

Evaluation of Surgical Anatomy of Common Hepatic Artery: A Cadaveric Study

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ABSTRACT

Background: Anatomical variations of the hepatic artery are important in the planning and performance of abdominal surgical procedures. Hence; the present study was conducted for assessing the surgical anatomy of common hepatic artery.

Materials & Methods: A total of 18 corpses were included and dissected in the department of human anatomy. All the specimens were then analyzed. A Performa was made and clinical and gender details of all the specimens were recorded. All the cadavers were preserved in 10 percent formaldehyde solution. Age range of all the cadavers was between 25 to 65 years. Analysis of origin, position and course of the arteries was done followed by measurement of their length and diameter. After analysis, recording of the relations of all the arteries from the celiac trunk was done. All the arteries which were studied were marked with colored thread. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software.

Results: Anatomic variations were found to be present in 27.78 percent of cadavers. Out of 7 females, anatomic variations were found to be present in 2 females while out of 11 males, anatomic variations were found to be present in 3 males. Among the hepatic artery specimens showing

variations, it originated directly from the superior mesenteric artery. The average length among the variation anatomy specimens of common hepatic artery was 2.81 cm while the mean diameter was 0.70 cm.

Conclusion: Variations in the hepatic artery are a common phenomenon and both anatomists and surgeons should be thoroughly aware of the variation patterns.

Key words: Cadaveric, Common Hepatic Artery, Surgical.

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Article History:

Received: 07-12-2019, Revised: 03-01-2020, Accepted: 28-01-2020

Access this article online	
Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2020.6.1.031	

INTRODUCTION

For decades, arterial variations of the abdominal aorta have attracted the attention of anatomists and radiologists due to their prominent significance in surgical specialties. The first description of normal and aberrant celiac trunk anatomy was published in 1756 by Haller.¹⁻³ Lipshutz seems to have been the first who suggested a classification of the celiac trunk into four types. Later, Adachi presented a more detailed classification, while the two most commonly used classifications were suggested by Morita and Michels. Variations in the vascular pattern of the celiac trunk and its branches should be taken into consideration when planning surgical interventions on the abdominal part of the esophagus, stomach, duodenum, liver, pancreas, gallbladder and spleen.^{4,5}

Anatomical variations of the hepatic artery are important in the planning and performance of abdominal surgical procedures. Normal hepatic anatomy occurs in approximately 80% of cases, for the remaining 20% multiple variations have been described.⁶

Given the high incidence of variations in the hepatic arterial system and its influence on procedures involving the region, it is critical that it be thoroughly studied, detailed and known by students and health professionals. This knowledge is relevant mainly for liver transplantation surgery. A significant number of complications can be avoided when the recognition of possible anatomical variations, both in organ donation and in liver implant, either from a living-donor or from a cadaver.^{7,8} Hence; the present study was conducted for assessing the surgical anatomy of common hepatic artery.

MATERIALS & METHODS

The present study was conducted in the Department of Anatomy, Jawaharlal Nehru Medical College, Sawangi (Meghe) Wardha, Maharashtra (India) and it included assessment of surgical anatomy of common hepatic artery in cadavers. Ethical approval was obtained from institutional ethical committee and written

consent was obtained after in detail the entire research protocol. A total of 18 corpses were included and dissected in the department of human anatomy. All the specimens were then analyzed. A Performa was made and clinical and gender details of all the specimens were recorded. All the cadavers were preserved in 10 percent formaldehyde solution. Age range of all the cadavers was between 25 to 65 years. Analysis of origin, position and course of

the arteries was done followed by measurement of their length and diameter. After analysis, recording of the relations of all the arteries from the celiac trunk was done. All the arteries which were studied were marked with colored thread. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Univariate regression curve was used for assessment of level of significance.

Table 1: Age and gender wise distribution of cadavers

Parameter		Number of patients	Percentage of patients
Age group (years)	25 to 40	3	16.67
	41 to 50	7	38.89
	51 to 65	8	44.44
Gender	Males	11	61.11
	Females	7	38.89

Table 2: Distribution of anatomic variation among males and females

Gender	Anatomic variation present		Anatomic variation absent	
	n	%	n	%
Males	3	60	8	61.54
Females	2	40	5	38.46
Total	5	100	13	100
p- value	0.448			

Table 3: Length and diameter of hepatic artery specimens showing variation

Parameter	Mean	SD
Average length (cm)	2.81	0.96
Average diameter (cm)	0.70	0.17

RESULTS

In the present study, out of 18 cadavers, 44.44 percent were of age group of 51 to 65 years. 38.89 percent of the cadavers were of age group of 41 to 50 years. 61.11 of the cadavers were males while remaining were females. Anatomic variations were found to be present in 27.78 percent of cadavers. Out of 7 females, anatomic variations were found to be present in 2 females while out of 11 males, anatomic variations were found to be present in 3 males. Non-significant results were obtained while assessing the distribution of anatomic variations among males and females.

In the present study, among the hepatic artery specimens showing variations, it originated directly from the superior mesenteric artery. The average length among the variation anatomy specimens of common hepatic artery was 2.81 cm while the mean diameter was 0.70 cm.

