Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2018; SP1: 2725-2727

**B Venkatesh**
PG Scholar, Department of Veterinary Anatomy
College of Veterinary Science, Rajendranagar, Hyderabad, Telangana, India

**G Purushotham**
Professor & Head, Department of Veterinary Anatomy
College of Veterinary Science, Rajendranagar, Hyderabad, Telangana, India

**D Pramod Kumar**
Professor & University Head, Department of Veterinary Anatomy College of Veterinary Science, Korutla, Jagtial, Telangana, India

**KBP Raghavender**
Professor & University Head, Department of Veterinary Surgery and Radiology
College of Veterinary Science, Hyderabad, Telangana, India

**Correspondence**
**B Venkatesh**
PG Scholar, Department of Veterinary Anatomy
College of Veterinary Science, Rajendranagar, Hyderabad, Telangana, India

# Histological studies on the common hepatic artery of sheep

**B Venkatesh, G Purushotham, D Pramod Kumar and KBP Raghavender**

**Abstract**
The present study was performed to illustration of common hepatic artery histological characteristics in six apparently healthy sheep. It was found that the common hepatic artery of sheep resembled microscopic features of a muscular artery. The endothelium of common hepatic artery rested on thin basement membrane. The subendothelial layer was very thin, the tunica media was composed smooth muscle cells interspersed with collagen and few scattered elastic fibers. The number of smooth muscle cell layers ranged from 25 to 30. The wavy external elastic lamina was broken and discontinuous. The tunica externa consisted of irregularly arranged connective tissue having collagen, elastic fibers and few fibroblasts which were intermingled.

**Keywords:** Sheep, Common hepatic artery, Histological study

## Introduction
The liver has a complicated circulatory system than any other organ in the body. The dual blood supply of the liver is a unique feature and it receives 25% of the cardiac output through portal vein and the hepatic artery in all animals. The hepatic artery is branch of coeliac artery which performs an autoregulation function for blood flow into liver (Getty, 1975; Nickel *et al*., 1979; Konig *et al*., 2004). Hence, lobulation pattern decides the hepatic arterial distribution in the liver lobes (Azevedo *et at*., 2008; Bianchi *et al*., 2015). The three-dimensional vessel arrangement is of great importance for analysing the anatomical variations of the vascular structures within the organ (Schmidt *et al*., 1980). This approach will be of practical importance in hepatic surgery because dissection planes and incisions depend to a greater extent upon vascular anatomy of the liver (Niza *et al*., 2004). The arteries histomorphological organization determines their physico-mechanical properties and is influenced by hemodynamic forces of the luminal blood flow including, pulse rate, arterial flow velocity and resistance to flow in vascular segments and supplied organs (Labarbera, 1990). There is no information available on the histological structure of common hepatic artery of sheep. Hence, the study was designed to establish a more precise and detailed information on the histomorphology of hepatic artery in sheep.

## Materials and Methods
Samples of hepatic artery were collected at the different places. They were fixed in 10% neutral buffered formalin and processed by routine paraffin method (Singh and Sulochana, 1998). About 5-6 µm thick sections were cut and subjected to the following routine and special staining techniques. Harris haematoxylin and eosin staining for micro-architecture (Singh and Sulochana,1998), Masson's trichrome method for collagen and muscle fibers (Singh and Sulochana, 1998), Verhoeff's method for demonstration of elastic fibers (Singh and Sulochana, 1998) and Van-Giesons method for demonstration of collagen fibers (Singh and Sulochana, 1998).

## Results and Discussion
In the present investigation hepatic vessels of sheep resembled microscopic features of a muscular artery comprising three layers within outwards viz., tunica intima, tunica media and tunica adventitia (Fig.1) which is in concurrence with the description of several authors like Burkel, (1970) in rats; Bacha and Bacha, (2000) in domestic animals; Kimani *et al*., (2011) in humans; Krus *et al*., (2000a) in humans; Aughey and Frye, (2001) in domestic animals; Eurell and Frappier, (2006) in domestic animals; Dyce *et al*., (2010) in domestic animals. The common hepatic artery of sheep in the present study showed tunica intima consisted of three sub layers viz., endothelium, subendothelial layer and internal elastic membrane or lamina.

