Santorinicele without Pancreas Divisum: Diagnosis with Multi-Detector Row CT and MR Cholangiopancreatography

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A santorinicele is a cystic dilatation of the dorsal pancreatic duct at the minor papilla, and has been reported in patients with pancreas divisum and pancreatitis. Santorinicele without pancreas divisum is extremely rare, with only one case being previously reported. We present here a case of santorinicele that was observed as a cystic dilatation of the distal dorsal pancreatic duct at MCDT, and had communication between the ventral and dorsal pancreatic ducts. Additionally, MRCP and ERCP firmly confirmed the presence of a santorinicele.

Index words: Pancreas
Pancreas, duct
Computered tomography (CT)
Magnetic resonance (MR)

The pancreas contains both the main duct and accessory duct of Santorini, the latter is the remaining portion of the dorsal bud and drains through the minor papilla. Santorinicele is a cystic dilatation of the dorsal pancreatic duct which is located just proximal to the minor papilla, and is analogous to ureterocele and choledochocele (1, 2). It is believed to be the result of a combination of obstruction and weakness of the distal dorsal pancreatic duct (2). Since Eisen et al (1) first reported four cases of santorinicele most reported cases in literature have had features such as pancreas divisum and pancreatitis, which were detected by endoscopic retrograde cholangiopancreatography (ERCP). To our knowledge, there has been only one reported case of santorinicele without a pancreas divisum (3). In this report, we present a case of santorinicele without pancreas divisum and pancreatitis, which was diagnosed incidentally by using multi-detector row CT (MDCT).

Case Report

A 67-year-old woman presented with abdominal pain and hematochezia. On the physical examination, the patient showed no significant abnormalities with the exception of a tender lower abdomen. Laboratory findings revealed no abnormalities except for a slightly elevated white blood cell count (14.8 × 10³/mL), which was normalized three days later. Serum amylase (84 U/L) and lipase (13 U/L) levels also revealed no abnormalities either. A colonoscopy showed diffuse erythema and ulcers at the transverse colon and descending colon, and these findings were consistent with ischemic colitis.

Multi-detector row CT (LightSpeed Pro; GE Medical Systems, Milwaukee, Wis) was performed after the colonoscopy. The CT parameters included a detector configuration of 1.25 mm × 16, a gantry rotation speed of 0.5 seconds and a table feed of 20 mm per gantry rotation. A total of 100-mL of iohexol (Omnipaque 300;
Nycomed Amersham, Princeton, NJ) was injected intravenously at a rate of 3 mL/sec. The entire abdominopelvic region was imaged twice, at 70 sec for the portal venous phase and 3 min for the delayed phase. The CT images showed mild and diffuse wall thickening from the distal transverse colon to the descending colon. We also observed a small round, hypovascular lesion at the head of the pancreas adjacent to the duodenal wall (Fig. 1A). Axial CT scans with a 1.25-mm collimation were reconstructed at a 0.625-mm interval in a dedicated workstation (Advantage window 4.2; GE Medical Systems), and coronal, paracoronal and sagittal images were then obtained. Reformation was performed by using the minimum intensity projection technique. The reformatted images clearly showed a cystic dilatation of the distal dorsal pancreatic duct and a communication between the ventral and dorsal pancreatic ducts (Fig. 1B). These findings were compatible with santorinicele without pancreas divisum. The dorsal pancreatic duct was equal to or slightly more prominent than the ventral pancreatic duct.

Subsequent magnetic resonance cholangiopancreatography (MRCP) was performed with a 1.5-T unit (Signa Twinspeed; GE Medical Systems, Milwaukee, Wis) with the use of a phased-array surface coil. The T2-weighted images were obtained by using half-Fourier rapid acquisition (single-shot fast spin-echo), and threedimensional imaging was performed in the axial, radial

![Fig. 1. Santorinicele without pancreas divisum in a 67-year-old woman.](image-url)

A. Axial CT scan obtained during the portal venous phase shows a small santorinicele [arrow] seen in the head of the pancreas adjacent to the duodenal wall. Mild and diffuse wall thickening of the descending colon [arrowhead] was due to ischemic colitis.
B. Oblique coronal CT image using minimum intensity projection technique shows the same santorinicele [arrow] and a communication between the ventral [short arrow] and dorsal [arrowhead] pancreatic ducts.
C. MRCP shows the same santorinicele and communication [arrow].
D. ERCP through the minor papilla shows the same santorinicele [arrow] at the distal dorsal pancreatic duct.
and coronal planes. An axial SSFSE T2 sequence (repetition time [TR]/echo time [TE] 4000/160 ms, matrix 384×256, field of view [FOV] 34 cm, slice thickness 8 mm), a radial fat-saturated sequence (TR/TE 4000/806 ms, matrix 448×224, FOV 28 cm, slice thickness 50 mm) and the coronal thin-slice sections (TR/TE 4000/250 ms, matrix 256×192, FOV 28 cm, slice thickness 4 mm) were taken. The MRCP images showed findings identical to those seen on the minimum intensity projection CT image (Fig. 1C).

