Annular Pancreas in Thais

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ABSTRACT

Objective: To study a congenital malformation of pancreas, the annular pancreas, and openings of pancreatic ducts. This abnormality can cause duodenal obstruction.

Methods: The annular pancreas and duodenum of an 86-year-old Thai female cadaver was removed. The length and width of the annular pancreas were measured, as well as the internal diameter of the duodenum at the surrounded part and also the higher level. The openings of pancreatic duct were also carefully observed.

Results: The second part of the duodenum was completely surrounded by the pancreatic tissue. The uncinate process extended over the anterior surface of the third part of the duodenum. The differences between the diameter of the duodenum at the surrounded part and at the higher level were 0.2 cm. there is no duodenal obstruction in this case. There were 2 openings of the pancreatic duct which opened to the second part of the duodenum. These ducts situated higher than the normal level, and were the primitive remains of the dorsal and ventral pancreatic buds.

Conclusion: Not all the cases of the annular pancreas cause duodenal obstruction. In the cases that the pancreatic tissue loosely surrounds the duodenum, the diameters of the duodenum at the surrounding and at the slightly higher level are nearly the same. The pancreatic openings showed the primitive characters, i.e., there were 2 openings represented 2 origins of the pancreatic buds.

Keywords: Annular pancreas; Duodenal stenosis; Obstruction

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The pancreas, a dual organ with both endocrine and exocrine functions, develops early in the embryonic life from the dorsal and ventral pancreatic buds of endodermal cells that arise from the caudal part of the foregut. This part of the foregut eventually develops into the duodenum. The larger dorsal pancreatic bud is the direct outgrowth from the dorsal surface of the duodenal endoderm. It is induced by the notochord and grows rapidly between the layers of the dorsal mesoduodenum. The dorsal pancreatic duct opens to the dorsal surface of the duodenum. The ventral pancreatic bud arises from the endoderm of the hepatic diverticulum which eventually becomes the common bile duct. The ventral pancreatic bud locates slightly caudal to the dorsal pancreatic bud. It is induced by the hepatic mesoderm and sprouts into the ventral mesentery just caudal to the developing gallbladder. The ventral pancreatic duct joins the common bile duct. As the duodenum rotates to the right and becomes a C-shaped loop, the ventral pancreatic bud and common bile duct rotates altogether and lies posterior to the dorsal pancreatic bud in the dorsal mesentery. Finally, the ventral and dorsal pancreatic buds fuse. The ventral pancreatic bud becomes the lower part of the head and the uncinate process. The dorsal pancreatic bud becomes the rest of the head, body and tail of the pancreas. According to the rotation, the pancreas comes to lie along the dorsal abdominal wall as one of the retroperitoneal structures. Their ducts anastomose to form the main pancreatic duct (of Wirsung), which is formed by the entire ventral pancreatic duct and the distal part of the dorsal pancreatic duct. The main pancreatic duct enters the duodenum at the site of the major papilla. The proximal part of the dorsal pancreatic duct degenerates, but this can be found persisting as the accessory pancreatic duct (of Santorini) that opens into the minor duodenal papilla, locates about 2 cm. cranial to the main duct.[1-5] There is a malformation of pancreas, the annular pancreas, which appears as a ring-like or annular part of the pancreas consisting of a thin band of normal pancreatic tissue that completely or partially encircles the second portion of the duodenum. This may result in various degrees of obstruction shortly after birth or much later in life. An annular pancreas is more often found in neonates and infants younger than one year of age; however, it is rare in adults. Symptomatic adults often have abdominal pain and distension, but the extent of the pancreatic annulus can vary with multiple presentations. Associated congenital anomalies such as Down syndrome, intestinal malrotation, intrinsic duodenal obstructions, cardiac defects and Meckel's diverticulum are also common. Annular pancreas is so far a rare congenital anomaly.[6-9] Although the exact cause is unknown, several theories have been proposed. Langman and Carlson suggested that the ventral pancreatic bud consists of two components that normally fuse and rotate around the duodenum. Occasionally, the right portion of

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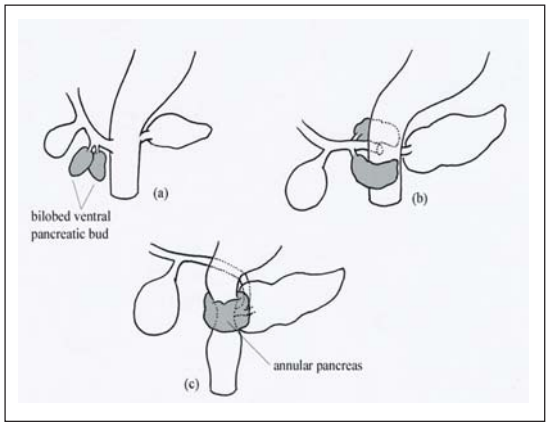

Fig 1. Diagram of the formation of an annular pancreas.