The endothelium was lined by a single layer of flat squamous cells which were placed on thin basement membrane. The nucleus shape was oblong and resembled tear drop which protruded into the lumen (Fig.2). The endothelial layer rested on thin basement membrane. The subendothelial layer was very thin and appeared as wavy layer attached to continuous internal elastic membrane (IEM) (Fig.3). The intima was separated from media by this IEM which seldom protruded into tunica media. The veracity of the present findings could be confirmed with the observations of Kimani *et al*., (2011) in humans, Krus *et al*., (2000a) in humans, Aughey and Frye, (2001) in domestic animals and Dyce *et al*., (2010) in domestic animals.

The tunica media in present study was composed of predominantly smooth muscle cells interspersed with collagen and few scattered elastic fibers (Fig.4). The smooth muscle cells were spindle shaped with centrally located nucleus. These cells were circularly arranged and concentrically held together by collagen and elastic fibers. The number of smooth muscle cell layers ranged from 25 to 30. These findings are in complete confirmation with reports of Aughey and Frye, (2001) in domestic animals; Eurell and Frappier, (2006) in domestic animals, Janiuk *et al*., (2007) in pigs, Janiuk *et al*., (2009) in cows.

The wavy external elastic lamina in the present study was broken and discontinuous which separated the tunica media from externa (Fig.3, 4 & 5). These observations are in agreement with findings of Aughey and Frye, (2001) in domestic animals and Eurell and Frappier, (2006) in domestic animals.

The prominent tunica externa consisted of irregularly arranged collagen, elastic fibers and few fibroblasts which were intermingled. There was no evidence of vasa vasorum and nervi vasorum amongst collagen fibers of this layer (Fig.3 & 5). These findings are in complete acceptance with Eurell and Frappier, (2006) and Dyce *et al*., (2010) while in partial acceptance with Aughey and Frye, (2001) in domestic animals. Arteries with predominant tunica adventitia would have the feature of limited expansion properties with artery.

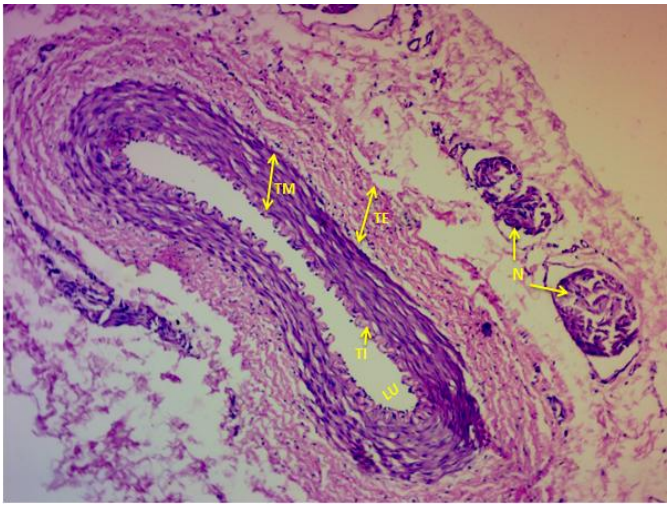


**Fig 1**: Photomicrograph of common hepatic artery showing three tunics

Tunica intima (TI), Tunica media (TM), Tunica externa (TE), Lumen (L), Nerve (N). H & E X10

