

Variant Human Pancreas: Aberrant Uncinate Process or an Extended Mesenteric Process

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Variations in the morphology of pancreas are not very common. We observed a rare variant of the uncinate process of the pancreas that extended in the mesentery of the small intestine. After its origin from the lower part of the head of the pancreas, the mesenteric process (MP) passed over the third part of the duodenum to enter the mesentery of the jejunum and ileum and extended up to the level of the pelvic brim. The branches of the superior mesenteric vessels were embedded in the extended MP of the pancreas. This aberrant extension of the pancreas was drained by a narrow duct, which joined the main pancreatic duct inside the head. We did not observe a separate uncinate process arising from the head. On histology normal acini and endocrine cells were observed in the extension. This variant is important as symptoms of pancreatic disease from such extensions may be confused with other commonly encountered acute or chronic abdominal conditions.

Key Words: congenital anomaly, aberrant exocrine gland, uncinate process

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The pancreas develops early in the embryonic life from 2 ventral and 1 dorsal endodermal diverticula along the distal foregut. Several anomalies have been described which occur due to malrotation or inappropriate fusion of various pancreatic diverticula. Failure of the fusion of the ductal system (pancreas divisum) and heterotopic pancreas are most common among the various developmental anomalies.^{1,2} As the pancreas develops in the mesenteries of the gut, accessory or heterotopic pancreatic tissue usually develops in the derivatives of the mesoderm connecting the gut and the parieties and may remain undetected throughout life unless it is pathologically involved. In the literature, an aberrant or heterotopic pancreas in the mesentery has been mentioned as a rare incidence.³ We observed an abnormal branching of the pancreas that ex-

tended in the mesentery of the small intestine in a human cadaver during dissection where the classic uncinate process was absent. The aim of this study is to describe the variant pancreas and to discuss its possible origin and clinical significance. Such a variation is important as it may mislead clinicians dealing with acute or chronic abdominal conditions involving mesenteric pancreas.

MATERIALS AND METHODS

Twenty-four well preserved human subjects (M:F = 7:1) were dissected over a period of three years by the medical students of AIIMS, New Delhi. The duodenum, pancreas and other abdominal organs were dissected as per instructions of Cunningham's Dissection Manual.⁴ Any gross variation in the anatomy of the pancreas, duodenum and lower part of the biliary tract was recorded. Various dimensions of the variant pancreas were recorded using a metric scale. The measurements recorded are:

- (1) Vertical height of the head of pancreas: Line joining the most dependent part inferior margin of the first part of duodenum to the superior margin of the third part.
- (2) Length of pancreas: From right margin of the head to the tip of the tail.
- (3) Vertical height of the extended mesenteric process: From the inferior margin of the head to the distal end of the branched process in the mesentery.
- (4) Maximum width of the body.

Finally, the variant pancreas was dissected to expose the ductal pattern, which was subsequently documented by photography and sketching. Using standard protocols for tissue processing and paraffin embedding parts of the mesenteric extension of the pancreatic tissue were processed for H&E staining and light microscopy.

RESULTS

The variant pancreas was noted in a female cadaver (aged 55 years, died due to myocardial infarction and there were no clinical history of pancreatic disease) where the body of the pancreas extended from the duodenum to the hilum of the spleen without any deviation from normal anatomic relations. The head of the variant pancreas was inside the concavity of the "C" loop of the duodenum and superiorly extended to

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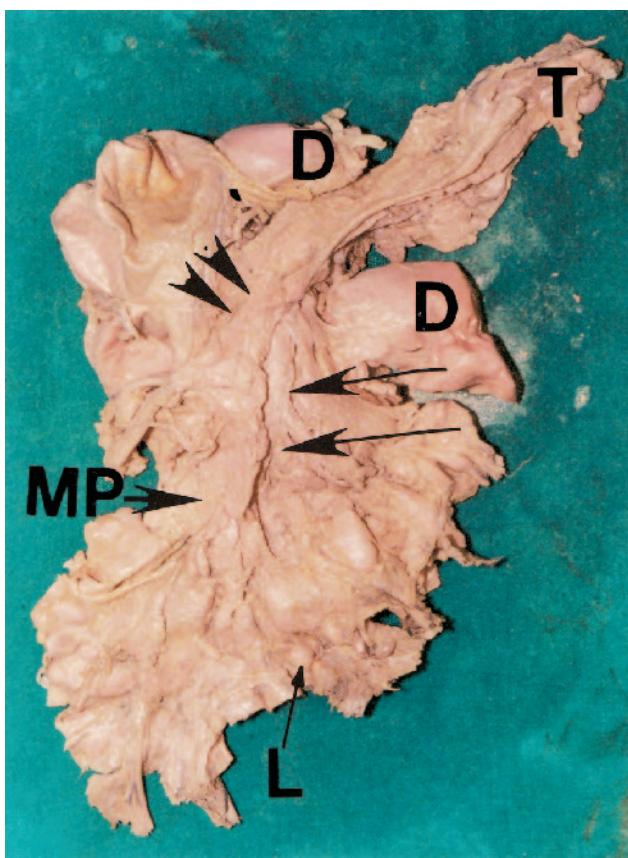


