ORIGINAL RESEARCH PAPER

Gastroenterology

VARIATIONS OF HEPATIC ARTERY ENCOUNTERED IN HEPATOPANCREATICO BILIARY SURGERIES: A STUDY ABOUT REPLACED HEPATIC ARTERY -AN ORIGINAL RESEARCH ARTICLE

KEY WORDS: Hepato biliary surgery, hepatic artery, superior mesenteric artery.

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ABSTRACT

Background: It is very essential to have a good knowledge about hepatic arterial anatomical variations while performing hepatopancreaticobiliary surgical procedures. The frequency of inadvertent or iatrogenic hepatic vascular injury rises in the event of aberrant anatomy and variations. Our study emphasizes the variations of hepatic artery especially the replaced right hepatic artery while doing pancreatico duodenectomy.

Methods: During routine 50 hepatopancreatico biliary surgeries done from the period of 2013 to 2018 at department of surgical gastro enterology i n kanyakumari government medical college, asaripallam,tamil nadu. We came across 2 cases of variations of right hepatic artery which was picked up and studied.

Results: Out of 50 hepatopancreatico biliary surgeries, only 2 cases(4%) showed the presence of replacing right hepatic artery originating from superior mesenteric artery.

Conclusions: An intact hepatic artery is the gateway to successful hepato biliary surgery. Surgeons undertaking hepato biliary surgery must know the hepatic artery anatomy to recognise multiple variants for safe surgery and low morbidity.

INTRODUCTION

The common hepatic artery usually arises from the coeliac trunk (85% of cases),but may also arise directly from the aorta or from the left gastric artery, superior mesenteric (3% of cases),gastroduodenal, right renal or splenic artery.

Aberrant hepatic arteries are of two types: Replacing and Accessory. An aberrant replacing hepatic artery is a substitute for the normal (usual) hepatic artery which is absent. An aberrant accessory hepatic artery appears in addition to one that is normally (usually) present. Some sort of aberrant (variable) hepatic artery either replacing or accessory, occurs in approximately 42% of individuals. (1)

The blood supply to the liver is unique,80% being derived from the portal vein and 20% from the hepatic artery. There are many anatomical variations and knowledge of which is essential for the safe surgery on the liver. The blood supply to the right lobe of the liver may be partly or completely supplied by a right hepatic artery arising from the superior mesenteric artery (2).

This study also explains the variations of right hepatic artery in two cases.

METHODS

During routine hepatopancreatico biliary surgeries (50) done from the period of 2013-2018 at Department of Surgical GastroEnterology, Kanyakumari Govt Medical College, Asaripallam,TamilNadu. We came across two cases of variations of right hepatic artery. The right hepatic artery was a type of aberrant replacing hepatic artery ,originating from superior mesenteric artery.

RESULTS

Out of the 50 hepatopancreatico biliary surgeries done within a period of 5 years from 2013-2018 ,2 cases (4%) showed the presence of replacing right hepatic artery originating from superior mesenteric artery.

DISCUSSIONS

Table 1. Uflackers Classification (3)

Coeliac Trunk Variations	Uflacker's Classification
Classic Coeliac trunk	TYPE I
Hepato Splenic trunk	TYPE II
Hepato gastric trunk	TYPE III
Hepato splenic mesenteric trunk	TYPE IV
Gastro splenic trunk	TYPE V
Coeliac mesenteric trunk	TYPE VI
Coeliac colic trunk	TYPE VII
No coeliac trunk	TYPE VIII

Table 2. Micheal's And Hiatt's Classification (4,5)

Hepatic artery variation	Micheal's classification	Hiatt's classification
1.Normal Anatomy	Type I	Type I
2. Replaced left hepatic artery originating from left gastric artery	Type II	Type II
3.Replaced right hepatic artery originating from superior mesenteric artery	Type III	Type III
4.Coexistence of Type II and III	Type IV	Type IV
5.Accessory left hepatic artery originating from left gastric artery	Type V	Type II
6.Accessory right hepatic artery originating from superior mesenteric artery	Type VI	Type III
7.Accessory left hepatic artery from left gastric artery and accessory right hepatic artery from superior mesenteric artery.	Type VII	Type IV
8.Accessory left hepatic artery from left gastric artery and replaced right hepatic artery from superior mesenteric artery	Type VIII	Type IV
9.Common hepatic artery originating from superior mesenteric artery	Type IX	Type V
10.Right and left hepatic artery originating from left gastric artery	Type X	NOD

