

## Case Report:

# Surgico-anatomical elucidation of variant dorsal pancreatic artery

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## Abstract:

The celiac trunk (CT) springs out from the abdominal aorta on its ventral aspect just below the aortic opening of the diaphragm at the level of twelfth thoracic vertebra. In the current study, we report the occurrence of an additional and anomalous dorsal pancreatic branch stemming out of CT besides the normally observed branches coexistent with absence of superior pancreaticoduodenal artery (SPDA). Haller has also a similar dorsal pancreatic branch to be arising from the CT and referred it as “arteria pancreatica suprema”. An attempt has also been made to discuss the morphology, distribution and clinico-embryological implications of this anomalous dorsal pancreatic artery (DPA).

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## INTRODUCTION

The celiac trunk (CT) springs out from the abdominal aorta on its ventral aspect just below the aortic opening of the diaphragm at the level of twelfth thoracic vertebra (1,2). The typical trifurcation of CT leads to formation of left gastric artery (LGA), splenic artery (SA) and common hepatic artery (CHA). This branching pattern described as “tripus halleri” is considered normal branching pattern of the CT (3). In exceptional cases, the CT may be duplicated or quadrupled (4). Although extremely rare, but it has been reported that all these branches namely LGA, SA and CHA may arise directly from the proximal part of abdominal aorta (5-7). Quite infrequently, a fourth branch could emerge from CT and has been named as dorsal pancreatic artery (8). Dupuis and Barnay, in a landmark case observed in 1874 reported a rare case of five branches of CT (9).

In the current study, we report the occurrence of an additional and anomalous dorsal pancreatic branch stemming out of CT besides the normally observed branches coexistent with absence of superior

pancreaticoduodenal artery (SPDA). Haller has also a similar dorsal pancreatic branch to be arising from the CT and referred it as “arteria pancreatica suprema”. An attempt has also been made to discuss the morphology, distribution and clinico-embryological implications of this anomalous dorsal pancreatic artery (DPA).

## CASE REPORT

During routine cadaveric dissection of a 65 years male cadaver for undergraduate medical teaching programme at Vardhman Mahavir medical college, New Delhi, India, we came across certain striking anatomical variations in the architecture of CT. We found that the celiac trunk apart from emanating the three usual branches namely LGA, SA and CHA, interestingly also yielded a fourth branch, the dorsal pancreatic artery (Fig.1). This artery measured 10cms in length from its origin to entrance into pancreatic parenchyma. DPA after its origin from the celiac trunk at the level of upper border of first lumbar vertebra coursed along the superior border of the body of the pancreas for about 2cms. When traced

further, it turned 5cms infero-laterally on the posterior surface of the body and ended by dividing into two transverse terminal branches that entered the substance of the pancreas 8cms proximal to tip of its tail (Fig.2). The proximal half of DPA was related anteriorly to the lesser sac and stomach whereas the distal half was related anteriorly to the body of pancreas. Posteriorly DPA was related to the abdominal aorta, left crus of the diaphragm, the left suprarenal gland, the left kidney and the splenic vein. After entering the posterior surface of the pancreas, DPA was found to be supplying the neck and upper half of its body. Pancreas also received its usual blood supply from inferior pancreaticoduodenal artery and the pancreatic branches of the splenic artery whereas superior pancreaticoduodenal artery was found to be absent. The above-mentioned arteries did not form any pancreatic arterial arcade. The other branches of the celiac trunk exhibited normal origin, course and branches. The cause of death of the patient was unrelated to the variation and there was no history of abdominal trauma or surgeries. The gross morphology of the pancreas was not found to display any significant variation.

## DISCUSSION

CT usually originates from left third of the abdominal aorta but may arise from middle or right third of the ventral surface of the aorta. After its origin, it runs downward and forward crossing aorta from left to right and from behind forward (3). In this case, it arose from middle third of the ventral surface of the abdominal aorta. The length of CT has been reported to be 10-12mm (3, 10) after which it gives off its first branch LGA followed by other branches namely CHA and SA. Sometimes these branches may directly come out of abdominal aorta (3, 10).

