Original Research Article

Comparative Histology of Human and Cow, Goat, Sheep Liver- Research Article

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Abstract

Comparative histology deals with the comparison of microscopic structural relations of the various animals with in the ecosystem. Here we compare the microscopic structure of the human liver with domestic animals like cow, sheep and goat. Human and Cow, goat and Sheep's Liver were taken and divided in to 3 groups. We kept liver specimen in formalin for fixation. Thin cut sections of specimen were taken after paraffin embedding. Slides were stained by Haematoxylene and Eosin, later observed the histological features under light microscope The study was undertaken for compare the histological differences like hepatic lobule, connective tissue septa, portal triad, hepatocytes of liver between human and cow, goat, sheep It plays a useful tool for morphological studies based on the evolution. Hepatic lobule was hexagonal in shape in cow, goat and sheep, but it was not clearly seen in human liver. Hepatocytes were larger in human beings but smaller and polygonal in cow, goat and sheep. Connective tissue septa were scanty in human liver, in Comparison to other animals. Central vein is closer to the hepatic lobule in human and Goat's Liver, while in case of cow and sheep, it was found to be close to the portal triad. This comparative histological study may be useful to all the research scholars who undertaken similar studies, veterinary scientists and the field of liver transplantation.

Keywords: Human liver, hepatocyte, comparative histology, portal triad

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Introduction

Liver is the largest organ of the body, its size is varies in different species. The weight of the liver in carnivores is 3%-4% of its body weight, and it is about 2% in omnivores and about 1%-1.5% in herbivores. The liver parenchyma is made up of a complex network of epithelial cells, supported by connective tissue and supplied by portal vein and hepatic artery. The hepatic lobule is the structural unit of liver. A roughly hexagonal arrangement of plates of Hepatocytes separated by intervening sinusoids which radiate outward from a central vein, with portal triads at vertices of each hexagon (1). In mammals initial hematopoiesis takes place in foetal liver (2). The connective tissue septa between individual hepatic lobule are scanty or less and the liver sinusoids are continuous between the lobules. The central vein appears in the center of each hepatic lobule and the hepatic sinusoids emerge between the plates of hepatocytes (3). This study was undertaken to observe, compare and differentiate the nature of human liver with that of cow, goat and sheep.

Materials and Methods

Total number of five liver specimens of cow, goat and sheep's were brought from local slaughter house. Human liver specimens were collected from fresh autopsied body of forensic department after taken

appropriate permission. For this comparative study, the selected specimens were free from liver diseases that were confirmed by the case history of autopsied body. Liver specimens were divides into 4 groups then infused with neutralized buffered formalin via hepatic vessels then fixed into 10% formalin over night. Liver specimens were cut into small bits without damaged by knife. Later embedded in Paraffin, then Sections of five microns were taken by rotary microtome and mounted on glass slides. Slides were stained by normal hematoxylin and eosin and stain. The histological differences were observed under light microscope by various magnifications.

Results

In the present study we compared the histological differences like, position of central vein, shape of hepatic lobule, shape of hepatocyte, sinusoids, connective tissue septa between portal triad, structures in portal triad, capsules with the portal triad of liver between the human and cow, goat, sheep.

Human liver histological observations

The central veins of liver forms approximately centre of the hepatic lobule. The hepatic lobule is roughly hexagonal in shape and mingled with the adjacent hepatic lobule because, of the absence of the tissue septum in between. The shape of hepatocyte is hexagonal and appearance of the nuclei of hepatocyte is little larger. Hepatic sinusoids are clear and are present among the radiating cords of liver cells. Connective tissue septum between portal triad in human liver is scanty or less. Branches of portal vein, hepatic artery and bile duct are present in connective tissue (Figure 1a, 1b).

Goat's liver histological observations

The central vein forms approximately centre of hepatic lobule and Margin is collapsed. Endothelium is visible and fenestrations of margins are more by sinusoids. The hepatic lobule is roughly hexagonal in shape. The shape of the hepatocyte is polygonal in shape and nuclei of hepatocyte are small in size. Hepatic sinusoids are present among radiating cords of liver cells. Connective tissue septum between portal triad in goat's liver was present but merging with hepatic lobule. Branches of portal vein, hepatic artery and bile duct are present in connective tissue (Figure: 2a, 2b).