*NOD – Not Otherwise Described

The anatomical variations in the coeliac trunk and the

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superior mesenteric arteries were first studied by Adachi in 1928 (6)

Embryologically each dorsal aorta gives paired ventral splanchnic branches which supply the yolk sac, the primitive gut and its derivatives. With the fusion of the dorsal aortae ,during the fourth week of intrauterine life ,the ventral branches fuse and form a series of several unpaired segmental vessels; which run in the dorsal mesentery of the gut and are connected by the ventral longitudinal anastomosing channel.

With the formation of the longitudinal anastomotic channel, numerous ventral splanchnic branches are withdrawn and ultimately only three trunks persist as coeliac artery to the foregut, superior mesenteric artery to midgut and inferior mesenteric artery to hind gut.

According to Tandler, the 11th and 12th ventral segmental roots disappear.The 10th and 13th roots remain connected via ventral anastomosis. The common hepatic left gastric and splenic arteries usually originate from the longitudinal anastomosis. These branches are usually separated from the 13th root (the future superior mesenteric artery).If the separation takes place at a higher level, branches of coeliac trunk are displaced to one of the superior mesenteric artery (7,8,9,10)

McGregor has stated that the hepatic artery may come from superior mesenteric artery or from aorta directly. The vessel divides near the liver into right and left branches which supply the respective lobes . One or other of these vessels may arise from superior mesenteric artery, aorta or left gastric artery. Such vessels may have unusual relationships in the right free border of the lesser omentum and present hazards in cholecystectomy(11).

In the study by Yang et al ,replaced or accessory right hepatic arteries originated from coeliac trunk, common hepatic artery or gastro duodenal artery in about 1.54% of cases(12).

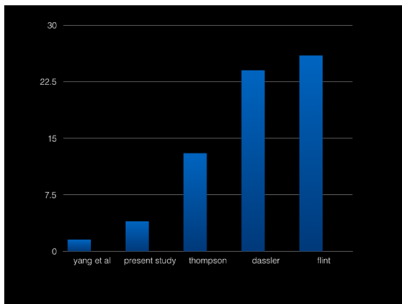
Henry Hollinshead has commented that aberrant hepatic arteries are far more common than are indicated . The percentage of aberrant right hepatic arteries which are the sole supply to the right lobe is greater.(13)

In Flint's series about 4/5th were replacing vessels ,presumably supplying the entire right lobe .Flint has described that 32% of left hepatic were aberrant and 26% of right hepatic artery were aberrant.(14)

Thompson estimated that aberrant left hepatic occur in about 25%of cases and aberrant right hepatic arteries only about half as frequently that is in about 12 to 13 percent (15).

Dassel and his colleagues found aberrant arteries much more frequently but in about that ratio ;43 % of cases had aberrant left hepatic arteries and 24 % had right one. (16).

Keith .L. Moore has stated that a common variety of right or left hepatic artery that arises as a terminal branch of hepatic artery proper may be replaced in part or entirely by an aberrant (accessory or replaced) artery arising from another source. The most common source of an aberrant right hepatic artery is superior mesenteric artery (17).



Henry Gray has stated that more commonly a replaced right hepatic artery or an accessory right hepatic artery arises from superior mesenteric artery. (18).

The present study is correlating with Micheal's type III classification.

