

# Supraduodenal and Right Gastric Arteries Originating from A Common Trunk: A Rare Anatomical Variant

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## Abstract

Knowledge of the anatomic variations of the supraduodenal artery (SDA) and right gastric artery (RGA) is necessary to reduce the procedure time and radiation exposure dose, as well as to avoid unexpected complications of catheter placement before hepatic arterial infusion chemotherapy. The SDA and RGA most commonly arise from the gastroduodenal artery (GDA) and the proper hepatic artery, respectively; however, they can branch from the left hepatic artery (LHA). In addition, the SDA frequently anastomoses with the RGA and occasionally with the GDA. We observed a rare anatomic variant of SDA and RGA originating from the LHA as a common trunk. The patient also had a variant of SDA communicating with the GDA. It is important for interventional radiologists to be aware of these variations.

**Key words:** Supraduodenal artery, Right gastric artery, Anatomical variant

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## Introduction

Implantation of a reservoir catheter system and subsequent hepatic arterial infusion chemotherapy (HAIC) is a treatment option for malignant hepatic tumors such as hepatocellular carcinoma and metastatic hepatic tumors [1, 2]. However, intra-arterial administration of anticancer drugs via the catheter system into the supraduodenal artery (SDA) or right gastric artery (RGA) can cause duodenitis, gastritis, or peptic ulcers [1-3]. To prevent these adverse effects, the SDA and RGA are commonly embolized prior to HAIC as long as these arteries branch from the gastroduodenal artery (GDA). Anatomic variations of SDA and RGA are widely known [1-9]. It is important for vascular interventional radiologists to recognize these variations.

## Case Report

This is a case report involving one patient; thus, institutional review board approval was not required. A 43-year-old man with intrahepatic cholangiocarcinoma and multiple liver metastases but no extrahepatic metastasis underwent systemic chemotherapy with docetaxel and carboplatin as first-line treatment. Hepatic arterial infusion chemotherapy (HAIC) with cisplatin and 5-fluorouracil was planned as the second-line therapy following disease progression. After obtaining the patient's written informed consent, percutaneous reservoir catheter placement for HAIC was scheduled. Pre-procedural dynamic contrast-enhanced computed tomography (CT) showed a normal hepatic artery pattern without a replaced or accessory hepatic artery. Selective arteriography of the common hepatic artery (CHA) revealed that the SDA branched off at an acute angle from the proximal end of the

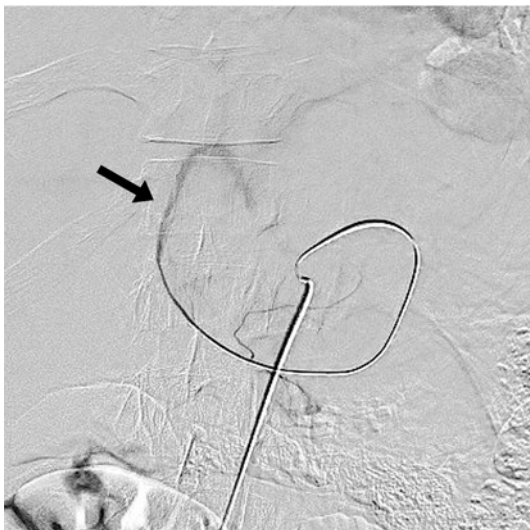
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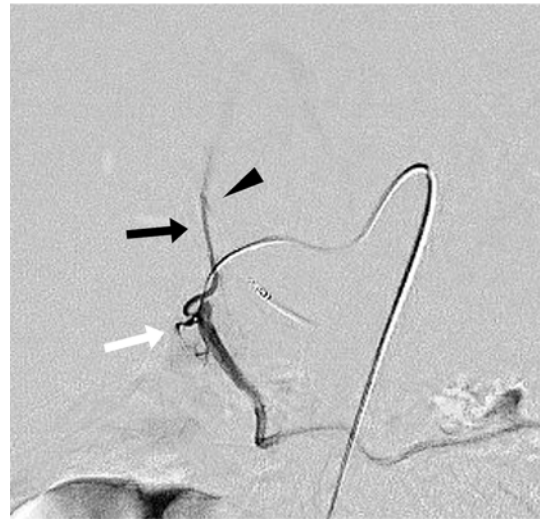


