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### RESEARCH ARTICLE

## GROSS ANATOMY AND VARIATIONS IN THE BRANCHING PATTERN OF COMMON HEPATIC ARTERY.

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#### Manuscript Info

#### Abstract

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#### Introduction:-

Common hepatic artery is a branch from coeliac trunk other branches from coeliac trunk are left gastric artery and splenic artery. Common hepatic artery is larger than the left gastric artery and passes to the right behind the omental bursa along the upper border of the body and neck of the pancreas. On reaching the upper surface of first part of the duodenum here the common hepatic artery provides origin to the right gastric, gastro duodenal and occasionally posterior superior pancreaticoduodenal arteries.

There after the common hepatic artery continues upwards with in the free margin of lesser omentum and in front of the epiploic foramen as the hepatic artery proper. Close to the porta hepatis the hepatic artery proper divides into right and left branches which supply respectively the physiological right and left lobes of the liver and undergo further segmental distribution

The right hepatic artery gives origin to cystic artery to supply the gall bladder. Therefore the entire hepatic arterial system provides three principal branches-right gastric, gastro duodenal and cystic artery This study has been undertaken to study the origin, course, branching pattern and variations in the common hepatic artery in humans. The anatomy of the hepatic artery is of great clinical significance in all hepato-biliary surgeries including liver transplants.

Recently, due to the rapid increase in the number of liver transplants and laparoscopic cholecystectomy the understanding of anatomy of common hepatic artery and its variations has become very important. Hepatic artery variation was first described by Michels et al. In liver transplants appropriate evaluation of hepatic arteries is essential for reducing operative and post-operative morbidity and mortality in donors and recipients both. This study will provide an additional data of hepatic artery and its if any variation to surgeons performing procedures in and around the porta hepatis.

The knowledge on variations in the celiac trunk and its branches are important for conditions like the coeliac axis compression syndrome and transcatheter therapy or during surgeries in this region. The digestive tract is embryologically divided into three segments, based on the vascular supply which arises as the unpaired anterior branches of the abdominal aorta. The foregut is supplied by the coeliac trunk. The coeliac trunk is the first ventral branch of the abdominal aorta which arises at the level of T12.

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The classical trifurcation of the coeliac trunk into the left gastric, the common hepatic and the splenic arteries was first observed by Haller in 1756. It is thus known as TripusHalleri, which is considered as a normal pattern. The midgut is supplied by the superior mesenteric artery. The superior mesenteric artery is the second ventral branch of the abdominal aorta which arises at the level of L1. In the present study, we noted an anomalous origin of the common hepatic artery from the hepatomesenteric trunk.

Knowledge on the variations which concern the vascular supply of the digestive tract is of extreme clinical importance during the performance of hepatic and pancreatic surgeries.

#### **Aims And Objectives:-**

The aim of the study is to know the detailed gross anatomy of the common hepatic artery in 30 human cadavers in the department of Anatomy PESIMSR Medical college, KUPPAM.

The objective of the study is to know the origin, course, branching pattern of common hepatic artery and also to know if any variation in its branching pattern.

#### **Review Of Literature:-**

Michels in 1996 he described the hepatic arterial anatomy and its variations using the results of 200 cadaveric dissections and identified 10 types of hepatic arterial anatomy.

Type 1-normal pattern.

Type 2-a replaced left hepatic artery from the left gastric artery.

Type 3-a replaced right hepatic artery from the superior mesenteric artery.

Type 4-a replaced right hepatic artery and left hepatic artery

Type 5- an accessory left hepatic artery

Type 6-an accessory right hepatic artery

Type 7-an accessory right hepatic artery and left hepatic artery

Type 8-a replaced right hepatic artery or left hepatic artery with other hepatic artery being an accessory one.

Type 9-the hepatic trunk as a branch of the superior mesenteric artery.

Type 10-common hepatic artery from the left gastric artery.

According to Hiatt in 1994 he identified 6 types of hepatic artery anatomy.

Type 1-left hepatic artery arising from the left gastric artery.

Type 2-right hepatic artery arising from the superior mesenteric artery.

Type 3- an accessory right hepatic artery

Type 4-common hepatic artery originating as a branch of the superior mesenteric artery.

Type 5-common hepatic artery from the left gastric artery

Type 6-an accessory right hepatic artery and left hepatic artery.