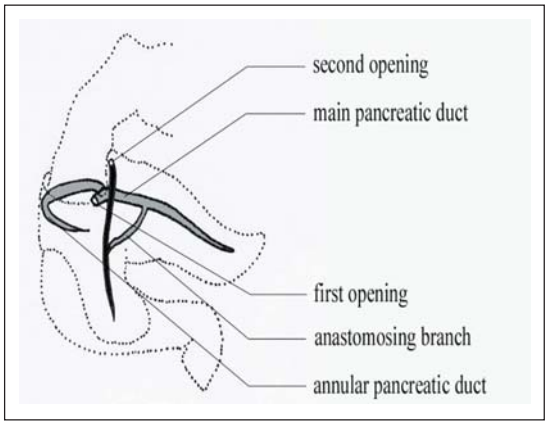

Fig 3. Diagram of pancreatic ducts and their openings.

the ventral bud migrates along its normal route but the left migrates in the opposite direction. (Fig.1)[2-3] Lecco suggests that the tip of the right part of the ventral bud adheres to the duodenal wall and stretches to form a ring during normal rotation.[10] Baldwin reports that the left part of the ventral bud persists, which develops to complete a circle of pancreatic tissue around the duodenum.[11] If this occurs in the early stage of development, the duodenal growth will be limited and the duodenal obstruction will occur.[6-9] However, in this report we found a case of an adult annular pancreas from one cadaver of the dissecting room of the Department of Anatomy, Faculty of Medicine Siriraj Hospital.

MATERIALS AND METHODS

An 86-year-old Thai female cadaver was found to have an annular pancreas surrounding the second part of the duodenum. The pancreas and the duodenum were removed. The diameter of the duodenum and other several parameters were carefully dissected and measured. The pattern and the openings of the pancreatic ducts were carefully observed and photographs were taken.

RESULTS

The pancreas of an 86-year-old female cadaver was found to be annular which surrounds the second part of the duodenum. The head of the pancreas forms an annular ring and its inferior part extends to cover the anterior surface of the third part of the duodenum. This resembles the uncinate process of the normal pancreas. The longest part from the left to right sides is 12.5 cm. The widest part from the upper to lower borders, including the extended uncinate process, is 5 cm. The width of the annular ring is 1.2 cm. The uncinate process is attached to the anterior surface of the third part of the duodenum but does not surround it. The annular ring, encircling the second part of the duodenum, may be the cause of the duodenal obstruction (Fig 2). After removal of the posterior part of the encircling pancreas, we found that the diameter of the surrounded part of the duodenum is 1.9 cm and the diameter of the duodenum higher to the ring is 2.1 cm. There are 2 openings of the pancreatic duct to the duodenum (Fig 3). One of them is at the upper part of the second part of the duodenum, which receives the drainage from the body and tail of pancreas. The duct is joined with the duct from the encircling part of the pancreas and the common bile duct before it opens into the duodenum (Fig 4). The second opening situates about 1 cm higher than the first opening, at the junction between the first and the second part of the duodenum. The latter opening is branched to the duct of the uncinate process, head of pancreas and annastomosing branch from the main pancreatic duct (Fig 5).

DISCUSSION

Annular pancreas is rare (1 in 20,000 cases) congenital anomaly in which the head of the pancreas totally or partially surrounds the duodenum. Some defects may occur such as duodenal stenosis. But in this case, the duodenum is normal even at the surrounded part. The uncinate process is longer than usual and attached to the anterior

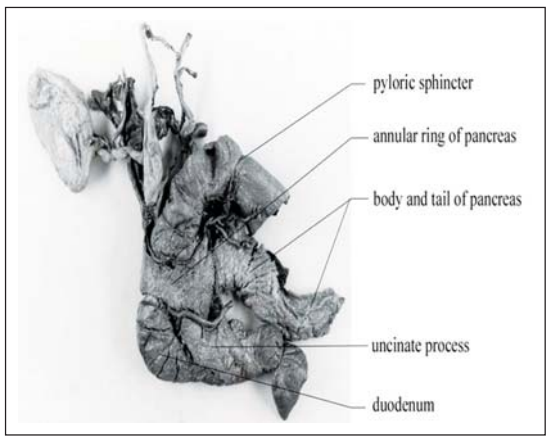

Fig 2. Anterior view annular pancreas.

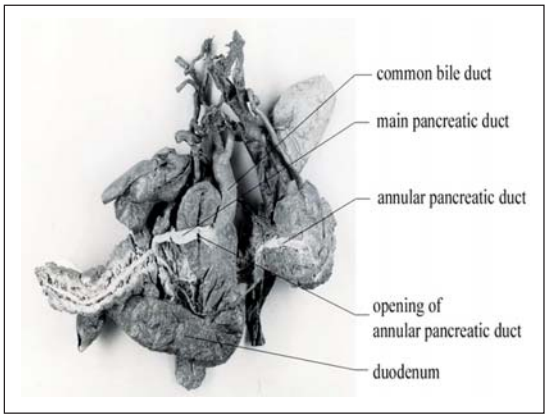

Fig 4. The opening of annular pancreatic duct at the posterior of the main pancreatic duct.