**Figure 1.** Arteriography obtained using a 4-Fr catheter placed in the common hepatic artery shows bifurcation of the proper hepatic artery into two hepatic arteries and branching of the supraduodenal artery at an acute angle from the proximal end of the left hepatic artery (arrow).

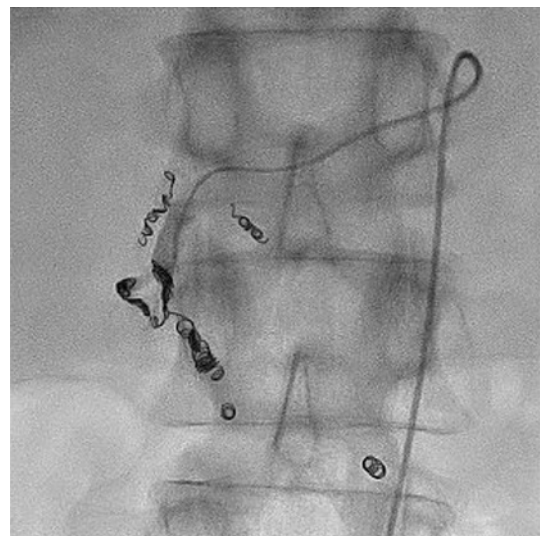


**Figure 2.** Arteriography obtained after a 2-Fr microcatheter was advanced coaxially into the left gastric artery from a 4-Fr catheter placed in the common hepatic artery. The right gastric artery and the left hepatic artery are seen (arrow). Subsequent embolization of the right gastric artery was successful.

left hepatic artery (LHA) (**Fig. 1**). The RGA was embolized using pushable metallic 0.018-inch coils (Hilal, Cook Medical, Bloomington, IN, USA) through the left gastric artery (LGA)-RGA arcade (**Fig. 2**). Selective arteriography of the GDA after embolization of the RGA revealed that the SDA communicated with the LHA and had a common trunk with the previously embolized RGA (**Fig. 3**). The SDA was embolized using pushable metallic 0.018-inch coils (Hilal, Cook Medical) via the GDA because the SDA branched off at an acute angle from the proximal end of the LHA. The

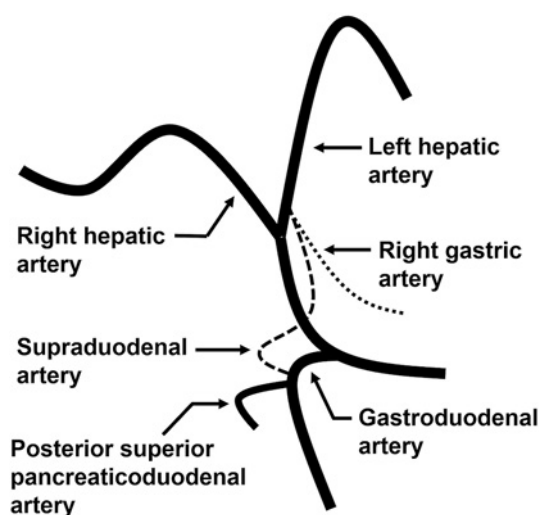


**Figure 3.** Arteriography obtained after a 2-Fr microcatheter was advanced coaxially into the gastroduodenal artery from a 4-Fr catheter placed in the common hepatic artery. The supra-duodenal artery (arrow) originates from the gastroduodenal artery near the origin of the posterior superior pancreaticoduodenal artery (white arrow) and communicates with the left hepatic artery as a common trunk with the right gastric artery (arrowhead), previously embolized with coils.



