and 9), and multiple collateral shunting vessels of the parenchyma dilated vessels in the hepatic parenchyma in arteriovenous fistula in the liver may be presented for evaluation of gastrointestinal foreign bodies (10).

The present work is therefore aims to give some information about the parenchymal distribution and topographic relation of both the portal and hepatic veins in both sheep and goat.

Materials and Methods
This study was carried out on the liver of 12 clinically healthy sheep and goat. The specimens were collected from the slaughterhouse in Mosul. To remove and
discharge of blood clots, the portal vein of livers was perfuse with normal saline and in order to demonstrate to the intrahepatic distribution of the portal and hepatic veins. Three techniques were used, cross anatomy the four livers of both animals with its related parts in situ then taken off portal and hepatic veins were dissected by use of routine dissection. The course and branches of portal and hepatic veins were studied and cast for other fresh specimens were injected with colored by Re acromed (consist of two solution A and B ( Acromed 250 ml and cold cure Acrylic 500 gm.) Which were mixed by a ratio (1:1). The portal and hepatic veins were injected either separately or together to show their topographic relation and the injected specimens were left for 2-3 days to dry in the open air for solidification of Re acromed - then the specimens were macerated in potassium hydroxide (10 %) for (4-5) days for corrosion lastly. The specimens were generally washed in water until become free from the macerated tissue. The technique of (11) was choice. Radiotechnical technique for another four specimens were inject with the contrast medium by hand using (20) ml of conray (280) (mehuime lothalamute injection BP 60% w / v). For (x) ray study certain parameters were used (50) KVP (2.3) m AS and (0.3) sec, the radiological image was fully described after examination of the films and the nomenclature used was adopted by (12).

Results and Discussion

The results of this study revealed that the portal vein lies between the hepatic artery dorsally and bile duct ventrally, the portal vein of the sheep is slightly narrower than the portal vein of the goats while the pattern of intrahepatic branches of portal vein in sheep is similar to goats. The portal vein immediately divided into right dorsal interlobular, right ventral interlobular (Fig. 1) and left interlobular branches in both animals (Fig. 2 and 3).

Right dorsal interlobular branch of the portal vein in sheep and goats, the branch run obliquely with ascended dorsally to ramify within the dorsal part of the right lobe, then continued dorsolaterally for about (3-4 cm), gave off branches of papillary process and caudate lobe, the parent vessel when it was accompanied by the corresponding hepatic vein (Fig. 4 and 5).

Right ventral interlobular branch extended ventrally forming a double curve along its course toward the ventral border of the medial part of the right lobe it gave 3-4 branches of variation size. These branches run in different directions. Near its origin, a central branch to the middle of diaphragmatic surface of the liver, supplying adjoining parts of the quadrate, caudate and right lobes, and the caudate process receives the separate branch from the parotid vein in goat (Fig. 5 and 6).

Left interlobular branch insisting runs at first in the long axis of the liver from porta toward the left lobe and at the boundary between the quadrate and caudate lobes covered by the papillary process, fat and hepatic lymph nodes. The left interlobular branch is divided for transverse and umbilical branch (Fig. 6). The transverse branch that extends from the porta to flexure was nearly (4-5) cm length and gives of several branches to the caudate and quadrate lobe. The umbilical branch also gives off several branches of the quadrate lobe which lie close to the visceral surface, and a diaphragmatic quadrate branch that turns to the dorsal border (Fig. 7 and 8).

Hepatic veins (Vena hepatica ) showed the opening of the hepatic vein in the caudal vena cava are best seen from the lumen (Fig. 9 and 10). In the present study, the membranous flap showed over the entrance of hepatic veins into the caudal vena cava in both animals. There are 3-4 large hepatic veins and two small veins in sheep, while in goats usually gives off a left large branch and two smaller right and intermediate branches. In both animals the hepatic vein interning the caudal vena cava independently, the veins of the left, right and intermediate empty themselves close to each other, while of these of the caudate and papillary processes open separately and a way from hepatic veins (Fig. 9 and 10). The three main hepatic veins run generally perpendicular to the branches of the portal vein and hepatic artery, extending from the vena cava toward the ventral border of the liver and they lie in the core of the liver parenchyma (Fig. 11).
The right hepatic vein (vena hepatica dextra) extending towards the ventral border of the lobe, along the course give 2-3 branches to the right lobe and one to the caudate process (Fig. 12). The intermediate hepatic vein (vena hepatica intermediate) extended dorsally through the parenchyma of quadrate and caudate lobe, given off branches to each side in sheep while in goats. The right and intermediate hepatic veins were relatively small veins and proceeded crossed the corresponding portal branches and ramified with in the right lobe and caudate process (Fig. 7 and 11).

The left hepatic vein (vena hepatica insistra) connected the caudal vena cava near the esophageal impression and divided into dorsal and ventral branches in sheep. The dorsal and ventral branches arborize in a tree-like manner with the two third of the lobe, while in goats the left hepatic vein was relatively large vessel which was drain the different part of the left lobe and the adjacent part of the quadrate lobe (Fig. 12 and 13). The left hepatic vein divided into dorsal middle and ventral branches that across the corresponding portal branches to be distributed with in the dorsal, middle and ventral parts of left lobe respectively. The opening of the major hepatic vein is arrange in two widely separated clusters (Fig. 9 and 10).

