



www.bioinformation.net
Volume 18(7)

Research Article

Received June 2, 2022; Revised July 31, 2022; Accepted July 31, 2022, Published July 31, 2022

DOI: 10.6026/97320630018630

Declaration on Publication Ethics:

The author's state that they adhere with COPE guidelines on publishing ethics as described elsewhere at <https://publicationethics.org/>. The authors also undertake that they are not associated with any other third party (governmental or non-governmental agencies) linking with any form of unethical issues connecting to this publication. The authors also declare that they are not withholding any information that is misleading to the publisher in regard to this article.

Declaration on official E-mail:

The corresponding author declares that lifetime official e-mail from their institution is not available for all authors

License statement:

This is an Open Access article which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited. This is distributed under the terms of the Creative Commons Attribution License

Comments from readers:

Articles published in BIOINFORMATION are open for relevant post publication comments and criticisms, which will be published immediately linking to the original article without open access charges. Comments should be concise, coherent and critical in less than 1000 words.

Edited by P Kanguane

Citation: Gaikwad *et al.* Bioinformation 18(7): 630-633 (2022)

Porta hepatis in relation to portal vein among Indians

Mrinalini Gaikwad^{1,*}, KN Geetha², K Prabhakaran¹ & Gnanadesigan Ekambaram³

¹Department of Anatomy, Nootan medical college and Research Centre, Sankalchand Patel University, Visnagar - 384315, Gujarat, India; ²Department of Anatomy, Malabar medical college and Research Centre, Ulliyeri, Kozhikode-673315, Kerala, India; ³Department of Physiology, Nootan medical college and Research Centre, Sankalchand Patel University, Visnagar - 384315, Gujarat, India; *Corresponding author

Affiliation URL:

College website: www.spuac.in

Author contacts:

Mrinalini Gaikwad - Email: mgaikwad_ana@nootanmedical.edu.in and drmrungalgaikwad@gmail.com

Abstract:

The porta hepatis / hilum of liver is a transverse fissure located in the inferior surface, where the major vessels and ducts enter or leave the organ. The major structures traversing the porta hepatis are the portal vein, the hepatic artery and the hepatic duct. Porta hepatis is an area of surgical and radiological significance. The knowledge of variations in structures traversing the porta hepatitis will reduce the risk of surgeries involving this area. Study was conducted in the department of anatomy dissection lab after obtaining ethical clearance. 30 liver specimens were used for these studies which were removed from the cadaver during under graduate teaching. Anatomical knowledge of variations in relations of structures present in porta hepatis is of immense help to surgeons and radiologists when they engage patients for

clinical procedures like liver transplant, cholecystectomy and diagnostic procedures. Hence this study was aimed to observe the relations of portal vein in porta hepatis.

Keywords: Porta hepatis, portal vein, bile duct, hepatic artery, liver specimens.

Background:

The liver is the largest gland and the most important organ in human body [1]. It also performs an astonishingly large number of tasks that impact the whole body system. As the liver is involved in majority of the metabolic activities in the body, it is more likely to get affected by various pathological conditions [2,3]. A liver surgery poses great challenge even for expert hands. Hepatobiliary surgery requires comprehensive knowledge of anatomy of liver and surrounding structures [4]. Porta Hepatis (PH) is a nonperitoneal deep fissure on the inferior aspect of liver which acts as a gateway for entry or exit of neurovascular structures. These structures include hepatic artery surrounded by autonomic plexus of nerves and the portal vein entering the liver, whereas hepatic ducts and some lymphatics emerge out of the liver. Porta hepatis is bounded by left lobe, caudate lobe, caudate process, right lobe, fossa for gall bladder and quadrate lobe of liver. Due to presence of these key structures in a small area, the clinical procedures around this region are associated with many iatrogenic complications. Porta hepatis transmits important neurovascular structures and hence it acquires great importance while carrying out various surgical and radiological procedures [5-7]. Knowledge and variations of hepatic system is essential to minimize morbidity encountered during hepato-biliary surgeries [8]. Therefore, it is of interest to evaluate the relation of portal vein with structures at porta hepatis. These findings will be of significance for anatomists, surgeons operating on this region, and radiologists to avoid iatrogenic complications.

Materials and Methods:

Study place:

The study was carried out in the department of anatomy at medical College, Kamothe, Navi Mumbai.