Various authors have reported different branching patterns of CT. The incidences vary from 25% cases of bifurcations, 10% trifurcations to 1.8-5% quadrifurcation (11). Interestingly five branches have also been reported by Serebrov (quoted by 3). These variations in the branching pattern of celiac trunk are thought to be its embryonic origin from ventral splanchnic branches of dorsal aorta (12, 13). In early phase of development, number of paired vitelline arteries supply the yolk sac. A longitudinal anastomoses takes place between these paired arteries and has been referred to as "Lang anastomose" (14). Amongst the four roots, the central two disappear and only the first and fourth roots remain connected. The first root yields CHA, LGA, SA whereas superior mesenteric artery arises from the fourth root. This "Lang anastomose" keeps these branches separated from each other. If any variation occurs at the level of separation, it results in formations of collateral branches. The other factors that may cause variations in the branching pattern of celiac axis includes midgut rotation & its physiological herniation, migration of spleen to the left and the hemodynamic changes that takes place in the abdominal organs (15).

In the present case, celiac trunk terminated by giving off four branches the LGA, CHA, SA and DPA; which simulates the earlier described quadrifurcation of CT in varying anatomy (11). Haller reported first description of DPA, as a variant branch of the celiac trunk as early as in 1756 (quoted by 3). Later, different authors have described the DPA with varying names as superior pancreatic artery, middle pancreatic artery, isthmic artery, arteria colli pancreatis and arteria pancreatica magna (16). Even the origin of DPA has been reported differently by different authors. . Some says, that it arises from

splenic artery (16, 17) whereas according to Toni et al (quoted by 11), DPA originated from gastrohepatic artery. DPA originated from splenic artery (22-80%), celiac trunk (3-33%), common hepatic artery (12-25%), superior mesenteric artery (6-25%) (16). Precise knowledge of these varying origins of DPA is of immense importance to angiographers to avoid overlapping views, which can conceal their diagnosis.

Pancreas is an organ having low blood supply (11). With progress in the incidences of pancreatic surgeries; it has become vital to be aware of the variant branches supplying the pancreas. Normally pancreas derive its vascular supply from celiac trunk and superior mesenteric artery. These arteries makes an arterial arcade to supply the head, neck, body and tail of pancreas. In this case, a variant DPA was also found to be supplying pancreas partially without forming arterial loops with other pancreatic branches. The duodenopancreatic arterial arcade was later on evaluated by application of maximum intensity projection and shaded surface delay in CT angiography (18). Earlier, DPA had been described as the first larger pancreatic branch of splenic artery (16, 17). DPA usually traverses a long course before entering the pancreatic parenchyma bifurcates into its two terminal branches which run transversely across the body but in opposite directions thus supplying the neck and body of the pancreas (17).

These variations are predisposed to iatrogenic injuries during extensive surgeries like total pancreatectomy and longitudinal pancreatectomy known as 'Puestow procedure' (3, 19). Therefore, precise knowledge of these rare variations of CT and arterial supply of the pancreas is essential for surgeons and radiologists in better planning and execution of pancreatic surgeries

and radiological interventions like celiacography (19).

## CONCLUSION

Limited data is available on the variations in vasculature of pancreas. Presence of these aberrant vessels can be a source of post-surgical complications and can even cause significant morbidity. Knowledge of presence of dorsal pancreatic artery and absence of superior pancreaticoduodenal artery will be of colossal importance to surgeons and radiologists dealing with pancreas.

Fig 1: photograph showing branching pattern of celiac trunk, CHA = common hepatic artery, CT = celiac trunk, DPA = dorsal pancreatic artery, LGA = Left gastric artery, Pn = pancreas, SA = splenic artery & St = stomach.



Fig 2 : DPA = dorsal pancreatic artery, LTDPA = left transverse dorsal pancreatic artery, RTDPA = right transverse dorsal pancreatic artery, Sp = spleen, SpH = splenic hilum & Pn = pancreas.



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