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Case Report

Radiology Section

Aberrant Origin of Splenic Artery Detected by Computed Tomography Abdominal Angiogram: A Case Report

MOHAN SHOBANA APARNA[1], SUNDARA RAJA PERUMAL[2]

ABSTRACT

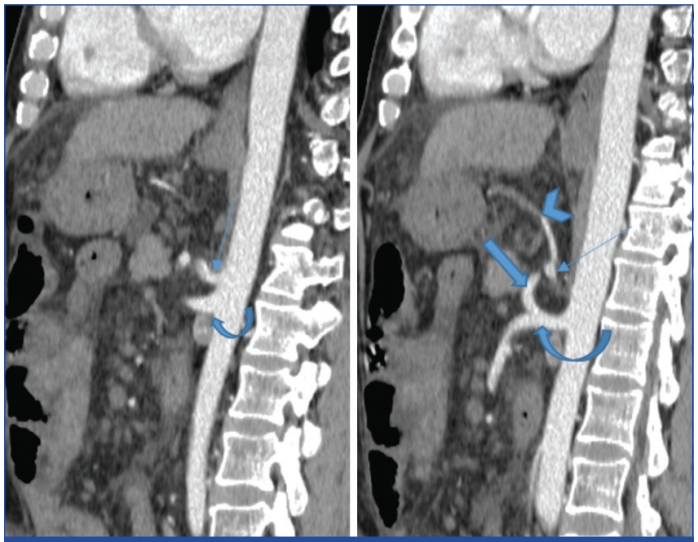
The splenic artery is one of the terminal arteries arising from the coeliac axis, supplying the spleen, pancreas and stomach. It courses along the superior border of the pancreas and travels into the splenorenal ligament and into the hilum of the spleen, accompanied by the splenic vein. The splenic vein joins with the superior mesenteric vein to form the portal vein. This is the most common anatomical pattern. Anatomical variations of the coeliac axis and splenic artery have been documented in the literature, but variations in the origin of the splenic artery are unusual and rare occurrences. This variation is important in the case of abdominal surgeries, like liver transplantation and pancreatic surgery. A 45-year-old male patient with cirrhosis of the liver underwent a Computed Tomography (CT) abdominal angiogram and Contrast-Enhanced Computed Tomography (CECT) abdomen as part of the assessment for liver conditions, portal hypertension, portosystemic collaterals and to rule out any hepatic neoplastic complications, like Hepatocellular carcinoma. In this patient, the splenic artery, instead of arising from the coeliac axis, was observed to originate from the superior mesenteric artery. Knowing this variation before surgery could prevent potentially life-threatening complications like as intraoperative or postoperative intra-abdominal bleeding.

Keywords: Anatomical variations, Coeliac trunk, Liver transplant

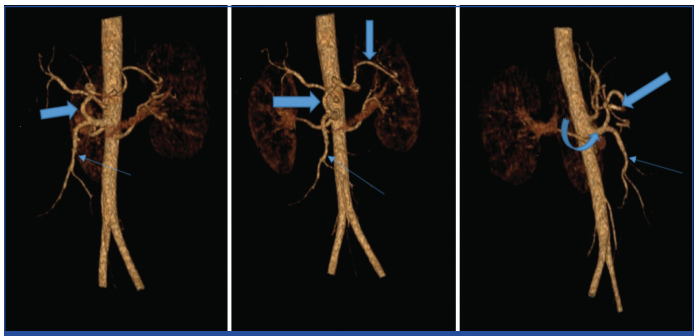
CASE REPORT

A 45-year-old male patient with a history of Hepatitis B virus seropositivity for four years and cirrhosis of the liver for four months came to the radiological department for a CECT scan of the abdomen as part of the evaluation of his cirrhotic liver and the presence of other complications like portal hypertension and collateral circulation. The CT abdominal imaging study revealed a shrunken liver with a nodular outline measuring 7 cm in height, caudate lobe hypertrophy, splenomegaly and the presence of collateral circulation around the lower end of the oesophagus and in the splenic hilum. Mild to moderate ascites were also noted. There was no evidence of hepatocellular carcinoma.

In addition to the above findings, the splenic artery was observed to originate from the superior mesenteric artery instead of the coeliac axis. The coeliac axis appeared relatively smaller in size and gave rise to the common hepatic artery and left gastric artery [Table/Fig-1,2]. The splenic artery initially coursed posterior to the body of the pancreas and then ascended laterally to the body of the pancreas. At the level of the tail of the pancreas, it terminated into multiple branches that supply the splenic parenchyma. The splenic vein was dilated and drained into the main portal vein. The inferior mesenteric vein was noted to drain into the superior mesenteric vein instead of draining into the splenic vein or the porto-splenic venous confluence. CT Maximum Intensity Projection (MIP) images clearly depicted this aberrant origin of the splenic artery [Table/Fig-3-5]. The coeliac axis appeared relatively smaller in size and gave rise to the common hepatic artery and left gastric artery [Table/Fig-3-5]. The inferior mesenteric artery and renal arteries appeared normal [Table/Fig-3-5].



