

# A Rare Case of Dorsal Agenesis of Pancreas, Choledochal Cyst, and Hirschsprung Disease in a Young Patient

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## ABSTRACT

Dorsal pancreatic agenesis is a rare congenital pancreatic malformation. There is just 1 reported case associating it with choledochal cyst. However, no cases have reported yet with both coexisting with Hirschsprung disease. We report a case of a 23-year-old man, presenting with on and off epigastric pain, sometimes radiating to the back. His medical records showed he had Hirschsprung disease as a neonate, for which he underwent Duhamel procedure. Ultrasound imaging revealed a choledochal cyst and a nonvisualized distal portion of the pancreas. Further cross-sectional imaging confirmed the findings—a type 1 choledochal cyst and a dorsal agenesis of the pancreas in a patient with Hirschsprung disease.

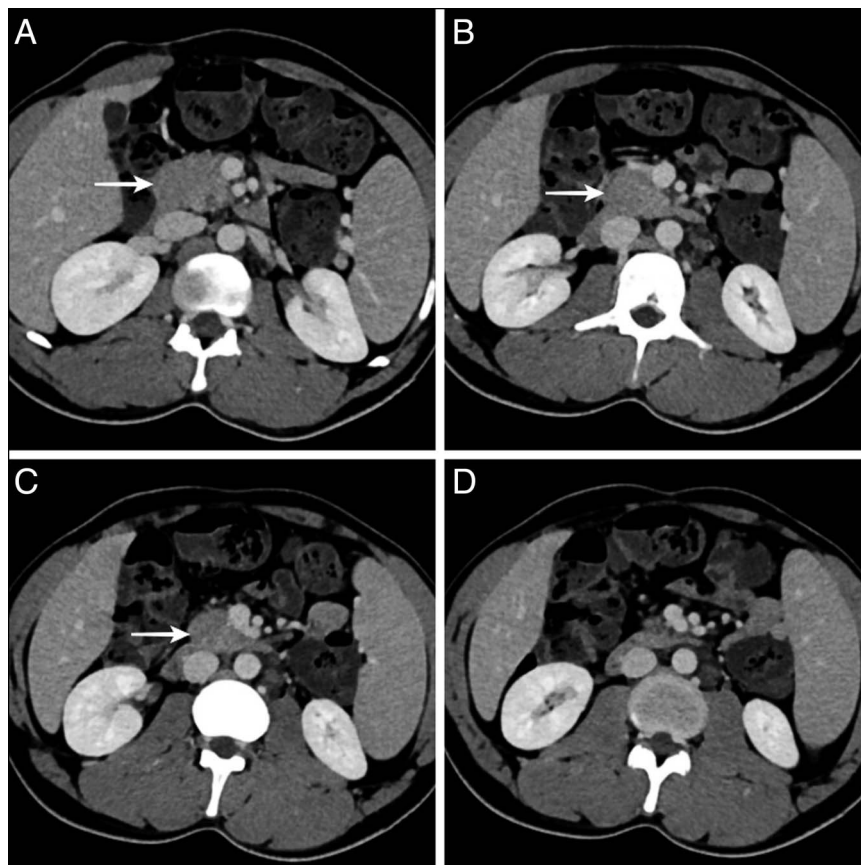
## INTRODUCTION

Agenesis of the dorsal pancreas is a rare congenital pancreatic malformation because of failure in the development of the dorsal bud of the pancreas resulting in absent corpus and cauda of pancreas.<sup>1</sup> Choledochal cyst is a congenital malformation of the biliary tree comprising both extrahepatic and intrahepatic components. It is rare with incidence reportedly varying between 1:100,000 and 1:150,000.<sup>2</sup> Hirschsprung disease (HD) is one of the most common pediatric surgical diseases with the incidence being 1 of 5,000 live births. It involves the distal colon and rectum and causes chronic constipation. Here, we report a rare case of a 23-year-old misdiagnosed with dorsal pancreatic agenesis with type I choledochal cyst post-Duhamel procedure for HD.

## CASE REPORT

A 23-year-old man presented with intermittent pain complaints in the upper abdomen, which was relieved with over-the-counter medications. He had a history of occasional constipation. He had no history of fever, nausea, vomiting, burning epigastric pain, loss of appetite or weight, or night sweats. Old hospital records showed that he was diagnosed with HD during neonatal period for which he underwent transverse colostomy at 1½ months of age, followed by Duhamel procedure with stoma closure at 4 years of age.