Endoscopic retrograde cholangiopancreatography (ERCP) was then performed. At ERCP, the minor papilla was prominent and bulging. There were no diverticula near the minor papilla. Pancreatography obtained after cannulation through the minor papilla confirmed a cystic dilatation of the distal dorsal pancreatic duct (Fig. 1D). However, we were unable to perform cannulation through the major papilla.

The patient was treated with antibiotics and fluid therapy, and completely recovered without residual symptoms of the ischemic colitis. The patient was discharged without any complications.

**Discussion**

During the embryologic state, the pancreas is formed from distinct ventral and dorsal buds; the two buds provide the main pancreatic duct, draining through the major papilla. The accessory duct (of Santorini) is the remaining portion of the duct in the dorsal pancreas and it may drain through the minor papilla. Santorinicele is a cystic dilatation of the accessory duct just proximal to the minor papilla (1, 2). To date, santoriniceles have been reported in patients with pancreas divisum, whether complete or incomplete (1, 2, 4-6). It has been suggested that these lesions result from obstruction of the minor papilla because santorinicele has been associated with pancreas divisum in several previous studies (1, 2).

Eisen et al (1) reported that three of four patients with santorinicele also had adjacent duodenal diverticula. These researchers suggested that santorinicele might be the result of a weakness of the duodenal wall adjacent to the accessory papilla. Therefore, santorinicele is believed to result from a combination of the relative obstruction and also the weakness of the distal ductal wall (1, 2). This pathogenesis is also a possible cause for the stenosis of the accessory papilla in association with pancreas divisum. This narrowing of the papilla results in high intraductal pressure which then leads to pancreatic pain or pancreatitis (1, 7).

To the best of our knowledge, there is only one report showing a santorinicele that was not associated with pancreas divisum (3). In this report, instead of the patient having pancreas divisum, the patient had another congenital anomaly, a bifid pancreas; this is an anatomical variant in which the main pancreatic duct is bifurcated along its length. We present here in this report another santorinicele without pancreas divisum. These two cases suggest that santoriniceles may exist without pancreas divisum. In addition, communication between the dorsal and ventral ducts was observed, and the diameter of the dorsal pancreatic duct was equal to or slightly more prominent than that of the ventral duct. Although the possibility of stenosis or obstruction of the minor papilla cannot be excluded, the exact pathogenesis of the santorinicele in the present case was difficult to define.

The santorinicele was detected on the axial CT images, and the reformatted CT images, when using the minimum intensity projection technique, also clearly showed a santorinicele and its relationship with the pancreatic duct, which was comparable to the MRCP image. The reformatted images were of the same image quality as the axial images due to the high spatial resolution of the MDCT and the recent advances in the post-processing programs. Eventually, both MDCT and MRCP findings allowed the physician to arrive at an accurate diagnosis of pancreatic duct abnormalities. ERCP was performed on this patient to verify the absence of pancreas divisum. Although we were unable to cannulate the major papilla, we believe the absence of pancreas divisum could be verified by demonstrating the communication between the dorsal and ventral ducts on the reformatted images.

ERCP and dynamic MRCP with secretin stimulation have been performed to confirm the diagnosis of a santorinicele and shown to be useful tools for investigating it (4-6). For this patient, we were only able to diagnose the santorinicele by using MDCT, which provided the same image quality as that of ERCP, and could eliminate the necessity of secretin-stimulated MRCP. In this respect, MDCT can play an important role in the detection of pancreatic duct abnormalities such as santorinicele.

As is known, santorinicele is a rare malady, and is usually associated with pancreas divisum and pancreatitis. In this report, we demonstrated a case of santorinicele without pancreas divisum, which is extremely
rare, that has radiological significance because it was diagnosed correctly by using only the reformatted images obtained from MDCT.

References