FIGURE 1

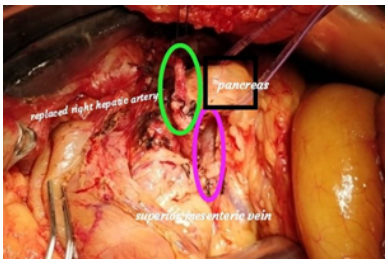
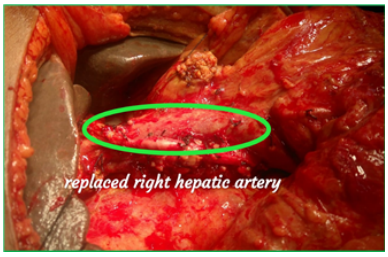


FIGURE 2



CONCLUSION

An intact hepatic artery is the gateway to successful hepatobiliary surgery. Introduction to laproscopic cholecystectomy has stimulated a renewed interest in the anatomy of hepatic artery. Surgeons undertaking hepatobiliary surgery must know their hepatic artery anatomy to recognize the multiple variants for safe surgery and low morbidity. Radiological procedures and treatment of penetrating injuries involving perihepatic area requires a good knowledge of the variants in hepatic vascular structures. Computerized Tomographic angiography helps to clearly delineate the vascular anatomy preoperatively which would help the surgeon in anticipating a vascular anomaly

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DECLARATIONS

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REFERENCES

1. Illustrated Encyclopeadia of Human Anatomic Variations . OPUS II: Cardiovascular system; Arteries; Abdomen : Variations in branches of Coeliac trunk .Hepatic artery :Ronald .A. Bergmann. PhD ; Adel.k.Affifi MD MS;Ryosuke .Miyachu.MD
2. Bailey and Love's ; Short Practice of Surgery.25th Edition :Edited by Normann.S. Williams Christopher .J.K. Bulstrode and P.Ronan O 'Connell.pg 1080
3. Uflacker.R.Atlas of Vascular Anatomy: An Angiographic approach; Baltimore; Williams and Wilkins 1997
4. Micheal's NA. Newer Anatomy of the liver and its variant blood supply and collateral circulation. AM J SURG 1996;112;337-47
5. Hiatt JR, Gabbay J, Busuttil RW Surgical Anatomy of the hepatic arteries in 1000 cases Ann Surg 1994;220;50-2
6. Adachi B (1928) DAS Areterien System Der Japener vol 2.Verlag der Kaiserlich Japanischen Universitat Zu Kyoto,Japan P.28;p 38,p 54
7. Tandler J .Uber dle Varietetan der Arteria Coeliaca and deren Entwicklung Anat Hefte 1094;25;473-500
8. Kaithur SG, Sarda R and Banker M. Multiple Vascular Variations of abdominal vessels in a male cadaver .Embryological perspective and clinical importance J Morphol .Sci.2011;28(3);152-156
9. Babu D, Khrab P, Coeliac trunk Variations: review with proposed new classification Int.J.Anat .Res 2013;1(3);165-170
10. Hemanth K,Garg S,Yadav TD,Sahni D Hepatogastrophrenic trunk and hepatosplenomesenteric trunk:A rare anatomic variation.Tropical Gastroenterology 2011;32(1);56-59.
11. Lee Mc Gregor's Synopsis of Surgical Anatomy; Gali Decker ,DJ du Plessis 12th edition pg 85-86
12. Yang Y,Jiang N,Lumq,Xu C,Cai CJ,Li H,Yi SH,Wang GS,Zhang JF,Chen GH (2007) Anatomical Variation of the donor hepatic arteries.Analysis of 843

cases.Nan Fangyi Ke Da Xue Xue Bao 27;1164-1166
13. W.Henry Hollinshead Anatomy foe Surgeons vol 2.2nd edition .The Thora ,abdomen and pelvis pg 348-353
14. Flint E.R Abnormalities of the right hepatic ,cystic and gastroduodenal arteries and of bile ducts.Brit.J.Surg.10;509;1923
15. Thompson I.M on The arteries and ducts in the hepatic pedicle .A study in statistical human anatomy. Univ .California Publ;Anat.1;55;1933
16. Dasler E.H ,Anson B.J, Hambley W C and Reimann A.F ;The cystic artery and constituents of the hepatic pedicle .A Study of 500 specimens ;Surg;Gynec &Obst 85;47;1947
17. Clinically Oriented Anatomy 4rth edition ;Keith .L.Moore,Arthur .F.Dalley.pg 267
18. Gray's Anatomy .The Anatomical basis of clinical practice 39th edition,Susan,Standring pg 1218