

THE STUDY OF INFERIOR POLAR ARTERY IN ADULT HUMAN SPLEENS

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ABSTRACT

Background and Aims: Spleen is supplied principally by splenic artery. In some spleens, additional arteries supply the superior or inferior pole of the spleen. The presence of such polar arteries in addition to the main splenic artery provides a firm base for the preservation of spleen during partial splenectomy and splenic artery embolization procedures. The aim of the present study is to observe the incidence of inferior polar artery and its origin in adult human spleens.

Materials and Methods: After obtaining ethical committee clearance, this observational study was done in Government Stanley Medical College and Hospital. Fifty adult human spleens were dissected out along with the entire course of splenic artery from the embalmed cadavers (35 males and 15 females). The spleen artery and its branches was traced by piecemeal dissection. Inferior polar branches, if present were dissected and traced.

Results: In the present study, Inferior polar artery was found in 72% of the splenic specimens. The inferior polar artery was originating from splenic artery in 55.56 %, left gastroepiploic artery in 25% and inferior terminal branch of splenic artery in 19.44% of splenic specimens.

Conclusion: Inferior polar artery originates from the splenic artery directly or inferior terminal branch of splenic artery or from the left gastroepiploic artery. The knowledge of the presence of inferior polar artery and its variations in origin is important for Surgeons, Interventional Radiologists and Surgical Gastroenterologists for performing surgical procedures involving the spleen.

KEYWORDS: Spleen, Inferior polar artery, Partial splenectomy.

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INTRODUCTION

Splenic artery, the largest and remarkably tortuous branch of coeliac trunk supplies oxygenated blood to spleen, stomach as well as pancreas. After originating from the coeliac trunk, the artery courses to the left behind the omental

bursa along the upper border of the body and tail of pancreas (Fig.1). In its course it crosses in front of the left crus of diaphragm, left psoas major, sympathetic trunk, left suprarenal gland and anterior surface of the left kidney. Then it enters between the two layers of leinorenal liga-

ment and before reaching the hilum of the spleen it divides into two or three terminal (primary or terminal) branches which are named as superior, middle and inferior terminal arteries respectively [1]. Each terminal branch further divides into two to six segmental branches either at the hilum of the spleen or after entering the spleen [2]. Each segmental artery subdivides into smaller and smaller branches which run through the trabecular septa in the interlobular spaces [2]. There is relatively little arterial collateral circulation between the segments, which means that occlusion of a segmental vessel often leads to infarction of part of the spleen. Apart from the terminal and segmental branches, the splenic artery also gives left gastroepiploic artery, short gastric arteries and pancreatic branches before entering into the hilum of spleen.

In some spleens, the splenic artery itself or one of its branches may give separate branches to superior or inferior pole (medial and lateral end) of the spleen[1]. These superior and inferior polar arteries do not pass through hilum of spleen, they directly go to the poles of spleen [1]. Superior polar artery, if present, may arise from the distal splenic artery or from the superior terminal artery or short gastric arteries or posterior gastric artery[1]. Inferior polar artery may arise from distal splenic artery or inferior terminal artery or left gastroepiploic artery [1]. Many textbooks of anatomy and surgery have failed to mention the presence of such polar arteries leading to lack of information about them among anatomists and surgeons [3].

Although the spleen was thought to be previously dispensable, increasing knowledge of its vital functions like filtration, immunity, storage and rapid deployment of monocytes, reservoir function and cytopoiesis has led to a conservative approach in the management of conditions involving the spleen. Splenectomy provokes a defect in IgM antibody production against T1-2 antigens such as capsular polysaccharides of bacteria. Thus it produces an increased risk of sudden Overwhelming Post Splenectomy Infections (OPSI) caused by Streptococcus Pneumonia, Nisseria Meningitidis, Haemophilus Influenza especially in children. So procedures such as partial splenectomy and partial splenic

artery embolization have replaced total splenectomy to a greater extent [4].The key success of such procedures depends on the ability of Surgeons and Interventional Radiologists to identify the polar arteries. The presence of such polar arteries in addition to the main splenic artery provides a firm base for the preservation of spleen [3]. The present study aims to make the surgeons aware of the incidence of inferior polar artery and its origin, thereby facilitating a successful splenic salvage by partial splenectomy and partial splenic artery embolization.