Routine blood investigations and serum amylase were normal. Contrast-enhanced computed tomography revealed fusiform dilation of proximal common bile duct for a length of 2.5 cm with a caliber of 1.2 cm and absent body and tail of pancreas (Figure 1) Magnetic resonance cholangiopancreatography (MRCP) revealed fatty replacement of the neck, body, and tail suggestive of dorsal pancreatic agenesis, as well as fusiform dilatation of the bile duct indicating type 1 choledochal cyst (Figure 2). There was no family history of recurrent abdominal pain, jaundice, or abdominal malignancy. Genetic evaluation could not be performed because of financial constraints and the unavailability of such facilities in the hospital. He was managed conservatively and was discharged with a plan for



**Figure 1.** Contrast-enhanced computed tomography shows the pancreatic head (white arrow) with the absence of tail and body (A–D: cranial to caudal).

excision of the choledochal cyst within 6 months. He was to follow-up for yearly imaging computed tomography surveillance to rule out newly developing malignant change of the ventral pancreas.

## DISCUSSION

Aplasia of the dorsal pancreas is a rare congenital condition with a description dating to 1911 by Heiberg in an autopsy study.<sup>3</sup> Since then, approximately 106 cases of dorsal pancreas agenesis were reported in the literature until 2015.<sup>4</sup> Of these reported cases, 50 percent were identified after 2008 owing to the availability of better investigative and imaging modalities. Choledochal cyst is a rare anomaly of the intrahepatic or extrahepatic bile duct causing cystic dilatation at 1 or more places. It is not familial but can be congenital. HD is characterized by severe constipation with congenital megacolon. Several studies and reports in the 1940s confirmed the association of distal aganglionosis with HD.<sup>5,6</sup> After a manual search in 3 databases PubMed, Ovid, and Google Scholar, only 1 case of an association between dorsal pancreatic agenesis and choledochal cyst has been reported in the literature until now.<sup>7</sup> However, no reported association of these 2 conditions with HD could be found.

The pancreas is formed by the dorsal and ventral pancreatic buds, which develop from foregut endoderm. At around 6–7 weeks of gestation, ventral pancreatic duct migrates posteriorly during gut rotation and fuses with dorsal bud.<sup>8,9</sup> The ventral bud forms the uncinata process and most of the head and drain through duct of Wirsung. The dorsal bud forms the rest of the pancreas and is drained by the duct of Santorini. Dorsal pancreatic agenesis is a rare congenital malformation because of the nondevelopment of dorsal bud. PDX1, PTF1A, and GATA 6 mutations have been shown to cause pancreatic agenesis in humans.<sup>10,11</sup> It has been hypothesized that dysgenesis or an ischemic insult during the embryogenesis can be the cause of dorsal pancreatic agenesis.<sup>12</sup> In a study by Yorifuji et al,<sup>13</sup> it was observed that dorsal pancreatic agenesis follows an autosomal dominant pattern in which pancreatic hypoplasia was associated with diabetes mellitus and congenital heart syndrome.

No proven syndromic or causal relation is found in the literature between these 3 conditions. Sonic hedgehog protein (SHH) secreted from epithelium is essential for several morphogenetic events during gut development. Suppression of SHH by the notochord in the prospective pancreatic endoderm leads to the development of the dorsal pancreas. Thus, overexpression of SHH would result in dorsal pancreatic agenesis.<sup>14</sup> Some studies have also reported the role of overexpression of SHH in



**Figure 2.** (A) Contrast-enhanced computed tomography shows rectal signature replaced by colonic haustrations (star), with the possible anastomotic site (colorectal) (dotted white arrow) and (B) 3D reconstructed magnetic resonance cholangiopancreatography images showing type 1 choledochal cyst with a small ventral duct of Wirsung (white arrows).

intestinal aganglionosis, by inhibiting the proliferation and differentiation of the enteric neural crest cells, a possible etiology for HD.<sup>15,16</sup> Aganglionosis of the rectum causes HD, and oligoganglionosis of the sphincter of Oddi may produce a functional obstruction and subsequently choledochal cyst. Further studies would be required to evaluate the causal link between these conditions or any syndromic etiology.

Contrast-enhanced computed tomography can identify the absence of the neck, body, and tail of the pancreas. However, a diagnosis of dorsal pancreas agenesis will be ambiguous if the absence of a dorsal pancreatic duct is not demonstrated and is confirmed with the use of either endoscopic retrograde cholangiopancreatography (ERCP) or MRCP. ERCP, although considered gold standard, is invasive and operator-dependent. MRCP is also of use in cases where cannulation with ERCP could not be performed.<sup>17</sup> In magnetic resonance using multiplanar reconstruction techniques, the absence of a dorsal pancreatic duct can be clearly demonstrated.<sup>12</sup> Recently, endoscopic ultrasound has been used in the diagnosis of agenesis of the dorsal pancreas. It has also been shown to demonstrate the dilated proximal pancreatic duct and the absent neck, body, and tail aiding in diagnosis.<sup>12,18</sup>

Most patients with dorsal pancreatic agenesis can be asymptomatic because of a functional exocrine and endocrine reservoir. A few may present with abdominal pain, loss of weight, pancreatitis, diabetes mellitus, exocrine insufficiency, and rarely pancreatic adenocarcinoma in the ventral component of pancreas.<sup>18–20</sup> A dorsal agenesis itself does not require any treatment. However, when it is accompanied with an endocrine or exocrine insufficiency, supplementation may be required.