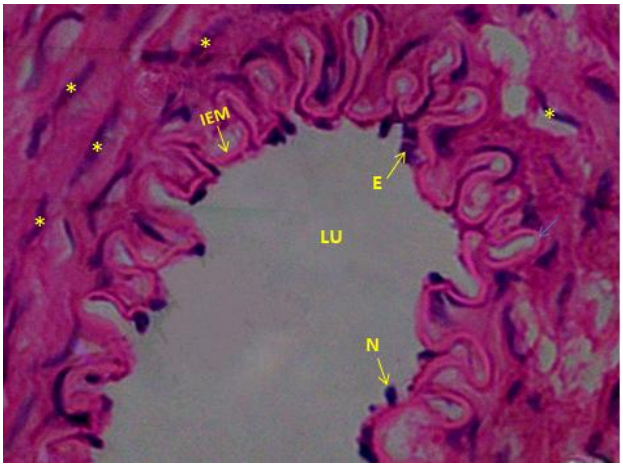


**Fig 2:** Photomicrograph of common hepatic artery showing endothelium, oblong nucleus

Endothelium (E), nucleus (N), Internal elastic membrane (IEM), Lumen (LU), Smooth muscle (*).& E X 60

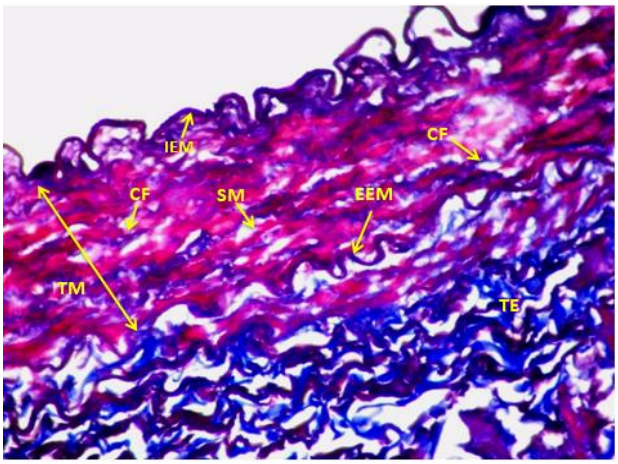


**Fig 3**: Photomicrograph of common hepatic artery showing internal elastic membrane, Collagen fibers and smooth muscle cells

Tunica media (TM), Tunica externa (TE), Internal elastic membrane (IEM), Smooth muscle (SM), Collagen fibers (CF), External elastic membrane (EEM). Masson's Trichrome X 40

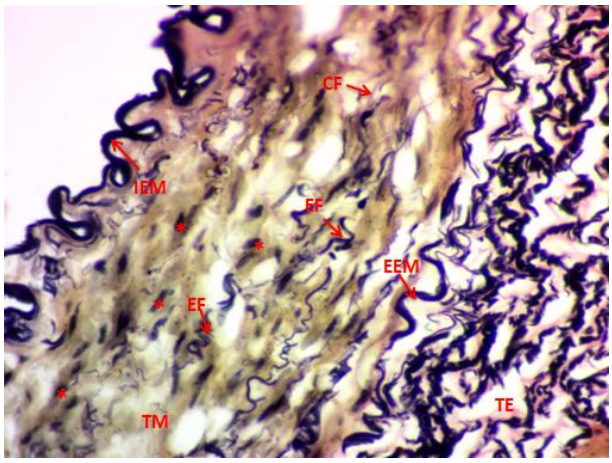


**Fig 4:** Photomicrograph of common hepatic artery showing elastic fibers

Tunica media (TM), Tunica externa (TE), Internal elastic membrane (IEM), Smooth muscle (*), Collagen fibers (CF), Elastic fibers (EF), External elastic membrane (EEM). Verhoeff's X 40