MATERIALS AND METHODS

After obtaining ethical committee clearance, this observational study was done in Government Stanley Medical College and Hospital, in the period between August 2011 to October 2013. Fifty adult human spleens were dissected out along with the entire course of splenic artery from the embalmed cadavers (35 males and 15 females). The specimens were preserved at room temperature in metal basins using 5% formalin solution, Water and Thymol crystals.

Dissection procedure: The spleen was removed from posterior abdominal viscera and stomach by cutting through the gastrosplenic and leinorenal ligaments. The pancreas along with the splenic artery was dissected up to the coeliac trunk where it originates. The spleen was dissected with the body and tail of the pancreas along with the long segment of splenic artery from its origin. Care was taken not to damage the polar arteries if any arising from the main trunk or its branches. The soft tissue attached to the hilum was removed to expose the terminal branches of splenic artery. Finally the segmental branches of splenic artery were identified and traced individually by removing the splenic tissue by piecemeal dissection of the spleen. The terminal and segmental arteries were clearly dissected and demonstrated. Inferior polar branches if present were dissected and traced.

RESULTS

Presence of inferior polar artery: Inferior polar artery was found in 36 out of 50 spleens. The incidence was 72% in the present study.

Origin of inferior polar artery: In 20 spleens,

inferior polar artery took origin directly from the splenic artery before its termination. The incidence was found to be 55.56% (Fig.2 and Fig.3). Further in 9 spleens, inferior polar artery originated from the Left gastroepiploic artery, a branch from splenic artery. The incidence was found to be 25% (Fig.2 and Fig.4) and in 7 spleens, the inferior polar artery originated from the inferior terminal branch of splenic artery. The incidence was found to be 19.44% (Fig.2 and Fig.5).

Fig. 1: Origin and course of splenic artery.



S- Stomach, C- Coeliac Trunk, SA- Splenic Artery, P- Pancreas, SPL- Spleen, TC- Transverse colon.

Fig. 2: Percentage of origin of inferior polar artery.

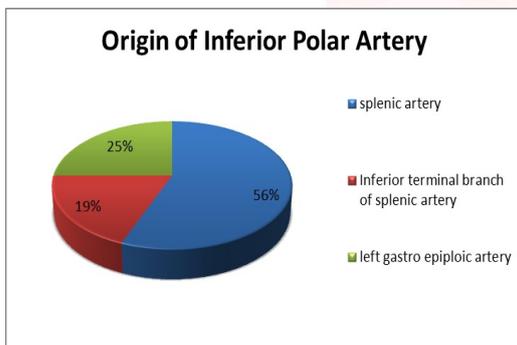
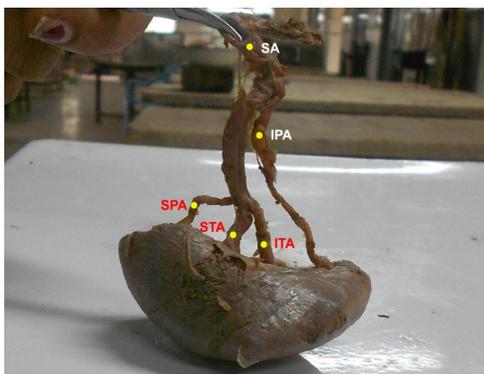


Fig. 3: Inferior polar artery originating directly from the splenic artery.



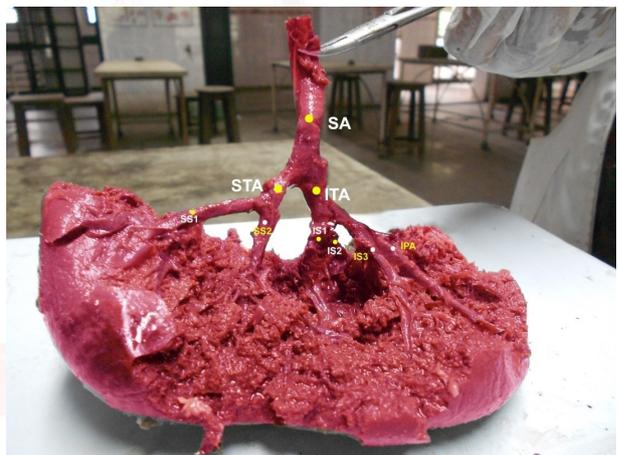
SA- Splenic Artery, STA- superior terminal artery, ITA – inferior terminal artery, IPA- inferior polar artery.

Fig. 4: Inferior polar artery originating from the left gastroepiploic branch of splenic artery.