DISCUSSION

Liver possesses dual blood supply; it receives blood from both the hepatic artery and the portal vein. Variations of the hepatic artery and its branches are exceedingly common. Variations in the origin and number of the hepatic arteries may be facilitated by defining the terms commonly used in describing such variations. These terms are “aberrant”, “accessory”, and “replacing”. A typical “normal” right hepatic artery (RHA) arises from the proper hepatic artery and supplies the right lobe of liver. Hepatic arterial perfusion

scintigraphy, Transhepatic Arterial Chemoembolization (TACE) and Hepatic Arterial Infusion (HAI) chemotherapy are the newer therapeutic techniques used in the treatment of primary and metastatic hepatic tumors that derive most of its blood supply from the hepatic artery.⁹⁻¹¹

In the present study, out of 18 cadavers, 44.44 percent were of age group of 51 to 65 years. 38.89 percent of the cadavers were of age group of 41 to 50 years. 61.11 of the cadavers were males while remaining were females. Anatomic variations were found to be present in 27.78 percent of cadavers. Out of 7 females, anatomic variations were found to be present in 2 females while out of 11 males, anatomic variations were found to be present in 3 males. Non-significant results were obtained while assessing the distribution of anatomic variations among males and females. Nossios G et al reviewed the existing literature on the hepatic anatomy and to stress out its importance in surgical practice. Two main databases were searched for eligible articles during the period 2000 - 2015, and results concerning more than 19,000 patients were included in the study. The most common variation was the replaced right hepatic artery (type III according to Michels classification) which is the chief source of blood supply to the bile duct.¹⁰ Dandekar U et al documented the normal anatomy and different variations of right hepatic artery to contribute to existing knowledge of right hepatic artery to improve surgical safety. This

study conducted on 60 cadavers revealed aberrant replaced right hepatic artery in 18.3% and aberrant accessory right hepatic artery in 3.4%. Considering the course, the right hepatic artery ran outside Calot's triangle in 5% of cases and caterpillar hump right hepatic artery was seen in 13.3% of cases. The right hepatic artery (normal and aberrant) crossed anteriorly to the common hepatic duct in 8.3% and posteriorly to it in 71.6%. It has posterior relations with the common bile duct in 16.7% while in 3.4% it did not cross the common hepatic duct or common bile duct. The knowledge of such anomalies is important since their awareness will decrease morbidity and help to keep away from a number of surgical complications.¹¹

In the present study, among the hepatic artery specimens showing variations, it originated directly from the superior mesenteric artery. The average length among the variation anatomy specimens of common hepatic artery was 2.81 cm while the mean diameter was 0.70 cm. Osman MO et al carried a study in dissecting rooms of the faculties of medicine in Sudan during the period from June till December 2017. Seventy Well-dissected cadavers with no disruption of the concerned area were included in the Study. The variations in the hepatic artery were seen in only 4 cadavers (5.7%); in two cases (2.85%) an accessory hepatic artery arising from celiac artery was observed and in the other two cadavers (2.85%) there was a replacing hepatic artery that arise from the superior mesenteric artery. Variations in the hepatic arterial system is uncommon in Sudanese cadavers which is matching those reported in the region and are different from those at the international level.¹² Hiatt JR et al studied anatomic variations in the hepatic arteries in donor livers that were used for orthotopic transplantation. Variations have occurred in 25% to 75% of cases. Donor livers represent an appropriate model for study because extrahepatic arterial anatomy must be defined precisely to ensure complete arterialization of the graft at time of transplantation. Records of 1000 patients who underwent liver harvesting for orthotopic transplantation between 1984 and 1993 were reviewed. Arterial patterns in order of frequency included the normal Type 1 anatomy (n = 757), with the common hepatic artery arising from the celiac axis to form the gastroduodenal and proper hepatic arteries and the proper hepatic dividing distally into right and left branches; Type 3 (n = 106), with a replaced or accessory right hepatic artery originating from the superior mesenteric artery; Type 2 (n = 97), with a replaced or accessory left hepatic artery arising from the left gastric artery; Type 4 (n = 23), with both right and left hepatic arteries arising from the superior mesenteric and left gastric arteries, respectively; Type 5 (n = 15), with the entire common hepatic artery arising as a branch of the superior mesenteric; and Type 6 (n = 2), with the common hepatic artery originating directly from the aorta. These data were useful for the planning and conduct of surgical and radiological procedures of the upper abdomen, including laparoscopic operations of the biliary tract.¹³

CONCLUSION

From the above results, the authors concluded that variations in the hepatic artery are a common phenomenon and both anatomists and surgeons should be thoroughly aware of the variation patterns.

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Source of Support: Nil.

Conflict of Interest: None Declared.

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Cite this article as: Darshna Gulabrao Fulmali, Preeti Thute, Anupama Sawal. Evaluation of Surgical Anatomy of Common Hepatic Artery: A Cadaveric Study. Int J Med Res Prof. 2020 Jan; 6(1):127-29. DOI:10.21276/ijmrp.2020.6.1.031