The vein of the papillary and caudate process (Vena processi papillares and caudati) were represented by (2-3) small veins are arising separately from the caudal vena cava (Fig. 7 and 14). This study revealed that the portal vein immediately divided into right dorsal interlobular, right ventral interlobular and left interlobular branches in both species, this didn’t agree with (13) who stated that the portal vein divided immediately upon entering the liver into very short right branch and a left long branch. The division of the portal vein in sheep into right dorsal, right ventral and left branch within the portal hepatic as observed in this study are in accordance with (14).

The terminology and distribution of the right and left branches matter and divergence in different species, however (15) in goats recorded that the right branch supplied the ventrolateral part of the right lobe and quadrate lobe. On the other hand in this connection the present work stated that, the right branch is represent by right dorsal and right ventral.

The course of the portal vein as revealed in the present work is in accordance with the results of (11) in goats, (12) in sheep, and with (16 and 17) in bovine and buffalo respectively studied. The origin, course and fine ramification of portal vein in Indian water buffaloes regarding the right dorsal and ventral branches divides into (3-4) branches is indicated by their names. In camels (18) stated that the right branch of portal vein is short and runs towards the ventral border of the right lobe and the secondary branches lies for the most part close to the visceral surface and ramification in different parts of the right lobe. It seen that the present results about distribution of the right interlobular branch is in agreement with reports in buffalo (19).

In sheep, the left branch curves ventrally and to the left within deep depression on the liver surface with number of small branches, at the level of the umbilical fissure (12). The left branch divided into dorsal intermediate and dorsal branch. The left branch of the portal vein in camel (18) also divided into umbilical and transverse part. The transverse part gives off many branches to the caudate lobe and a few to the quadrate lobe. The present results showed that the left interlobular branch run at first in the long axis of the liver from porta toward left lobe. Nevertheless, the current work did not observe any anastomosis between the terminal branches of the portal vein and a similar result was recorded by (18) in camel. Search in the available literature revealed no investigation concerning the portal vein of the sheep, which is slightly narrower than the portal vein of the goats.

In the present study revealed that the membranous flap over the orifices of hepatic veins into the caudal vena cava in both animals was also observed by (20) in goats. This work revealed that there are 3-4 large hepatic veins in sheep, while in goats usually gives off a left large branch and two smaller right and intermediate branches, and in both animals, the hepatic vein entering the caudal
The veins of the left, right and intermediate lobes empty themselves close to each other, while of these of the caudate and papillary processes open separately and a way from hepatic veins. In this connection, (11) reported that in the goats the right hepatic vein was substituted by a small veins originated from the middle one, while (21 and 19) stated that in the buffalo, it was represented by (4-6) medium sized veins, (12) similar number of branches reported in sheep, (22) in goats recorded three hepatic vein while (23) observed two large two medium sized and about nine small hepatic veins in camel.
Figure 7: The diaphragmatic branch of portal vein in goat.

Figure 8: Opening of the hepatic vein in sheep.

Figure 9: The opening of hepatic vein in goat.

Figure 10: Hepatic vein divided into 1-right 2-intermediate and 3-left branches by X ray in goat.

Figure 11: The divisions of the hepatic vein into 1-right 2-intermediate left branches in sheep.

Figure 12: The division of the hepatic vein into 1-right 2-intermediate 3-left and 4-papillary branches by cast in sheep.

References


دراسة تشريحية وشعاعية للأوردة البابية والكبدية في الأغنام والمعز Capras hircus و Ovis aris

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الخلاصة

يهدف البحث لمعرفة الطوبغرافية لتشعبات الأوردة البابية والكبدية عند الأغنام والمعز لتوفر قاعدة أساسية عند المداخلات الجراحية لللكبد وكذلك عند زرع عبادات الكبد. اجري هذا البحث على (12) كبد من الأغنام والماعز بالبغدادية ومن كل الجنسين واستعمل التشريح العيائي وعمل قابل الراتنج النتكلي والتصوير الشعاعي لتقييم وتوثيق مسارات التصرف البائي والكبد لدى كل كلا الصيادين. أوضح النتائج عدم وجود اختلافات كبيرة في تفرعات الوريد البائي داخل الكبد عند الأغنام والماعز ولكن الوريد البائي في الأغنام أضيق قليلاً مما هو عليه في الماعز. وبنى الدراسة أن الوريد البائي يقسم إلى ثلاثة أفرع رئيسية: فرع بين فصيصي ظهري ايمن ومن ثم توسع بين فصوص يذي وفرع برونزي وفرع بين الفصيصي الظهري الآيمن.

الخلاصة:

1. الفروع الوريدية بين الفصوصي وفصوصي ظهري: يعدها الفروع بين الفصوصي ظهري دخلي ومن ثم توسع بين فصوص يذي وفرع برونزي وفرع بين الفصوصي الظهري الآيمن.
2. الفروع الوريدية بين الفصوصي وفصوصي حامل: يعدها الفروع بين الفصوصي حامل ومن ثم توسع بين الفصوصي ظهري دخلي وفرع بين الفصوصي ظهري دخلي.
3. الفروع الوريدية بين الفصوصي وفصوصي داخلي: يعدها الفروع بين الفصوصي داخلي ومن ثم توسع بين الفصوصي ظهري دخلي وفرع بين الفصوصي ظهري دخلي.

الكلمات المفتاحية: مشاهدات عيانية، شعاعية، الوريد البائي الكبدية، الأغنام، المعز.