Unusual branching pattern of splenic artery: anatomical description and clinico-embryological explanation

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Abstract

Introduction
This study reports a case of two rare variations in the branching pattern of the splenic artery.

Case report
During the course of routine dissection of a 42-year-old male cadaver for teaching of preclinical medical students, we noticed two rare variations in the branching pattern of the splenic artery. The splenic artery was significantly non-tortuous; it was smaller (6 cm) in length. The splenic artery was seen to give a posterior gastric branch along with an accessory branch to the splenic flexure of the colon.

Discussion
The uniqueness of the current report lies in the fact that the splenic artery gave both the posterior gastric branch and an accessory branch to the left colic flexure. It is important for the surgeon to be aware of the existence of these variant branches of the splenic artery. These variations may be overlooked intraoperatively increasing the chances of inadvertent bleeding if damaged. Hence, their importance in abdominal surgical procedures especially, pancreatic transplant surgeries and left colonic resections cannot be overlooked. It is equally interesting to note that in this case; an artery of the foregut was seen supplying an area of the artery of the hindgut. This variation in the branching pattern of splenic artery can be correlated with its embryological development.

Conclusion
We as anatomists submit that awareness of variations of splenic artery as described in the current report would contribute to minimise vascular complications during abdominal surgeries.

Introduction
The splenic artery is the largest branch of the celiac trunk and it is considered a classic example of a tortuous artery in the body. It courses superior and anterior to the splenic vein, along the superior edge of the pancreas. Near the splenic hilum, the artery usually divides into superior and inferior terminal (IT) branches, and each branch further divides into four to six segmental intrasplenic branches. The branches of splenic artery entering into the spleen through poles of the spleen are called polar arteries, i.e., superior and inferior polar arteries. The gastric branches of the splenic artery include the left gastroepiploic, short gastric artery and sometimes, posterior gastric artery (PGA). PGA when present arises from the splenic artery in its middle section posterior to the body of the stomach. It ascends behind the peritoneum of the lesser sac towards the fundus of stomach and then reaches the posterior surface of the stomach in the gastrophrenic fold. The PGA supplies the superior portion of the posterior wall of the gastric body, near the cardiac area, and the fundus. Although investigated and depicted in many anatomical studies, a consensus regarding the incidence, course and distribution of PGA is not yet reached. Many variations in the course and branching patterns of splenic artery are mentioned in the literature. However, a branch of the splenic artery to colon is rare. This case describes a rare branch to the splenic flexure of the colon, arising from one of the terminal branches of splenic artery.

Case report
During the course of routine dissection of a 42-year-old male cadaver for teaching of preclinical medical students, we noticed two rare variations in the branching pattern of the splenic artery. The splenic artery was seen as usual arising from the coeliac trunk, but was significantly non-tortuous. It was 6 cm in length and 0.8 cm in diameter. It gave off the PGA (Figure 1) 2.2 cm from its origin. PGA was 0.8 cm in diameter and 7.2 cm in length. It coursed obliquely upward and towards the left, raising a fold for 3.8 cm and divided into a superior terminal branch (Figure 1) and an IT branch (Figure 1). The IT artery further divided into two extrahilar branches 2.5 cm away from the hilum. The upper (Figure 1) of these branches entered the hilum of spleen. The lower branch (Figure 1) was 2 cm in length and it further gave one branch to the splenic hilum and another branch (Figure 1)
to the lower pole of the spleen, which was running along the intermediate border of the spleen. The lower branch of the IT artery, after supplying the lower pole of the spleen gave an additional branch to the splenic flexure of colon (Figure 1). This accessory left colic artery (Figure 1) traversed inferolaterally, anterior to the tail of the pancreas and left renal vein to reach the splenic flexure of colon. The splenic flexure of colon was also supplied by the usual left colic branch of the inferior mesenteric artery. The peritoneal folds in the vicinity of the spleen were unremarkable. The other branches of celiac trunk followed their normal course and displayed no apparent variation.

