

# Aberrant Inferior Pancreatic Artery Arising From Replaced Middle Colic Artery

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## Research Article

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# Abstract

**Purpose:** Anatomical variants of the celiac trunk are frequently encountered during angiography. The purpose of this case report is to describe a rare celiac trunk variant and additional aberrant pancreatic vasculature discovered during trauma workup.

**Methods:** We report a rare anatomic variant in which the celiac trunk gives rise to the middle colic artery. In addition, we report a replaced Inferior pancreatic artery variant that has not been previously described in literature.

**Results:** Emergent angiogram performed on a 19-year-old female, who was activated as a level 1 trauma, demonstrated the middle colic artery arising from the celiac trunk and providing a pancreatic artery branch supplying a portion of the pancreatic body and tail.

**Conclusion:** This case demonstrates rare arterial variants and emphasizes the importance of preoperative imaging prior to interventional procedures or abdominal surgery.

## Introduction

The celiac trunk is the first major splanchnic artery of the abdominal aorta and supplies majority of the foregut including the pancreas. Of the three ventral branches of the abdominal aorta, the celiac trunk and superior mesenteric artery (SMA) are most frequently seen with branching variations. The normal branching pattern for the celiac trunk involves a trifurcation to give rise to the common hepatic artery (CHA), left gastric artery (LGA), and splenic artery (SA). Quadrifurcation of the celiac trunk occurs when there are four branches arising directly off the celiac axis. This is a rare occurrence with an incidence of up to 8% [9, 14].

The blood supply to the pancreas is abundant and forms a dense vascular network with arterial anastomoses. The inferior pancreatic artery (IPA) also known as the transverse pancreatic artery is a branch of the dorsal pancreatic artery and supplies a portion of the pancreatic body and tail. The IPA typically originates from the dorsal pancreatic artery which originates from the splenic artery however variant origins from the SA, CHA, Celiac trunk, and SMA have been documented [1–3].

Failure to recognize the presence of these vascular anomalies during invasive procedures could have devastating consequences. Thus, it is important to meticulously review preoperative imaging prior to interventional procedures or abdominal surgeries.

## Case Report

We report a case of a 19-year-old female with no known past medical history who presented as a level 1 trauma after being ejected from a high-speed motor vehicle crash. After initial trauma resuscitation and blood transfusions, CT of the whole body was performed.

MDCT (multidetector computed tomographic) angiography of the chest, abdomen and pelvis was done using a General Electric Revolution Evo scanner. The scanning parameters were as follows: 120 kVp; Auto mA; 0.5 second gantry rotation time; 1.375mm pitch; 2.5mm slice thickness. The scanning area included the chest, abdomen and pelvis.

CT angiography of the abdomen and pelvis revealed a grade 4 right hepatic lobe laceration as per the American Association for the Surgery of Trauma (AAST) classification. Active bleeding from several branches of the right hepatic artery (RHA) was visualized. Other injuries included a splenic laceration, comminuted pelvic fractures, and active extravasation from bilateral internal iliac arteries.

Upon detailed review of the vascular anatomy, CT angiography revealed a quadrifurcation of the celiac trunk giving rise to the CHA, LGA, SA, and MCA (Fig. 1). In addition, an arterial branch arising from the replaced MCA was visualized to provide blood supply to part of the pancreatic body and tail, following the course and distribution of the IPA.

Patient underwent emergent angiography and embolization of the actively bleeding vessels. Digital subtraction angiogram (DSA) of the celiac trunk demonstrated a fourth vessel providing arterial supply to the transverse colon representing a replaced MCA (Fig. 2a). Additionally, a branch was seen arising from the replaced MCA and traveling towards the right upper quadrant of the abdomen representing the replaced IPA seen on CT angiography. DSA of the SMA revealed an absence of the MCA (Fig. 2b).

## Discussion

It is hypothesized that during embryological development, splanchnic arteries arising from the dorsal aorta can undergo unusual development secondary to retention, disappearance, or translocation of parts of the primitive arterial plexus [10–13].

Of the rare celiac trunk variants, quadrifurcation represents branching of the celiac trunk into four vessels. Macro-Clement initially described this as a Type 1c celiac trunk variant [4]. Quadrifurcations of the celiac trunk have since been further categorized as common and uncommon variants [8]. A common quadrifurcation occurs when a fourth branch is added to the celiac trunk, while an uncommon quadrifurcation is characterized as those which are missing a normal celiac branch. Quadrifurcation of the celiac trunk with the addition of the middle colic artery (MCA) is a very rare variation described in cadaveric studies with a frequency of 0.5–1% and has been termed the Bergman Type 3 variation [5–6, 14–15]. The anomalous branch can be one of the two inferior phrenics, the dorsal pancreatic artery, the gastroduodenal artery or the middle colic artery found in 1.2–4.8% [12].

