



Case Report:

Anatomical Variations of the Splenic Artery

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Citation

Belic O, Mazuruc N, Covantev S. Anatomical Variations of the Splenic Artery. *Online J Health Allied Scs.* 2017;16(2):19. Available at URL: <http://www.ojhas.org/issue62/2017-2-19.html>

Submitted: Feb 27, 2017; Accepted: July 14, 2017; Published: July 30, 2017

Abstract: The splenic artery is characterized by large individual variability on both extra-and intraorganic levels. The authors describe the case of an accessory splenic artery, which was found in the study of corrosion cast preparation. An accessory artery diameter of 0.1 mm was diverted at a sharp angle from the upper branch of the splenic artery and at the level of the hilum branched into two vessels of I and II order from a sharp angle. In the parenchyma it accompanied the segmental arteries and had a shared blood supply with them.

Key Words: Spleen; Anatomic variants; Splenic arteries; Corrosion cast; Spleen vascularization; Accessory artery.

Introduction:

The development of industry, construction sites, tourism, mechanization of agriculture, and mass sport exercising leads to an increase of trauma incidence, which lately has been holding an important place in the overall morbidity and even mortality. According to the WHO, 8-10 million people are hospitalized each year with traumas. Severe associated chest and abdomen injury is one of the most severe encounters both during military conflicts and daily life. Spleen lesions as part of isolated or associated abdominal trauma are observed in 23-40% of cases.(1)

In case of multiple ruptures of the spleen most surgeons perform splenectomy that being a grounded decision. The rate of postsplenectomy complications especially in combined trauma of abdominal organs is very high - 11-32%. In isolated lesions of the spleen infectious complications occur less frequently - 0.5-1% of cases. Among postsplenectomy complications a special role is held by sepsis - 2% in isolated lesions of the spleen.(2) The splenectomy performed at a younger age increases the risk of immunological disorders, may lead to functional disorders and reduce the regenerative capacity of the organism.

The susceptibility to infections, mainly to pneumococcal flora, in children after splenectomy reaches 4%, with a mortality of 88%.(3) Given the high rate of complications after splenectomy, many authors prefer a full or at least partial organ preservation tactic of treatment.(4)

The knowledge of structural and topographic aspects of blood vessels of the spleen is important for surgical interventions, planned and urgent and of immunocompetent organs, especially now with the increase of the number of surgery procedures with maximum sparing of the organs damaged by associated or isolated trauma of the abdomen. Splenofafia is often considered dangerous due to the risk of bleeding from sutured spleen tissues.

This danger can be reduced by improving the surgical techniques and detailed knowledge of topographical and morphological as well as the functional possibilities that comprise the local and regional spleen apparatus, and its surrounding anatomical structures, including collateral paths of vascularization.

The present study reports the anatomical variation in terminal branching pattern of the splenic artery. Knowledge of the existing aberrations is important in planning and conducting surgical procedure.(5)

Case Report

The study of the individual anatomical variability of human spleen blood vessels architectonics, including their extrahepatic segments was performed by injecting plastic polychrome material (BMS 0.15) with the following making of corrosive product. Additional artery was found in a 69 years old woman on the casts of the blood vessels of the spleen, the description of which was not found in literature (Fig. 1).

The splenic artery had a sinusoidal character. A short trunk deviated at a distance of 2.5 cm from the lower portioned artery, which ramified into the artery of the tail of the pancreas and to the left gastroepiploic artery. At 1 cm of the level of the trunk branch of the low portioned artery, an additional branch passes to the lower pole. The low portioned artery at its beginning is located anterior to the splenic vein, and closer to the gate – in front of the lobar vein. Prior to the entrance of the lower portion the artery branches at an obtuse angle in two segmental branches which in their turn are divided in a sharp angle are lost in the parenchyma of the lower lobe. All the branches of the vessels have a sharp angle of ramification. The artery to the upper lobe passes immediately into the

parenchyma of the spleen after its inception behind the lobar vein and divides in two segmental branches. From the top of the bend of the spiral from the upper lobar artery a thin branch leaves ($d = 0.1 \text{ mm}$) which directs to the hilum of the spleen on a straight trajectory. At a distance of 1 cm to the hilum the artery divides into 2 vessels. The upper branch directs to the upper lobe, where it is again divided into 2 vessels, which pass through the capsule of the spleen into the parenchyma and accompany the upper segmental arteries. The lower vessel before entering the parenchyma branched into two branches to the lower lobe of the spleen where each of them branches into two branches which passed closer to the segmental arteries. Such a branch of the splenic artery should be considered in surgical interventions, especially in microsurgery.

Discussion

Classification of the lobes and splenic segments is presented differently in literature. According to Redmond et al (1989) splenic artery divides into two lobar branches the superior splenic artery and the inferior one, but there wasn't registered a third lobar artery.(6) According to Treutner et al (1993) the splitting of the splenic artery in two principal branches was observed in 30 spleens (bifurcation) (93.8%) and into three main arteries – in two cases (6,2%). In 65.7% was found a superior polar artery of the II order, or three with the genesis from a branch of the splenic artery. In 28.1% of the cases the blood supply of the superior pole was directly from the splenic artery. An artery of the II or the III order from a branch of the splenic artery reached the inferior pole in 46.9% of the cases. In 46.9% of the cases the inferior polar artery originated either from the splenic artery, or from the spleno-epiploic trunk.(7)