#### **As per Variable Branching Pattern Of The Common Hepatic Artery by SenthilkumarAnbumani:-**

Seven branches arises from the terminal end of common hepatic artery, out of which five are hepatic arteries and the other two are superior pancreaticoduodenal and right gastro epiploicarteries. Gastroduodenal, right gastric and proper hepatic arteries were absent.

#### **As per anomalous origin of the hepatic artery from the Hepato-mesentric:-**

trunk by ThotakuraBalaji, HannahSugirthabaiRajilaRajendran mesentric trunk originated from the ventral surface of the aorta at the L1 level. After coursing anteriorly, the trunk divided into the common hepatic artery and the superior mesenteric artery. The common –

The Hepato- hepatic artery is normally a branch of the coeliac trunk, but in the present case, the coeliac trunk gave two branches i.e. the left gastric and the splenic arteries.

#### **Results:-**

The present work on “**variations in the branching pattern of common hepatic artery in cadavers**” was done on 30 adult cadavers of unknown age groups.

The observations are recorded according to the proforma given below.

Total number of cadavers dissected;

**Table no 1:-**

S.NO	SEX	TOTAL NO.OF BODIES
1	Male	22
2	Female	8

Variations of branching pattern of common hepatic artery

**Fig: 1:-**Normal Branching Pattern Of Common Hepatic Artery

1. Common Hepatic Artery arising from Coeliac trunk.
2. It runs upwards to the right with slightly looping in upward direction.
3. It divides into Gastroduodenal artery and Hepatic Artery Proper.
4. Hepatic Artery Proper is very short measuring less than 1cm dividing into Left and Right Hepatic Arteries.
5. This is the normal branching pattern arising from the common hepatic artery and also in this image there is no variation and common hepatic artery arising from the coeliac trunk..

**Fig 2:-Variations In The Branching Pattern Of Common Hepatic Artery**

1. Common Hepatic Artery is arising in common with superior mesenteric trunk as a Hepatomesentric trunk.
2. Hepatomesentric trunk arises from the abdominal aorta.
3. Hepatomesentric trunk measuring around 2 cm and divides into 2 branches.

**Namely:-**

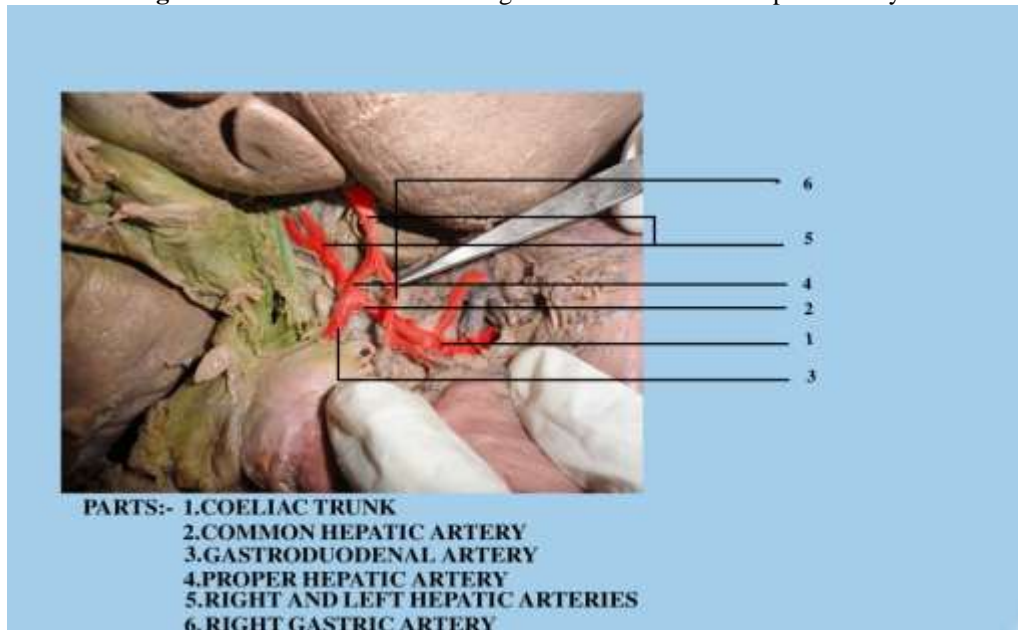
Common Hepatic Artery and  
Superior mesentric Artery.

1. Common Hepatic Artery measures around 6cm runs upwards to the right slightly vertically on reaching the lesser omentum in front of the Portal vein.
2. It ends by dividing into 2 branches.