Cow's liver histological observations

The central veins in cow's liver forms approximately closer to portal triad and margin of lumen is collapsed, Endothelium is visible, and fenestrations of margins are more by sinusoids. The hepatic lobule is hexagonal approximately in the cow's liver. The shape of hepatocyte is polygonal and is arranged in radiating cords and nuclei of hepatocytes are smaller. Hepatic sinusoids are present radiating of cords of liver cells. Connective tissue septum between portal triad in Cow's Liver was well seen and merging with hepatic lobule. Branches of portal vein, hepatic artery and bile duct are present in connective tissue (Figure 3).

Sheep's liver histological observations

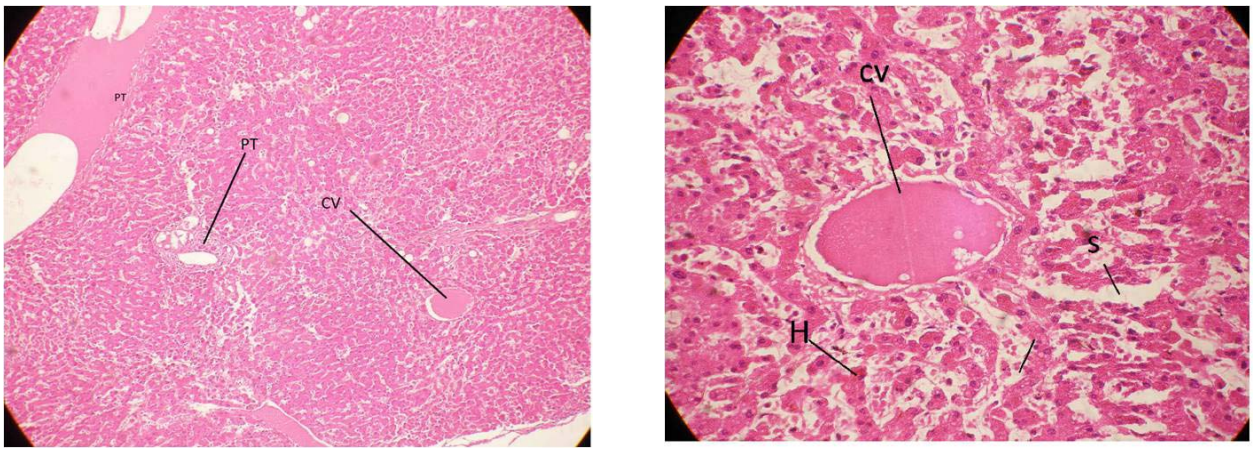
The central vein in sheep seen closer to portal triad, margin of lumen is collapsed, Endothelium is visible, and fenestrations of margins are minimal. The hepatic lobule is roughly hexagonal in sheep's liver. The shape of hepatocyte is hexagonal and nuclei of hepatocytes is little larger than goat and cow. Hepatic sinusoids are present among radiating cods of liver cells. Connective tissue septum between portal triad in sheep's liver was prominently present merging with hepatic lobule. Branches of portal vein, hepatic artery and bile duct are present in connective tissue (Figure 4).

Discussion

The liver consists of multiple lobes in animals, the number and arrangement is varies, considerably among domestic animal species and 70%-80% of the liver mass is composed of Hepatocytes (4). The traditional functional subunit of the liver is hepatic lobule, a hexagonal structure; 1-2mm wide .The limiting plate, a discontinuous border of Hepatocytes, forms the outer boundary of the portal area (5). Hepatic lobules are roughly hexagonal in shape and are centered on a terminal hepatic venule and portal tracts are positioned at an angle of the hexagon (6). hepatocytes are intimately contacted with sinusoidal capillaries that form a thick network In mammalian livers (7).In fetal stage, the mammalian liver develops as a hematopoietic organ earlier to the bone marrow development (8). According to William J Banks, morphological units of the liver is Hepatic lobule, these prismatic, polygonal masses have plates of hepatocytes placed between anastomotic hepatic sinusoids. The plates appear to radiate from centrally placed vessel, the central vein (9).