Vascular supply to the pancreas is complex, thus it is important to meticulously evaluate arterial supply prior to any pancreatic intervention. Variants of the IPA with aberrant origins arising from the SA, CHA, Celiac trunk, and SMA have been seen and described [1–3,7]. However, an aberrant IPA arising from the MCA has never been documented.

To emphasize the importance of personalized imaging based preoperative evaluation we present a case that has not been previously described in literature - in which a quadrifurcation of the celiac trunk gives rise to a replaced MCA that provides arterial supply to the pancreas via an aberrant IPA.

## Conclusion

In conclusion, we report a rare quadrifurcation of the celiac trunk with an aberrant branching pattern of the IPA. No previous case report has described an IPA arising from a replaced MCA which brings the most interest in the current work. This case highlights the role of personalized imaging based management with CT angiography is an important tool that should be used to reduce morbidity and mortality during interventional procedures and major surgeries such as colectomies and pancreatectomies.

## Declarations

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Consent for publication: Yes

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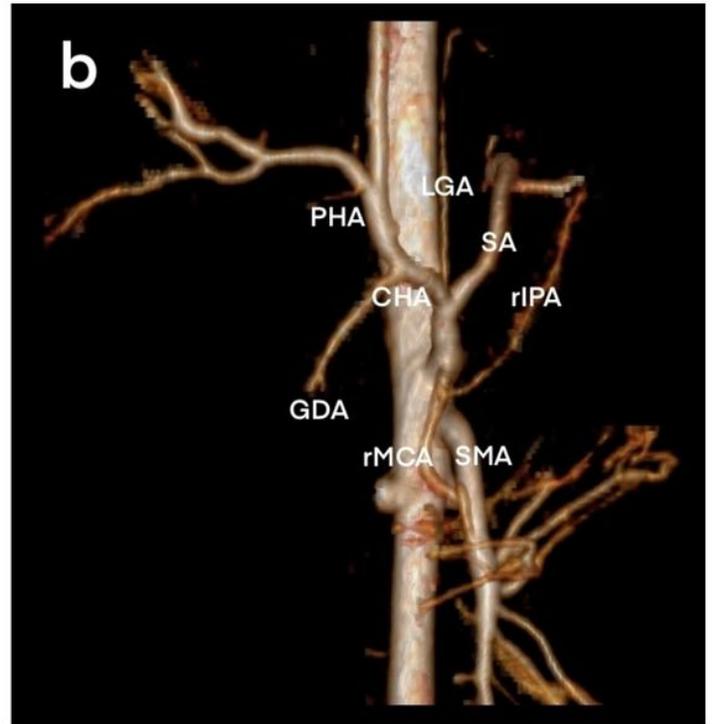
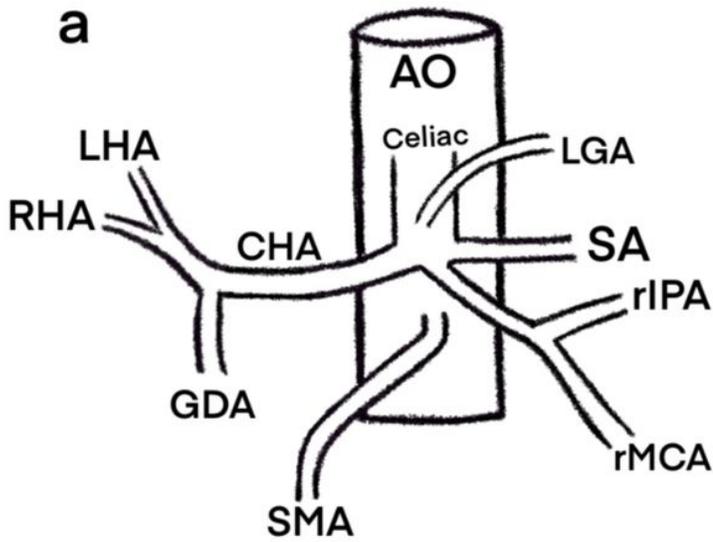
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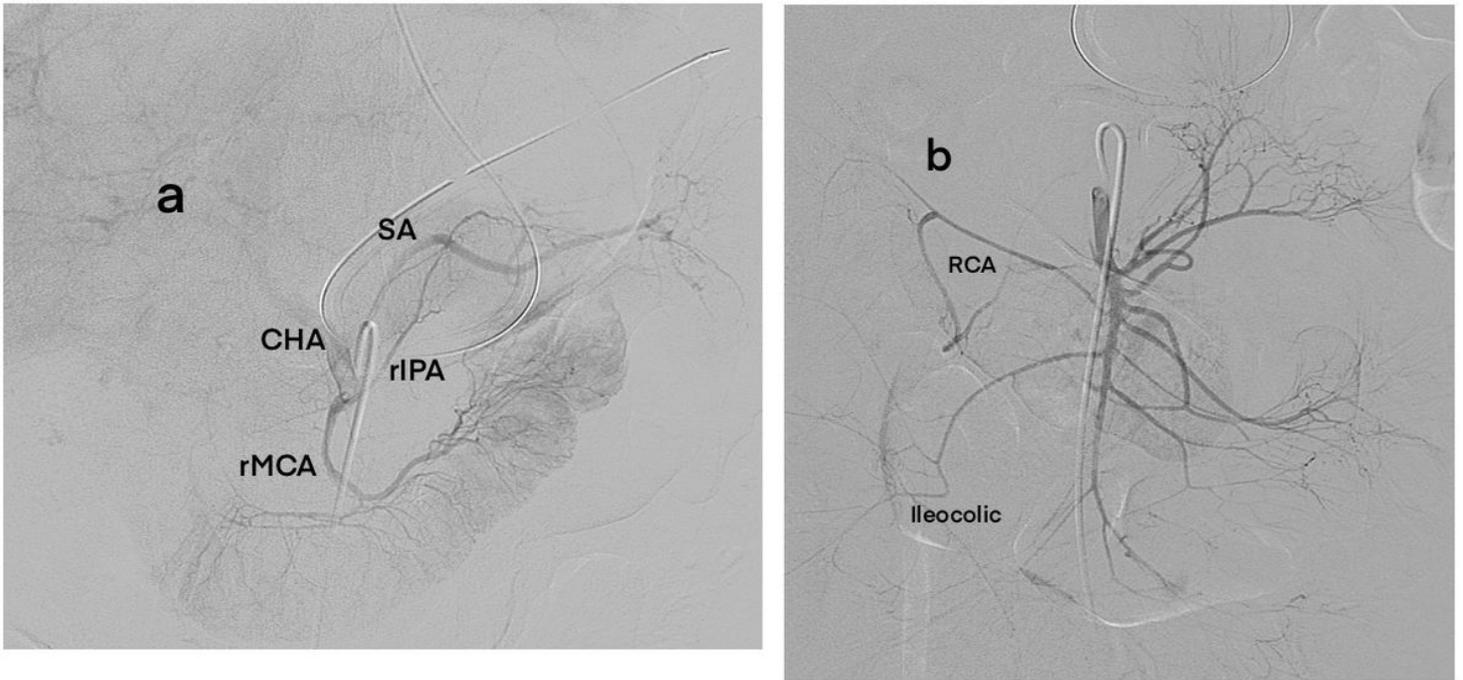
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## Figures