FIGURE 1. Photograph of the duodenum, pancreas and mesentery of the small intestine showing the pancreas and its mesenteric process (MP). Note the anterior surface of the pancreas (arrowheads) is continuous with the MP. The MP has been dissected to expose the branches of the superior mesenteric vessels (small arrows). L, D, and T represent small lymph nodes in the mesentery, duodenum, and tail of pancreas respectively. [A color version of this figure is available in the online version of the article at www.pancreasjournal.com]

the inferior margin of the 1st part of duodenum. Morphologic features of the body and tail were unremarkable. However a prominent extension of the pancreatic tissue was noted in the mesentery which was quite different from the normal hook shaped small uncinate process. The mesenteric process (MP) originated from the junctional region between head and neck of the pancreas, from where the uncinate process normally arises. The inferior surface of the body of the pancreas became anteroinferior where it joined the head and continued with the extended MP (Fig. 1) that extended up to the pelvic brim, passing ventral to the third part of the duodenum. The superior mesenteric artery and its jejunal and ileal branches and the superior mesenteric vein and its tributaries were embedded in the mesenteric extension of pancreatic tissue. Many lymph nodes were also found embedded in the mesentery alongside the pancreatic tissue.

The dimensions of the pancreas and its mesenteric process are as follows:

- (1) Vertical height of head = 4.5 cm
- (2) Length (head to tail) = 17 cm
- (3) Maximum width = 5 cm
- (4) Length of extended MP = 18.5 cm

There were 32 well circumscribed lymphatic nodules, measuring 0.5 to 2.5 cm in vertical and 0.4 to 3.5 cm in horizontal dimensions, associated with the tip, right and left margins of the pancreatic tissue in the mesentery (Fig. 2).

The ductal pattern of the head, neck, body and tail of the variant pancreas (Fig. 2) was similar to that of the normal gland. An accessory pancreatic duct opened at the minor duodenal papilla. The mesenteric extension of the pancreas was drained by a thin caliber duct, which in turn joined the main duct. The common bile duct and the main pancreatic duct joined before opening at the major duodenal papilla in the second part of the duodenum. Histologic sections of the extended MP showed serous acini with occasional Islets of Langerhans similar to other parts of the pancreas.

DISCUSSION

Developmentally, the type of pancreas noted in the present study can be a result of distal prolongation of ventral anlage after it has rotated posteriorly behind the distal foregut and achieved a caudal position with respect to the dorsal anlage. It can also be due to adhesion of embryonic pancreatic cells to