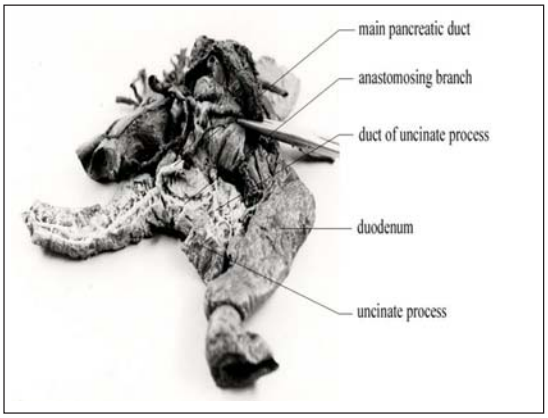

Fig 5. The opening and relation of the duct of uncinate process.

surface of the third part of the duodenum. The opening of main pancreatic duct is higher than usual, which is in the same level of the normal opening of the accessory pancreatic duct. The duct joins the annular pancreatic duct posteriorly before joining with the common bile duct at the opening to the duodenum. This is opposite to Choi's report, which describes that the annular pancreatic duct opens to the anterior aspect of the main duct.[12] The duct of the long uncinate process joins with a branch from main duct and opens to the duodenum slightly higher than the former opening as an accessory pancreatic duct.[8-14] At the dissecting room of the Department of Anatomy, Siriraj Hospital, we have about 60 cadavers each year, but there has been no report on annular pancreas before this. This condition, therefore, seems to be very rare in healthy adults.

CONCLUSION

Annular pancreas is a rare congenital anomaly found in the new born and is extremely rare in adults. This condition may lead to many defects especially duodenal stenosis and duodenal atresia. But this study shows that the obstruction may not occur under annular pancreas condition. The lumen of the duodenum at the encircling part is nearly the same as the non-encircling part, this indicates that the annular pancreas cause no effect on the gut lumen. The opening of the annular pancreatic duct is at the posterior of the main duct. This is opposite to the report of Choi JY, which describes that the annular pancreatic duct opens into the anterior of the main duct.[12]

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บทคัดย่อ

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วัตถุประสงค์: เพื่อศึกษาลักษณะของแอนนูลาร์แพนเครียส และรูเปิดของระบบท่อของแพนเครียส ซึ่งเป็นสาเหตุหนึ่งของการอุดตันของลำไส้เล็กส่วนดูโอดินัม

วิธีการ: แยกส่วนของแพนเครียสและลำไส้เล็กดูโอดินัมออกจากอาจารย์ใหญ่เพศหญิง สัญชาติไทย อายุ 86 ปี นำมาวัดความกว้างและความยาวของแอนนูลาร์แพนเครียส รวมถึงเส้นผ่านศูนย์กลางของดูโอดินัมระดับที่ถูกแอนนูลาร์แพนเครียสล้อมรอบ และระดับที่สูงกว่า พร้อมทั้งศึกษาระบบท่อของแพนเครียสที่เปิดเข้าสู่ดูโอดินัม

ผลการศึกษา: แอนนูลาร์แพนเครียสล้อมรอบส่วนที่สองของดูโอดินัมอย่างสมบูรณ์ และส่วนอันซิเนตโปรเซสของแพนเครียส มีความยาวกว่าปกติ โดยยาวลงมาคลุมด้านหน้าของลำไส้เล็กดูโอดินัมส่วนที่สาม เส้นผ่านศูนย์กลางของดูโอดินัมส่วนที่ถูกล้อมรอบและส่วนที่สูงกว่า มีความแตกต่างกัน 0.2 เซนติเมตร ซึ่งไม่ทำให้เกิดการอุดตันของดูโอดินัม ในส่วนของระบบท่อของแพนเครียสนี้ มีรูเปิดสู่ดูโอดินัมสองรู โดยรูทั้งสองอยู่สูงกว่าระดับปกติ และเป็นรูซึ่งเกิดจากรูดั้งเดิมของหน่อของแพนเครียสทั้งด้านหลังและด้านท้อง ที่ไม่เชื่อมกันอย่างปกติ

สรุป: ในการศึกษาครั้งนี้สรุปได้ว่า แอนนูลาร์แพนเครียสไม่ก่อให้เกิดการอุดตันของดูโอดินัมทุกรายไป ดังเช่นรายนี้มีชีวิตอยู่ได้อย่างปกติจนอายุ 86 ปี รูเปิดของท่อของแพนเครียสส่วนล้อมรอบดูโอดินัม เปิดเข้าสู่ท่อหลักของแพนเครียสทางด้านหลัง ซึ่งตรงข้ามกับรายงานของชอย ซึ่งรายงานว่ารูเปิดของท่อของแพนเครียสส่วนที่ล้อมรอบดูโอดินัมเปิดเข้าสู่ท่อหลักของแพนเครียสทางด้านหน้า