Study design:

This is a cross sectional, Observational study

Duration of study:

January 2011 to January 2012

Sample size:

30 human liver specimens irrespective of age and sex were taken for the study

Inclusion criteria:

Intact and undamaged liver specimens were taken for the study

Exclusion criteria:

Bodies on which abdominal surgeries was performed were excluded

After acquiring institutional ethical committee clearance (MGM/IHS/RS/2011/1027) the study was carried out. The method of dissection was done according to the Cunningham's manual of

practical anatomy volume - II [9]. By using dissection instruments (Figure 1) the liver specimens were removed and preserved in 10% formalin during regular dissection for medical undergraduate. Porta hepatis were identified and carefully dissected and studied. The structures at porta hepatis were identified and their relations to the portal vein were observed and noted down. Variations found were meticulously cleaned and photographed.



Figure 1 Materials used for the dissection

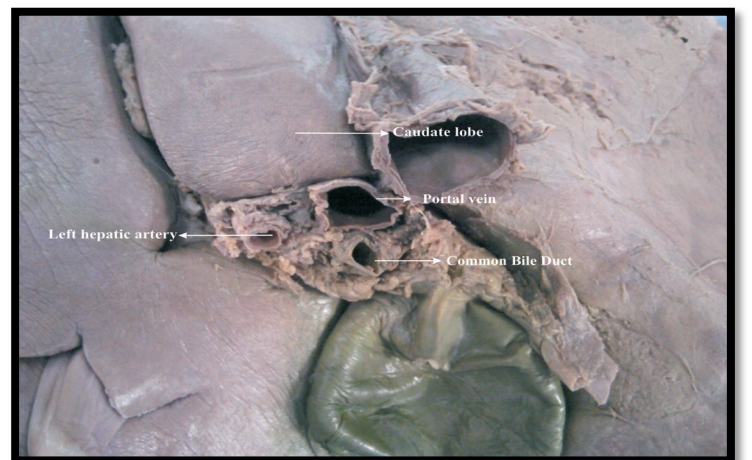


Figure 2 Porta hepatis shows normal relations were found liver specimen

Results:

Normal Relations at Porta Hepatis were observed in 29 liver specimens (Figure 2). To the left of portal vein is the left hepatic artery (This relation shows slight changes depending on the level of section of porta hepatis) if the section is through the upper part of porta hepatis. The left hepatic artery lies on the left side of portal vein, where as if the section is through the lower part the artery was observed anterior and to the left of portal vein. **Figure 2 Shows**

Normal relations at porta hepatis: Porta hepatis is situated between caudate lobe and quadrate lobe. The relations at porta hepatis are anterior to the portal vein are the common bile duct and Posterior to the portal vein is caudate lobe of liver. **Figure 3 Shows Variation at porta hepatis:** Variation found only in one liver specimen (1 out of 30 ie. 3.3%). The variation is anterior to portal vein the common bile duct. Posterior to the portal vein inferior vena cava and Left side hepatic artery and also two arteries and two ducts were observed in the same specimen.

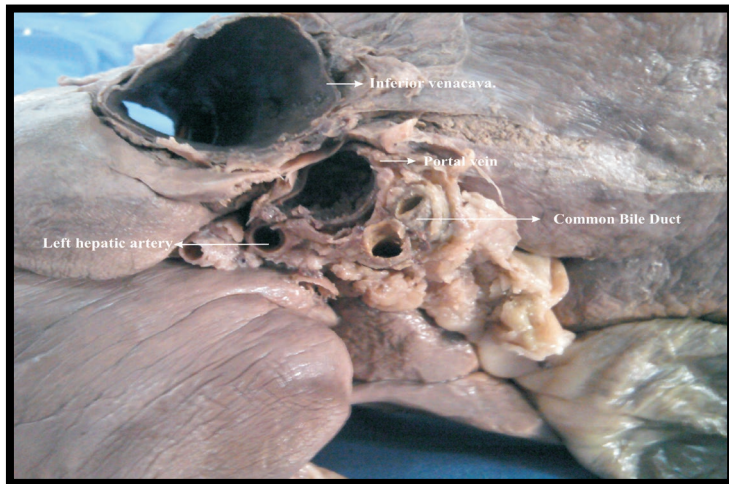


Figure: 3 Porta hepatis shows variation only in one liver specimen (1 out of 30 ie. 3.3%)

Discussion:

