

## Splenic Artery, It's Branches and Variations

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### Abstract

**Aim:** Current study aimed to study the coeliac trunk and its branches in 50 specimens, presence of supernumerary branches from coeliac trunk and its branches, and presence of any aberrant vessels. **Method:** The study was carried out in 50 human cadaveric specimens. Of the 50 specimens, 22 were done in the dissection hall cadavers, 28 were collected from the post mortem. The arteries supplying the liver, stomach, pancreas and the spleen were dissected. **Results:** The mean length of the splenic artery was 9.11 cm (ranged from 8 cm to 13.5 cm). Its tortousity index was from 1.02 to 1.29. Suprapancreatic course in 76%, retropancreatic course in 20% and intrapancreatic course in 4% were noted. Apart from the usual branches, the superior polar (30%), inferior polar (36%) and both polar arteries (8%) were found. 18% of specimens had dorsal pancreatic artery, 28% had posterior gastric artery and 12% had gastrosplenic artery. Regarding the Left gastric artery, it took origin from the coeliac trunk in 96%, from the aorta in 2% and from the splenic artery in 2% of the specimens. **Conclusion:** The knowledge of the branching pattern, variations in the origin and the presence of supernumerary branches and aberrant arteries which had been enumerated in this study will be helpful to the surgeons and the radiologists.

**Keywords:** Supernumerary branches, coeliac trunk, splenic artery.

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### INTRODUCTION

Identification of replaced arteries is more important because that may be the only blood supply for that region, ligation of which may lead to fatal necrosis. Knowledge of accessory arteries is also a must to anticipate the presence of an additional artery during surgery.

Sometimes the aberrant hepatic artery for the left lobe of the liver takes origin from the left gastric artery. Lack of awareness of this vessel may lead to severing of the only blood supply of the left lobe and lead to ischemic necrosis.

Variations had been noticed in the origin of the left gastric artery from aorta instead of from coeliac trunk. This alerts the surgeons during the gastric surgeries. Branching pattern Variations of the celiac trunk have been reported by many authors [1-6].

The varied origin of common hepatic artery as a direct branch from aorta and the origin of superior mesenteric artery from coeliac trunk must be known by the gastroenterologists during the surgical procedures.

The rare origin of middle colic artery from coeliac trunk must also be known by the surgeons because careless ligation of which may lead to the ischemic necrosis of the right two-third of the transverse colon.

The presence of aberrant right hepatic artery from superior mesenteric artery and its unusual course as running posterior to the head of the pancreas and posterior to the portal vein should be borne in mind during portocaval shunt surgeries and care should be taken not to interfere with the blood supply of the right lobe of the liver.

Seok Kil Zeon *et al.*, studied the angiographic branching pattern of splenic artery in 43 splenic arteriograms and 7 coeliac arteriograms and found 76% of cases had superior polar artery and 24% had inferior polar artery [7].

Jauregui E found that the splenic artery originates, in all cases, from the coeliac trunk, and this artery is the most important with an average length of 10.6 centimeters. The branches are noted to be superior polar artery appearing in 53% of the cases, inferior polar artery appearing in a 33% [8].

Daisy Sahni A *et al.*, found that the posterior gastric artery arose from about the middle of the splenic artery [9].

Pandey SK *et al.*, studied the splenic artery in 320 cadavers [10]. They found the origin of splenic artery from coeliac trunk (90.6%), aorta (8.1%) & other sites (1.3%). Suprapancreatic course of the artery was commonly observed (74.1%) followed by enteropancreatic (18.5%), intrapancreatic (4.6%), and retropancreatic (2.8%) courses.

Knowledge of variation of vascular anatomy of liver and stomach and its relation to lymph nodes is required for gastroenterologists. Because lymphatic metastasis in carcinoma of stomach require dissection of nodes along these arteries, for which both normal and variational vascular anatomy is much essential.

Because of these surgical importance and the existence of wide variations in the arterial supply of supramesocolic organs and its need for surgeons, radiologists and anatomists, the study on coeliac trunk and its branches had been undertaken.