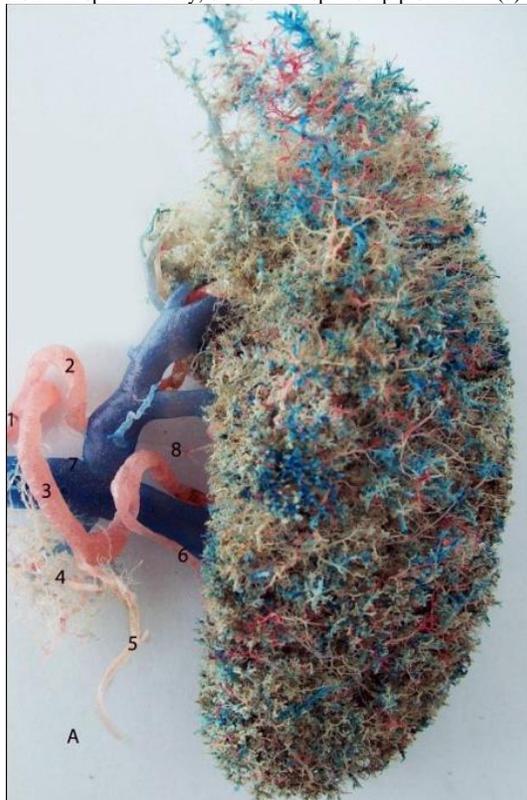


Fig. 1. Accessory splenic artery. A: Branching of the splenic artery in the hilum (front view). 1 - splenic artery, 2 - upper lobar artery, 3 - lobar artery, 4 – vessels to the tail of the pancreas, 5 - left gastroepiploic artery, 6 - inferior polar artery, 7 - splenic vein, 8 – accessory splenic artery.

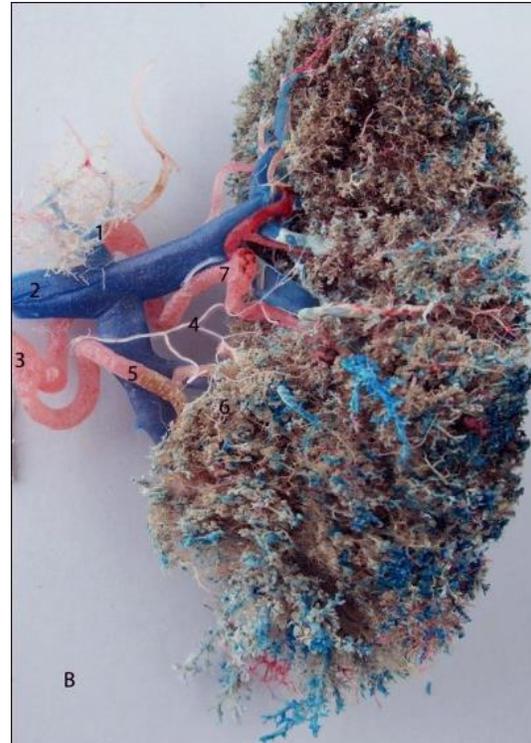


Fig. 1. Accessory splenic artery. B: The branches of the splenic artery (rear view). 1 - vessels to the tail of the pancreas, 2 - splenic vein, 3 - splenic artery, 4 - accessory splenic artery, 5 - upper lobar artery, 6 - spleen, 7 - lobar artery.



Fig. 1. Accessory splenic artery. C: Detailed view. 1 - vessels to the tail of the pancreas, 2 - splenic vein, 3 - splenic artery 4 - lobar artery, 5 - upper lobar artery, 6 - accessory splenic artery, 7 - upper lobar vein, 8 - splenic vein, 9 - inferior polar artery.

Liu et al (1996) studied 850 splenic specimens in which there were found: spleens with a single lobar artery in 7 (0.8%) cases, spleens with two arteries – in 730 (86%) cases, spleens with three lobar arteries in 104 (12.2%) of cases, spleens with more than three lobar arteries in 9 (1%) of cases.(8) Cougard (1984) established the division of splenic artery in «Y» in 70% of cases.(9) The same version was registered by Cortes and co-workers (1998) in 73.3% of all the observations. The splenic artery division variant in «T» by Cougard (1984) is described in 30% of cases, and by Cortes and co-workers (1988) in 26.3% respectively.(10) The mentioned above authors found that in 80% of the cases the splenic artery divides into two branches supplying splenic lobes. As to the rest of the cases – 20% the spleen is supplied through the extending branches arising, as a result, of trifurcation of the splenic artery. The lobar arteries in their turn branch into segmental branches, the number of which varies from one to four. Most frequently four segmental arteries persist - 45.5% of the cases, the presence of two segmental branches was registered by Cougard et al (1984) in 36.4% of the cases.(9) The superior lobar artery gives an average of three segmental arteries, while the inferior lobar artery – 2–3 segmental branches according to Williams et al (1995).(10) The splenic artery near the tail of the pancreas enters the lienorenal ligament and then divides into five or more terminal branches, which enter the hilum of the spleen. The splenic artery has divided into terminal branches in 311 cadavers (97%). In nine cadavers (2.8%) it passed through the hilum of the spleen without dividing. Two terminal branches were the most common (63.1%) followed by four (18.8%), six (9.7%) and more than 6 (5.6%) branches.(11)

Embryologically the primitive dorsal aorta has given a series of ventral splanchnic arteries for the primitive gut and its derivatives. Most of these branches normally disappear, but the persistence of normally disappearing branch (branches or abnormal fusion among primitive arteries might explain the abnormal origin and the course of the splenic artery. Taking into consideration the relatively high prevalence of variation of the splenic artery, it is advisable for the surgeons operating in the area of supracolic region to keep in mind the possibility of its occurrence and of the complications to which it may lead, during surgical procedures.(12)

To know these variations is significantly important during surgical and radiological procedures of the upper abdominal region in order to avoid any serious complications.

Conclusion

In the last years, there is an increase of the number of surgery procedures with maximum sparing of the organs. To perform such procedures the surgeon should be aware of the vascular anatomy of the region. The present study reports the anatomical variation in terminal branching pattern of the splenic artery.

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