[Table/Fig-1,2]: CT abdominal Aortogram sagittal images show coeliac axis (thin arrow), Superior Mesenteric Artery (SMA) (curved arrow), splenic artery from SMA (bold arrow), and common hepatic artery from coeliac axis (arrowhead). (Images from left to right)



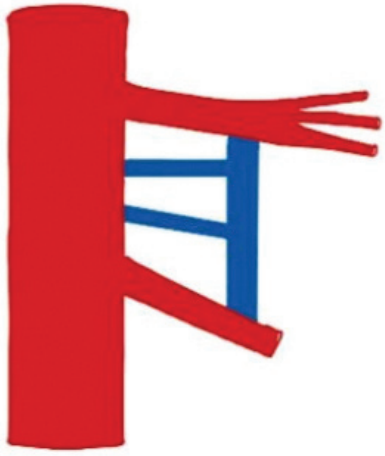
[Table/Fig-3-5]: CT Maximum Intensity Projection (MIP) images show the splenic artery (Bold arrow), SMA (curved arrow), and SMA (Thin arrow). (Images from left to right)

DISCUSSION

The coeliac artery is the first ventral branch of the abdominal aorta, arising at the D12-L1 level and trifurcating into the common hepatic artery, left gastric artery and splenic artery as terminal branches, which is the classic distribution pattern. This pattern is seen in 86% of the population [1,2]. The splenic artery is the largest terminal branch and supplies the spleen, fundus, greater curvature of the stomach and body and tail of the pancreas. Variations in the origin of the coeliac artery are more common and have been well documented in the

literature. However, variations in the origin of the splenic artery are a rare phenomenon, with reported prevalence varying between 0.03 to 1% [1-3]. This is a clinically significant anatomical variant, especially for patients undergoing surgeries, like liver transplantation, pancreatic surgeries and vascular interventions.

Embryologically, the development of the mesenteric arterial system is formed from four roots of the omphalomesenteric artery, with the first root giving rise to the coeliac artery and its branches, while the fourth root gives rise to the SMA and its branches. The second and third roots usually disappear [Table/Fig-6]. The aberrant origin of the splenic artery is due to defects or alterations in the formation of the splanchnic roots [4].



[Table/Fig-6]: Schematic diagram shows four roots of omphalomesenteric artery.

Fiorello B and Corsetti R reported a case of the splenic artery originating from the SMA, similar to the case presented here. A 76-year-old patient with a history of back pain was evaluated by CECT of the abdomen, revealing a mass in the body of the pancreas, dilated distal pancreatic duct, atrophy of the tail of the pancreas, and an aberrant origin of the splenic artery from the SMA, leading to a diagnosis of pancreatic carcinoma [1]. Felli E et al., also reported a case of the aberrant origin of the splenic artery from the SMA. An 80-year-old female patient diagnosed with septic shock underwent a contrast CT of the abdomen, which showed small bowel ischaemic changes. The splenic artery was originating from the SMA and this anomaly was confirmed during an exploratory laparotomy [5].

Maske S et al., reported a case of an accessory splenic artery while dissecting a formalin-embalmed female cadaver. During routine dissection of the supracolic compartment, the coeliac trunk was identified at the level of T12. The trunk gave rise to three major branches: the left gastric artery, common hepatic artery and principal splenic artery. An accessory splenic artery was seen arising from the principal splenic artery with a tortuous course and supplying the diaphragmatic surface and upper part of the splenic parenchyma [6]. Graf O et al., studied the anatomic variants of the mesenteric venous system, including the Superior Mesenteric Vein (SMV) and Inferior Mesenteric Vein (IMV), showing that in 56% of patients, the IMV drained into the splenic vein (the most common anatomical variant), in 26% it drained into the SMV, and in 18% it drained into the angle between the splenoportal confluence [7]. In this case, the IMV was seen draining into the SMV, constituting a less common anatomical variant of drainage for the IMV.

The identification of this anatomical variant in various abdominal surgeries like liver transplantation, pancreatic surgery and vascular surgery, is crucial for preventing unexpected iatrogenic vascular injuries and intraoperative or postoperative bleeding. Liver transplantation is the definitive treatment for this patient, making the evaluation of the arterial supply to the liver parenchyma and the detection of variations in the abdominal aorta and its branches essential. Recognising these anatomical arterial variations and their courses will modify the operating surgeon's approach, help prevent inadvertent iatrogenic injuries, reduce unexpected intraoperative blood loss, avoid postoperative complications and minimise morbidity and mortality.

CONCLUSION(S)

The unrecognition of this condition could lead to unforeseen intraoperative and postoperative bleeding, increased blood loss, prolonged operative time and heightened morbidity, all of which could be avoided by preoperative imaging like CT angiogram. This imaging is widely available and provides detailed anatomical information. The preoperative identification of anatomical arterial variants would help prevent potentially life-threatening and catastrophic complications during abdominal surgeries.

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PARTICULARS OF CONTRIBUTORS:
1. Junior Resident, Department of Radiodiagnosis, SRM Medical College Hospital and Research Centre, Kattankulathur, Chengalpattu, Tamil Nadu, India.
2. Professor, Department of Radiodiagnosis, SRM Medical College Hospital and Research Centre, Kattankulathur, Chengalpattu, Tamil Nadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Mohan Shobana Aparna,
Junior Resident, Department of Radiodiagnosis, SRM Medical College Hospital and Research Centre, SRMIST, Kattankulathur, Chengalpattu-603203, Tamil Nadu, India.
E-mail: draparna.rad@gmail.com, am5355@srmist.edu.in

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