SA- Splenic Artery, LGA- Left Gastroepiploic artery, IPA- inferior polar artery, STA- superior terminal artery, ITA – inferior terminal artery.

Fig. 5: Inferior polar artery originating from inferior terminal artery.



SA- Splenic Artery, STA- superior terminal artery, ITA – inferior terminal artery, IPA- inferior polar artery. SS1- 1st segmental branch from superior terminal artery SS2- 2nd segmental branch from superior terminal artery IS1- 1st segmental branch from inferior terminal artery IS2- 2nd segmental branch from inferior terminal artery IS3- 3rd segmental branch from inferior terminal artery

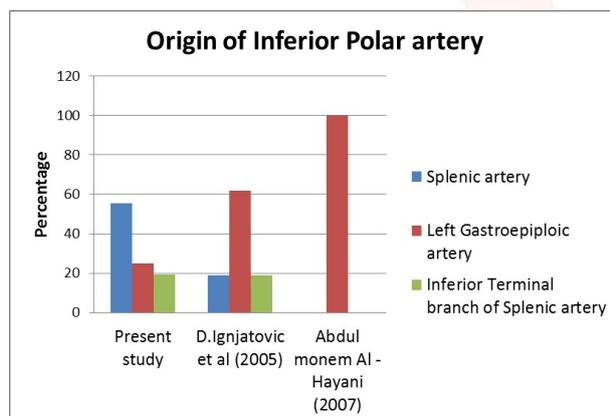
DISCUSSION

Presence of inferior polar artery: According to the study by Abdulmonem Al-Hayani, each end of the spleen(100%) was found to receive one or more arteries which would be referred as polar arteries[3]. According to Michel, the incidence of inferior polar artery was 82%[5]. In a study done by Katritsis et al in 70 human spleens, inferior polar artery was found in 80% of the specimens [6]. In the present study, out

of 50 specimens, Inferior polar artery was found in 72% of the spleens which was lower than that mentioned by Michel [5], and Katritsis et al [6]. JA Cortes and L Gomez Pellico, reported that inferior polar artery was found in 36.6% of the cases[7]. According to the study done by Garcia-Lemes, inferior polar artery was found in 55.24% of the specimens[8]. Liu et al, reported the incidence of inferior polar artery to be 38.8% [9]. In a study by Prashant Nashiket Chaware et al , the inferior polar arteries was found in 50.06% of specimens[10]. In a study by Voboril, the incidence of inferior polar artery was 18%[11]. According to D.Ignjatovic et al, inferior polar arteries occurred in 20.6% of the cases[12]. According to the study done by Mikhail et al , the incidence of inferior polar artery was 62% of the total cases[13]. In the present study, the incidence of inferior polar artery was found to be 72% which was higher than that observed by JA Cortes and L Gomez Pellico, Garcia-Lemes, Liu et al , Prashant Nashiket Chaware et al, D.Ignjatovic et al, Mikhail et al.

Origin of inferior polar artery: According to Ignjatovic et al, inferior polar artery originated from the splenic artery in 19% of the cases [12]. In the present study, in 55.56% of spleen specimens, inferior polar artery took origin directly from the splenic artery before its termination which was higher in incidence than that of Ignjatovic et al (Fig.6).

Fig. 6: Comparison of percentage of origin of inferior polar artery.



According to the study done by JA Cortes et al [7] and Abdulmonem Al- Hayani [3], inferior polar artery originated from the left gastroepiploic artery in all cases. Ignjatovic et al, reported the origin of inferior polar artery from the left gastroepiploic artery in 13% of the cases [12].

In the present study, inferior polar artery took origin from the left gastroepiploic artery in only 25% of the cases. This finding was lower than that of JA Cortes et al and Abdulmonem Al- Hayani but higher than that of Ignjatovic et al (Fig.6).

Inferior polar artery originated from inferior terminal branch of splenic artery in 19% of the cases in the study conducted by Ignjatovic et al [12]. Present study also reported the origin of inferior polar artery from the inferior terminal branch in 19.44% of the splenic specimens (Fig.6).

CONCLUSION

Inferior polar artery originates from the splenic artery directly or inferior terminal branch of splenic artery or from the left gastroepiploic artery. The knowledge of the presence of inferior polar artery and its variations in origin is important for Surgeons, Interventional Radiologists and Surgical Gastroenterologists for performing surgical procedures involving the spleen.

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Conflicts of Interests: None

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