## MATERIAL AND METHODS

### Sample Study

The study was done in 50 human cadaveric specimens. Of the 50 specimens, 22 were done in the dissection hall cadavers, 28 were collected from the post mortem samples irrespective of age and sex.

### Collection of Specimens

By an I-shaped incision extending from the suprasternal notch to pubic symphysis, anterior chest wall was opened. The heart and lungs were removed from the thorax. The thoracic aorta, thoracic part of inferior vena cava and oesophagus were tied, cut and removed proximally. Distally the abdominal aorta and inferior vena cava were tied and cut below the level of origin of the renal arteries and removed along with abdominal diaphragm, liver, spleen, stomach and pancreas in too. The specimens were washed in the running water. 300-400 ml of 10% formalin was injected through one cut end of the abdominal aorta using a 20 ml syringe and then the specimens were completely immersed in the buckets containing 10% formalin solution and were preserved for 10 days.

### Gross Dissection

#### In Dissection Hall Specimens

Manual dissection was done in 22 dissection hall cadavers. According to the textbook of Cunningham's manual of Practical Anatomy, abdominal cavity was opened by cutting and reflecting the muscles of anterior abdominal wall. The liver was pulled superiorly and its inferior margin was tilted anteriorly to expose the lesser omentum. The anterior layer of lesser omentum was removed close to the lesser

curvature of the stomach and the left gastric artery was traced along its gastric and oesophageal branches. The right gastric artery was traced to the proper hepatic artery. The branches of proper hepatic artery were traced. The gastroepiploic arterial arcade in the greater omentum was identified and dissected. The anterior layer of the greater omentum was cut 2.3 cm inferior to the arteries and the omental bursa was opened.

The stomach, right gastric and gastro-epiploic vessels were cut immediately to the left of the pylorus and turned to the left. The coeliac trunk was identified. The dense autonomic plexus around the trunk and its branches were removed and the branching pattern had been noticed. The splenic artery was traced along the superior border of pancreas and its branches were noticed. All the findings were recorded.

### In Postmortem Specimens

Manual dissection was done in the 28 post mortem specimens regarding the origin of the coeliac trunk and its branches. The arteries supplying the liver, stomach, pancreas and the spleen were dissected according to the above said procedure and the findings were recorded.

## RESULTS

### Length

The length of the splenic artery ranged from 8 cm to 13.5 cm. Its mean length was 9.11 cm. The number of specimens having variable length was tabulated (Table-1).

Table-1: Length of the Splenic Artery

Length (cm)	No. of specimens
8.0 to 10.0	26
10.1 to 12.0	18
12.1 to 13.5	6

### Tortuosity Index

Splenic artery is famous for its tortuosity. In some specimens, it was highly tortuous and in few it was almost straight. The ratio of the curved length of the splenic artery to its straight distance from its origin to the point of commencement of hilar branches is called as tortuosity index. It ranged from 1.02 to 1.29.

### Relation with the Pancreas

The course of splenic artery is usually along the upper border of the pancreas. This usual supra-pancreatic course was noticed in 38 specimens (Figure1). In 10 specimens, it passed behind the pancreas. In 2 specimens, it passed inside the substance of pancreas (Figure-1).

### Branches

In all the specimens, the usual branches of splenic artery such as pancreatic branches, short gastric arteries, and the left gastroepiploic artery were