Discussion
The spleen and the pancreas receive their vascular supply from the splenic artery. The splenic artery gives off five to six short gastric arteries and the left gastroepiploic artery which supplies the stomach. From the middle part of its course, the splenic artery may give off a PGA to the stomach. DiDio et al. found the PGA in 46% of their subjects. According to DiDio, the surgical importance of the PGA is attributed to its relatively high incidence and the fact that it augments the blood supply to the superior part of the posterior gastric wall. In addition, it has an almost hidden origin from behind the splenic artery. Loukas et al. found the most common origin of PGA was from the left gastric artery in 41.8% cases, from splenic artery in 25.5% cases, double PGA, i.e., from left gastric and splenic artery in 22.4% cases and from celiac trunk in 10.2% cases. In yet another investigation, Suzuki et al. found out PGA was originating from the superior aspect of the middle third of the splenic artery in 62.2% cases. A coeliacographic study reported PGA in 55.7% of cases, measuring 3.2–7.4 cm in length and 0.7–2.1 mm in diameter. Yu W et al. concluded from their study that PGA originates from the proximal third of the splenic artery in 13.3%, from middle third in 77.77% and from distal third in 8.88% cases. The PGA in this case was arising from the proximal third of the splenic artery and displayed calibre and length similar to that reported in the literature. It is important for the surgeon to be aware of the existence of this cranially directed branch of the splenic artery to the posterior gastric wall and of its variations. These vessels have a ‘hidden’ posterior location and may be overlooked intraoperatively increasing the chances of inadvertent bleeding if damaged. Hence, its importance in abdominal surgical procedures and in pancreatic transplant surgeries cannot be overlooked.

Splenic artery, the largest branch of celiac trunk is cited as an example of the tortuous artery in standard anatomical text books. However,
the tortuosity of splenic artery is absent in infants and in children and develops with age. The splenic artery in the current investigation was significantly non-tortuous, thereby, retaining the infant like anatomical pattern, a feature very rarely seen in adults. The average length of the splenic artery is 13 cm (8–32 cm) and the average width is 7.5 mm (5–12 mm). The splenic artery in this case was considerably smaller in length (6 cm) but normal in diameter (5 mm).

The splenic flexure of colon is supplied by the left colic artery, a branch of inferior mesenteric artery. Amonoo-Kuofi et al. found an anomalous middle colic artery from the proximal segment of the splenic artery. Liu et al. reported a branch from the splenic artery to the left colic flexure. Rusu et al. reported a case where a left accessory aberrant colic artery was observed to be supplying the splenic flexure but it was originating from superior mesenteric artery. Bamac et al. reported a case of distal one-third of the transverse colon being supplied by a branch from the distal part of the splenic artery, which later continued to the hilum of the spleen. In our case, the IT branch of the splenic artery first gave a polar branch to the lower pole of the spleen and then gave an accessory branch to the splenic flexure of the colon. Additionally, the splenic flexure was also supplied by the left colic artery arising normally from the inferior mesenteric artery.

The uniqueness of the current report lies in the fact that the splenic artery gave both the posterior gastric artery and an accessory branch to the left colic flexure. It is equally interesting to note that in this case, an artery of the forerogut was seen supplying an area of the artery of the hindgut. This variation in the branching pattern of the splenic artery can be correlated with its embryological development. The coeliac, superior mesenteric and inferior mesenteric arteries are derived from fusion of the vitelline arteries supplying the yolk sac, and are located in the dorsal mesentery of the gut. These vessels supply the derivatives of the foregut, midgut and hindgut. Embryologically, the splenic artery is derived from the celiac trunk. It supplies the spleen, pancreas, stomach and greater omentum. The inferior mesenteric artery supplies the derivatives of the hindgut, i.e., from the distal one-third of the transverse colon to the upper half of the anal canal. The distal one-third of the transverse colon including the splenic flexure is supplied by the left colic artery, a branch of the inferior mesenteric artery. The variation seen in our case can possibly be attributed to abnormal fusion or abnormal migration of these primary arteries.

Recent reports have explored and subsequently demonstrated the importance of the identification of PGA in surgical procedures such as subtotal gastrectomy, splenectomy and pancreatic transplantation. The surgical relevance of aberrant or accessory left colic arteries is reflected in surgical procedures like left colectomies and nephrectomies.

The authors further speculate that since the splenic flexure of the colon in this particular case presents a dual supply, this fact may be of particular value to the gastro surgeon who wishes to perform resection procedures on this segment of the gut.

Conclusion

We as anatomists submit that awareness of variations of splenic artery as described in the current report would contribute to minimise vascular complications during abdominal surgeries. Additionally, knowledge of such vascular variations should also prove useful in angiographic studies. The presence of two additional branches of splenic artery provides academic as well as clinical relevance.

References

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