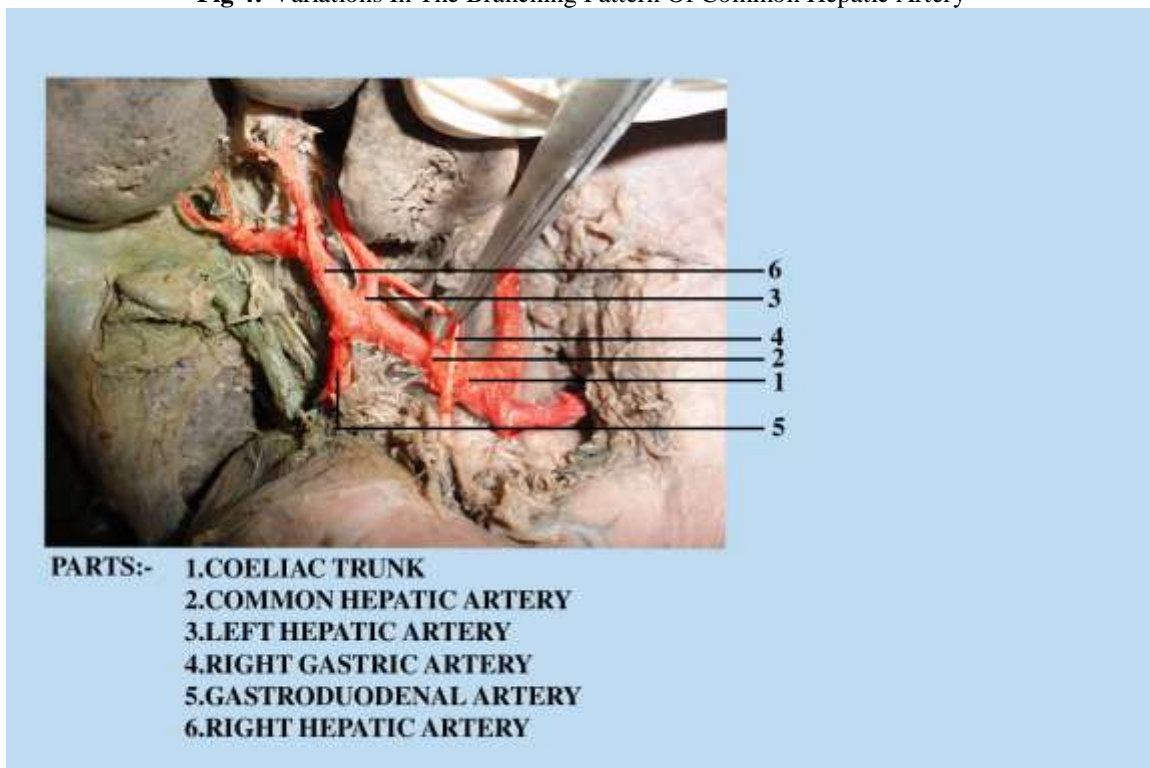
**Namely:-**

Gastroduodenal Artery and  
Hepatic Artery Proper.

1. Hepatic Artery proper is very short divides into right and left Hepatic Arteries.
2. Left Hepatic Artery on reaching the Porta Hepatis divides into 3 segmental branches.
3. Right Hepatic Artery on reaching the Porta Hepatis divides into 4 segmental branches.

**Fig 3:-Variations In The Branching Pattern Of Common Hepatic Artery**

1. Common Hepatic Artery arising from Coeliac Trunk
2. It runs to the right obliquely upwards dividing into Gastroduodenal artery and Hepatic artery proper.
3. Hepatic Artery proper is very short measures less than 1cm dividing into left & right Hepatic arteries.
4. Right Gastric artery is arising from left Hepatic artery.
5. Left Hepatic artery dividing into two segmental branches near the PortaHepatis.
6. Right Hepatic artery dividing into two segmental branches slightly away from the PortaHepatis