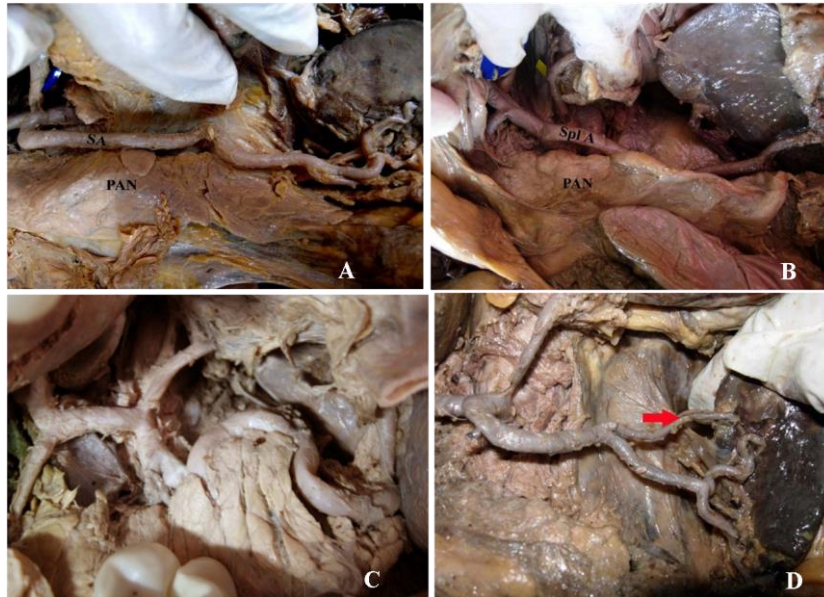
observed. The artery terminated by dividing into two or more splenic branches that entered into the hilum of the spleen. Apart from these usual branches, some of the peculiar branches were noted. They were:

**(a) Polar Arteries:**

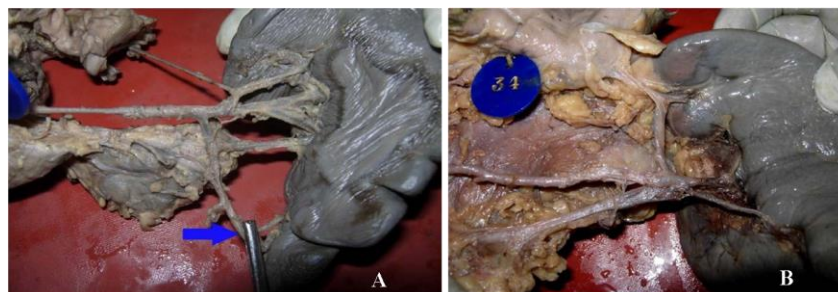
A separate branch from the splenic artery was observed to enter into the superior or inferior poles according to which they are named as superior polar

artery and inferior polar artery respectively. In the present study:

- Superior polar artery was observed in 15 specimens (Figure-1).
- Inferior polar artery was observed in 18 specimens (Figure-2).
- Both superior and inferior polar arteries were observed in 4 specimens (Figure-2).



**Fig-1: A. Splenic artery running along the upper border of pancreas. B. Retropancreatic course of splenic artery. C. Intrapancreatic course of splenic artery. D. Superior polar artery from splenic artery**



**Fig-2: A. Inferior polar artery from splenic artery. B. Superior and inferior polar artery**

**Dorsal Pancreatic Artery**

In 9 specimens, dorsal pancreatic artery took origin from the proximal few centimeter of origin of the splenic artery (Figure-3).

**Posterior Gastric Artery**

In 14 specimens, the posterior gastric artery took origin from the middle of the splenic artery and it coursed upwards to enter into the posterior surface of the stomach (Figure-3).

**Gastrosplenic Artery**

In 12 specimens, the gastrosplenic artery took origin from the splenic artery. This artery divided into two branches, one entered into the posterior surface of

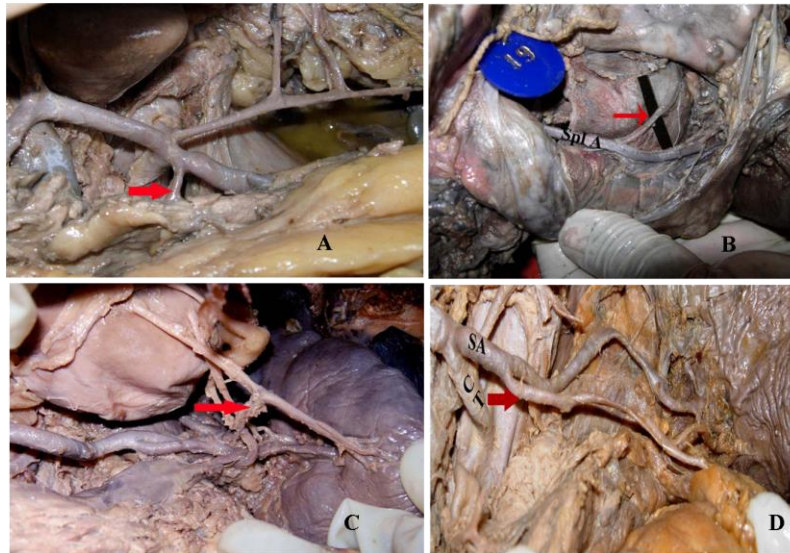
the stomach and the other entered into the inferior pole of the spleen (Figure-3). This artery is considered to be the intermediate type between posterior gastric artery and inferior polar artery.