Porta hepatis acts as the gateway of liver through which important structures enter and exit, namely the Portal vein, hepatic artery, and hepatic duct. The anatomical arrangement of these structures is very important for surgeons and radiologists. Present study was conducted on 30 formalin preserved liver specimens. Structures at Porta hepatis were identified and their relations to portal vein were observed and noted. Variation found only in one liver specimens (1 out of 30) Anterior to portal vein the common bile duct, Posterior to the portal vein inferior venacava. Two arteries and two ducts were observed in this specimen in the left side hepatic artery. Normal relations were observed in all 29 liver specimens. Porta hepatis is situated between caudate lobe and quadrate lobe. The relations at porta hepatis are Anterior to the portal vein the common bile duct, Posterior to the portal vein the caudate lobe, Left side of portal vein the left hepatic artery. Dhanalaxmi D *et al.* [3] studied the dimensions of Porta hepatis which included the transverse and anteroposterior diameters and the circumference which showed a wide variation. The number of structures and their arrangement with various combinations was observed, the most common combination observed was of two veins, two arteries, and one duct which were seen in 36% of specimens. The mean transverse diameter, anteroposterior diameter, and total circumference of PH were 3.17 ± 0.50 , 1.68 ± 0.36 , and 10.46 ± 1.415 cm, respectively. Eighteen specimens showed presence of two arteries, two veins, and one duct at PH. Maximum number of arteries, veins, and ducts passing through PH

were 5, 4, and 1, respectively. The ducts were anterior, arteries in the middle, and veins were posterior in PH of all the livers. Dimpay Gupta *et al.* [4] studied the Structures passing through porta hepatis, they observed high variations in terms of their number and combination. Most common combination of structures was observed by them were 2 arteries, 1 vein and 1 duct which was seen in 32% of specimen, followed by combinations of 3 arteries, 1 vein, 1 duct and 4 arteries, 1 vein and 1 duct in 16 % of liver specimens each. Another study conducted by M. Sapna *et al.* [1] found portal vein was the posterior most structure and the hepatic duct was the anterior most structure in all the liver they have studied. The hepatic artery and its branches were in between the duct and the vein. The number of ducts and vein found in porta hepatis varied 1 to 3 and the artery it was 1 to 4. In 51% of livers specimens, only one vein and in 80% of cases only one duct passed through the porta hepatis. In 56% of cases two arteries passed through the porta hepatis. Rela *et al.* [10] studied thirty seven consecutive livers specimens during ex vivo liver splitting procedure and reported an abnormal right accessory artery arising from the left hepatic artery was high in the porta hepatis. In Present study one liver specimen showed 2 arteries and 2 ducts and one vein, where the portal vein was posteriorly related to inferior vena cava. With the advent and routine use of multicolour computed tomography, three dimensional imaging of structures at porta hepatis is possible and the variations and anomalies are coming into notice more and more. Liver specimens studied have shown anatomical variations of structures at porta hepatis. Advancement in liver transplant and other biliary system surgeries increases the significance of variations of structures at porta hepatis.

Conclusion:

Data shows that its knowledge will be of great importance to anatomists, surgeons, and radiologists

References:

- [1] Sapna M *et al.* *International Journal of Morphology* 2015 **33**:1:164 [DOI:10.4067/S0717-95022015000100026]
- [2] Tirumani SH *et al.* *Radiographics* 2014 **34**:1 [PMID: 24428283]
- [3] Dhanalaxmi D *et al.* *Natl J Clin Anat* 2019 **8**:22 [DOI: 10.1055/s-0039-1688545]
- [4] Gupta D *et al.* *International Journal of Biomedical and Advance Research* 2017 **8**:03: 121 [DOI: <https://dx.doi.org/10.7439/ijbar.v8i3.3956>]
- [5] Ravikiran HR 2021 **5**:2:71 [DOI: 10.33545/surgery.2021.v5.i2b.663]
- [6] Prasanti GV *et al.* *Semin Intervent Radiol* 2015 **32**:2 [PMID: 26038625]
- [7] Grat M *et al.* *Hepatol Int* 2012 **6**:2 [PMID: 21670969]
- [8] Mohammed AB, *Physiol Biochem Int J* 2017 **3**:1 [DOI-1019080APBIJ]
- [9] G.J Romanes Cunningham's Manual of Practical Anatomy 15th ed. New York: Oxford University Press 2000 **2**:137
- [10] Rela M *et al.* *Transplantation* 1998 **66**:6 [PMID: 9771843]