**Figure 4.** Arteriography of the gastroduodenal artery after embolization of the supra-duodenal artery, the common trunk of the anterior superior pancreaticoduodenal artery and right gastroepiploic artery, the posterior superior pancreaticoduodenal artery, and the gastroduodenal artery using metallic coils.

common trunk of the anterior superior pancreaticoduodenal artery and right gastroepiploic artery, posterior superior pancreaticoduodenal artery (PSPDA), and the GDA were then embolized using pushable metallic 0.018-inch coils (Hilal and Tornado, Cook Medical) (**Fig. 4**). A 2.7-Fr W spiral catheter (PIOLAX, Yokohama, Kanagawa, Japan) was inserted into the peripheral branch of the LHA, and the side



**Figure 5.** Schema of the present case. The supraduodenal artery originates from the left hepatic artery as a common trunk with the right gastric artery and communicates with the gastroduodenal artery.

hole was positioned at the proper hepatic artery (PHA). A subcutaneous pocket was created in the right thigh, and the reservoir port was placed in the pocket. HAIC with cisplatin and 5-fluorouracil was initiated 3 days later.

## Discussion

The SDA, which was first described by Wilkie in 1911, supplies blood to the proximal duodenum [4]. According to previous studies, the SDA most commonly originates from the GDA (26%-55%), followed by the LHA (9%-20%), CHA or PHA (20%), RGA (8%-13%), and less commonly, the cystic artery or PSPDA [4-7]. Wilkie stated that SDA appeared to be an end artery in most cases [4]. However, Bianchi et al. reported that the SDA frequently forms anastomoses with neighboring arteries such as the RGA, PSPDA, or pericholedochal plexus, and with a greater occurrence than has been previously reported [8]. The RGA supplies the gastric antrum, pylorus, and proximal duodenal bulb and is rich in anatomic variations [1, 2, 9]. It commonly arises from the PHA (40%-56%) and often branches at an acute angle. The RGA is also known to originate from the LHA or RHA (21%-42%), CHA (1.5%-10%), and GDA (1.5%-10%) [1, 2]. In the present patient, the SDA originated from the LHA as a common trunk with the RGA and communicated with the GDA (**Fig. 5**). To the best of our knowledge, this variation has not been previously reported.

In this case, it was necessary to embolize both the SDA and RGA prior to HAIC to prevent toxic events in extrahepatic organs such as the stomach and duodenum, caused by the infusion of chemotherapeutic agents during HAIC [3, 10]. Ou et al. reported two patients who suffered hemorrhagic duodenitis with ulcers after HAIC without embolizing the SDA, which branched off the LHA. These SDAs were successfully embolized using coils, and HAIC was re-

performed [3]. In the present case, the SDA was embolized using metallic coils via the GDA because the SDA branched off at an acute angle from the proximal end of the LHA. Embolization of arteries with a sharp branching angle, such as the RGA, is considered a difficult procedure [1, 2, 9]. The communication of the SDA between the LHA and GDA is another indication of why we catheterized the SDA from the GDA. We identified the anatomical course of the artery based on a retrospective review of preprocedural contrast-enhanced CT. Duodenal wall enhancement on digital subtraction arteriography (DSA) confirmed SDA as the communicating artery in the present case. As the RGA originated from the LHA at an acute angle and showed a common trunk with the SDA on DSA, we embolized the RGA with metallic coils via the retrograde route from the LGA.

In summary, we identified a rare anatomic variant of SDA and RGA originating from the LHA as a common trunk. The patient also had a variant of SDA that communicated with the GDA. We believe that knowledge of such anatomic variations reduces procedure time and radiation exposure dose and can avoid unexpected complications for placement of a reservoir catheter system prior to HAIC.

**Conflict of interest:** The authors declare that they have no conflicts of interest to report.

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