**Left Gastric Artery**

In one specimen, the left gastric artery took origin from the splenic artery.

**Accessory Splenic Artery**

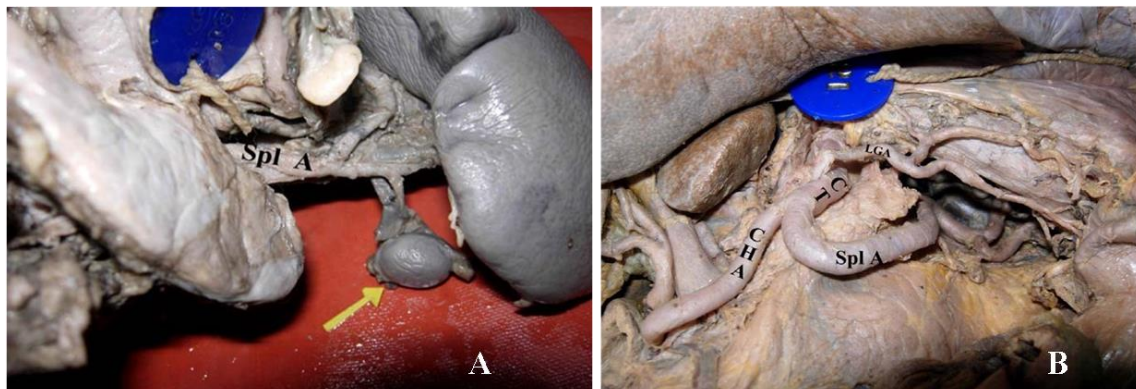
In 1 specimen, an inferior polar branch which was given off from the very proximal segment of splenic artery ran very parallel to the later as an accessory splenic artery entered into the inferior pole of the spleen (Figure-3).



**Fig-3: A. Dorsal pancreatic artery from splenic artery. B. Posterior gastric artery from splenic artery. C. Gastrosplenic artery dividing into 2 branches to supply the posterior surface of stomach & inferior pole of spleen. D. Accessory splenic artery running as inferior polar artery parallel to splenic artery**

**(b) A branch to the Accessory Spleen**

In 1 specimen, a branch from the splenic artery supplied an accessory spleen which was present in the lienorenal ligament (Figure-4).



**Fig-4: A. Splenic artery giving a branch to accessory spleen. B. LGA divided into two branches that supply anterior and posterior surfaces of the stomach**

**DISCUSSION  
SPLENIC ARTERY**

**Origin**

Jauregui E found in his studies that the origin of splenic artery was from coeliac trunk only. In my study also, in all the specimens, splenic artery took origin from coeliac trunk only [8].

**Length**

Michels [5] found the varying length of splenic artery from 8 to 12 cm. Jauregui E found to be 10.6 cm. In my study, the length varied from 8 cm to 13.5 cm which correlates with that of the previous studies [15].

**Tortuosity Index**

Sylvester PA in 73 specimens measured the tortuosity index. According to him, it is the ratio between the curved length and the straight length of

splenic artery. The ratio was measured and ranged from 1.02 to 1.29 [11].

**Relation to the Pancreas**

Franz K in his short series of 28 cases, found the splenic artery running along the upper border of pancreas in 12(42.8%), behind it in 10(35.7%), somewhat above it in 4(14.3%) and front of it in 2(7%) cases [12]. Pandey SK *et al.*, found its suprapancreatic course in 74.1% cases, enteropancreatic course in 18.5% intrapancreatic in 4.6%, retropancreatic in 2.8% [10].

In our study, in 38 specimens (76%), splenic artery had suprapancreatic course, 10 specimens (20%) had retropancreatic course, 2 specimens (4%) had intrapancreatic course. No specimens had enteropancreatic course.