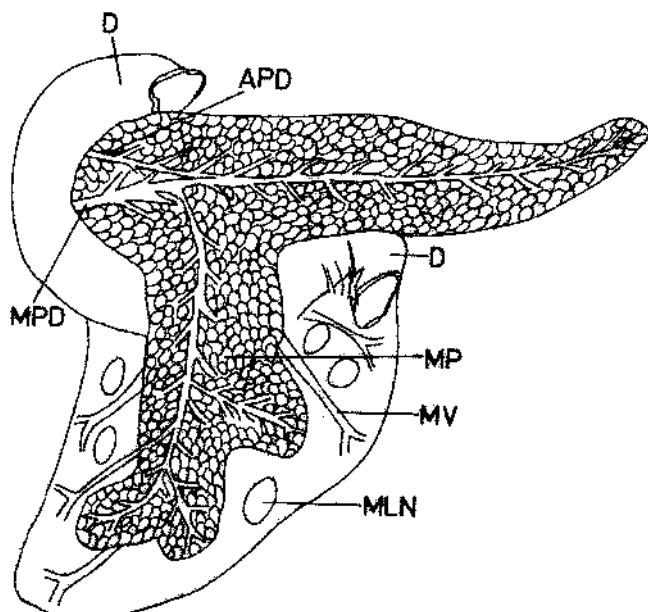


FIGURE 2. Schematic diagram of the described variations and its relations with the surrounding structure. Note the duct of the mesenteric process (DMP) joined the main pancreatic duct (MPD). (D, duodenum; DS, duct of Santorini; DW, duct of Wirsung; MP, mesenteric process of pancreas).

neighboring structures during rotation of normal or abnormal pancreatic primordia during 4th to 5th week of intrauterine life. In the present case, fusion of ducts of ventral and dorsal anlage have occurred such that the body, tail and caudal part of head are being drained by main pancreatic duct which is derived from duct of dorsal and ventral anlage and cranial part of head of pancreas is drained by accessory pancreatic duct derived from duct of dorsal bud. The mesenteric extension from the inferior part of the head also seems to be drained by a narrow duct derived from the duct of the ventral anlage. Therefore the extended MP, which arose at the equivalent position of the uncinate process, appears to be a derivative of the ventral pancreatic bud. This extension is in continuity with the main part of the pancreas that has been sequestered in the mesentery of the small intestine. Thus, this is an incidence of displaced pancreatic lobe in the mesentery which is different from accessory or heterotopic pancreatic tissue which are considered an error of cell differentiation in situ. Therefore the present case is an abnormal extension of the part of normal pancreatic tissue inside the mesentery. Absence of a hook shaped uncinate process at its normal anatomic site is due to the distally extending pancreatic tissue, which may actually be analogous to uncinate process of the normal pancreas.

The origin of uncinate process is a subject of much controversy. Many authors suggested that it is derived from the ventral bud.^{5,6} Conversely, Lechner and Read (1966)⁷ are of the view that it originates from the dorsal primordium. Their argument is based on the observation of a patient with agenesis of the dorsal pancreas, in whom the isthmus, body, tail, and uncinate process of the pancreas were absent. According to Rassu and Vaida (1952)⁸ the uncinate process arises from the junction of the ventral and dorsal buds. The development of the pancreatic rudiment is dependent upon interaction of its epithelial and mesenchymal component as various mesenchymes seem to possess quantitatively different inducing strengths.⁹ The endoderm of the ventral and dorsal pancreatic buds require different signals for differentiation: the notochord is essential for dorsal endodermal bud to acquire a pancreatic fate and under various circumstances pancreatic cytodifferentiation can occur enormously.^{10,11} Therefore, in the present case, it is possible that the ventral and dorsal pancreatic bud had grown at differential rates giving rise to an enormous uncinate process in the mesentery.

Pancreas seems to be an emergent trait of vertebrates, since no comparable structure in the invertebrates or even lower chordates are present. In cyclostomes, the pancreatic tissue remains buried in the substance of the liver or in the wall of the small intestine. Since no duct appears in these forms, it is assumed that the pancreas is primarily endocrine not digestive gland. Higher vertebrates beginning with elasmobranchs have both dorsal and ventral pancreas. In fishes, the pancreas is scat-

tered in the mesentery and is difficult to identify as one organ. In rodents, the pancreas is very diffuse dendritic type and extends inside the mesentery.¹² Therefore, mesenteric extension of the pancreas is not just an embryological deviation; it must be considered from the aspects of ontogenesis.

Narrowing of the duct with narrow orifice draining such an extensive extension may lead to retention of pancreatic juice and enhance parenchymal lesion in the pathogenesis of chronic pancreatic disease.^{13,14} Therefore, knowledge of such variation is essential for diagnosing an obscure abdominal pain arising from similar conditions. Such pancreas may be a cause of duodenal obstruction because of its peculiar relation with the duodenum. Superior mesenteric vessels may be affected in pathologic involvement of this variety of pancreas and can result in fatal consequences also, if vascular supply to intestine is affected. Extension of pancreas up to pelvic brim renders it susceptible to damage in injuries of hypogastrum. This is a new and unusual variant of the pancreas and quite different from that of previous descriptions, which has immense surgical importance and requires special attention.

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