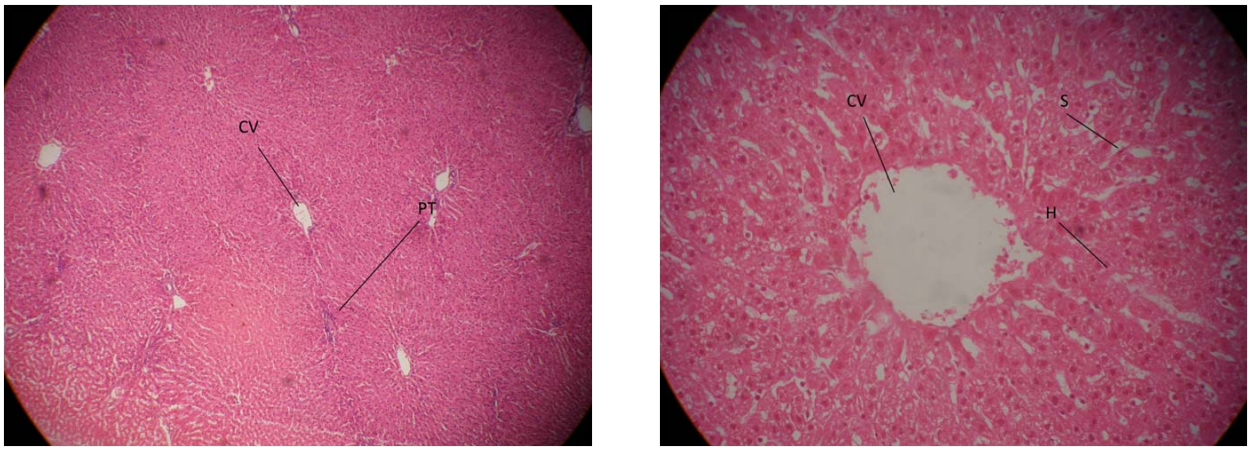
Conclusion

The Comparative histological study among human, cow, sheep, Goat's Liver was concluded, that hepatic lobules were not distinct in case of human liver. Hepatocytes were consistently found to be hexagonal in shape, larger in size in human liver in comparison to



(a) (b)

Figure 1: (a) Human Liver H & E stain. 100 × showing CV: central vein, PT: portal triad. (b) Human Liver H & E stain. 400 × showing CV: central vein, H: Hepatocyte, S:Sinusoid.



(a) (b)

Figure 2: (a) GOAT'S Liver H & E stain. 100 × showing CV: central vein, PT: portal triad. (b) GOAT'S Liver H & E stain. 400 × showing CV: central vein, H: Hepatocyte, S: Sinusoid.

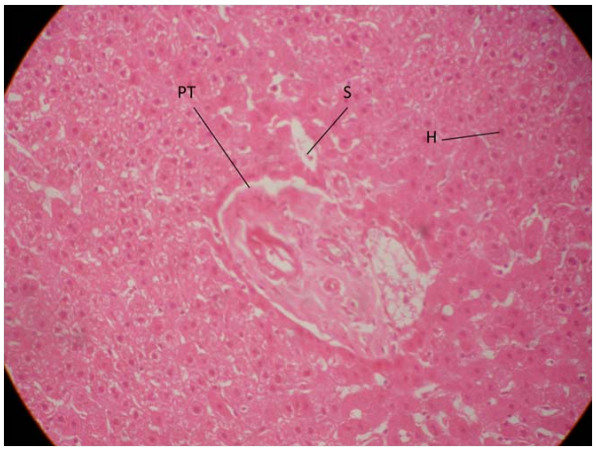


Figure 3: COW'S Liver H & E stain. 400 × showing CV: central vein, PT: portal triad, S: Sinusoid

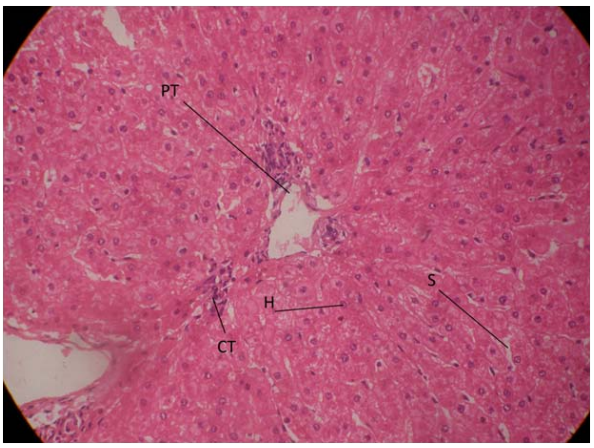


Figure: 4: SHEEP'S Liver H & E stain. 400 × showing PT: Portal triad, S: Sinusoid, H: Hepatocyte.

other animals taken in this study. The shape of the Hepatocytes in case of cow, goat, sheep, consistently found to be polygonal in appearance. Rest of the histological structure was more or less similar. The significance of the comparative study of livers of animal and human is mainly difference in cytoarchitectural. These differences are may be due to the phylogenical or evolutional or developmental.

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