**Fig 4:-Variations In The Branching Pattern Of Common Hepatic Artery**

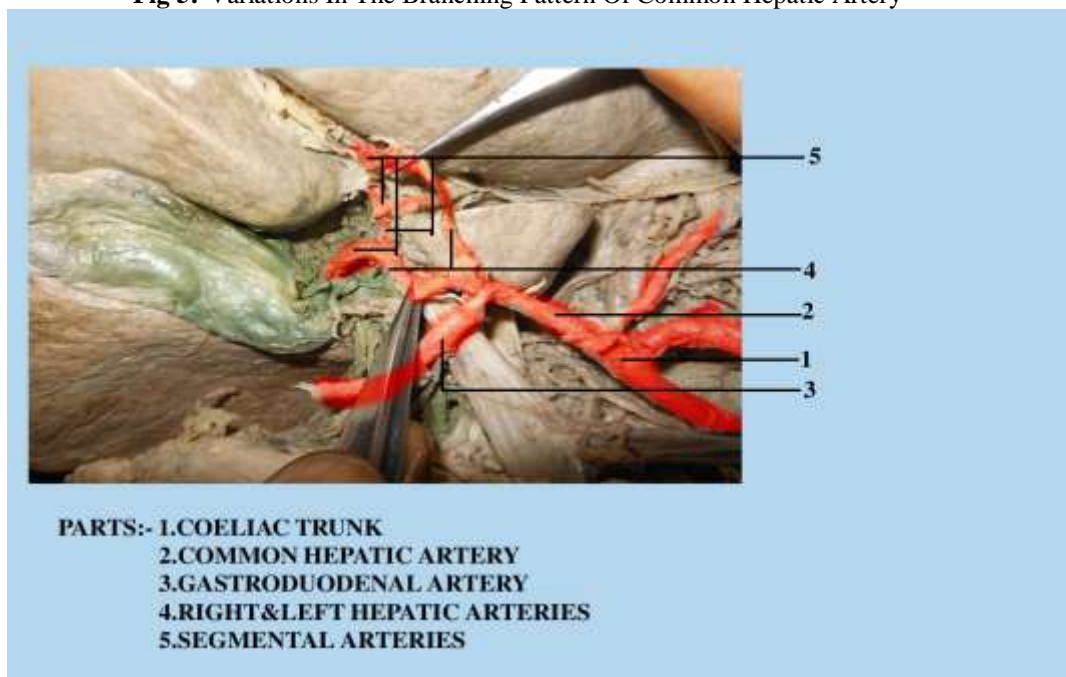


1. Common Hepatic Artery arising from Coeliac trunk.
2. It runs upwards to the right obliquely reaching the lesser omentum.
3. Common Hepatic Artery is dividing into 3 branches.

**Namely:**

1. Left Hepatic Artery.
2. Right Hepatic Artery&
3. Gastroduodenal artery
4. Right Gastric Artery arising from Left Hepatic Artery.

**Fig 5:-Variations In The Branching Pattern Of Common Hepatic Artery**



1. Common Hepatic Artery is arising from Coeliac trunk.
2. It runs upwards to the right in a straight course on reaching the lesser omentum.
3. It divides into 3 branches

**Namely:-**

Gastroduodenal artery,  
Right Hepatic Artery and  
Left Hepatic Artery.

Left Hepatic Artery is comparatively smaller in size which again divides into 2 segmental branches.

**Discussion:-**

Present work ‘‘variations in the branching pattern of common hepatic artery’’ was done on 30 adult cadavers of unknown age groups.

The following books were referred in order to discuss the preceding observations.

As per **A.K DATTA** text book of human anatomy 9<sup>th</sup> edition- The common hepatic artery takes origin from the coeliac trunk .It is larger than the left gastric artery and passes to the right behind the omental bursa along the upper border of the body and neck of the pancreas .on reaching the upper surface of first part of the duodenum the artery insinuates forwards beneath the peritoneal floor of the epiploic foramen along the inferior or right gastropancreatic fold and reaches the right free margin of the lesser omentum. Here the common hepatic artery provides origin to the right gastric ,gastroduodenal and occasionally posterior superior pancreaticoduodenal arteries . There after the common hepatic artery continues upwards within the free margin of lesser omentum and infront of the epiploic

foramen as the hepatic artery proper which is accompanied with the portal vein posteriorly and the bile duct on its right side. Close to the portahepatis the hepatic artery proper divides into right and left branches which supply respectively the physiological right and left lobes of the liver and undergo further segmental distribution. The hepatic artery gives origin to cystic artery to supply the gall bladder. Therefore the entire hepatic arterial system provides three principal branches –right gastric, gastroduodenal and cystic.

