STUDY OF ABERRANT LEFT HEPATIC ARTERY FROM LEFT GASTRIC ARTERY AND ITS CLINICAL IMPORTANCE

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ABSTRACT

Objectives: Variations of the hepatobiliary region are frequent and are of concern to the radiologists and gastroenterological surgeons. The variations reported in the literature are of several kinds such as accessory hepatic arteries, replaced hepatic arteries and additional branches. The present study describes the incidence of origin of aberrant left hepatic artery from left gastric artery and its clinical importance.

Methods: 50 adult embalmed human cadavers of both the sexes were studied by dissection method at the Department of Anatomy, MVJ Medical College and other medical colleges in and around Bangalore.

Results: In 4(8%) specimens, the aberrant left hepatic artery had its origin from left gastric artery. Out of the 4 specimens, the aberrant left hepatic branch was accessory in 3(6%) specimens and replaced in 1(2%) specimens.

Conclusion: The knowledge about variations in the anatomy of subhepatic region is of immense significance to hepatobiliary surgeons since bleeding from aberrant vessels may increase the risk of intra-operative complications.

Key Words: Accessory left hepatic artery, Hepatobiliary surgery, Left gastric artery, Replaced left hepatic artery

INTRODUCTION

The common hepatic artery, a branch from celiac trunk divides into right and left branches to the hepatic lobes. Variations of hepatic arteries are common and surgically important.¹ Aberrant hepatic artery is 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 (a variable) accessory hepatic appears in addition to one that is normally (usually) present.² The most common aberrant hepatic arterial variations are right hepatic artery originating from the superior mesenteric artery (10–12% of individuals) and left hepatic artery or accessory left hepatic artery originating from the left gastric artery (25% of individuals).³ Michaels⁴ in his dissection of 200 cadavers has reported the incidence of accessory left hepatic artery from left gastric artery in 8% and replaced left hepatic artery from left gastric artery in 10% specimens. An aberrant left hepatic artery arising from left gastric artery either as an accessory or replacing the left hepatic artery is occasionally seen in patients with gastric cancer. Resection of this aberrant vessel which feeds a wide area of the liver, as a part of gastrectomy procedure may cause postoperative liver dysfunction.⁵ Present study is undertaken to know the incidence of origin of aberrant left hepatic artery from left gastric artery and its clinical importance.

MATERIALS AND METHODS

Fifty adult embalmed human cadavers from south Indian population were studied irrespective of their sex. The specimens were obtained from the Department of Anatomy, MVJ Medical College and other medical colleges in and around Bangalore. The gross dissection was done following the guidelines of Cunningham’s manual. The peritoneal cavity was opened and the anterior layer of peritoneum from the lesser omentum close to the lesser curvature of stomach was removed. The Coeliac trunk and its branches namely, left gastric, common hepatic and splenic arteries were identified and cleaned. The dense autonomic plexus from its branches was removed. The left gastric artery was traced till it curves posteriorly around the superior surface of omental bursa. The common and proper hepatic artery and its branches to the
porta hepatis were exposed and cleaned. The aberrant left hepatic artery from left gastric artery if present was identified and cleaned. The data obtained was analyzed and compared with that of previous studies.

RESULTS

Out of the 50 specimens studied, the aberrant left hepatic artery arising from left gastric artery was seen in 4 (8%) specimens. The remaining 46 (92%) specimens did not show the presence of aberrant left hepatic artery. It was observed that out of the 4 specimens, the aberrant left hepatic artery was accessory in 3(6%) and replacing in 1(2%) specimen. The aberrant left hepatic artery was originating from the proximal one third of left gastric artery in 3(6%) specimens and from the middle one third in 1(2%) specimen. In all the specimens, an aberrant branch arose from the left gastric artery and entered the visceral surface of the left lobe of the liver at a site independent from the porta hepatis. In specimen no.9 (Fig 1), the Coeliac trunk branched into four arteries; Gastroduodenal, Left gastric, Right hepatic and Splenic arteries. The replaced left hepatic artery was arising from left gastric artery and entered the left lobe of the liver. In specimen no. 26 (Fig 2), the coeliac trunk divided into Common Hepatic, Splenic, Left gastric, Dorsal pancreatic and Left inferior phrenic arteries. An accessory left hepatic artery was seen arising from the left gastric artery. This artery passed from below upwards in the cranial part of the lesser omentum and entered the left lobe of liver through the fissure for ligamentum venosum. The rest of the course of left gastric artery was normal in all the specimens.

DISCUSSION

The incidence of aberrant left hepatic artery from left gastric artery varies from 6.1-21% in various studies and is summarized in Table 1. The highest incidence of aberrant left hepatic artery from left gastric artery was reported by Urugel (21%) and the lowest by Iezzi (6.1%). In the present study, its incidence is 8% which is within the range.

The embryological basis for the origin of aberrant left hepatic artery from left gastric artery is as follows:

The primitive liver is supplied by 3 embryonic hepatic arteries namely, Left hepatic, Right hepatic and Common hepatic arteries. The Left and Right hepatic arteries undergo regression. If they persist, they lead to the development of aberrant hepatic arteries.