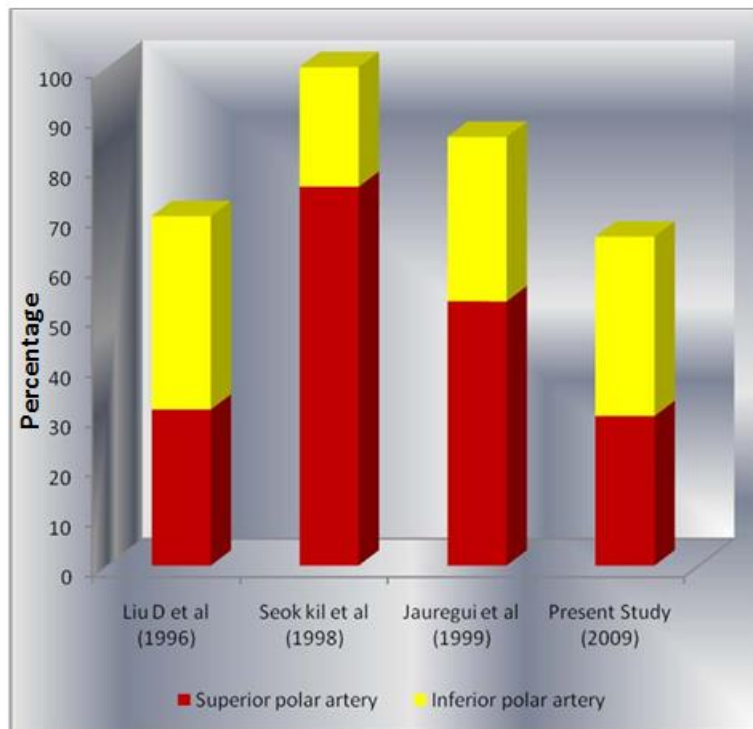
**Branches**

Polar Arteries: Liu D *et al.*, [13] reported the incidence of superior polar artery and inferior polar artery in 31.3% and 38.8% respectively [13]. Seok Kil Zeon *et al.*, found its incidence in 76% and 24% respectively [7]. Jauregui E found its incidence in 53% and 33% respectively [8]. In our study, superior and

inferior polar artery was observed in 30% and 36% of specimens respectively. These findings are similar to that of Liu D *et al.*, study. The presence of both polar arteries was reported by Liu D *et al.*, [13] in 13.3% In the present study, the incidence of both polar arteries is 8%, which is closely similar to the above study (Table-2, & Chart- 1 ).

**Table-2: Polar Arteries from Splenic Artery**

Sl. No	Name of the authors	Year of study	No. of Specimens	Superior polar artery	Inferior polar artery	Both polar arteries
1.	Liu D <i>et al.</i> ,	1996	280	31.3%	38.8%	13.3%
2.	Seok Kil Zeon	1998	50	76%	24%	-
3.	Jauregui E	1999	-	53%	33%	-
4.	Present Study	2009	50	30%	36%	8%



**Chart-1: Polar Arteries from Splenic Artery**

**a. Posterior Gastric Artery**

Posterior gastric from splenic artery was reported by Trubel W *et al.*, in 27% [14]. In my study, the incidence was 28% which correlates with the above study.

**b. Gastrosplenic Artery**

Trubel W *et al* (1988) described about the gastrosplenic artery which divides into polar branch to supply the spleen and a gastric branch to supply the stomach [14]. In this study, this gastrosplenic artery was noted in 12% of specimens.

**c. Accessory Splenic Artery**

Michels found an accessory splenic artery which was actually a superior polar artery running parallel to the splenic artery [5]. In our study, an inferior polar artery ran as an accessory splenic artery,

which was very parallel to the splenic artery in 1 of the specimens (2%).

**CONCLUSION**

A good knowledge of anatomy of splenic artery is very much essential during splenectomy, percutaneous interventional techniques such as partial splenic artery embolization, stent placement, etc. During surgery, arterial variations cannot be ignored for the risk of ligating the wrong vessel or severing an essential artery resulting ischemia or bleeding.

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