**Figure 1**

Quadrifurcation of the celiac trunk with the addition of the middle colic artery. Aberrant origin of the transverse pancreatic artery arising from the middle colic artery. a Schematic drawing of the abdominal aorta (AO), celiac trunk, common hepatic artery (CHA), gastroduodenal artery (GDA), left hepatic artery (LHA), right hepatic artery (RHA), left gastric artery (LGA), splenic artery (SA), replaced middle colic artery (rMCA), replaced inferior pancreatic artery (rIPA), superior mesenteric artery. b 3D reconstruction of a CT angiogram demonstrates an oblique view of the abdominal aorta. There is quadrifurcation of the celiac trunk giving rise to the splenic artery (SA), left gastric artery (LGA), common hepatic artery (CHA), and replaced middle colic artery (rMCA). Replaced inferior pancreatic artery (rIPA) is seen as a branch of the rMCA. Gas-troduodenal artery (GDA), proper hepatic artery (PHA), and superior mesenteric artery (SMA) are also labeled.



**Figure 2**

Anatomic anomalies of the middle colic artery and transverse pancreatic artery visualized on angiography. a Digital subtraction angiogram of the celiac trunk demonstrates a quadrifurcation providing branches to the common hepatic artery (CHA), left gastric artery (LGA), splenic artery (SA), and replaced middle colic artery (rMCA). Additionally, there is an aberrant origin of the inferior pancreatic artery (rIPA) from the MCA. b Digital subtraction angiogram of the superior mesenteric artery demonstrates ileocolic and right colic arteries (RCA). There is an absence of the middle colic artery.