As per **T.S.Ranganathan** text book of human anatomy 6<sup>th</sup> edition- common hepatic artery arises from the coeliac trunk. It passes downwards and to the right behind the lesser sac and then turns forwards within the inferior gastropancreatic fold above the first part of the duodenum. It gives rise to the right gastric artery, and divides into a gastroduodenal trunk and proper hepatic artery.

As per **HOLLINSHEAD'S** text book of anatomy 5<sup>th</sup> edition- The common hepatic artery takes origin from the coelic trunk. It reaches the inferior boundary of the epiploic foramen formed by the duodenum and the pancreas and passes forward into the hepato duodenal portion of the lesser omentum. Here, it divides into a hepatic artery proper and the gastroduodenal artery.

As per **CUNNINGHAM'S** manual of practical anatomy 15<sup>th</sup> edition- The common hepatic artery arises from the coeliac trunk. It gives rise to gastroduodenal and proper hepatic arteries inferior to the portahepatis. Proper hepatic artery divides into right and left hepatic arteries. Cystic artery arises from the right hepatic artery.

As per **B.D.CHAURASIA'S** human anatomy 5<sup>th</sup> edition- The common hepatic artery arises from the coeliac trunk. It runs upwards in the right free margin of the lesser omentum, in front of the portal vein, and to the left of the common bile duct. Reaching the portahepatis it terminates by dividing into right and left hepatic branches.

Branches:-

1. The gastroduodenal artery
2. The right gastric artery
3. The supra duodenal artery is an inconstant branch.
4. In this study 30 Common Hepatic Arteries from human cadavers of both sexes (male 20 and female 10) were compared, the variations in their branching pattern were studied.
5. In 28 Specimens the Common Hepatic Artery was found to be arising from Coeliac trunk.
6. In 2 specimens the Common Hepatic Artery was found to be arising from the Hepato Mesenteric trunk.
7. In 27 specimens the Common Hepatic Artery was continuing as hepatic artery proper, after giving origin to gastroduodenal artery.
8. In 3 specimens right gastric artery was arising from the left hepatic artery.
9. In 27 specimens right gastric artery was directly arising from the Common Hepatic Artery.
10. In 27 specimens the Hepatic Artery proper was dividing into right and left hepatic arteries.
11. In 7 specimens Cystic Artery was arising from Right Hepatic Artery.
12. In 1 specimen the Hepatic Artery proper was dividing directly into segmental arteries.
13. In 29 specimens Right and Left Hepatic Arteries were giving rise to segmental arteries.
14. In 3 specimens the Common Hepatic Artery was directly giving rise to Right And Left Hepatic Arteries.
15. It was observed that, in 29 specimens, the Right And Left Hepatic arteries were entering the Liver through the portahepatis while in 1 specimen the Hepatic Artery proper divided into segmental branches and, these segmental branches were entering the Liver through the portahepatis.

### Summary And Conclusion:-

In the present study, 30 specimens of Common Hepatic Artery from adult cadavers of mixed Sexes were observed, for their origin, termination, branching pattern and variations if any.

In the literature available, it is observed that Common Hepatic Artery takes origin from Coeliac Trunk and gives rise to right gastric artery, gastroduodenal artery and continues as hepatic artery proper and finally divides into right and left hepatic arteries. Cystic artery takes origin from the right hepatic artery.

Apart from the above structures following variations, were observed.

1. The common hepatic artery arising from the hepato mesenteric trunk in 2 specimens.
2. Right gastric artery arising from the left hepatic artery in 3 specimens.
3. Hepatic artery proper dividing directly into segmental arteries in 1 specimen entering portahepatis.
4. The common hepatic artery giving rise to right and left hepatic arteries, directly in 3 specimens.

In this study, it is observed that, often variation exist in the branching pattern of the common hepatic artery, hence, during intervention, care need to be taken, for variations if any ,by surgeons .This study will be of much use to the researchers, taking similar or same topic for further studies.

### Results:-

In 93% cases common hepatic artery arises from the coeliac trunk.

1. In 2% cases common hepatic artery arises from the hepato mesenteric trunk.
2. In 1% case hepatic artery proper dividing directly into segmental arteries entering portahepatis.
3. In 3% cases common hepatic artery giving rise to right and left hepatic arteries directly.

In this study ,it is observed that ,often variation exist in the branching pattern of common hepatic artery,hence,during intervention,care need to be taken,for variations if any,by surgeons .This study will be of much use to the researchers,taking similar or same topic for further studies.

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