Because these patients are at higher risk of pancreatic malignancy, annual surveillance is recommended.

## DISCLOSURES

Author contributions: UK Chapa, S. Dutta, and AM Remesh wrote the manuscript. A. Jain, R. Abhinaya, and VP Nelamangala Ramakrishnaiah revised the manuscript for intellectual content and approved the final manuscript. VP Nelamangala Ramakrishnaiah is the article guarantor.

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## REFERENCES

1. Joo YE, Kang HC, Kim HS, et al. Agenesis of the dorsal pancreas: A case report and review of the literature. *Korean J Intern Med* 2006;21(4):236–9.
2. Tarallo N, Curti M, Molinelli V, Leonardi A, Fugazzola C. Diverticulum of common hepatic duct leading to obstructive jaundice, a case report. *BJR Case Rep* 2019;5(2):20180105.
3. Guimarães AB, Guimarães CA, Manso JEF, Guimarães AB, Guimarães CA, Manso JEF. Agenesis or pseudoagenesis of the dorsal pancreas. *Rev Col Bras Cir* 2015;42(5):352–5.
4. A Cienfuegos J, Rotellar F, Salguero J, Benito A, Solórzano JL, Sangro B. Agenesis of the dorsal pancreas: Systematic review of a clinical challenge. *Rev Esp Enferm Dig* 2016;108(8):479–84.
5. Robertson H, Kernohan J. The myenteric plexus in congenital megacolon. *Mayo Clin Proc* 1938;13:123–5.
6. Bodian M, Stephens FD, Ward BC. Hirschsprung's disease and idiopathic megacolon. *Lancet* 1949;1(6540):6–11.
7. Oyachi N, Ohhama Y, Take H, et al. Aplasia of the dorsal pancreas and choledochal cyst. *Pediatr Surg Int* 2006;22(6):557–9.

8. Gittes GK. Developmental biology of the pancreas: A comprehensive review. *Dev Biol* 2009;326(1):4–35.
9. Shih HP, Wang A, Sander M. Pancreas organogenesis: From lineage determination to morphogenesis. *Annu Rev Cell Dev Biol* 2013;29:81–105.
10. Body-Bechou D, Loget P, D’Herve D, et al. TCF2/HNF-1beta mutations: 3 cases of fetal severe pancreatic Agenesis or hypoplasia and multicystic renal dysplasia. *Prenat Diagn* 2014;34(1):90–3.
11. Allen HL, Flanagan SE, Shaw-Smith C, et al. GATA6 haploinsufficiency causes pancreatic Agenesis in humans. *Nat Genet* 2011;44(1):20–2.
12. Gold RP. Agenesis and pseudo-agenesis of the dorsal pancreas. *Abdom Imaging* 1993;18(2):141–4.
13. Yorifuji T, Matsumura M, Okuno T, et al. Hereditary pancreatic hypoplasia, diabetes mellitus, and congenital heart disease: A new syndrome? *J Med Genet* 1994;31(4):331–3.
14. Kim SK, Hebrok M, Melton DA. Notochord to endoderm signaling is required for pancreas development. *Development* 1997;124(21):4243–52.
15. Fu M, Lui VC, Sham MH, Pachnis V, Tam PK. Sonic hedgehog regulates the proliferation, differentiation, and migration of enteric neural crest cells in gut. *J Cell Biol* 2004;166(5):673–84.
16. Nagy N, Barad C, Graham HK, et al. Sonic hedgehog controls enteric nervous system development by patterning the extracellular matrix. *Development* 2016;143(2):264–75.
17. Macari M, Giovanniello G, Blair L, Krinsky G. Diagnosis of Agenesis of the dorsal pancreas with MR pancreatography. *AJR Am J Roentgenol* 1998; 170(1):144–6.
18. Zhong JW, Yu LM, Ying QJ, et al. Performance of endoscopic ultrasound for diagnosis of Agenesis of the dorsal pancreas: A case report. *J Int Med Res* 2019;4:300060519884148.
19. Sonkar SK, Kumar S, Singh NK. Agenesis of dorsal pancreas in a young adult: A rare cause of diabetes mellitus. *BMJ Case Rep* 2018;2018: bcr2017223301.
20. Erotokritou A, Gerharz CD, Sagir A. Agenesis of dorsal pancreas associated with pancreatic neuroendocrine tumor: A case report and review of the literature. *J Med Case Rep* 2018;12(1):185.

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