A Study of Mode of Origin of Inferior Phrenic Artery in 30 Adult Human Cadavers -Clinical Implications

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Abstract

Keeping in view the paucity of information related to inferior phrenic arteries, the present study has been carried out to provide a detailed account of variation in the mode of origin of inferior phrenic artery. The study was carried out on 30 adult human cadavers of known sex. On the right side, the inferior phrenic artery arose independently in 20 cases (66.6

Index terms— Inferior phrenic artery, Hepatocellular carcinoma, Aorta, Coeliac trunk.

A Study of Mode of Origin of Inferior Phrenic Artery in 30 Adult Human Cadavers -Clinical Implications Ambica Wadhwa ? & Sandeep Soni ? Abstract -Keeping in view the paucity of information related to inferior phrenic arteries, the present study has been carried out to provide a detailed account of variation in the mode of origin of inferior phrenic artery. The study was carried out on 30 adult human cadavers of known sex. On the right side, the inferior phrenic artery arose independently in 20 cases (66.6%) and by a common trunk in 10 cases (33.3%). On the left side the artery arose independently in 20 cases (66.6%) and by a common trunk in 10 cases (33.3%). The renal artery was seen as the source of the inferior phrenic artery on 3 sides. The inferior phrenic artery usually originates from the aorta or celiac trunk and less frequently from the renal, hepatic or left gastric arteries. This artery is a major source of collateral or parasitized arterial supply to hepatocellular carcinoma, second only to the hepatic artery. Recognition of variations enables clinicians to distinguish features which merit further investigations or treatment from those which do not .Clinical implications of variations in this artery have been stressed upon.

Keywords : Inferior phrenic artery, Hepatocellular carcinoma, Aorta, Coeliac trunk.

n anatomy, normality embraces a range of morphologies. It includes those that are most common and others called variations which are less frequent but not considered abnormal. Variations ranging from subtle to remarkable affect every part of the human body. They may have important influences on predisposition to illness, symptomatology, clinical examination, investigation and patient management including operative surgery. Recognition of variations enables clinicians to distinguish features which merit further investigations or treatment from those which do not (Willan and Humpherson, 1999).

Anomalous blood vessels are always interesting from a purely scientific point of view, especially since they so often shed light on obscure problems of phylogeny and ontogeny. They may also be of considerable significance from a clinical or a surgical standpoint (Dawson and Reis, 1922) The knowledge of the arterial anatomic variations is very important for the clinical, radiological and surgical diagnosis. Regarding inferior phrenic arteries, which irrigate the diaphragm, it is known that they vary in relation to their origin. The purpose of the present study is to verify these variations. Vascular variations are constantly observed in dissection of adult cadavers (Lipshutz, 1917). Recent advances stress upon the fact that right inferior phrenic artery is the most common extrahepatic feeding artery supplying the hepatocellular carcinoma. The great importance of such knowledge lies in the fact that an unresectable hepatocellular carcinoma can be treated by transcatheter embolization of not only its typical blood supply, the right or left hepatic arteries, but also by embolization of a right inferior phrenic artery, if involved (Tanabe et al, 1998).

These arteries also contribute to arterial supply of adrenal glands are of thus important in angiographic examination for adrenal lesions **??**Kahn,1967).

According to Pick and Anson (1941), these arteries may arise from the coeliac artery (34.8%), aorta (26.3%) or from a common trunk that stems from the aorta (18.5%) or coeliac trunk (13.0%). Rarely, it may arise from the renal artery (5.8%). The purpose of the present study is to analyse the variations in mode of origin of inferior phrenic artery and its clinical implications thereof.

The material for the study comprised of 30 adult well-embalmed human cadavers from Department of Anatomy , Governmentt Medical College, Amritsar, Punjab. They were serialized from 1-30 with suffix 'M' for male and 'F' for female. The abdominal cavity was opened by a cruciform incision passing through the whole thickness of the anterior abdominal wall. Flaps were reflected. The abdominal viscera i.e. stomach, intestines liver, pancreas and spleen were systematically removed according to Cunningham's Manual of Practical Anatomy (Romanes, 2000). The crus of the diaphragm with the inferior phrenic artery was traced and cleaned. All the ganglions and the nervous tissue around the arteries were removed. After resection of Introduction II.