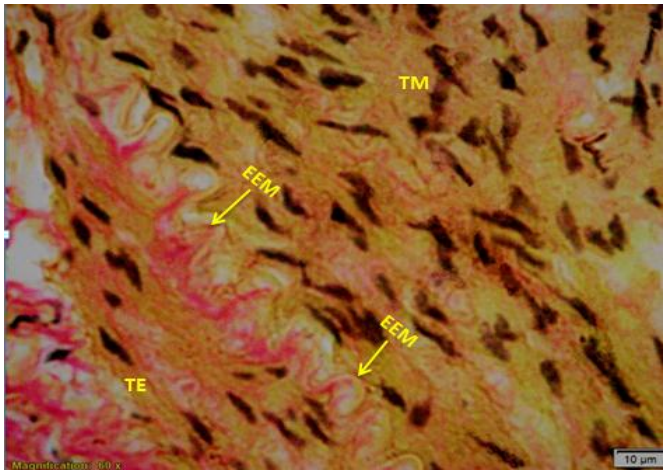


**Fig 5:** Photomicrograph of common hepatic artery showing external elastic membrane

Tunica media (TM), Tunica externa (TE), External elastic membrane (EEM). Vangieson X 60

## References


1. Aughey E, Frye FL. Comparative veterinary histology with clinical correlates. CRC Press, 2001.
2. Azevedo LM, Carvalho MAM, Menezes DJA, Machado GV Sousa AAR, Xavier FG. Intraparenchymal distribution of the hepatic artery in agouti. Brazilian Journal of Veterinary Research and Animal Science. 2008; 45(1):5-10.
3. Bacha WJ, Jr LM, Bacha. Color Atlas of Veterinary Histology. 2nd ed. Lippincott William and Wilkins, U.S.A. 2000, 57-58.
4. Bianchi P, Kfoury Junior J, Gonçalez P. Intraparenchymal distribution of hepatic artery in rabbits (*Orictolagus cuniculus*). Acta Veterinaria Brasilica. 2015; 9(4):301-305.
5. Burkel WE. The fine structure of the terminal branches of the hepatic arterial system of the rat. The Anatomical Record. 1970; 167(3):329-349.
6. Dyce KM, Sack WO, Wensing CJG. Text book of veterinary anatomy. 4thedn. Saunders-Elsevier, 2010.
7. Eurell JA, Frappier BL, Dellman's Textbook of Veterinary Histology. 6thEdition, Chp.3.Blackwell Publishing Professional 2121 StateAvenue, Ames,Iowa 50014, USA. 2007, 119-121.
8. Getty R. The anatomy of domestic animals. Ed 5 Philadelphia: WB Saunders. 1975, 1298.
9. Janiuk I, Charuta A, Węgrzyn M. Micro-architecture of the wall of main arterial vessels supplying the gastrointestinal tract in the cow. Bull Vet Inst Pulawy. 2009; 53:299-302.
10. Janiuk I, Wysocki JAROSLAW, Skobowiat CEZARY. Muscle sphincters of visceral and superior mesenteric artery walls of domestic pig. Bulletin-Veterinary Institute In Pulawy. 2007; 51(2):309.
11. Kimani SM, Ogeng'o JA, Saidi H, Ndung'u B. Comparative intimal-media morphology of the human splenic and common hepatic arteries. Journal of Morphological Science. 2011; 28(1):52-56.
12. Konig HE, Liebich HG. Anatomy of Domestic Animals. text and colored atlas. Porto Alegre: Atmed, 2004, 399.
13. Krus S, Turjman MW, Fiejka E. Comparative morphology of the hepatic and coronary artery walls. Part I. Differences in the distribution and intensity of non-atherosclerotic intimal thickening and atherosclerosis. Medical Science Monitor. 2000a; 6(1):BR19-BR23.
14. Labarbera M. Principles of design of fluid transport system in zoology. Science. 1990; 249:992-1000.
15. Nickel R, Schummer A, Seiferle E. The Viscera of the Domestic Mammals. 2nd revised edn. Verlag Paul Parey, Berlin, 1979.
16. Niza MM, Ferreira AJ, Peleteiro MC, Vilela CL. Bacteriological study of the liver in dogs. J. Small Anim. Pract. 2004; 45:401-404.
17. Schmidt S, Lohse CL, Suter PF. Branching patterns of the hepatic artery in the dog: arteriographic and anatomic study. American journal of veterinary research. 1980; 41(7):1090-1097.
18. Singh UB, Sulochana S. Handbook of histological and histochemical techniques. Premier publishing house, Hyderabad, 1998.