

# Anatomical Description and Clinical Relevance of a Rare Variation in the Mesenteric Arterial Arcade Pattern

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## ABSTRACT

Solitary vascular variations of the mesenteric arteries are extremely rare and have been seldom reported in the past. The aim of this study is to emphasize the anatomical and clinical relevance of one such rare variation of inferior mesenteric artery (IMA). The current case anomaly was incidentally observed while guiding the undergraduate medical students in the dissection of the mesenteric region of the abdomen in an Indian cadaver. An Accessory left colic artery was seen to be branching off from the Inferior Mesenteric artery and further dividing into two transverse branches which took part in the formation of arterial arc for the perfusion of the transverse and the descending colon. Awareness of such aberrant branches of Inferior Mesenteric artery helps in optimal selection of the mode of treatment or operative planning. Additionally, this knowledge minimizes possible iatrogenic injuries resulting from surgeries. Moreover, surgical anatomy of anomalous branches of Inferior Mesenteric artery is extremely essential for planning and successfully executing reconstructive procedures using these branches as pedicles for the transposed part of the colon.

**Keywords:** Colon, Inferior mesenteric artery, Left colic artery, Reconstruction

## CASE REPORT

During routine cadaveric dissection for first year MBBS students, a rare variation in the branching pattern of inferior mesenteric artery was observed in an adult male cadaver of Indian origin. The inferior mesenteric artery originated from the ventral aspect of the abdominal aorta at the level of the third lumbar vertebra 4 cm above the aortic bifurcation. It traversed ventro-laterally in the retroperitoneal space and descended to the left of the abdominal aorta for 4 cm and terminated by dividing into a left colic artery and a sigmoido-rectal artery. Apart from these usual branches, a third anomalous branch named as accessory left colic artery (ALCA) originated 2 cm distal to the origin of the common trunk of the inferior mesenteric artery [Table/Fig-1]. This ALCA traversed a vertical course superiorly and was related to the left testicular artery posteriorly and the left testicular vein postero-laterally. It first ascended for 6 cm to reach the lower border of the body of the pancreas where it formed a 'Y' shaped bifurcation, the ALCA representing the stem and the right and left branches their respective limbs. The right branch coursed horizontally along the lower border of pancreas for 5 cm and terminated by anastomosing with the middle colic branch of the superior mesenteric artery. The left branch ran supero-laterally along

the anterior surface of body of the pancreas for 5.5 cm and entered the transverse mesocolon and anastomosed with the ascending branch of the left colic artery. Both these branches of the ALCA were participating in the formation of the arterial arcade for the large bowel and were supplying the left one third of the transverse colon and the proximal part of the descending colon. The other branches of the inferior mesenteric artery displayed normal origin, course and branching pattern. The gross morphology of the large intestine was normal. The superior mesenteric artery displayed normal course and branching pattern.

## DISCUSSION

The marginal artery of Drummond [1] and the arterial arc of Riolan [2] form a collateral system that plays a vital role in maintenance of perfusion of the gut. Normally the left one third of the transverse colon is supplied by the ascending branch of left colic artery (LCA). As reported in various literatures and in many standard textbooks of anatomy, the LCA also supplies the whole of descending colon. Colon is an ideal candidate for salvage procedures like oesophageal reconstruction [3], owing to its length, mucosal acid resistance and its rich blood supply [4].

According to a study, the inferior mesenteric artery most commonly divides into LCA and common sigmoid trunk [5]. Here we report an extremely rare case where inferior mesenteric artery (IMA) gives rise to a fourth branch named as Accessory left colic artery (ALCA), supplying the splenic flexure of colon. Though, it is very rare to find variation in the arterial supply of the left colic flexure, Amonoo-Kuofi HS et al., have described a similar case of an accessory left colic artery arising from the superior mesenteric artery (SMA) which supplied the splenic flexure and the proximal part of the descending colon [6]. A similar variant branch arising from splenic artery supplying the left colic flexure has also been described by Liu ST [7]. This kind of variant arterial supply to the hind gut defies the normal embryological territorial pattern of the vitelline arteries. In such cases the SMA appears to contribute maximally towards the formation of the arterial arcade for the large colon [6].

In the current surgical practice, interposition graft of the left colon has emerged as a most popular procedure in various reconstructive surgeries [8]. Earlier, the standard procedure that was carried out for left colonic interposition graft required the mobilization of splenic and



**[Table/Fig-1]:** Dissection of inferior mesenteric artery and its branches. Note an Accessory left colic artery (ALCA) branching off from the Inferior Mesenteric artery (IMA) and further dividing into two transverse branches taking part in the formation of arterial arc for the perfusion of the transverse colon (TC) and the splenic flexure (SF). Photograph of the branches of Inferior Mesenteric Artery showing AA-abdominal aorta, SA-sigmoidal artery, IMA-inferior mesenteric artery, LCA- left colic artery, Desc. LCA-descending branch of left colic artery, Asc. LCA- ascending branch of left colic artery, ALCA-accessory left colic artery, TC-transverse colon, SF-splenic flexure, S-Superior, I- Inferior, L- left, R- Right

hepatic flexures of colon. This was done after the ligation of middle colic artery in which case left colic artery served as the only source of blood supply. Performing such interposition carried a major risk of damaging the arterial or venous collaterals which otherwise would serve as major source for graft perfusion [9]. Intraoperative injury to the ascending branch of left colic artery may result in potentially life threatening postoperative complications like avascular necrosis and ischemic graft failure. Such risk can be overcome by the accessory aberrant collateral arteries like ALCA carrying blood to this critical area [9].

A mesenteric angiographic study done in patients scheduled for interposition, reports that a discontinuity may exist between the superior and inferior mesenteric arterial anastomoses in 48% of cases [10]. This makes the left third of transverse colon most susceptible for avascular necrosis. The significance of this critical colonic landmark lies not only in the occlusive vascular impairment but also in non-occlusive ischemic colitis [11]. In such conditions, ALCA can serve as the prime source of alternative blood supply. In cases of abdominal surgeries done for thromboembolic disorders involving inferior mesenteric artery, ligation of the IMA should always be done nearer to its origin preferably proximal to the origin of left colic branch, otherwise it can lead to fatal colonic degeneration. In such ischemic conditions triggered iatrogenically, accessory left colic artery would serve as the only source of blood supply to the left third of transverse colon.

In patients undergoing left hemicolectomy it becomes essential that a radiologist makes an accurate diagnostic interpretation of diseases and vascular involvement so as to preserve the vessels and avoid fatal injury during surgery. Accidental ligation of aberrant colic artery may result in necrosis of colon due to ischemia or graft injury. The aberrant branches may also interfere with radiological interventional procedures. Patients with vascular variations are also at high risk for misperfusion during chemotherapy. Therefore, apart from having academic significance, these arterial alterations assume relevance

for surgeons and radiologists for improving patient care intra and postoperatively.

## CONCLUSION

With increase in the incidence of advanced oesophageal carcinoma, colonic interposition may serve as the only surgical option. Early appreciation of vascular variations dictates that extra caution should be taken while planning abdominal surgery. Therefore, precise knowledge of colonic vasculature and its variations is a prerequisite for Surgeons and Radiologists so as to avoid unwanted complication.

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