1 Material and Methods

adhesion of tissues all along the median arcuate ligament, the arteries were exposed and their mode of origin was studied.

In the current study, the origin of the artery though variable, there was a marked tendency for the origin of inferior phrenic arteries of the right and left sides to be symmetrical; the most common source of origin being the abdominal aorta independently.

Table 1 : Incidence of source of origin of . On the right side, the inferior phrenic artery arose independently in 20 cases (66.6%) and by a common trunk in 10 cases (33.3%). On the left side the artery arose independently in 20 cases (66.6%) and by a common trunk from the abdominal aorta in 10 cases (33.3%). The renal artery was seen as the source of the inferior phrenic artery on 4 sides -3 on the right side and 1 on the left side. It is clear from Table **??** that independent origin of inferior phrenic artery from abdominal aorta is more common than coeliac trunk on both the sides.

2 RIPA -Right Inferior phenic artery LIPA -Left inferior phrenic artery

Considering the paucity of information presently available concerning these arteries, a more definitive study seemed appropriate and necessary, both for its potential clinical applications and to provide additional data to contemporary anatomical literature. The Gray's Anatomy gives the most complete textbook account, claiming origins from both the celiac trunk and aorta, as well as describing common trunk origins and mentioning alternative origins, including the renal or accessory renal arteries, the left gastric, hepatic, and gonadal arteries. The computed tomography (CT) study by Gokan et al (2001) described these arteries with slightly greater detail and included actual percentages.

Table **??** : Comparison of the incidence of source of inferior phrenic artery.

The results of the present study corroborate with the findings of Merklin and Michels (1958).

Inferior phrenic artery may arise more frequently from the coeliac axis than directly from the aorta (Rossi & Cova, 1904; **??**dachi, 1928 andPick &Anson, 1941); However Quain, 1844; Descomps, 1910;and Lipshutz, 1917 commented that the inferior phrenic artery arises more commonly from the aorta than from coeliac trunk.

Those instances in which the inferior phrenic artery arises from the renal artery, suprarenal arteries are rarely derived from other than renal sources. This fact may be of surgical importance, in clamping renal pedicle, in nephrectomy, when the entire blood supply of the suprarenal gland on that side could be ligated by tying the renal artery proximal to its inferior phrenic branch. Fortunately with the phrenic artery arising from the renal artery more commonly on the right side, the proximal segment of right renal artery, where the phrenic usually takes root, is covered by inferior vena cava anteriorly and thus preventing them from trauma in manipulation of renal pedicle. Contrary, the hazard is greater on the left side (Pick and Anson, 1941).

Modern surgical techniques depend in part on knowledge of both the normal and the anomalous arterial blood supply. The inferior phrenic artery is a major source of collateral or parasitized blood supply to hepatacellular carcinoma , second only to hepatic artery. This is useful to evaluate the efficacy and safety of transcatheter oily chemoembolization therapy (TOCE) via the inferior phrenic artery (IPA) in hepatocellular carcinoma (HCC).

The knowledge of this type of variation shows that surgeons must be cautious to avoid unintentional sectioning of small caliper arteries, as it may occur during the celiac artery decompression in the compression syndrome of the celiac trunk by the median arcuate ligament. IV.