Kulesza has explained that there should be presence of sufficient quantities of signalling molecules and growth factors produced by the developing and migrating

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**Figure 1:** Replaced Left Hepatic Artery arising from Left Gastric Artery

**Figure 2:** Accessory Left Hepatic Artery arising from Left Gastric Artery

**Legends for photos**

Acc LHA – Accessory Left Hepatic Artery  
CT- Coeliac Trunk  
CHA- Common Hepatic Artery  
DPA- Dorsal Pancreatic Artery  
GDA- Gastroduodenal Artery  
LIPA- Left Inferior Phrenic Artery  
LGA- Left Gastric Artery  
Pa- Pancreas  
Replaced LHA – Replaced Left Hepatic Artery  
SA- Splenic Artery
mammalian cells for the normal development of any vis-
cera. In the event of an improper signalling and incor-
rect gradient, there may occur visceral anomalies. When
an artery does not originate from an orthodox position,
being the only supply to a particular lobe, it is called a
replaced artery.

The left hepatic artery arising from left gastric artery
may be injured as it lies in the upper portion of the lesser
omentum during mobilization of stomach in gastrectomy
and hiatal hernia repair. So these aberrant vessels must
be recognized, since even in gastrectomy because of gas-
tric cancer it was shown that leaving the aberrant hepatic
artery and the proximal left gastric artery has the same
oncologic effect as complete ligation of the left gastric
artery. Accessory left hepatic artery provides a source of
collateral arterial circulation in cases of occlusion of the
vessels in the porta hepatis.

1, 5 It is important that interventional radiologists who per-
form hepatic arterial embolisation be familiar with both
common and rare hepatic arterial variants, because fail-
ure to recognize the presence of an aberrant vessel can
result in incomplete embolisation of liver tumours. Fa-
miliarity with these variants can also help one avoid vari-
ous surgical complications.

The replaced left hepatic artery originating from left
gastric artery must be identified and ligated before left
hepatectomy is performed, because the major arterial
branch to the left liver does not need to be found in the
porta hepatis.

The accessory hepatic artery provides an additional
source of arterial blood to the left hepatic lobe and may
be sacrificed without compromising the arterial supply
to the left hepatic lobe. An accessory left hepatic artery
needs to be occluded separately when controlling the in-
flow to the left hepatic lobe because this artery will not
be occluded when the blood supply in the porta hepa-
tis is occluded. Distinction between an accessory and a
replaced artery is therefore important. Recognition of a
replaced or an accessory artery is important so that the
vessel can be ligated at the time of catheter placement to
allow uniform perfusion of the hepatic parenchyma. 6, 8, 10

Accidental ligation of aberrant hepatic arteries may lead
to liver necrosis and death. The role of the accessory ar-
teries and the segments of the liver supplied should be
considered during planning for liver surgery since these
vessels are end arteries in most cases and injury would
compromise liver supply, resulting in necrosis of the en-
tire left hemiliver or some segments, commonly two and
three.

An aberrant hepatic artery may cause a potential error
in the angiographic diagnosis of traumatic liver haema-
toma. So the aberrant hepatic vascularisation should be
assessed preoperatively by invasive and non-invasive
techniques to avoid fatal complications. 13, 15, 16

CONCLUSION

Aberrant left hepatic artery arising from left gastric ar-
tery is a common anomaly found in 8% of specimens.
The knowledge of existence of aberrant hepatic arteries,
either accessory or replacing, is important during hepa-
tobiliary surgeries as they present potential bleeding
risks and complicates the procedure. They also have im-
portance in partial hepatectomy, gastric resection, opera-
tions performed near the gastro hepatic ligament, includ-
ing esophagogastrectomy, gastric bypass, and antireflux
procedures. Knowledge of variant hepatic arteries is of
greatest importance in liver transplantation.

Table 1: Showing the Incidence of Origin of Aberrant Left Hepatic Artery from Left Gastric Artery

<table>
<thead>
<tr>
<th>Author</th>
<th>Number of specimens</th>
<th>Aberrant Left Hepatic artery</th>
<th>Replaced Left Hepatic Artery</th>
<th>Accessory Left Hepatic Artery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covey (2002)</td>
<td>600</td>
<td>15.2%</td>
<td>4.5%</td>
<td>10.7%</td>
</tr>
<tr>
<td>Rawat (2006)</td>
<td>125</td>
<td>12.8%</td>
<td>4%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Winston (2007)</td>
<td>371</td>
<td>12%</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>Chitra (2010)</td>
<td>50</td>
<td>14%</td>
<td>10%</td>
<td>4%</td>
</tr>
<tr>
<td>Iezzi(2008)</td>
<td>524</td>
<td>6.1%</td>
<td>5.9%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Urugel(2009)</td>
<td>100</td>
<td>21%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>Andujar (2007)</td>
<td>1081</td>
<td>13.6%</td>
<td>9.7%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Sehgal (2013)</td>
<td>50</td>
<td>8.17%</td>
<td>4.17%</td>
<td>4%</td>
</tr>
<tr>
<td>Present study(2014)</td>
<td>50</td>
<td>8%</td>
<td>2%</td>
<td>6%</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENT

The authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors/editors/publishers of all those articles, journals and books from where the literature of this article has been reviewed and discussed. Authors are grateful to IJCRR editorial board members and IJCRR team of reviewers who have helped to bring quality to this manuscript.

REFERENCES