3 DISCUSSION

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Figure 1: Figure 1 :

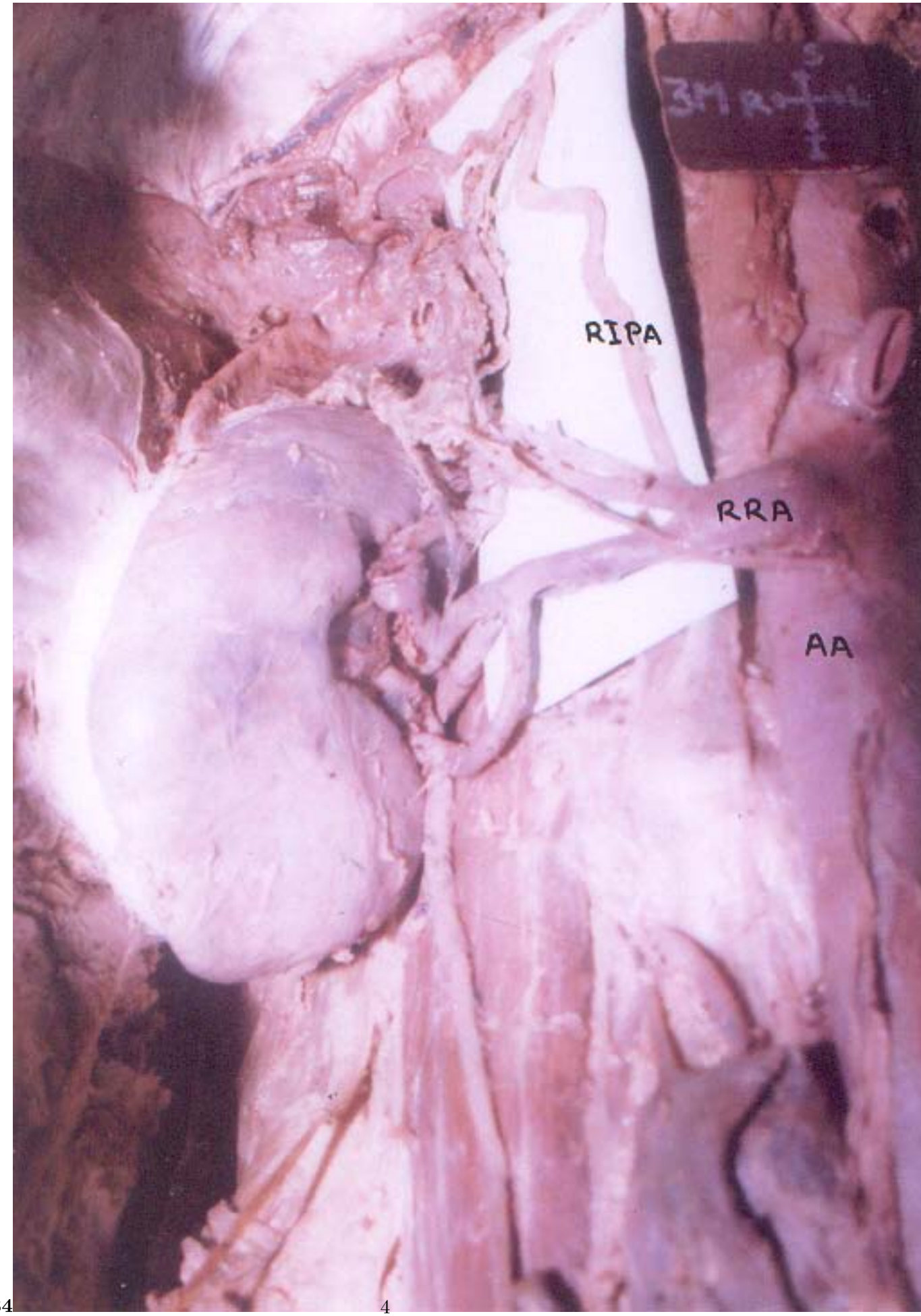

Figure 2: Figure 2 :Figure 3 :Figure 4 :

Author (years)	No. of dissections	Source of the artery				
		Aorta		Coeliac trunk		Renal
		Independently	Common trunk	Independently	Common trunk	
Adachi (1928)	34	-	6	16	12	-
Cauldwell and Anson (1936)	106	31	23	25	27	-
Michels (1955)	60	6	12	18	24	-
Merklin & Michels (1958)	44	8	8	8	14	8
Present study (2004)	60	23	6	13	4	4

Figure 3:

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