

## CASE REPORT

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# Discrepancy Between Pancreatographic and Histopathological Findings in the Ventral Pancreas of Pancreas Divisum

Terumi Kamisawa<sup>1</sup>, Shin-Ichirou Horiguchi<sup>2</sup>, Yukiko Hayashi<sup>2</sup>, Nobuaki Funata<sup>2</sup>

<sup>1</sup>Department of Internal Medicine, and <sup>2</sup>Department of Pathology, Tokyo Metropolitan Komagome Hospital. Tokyo, Japan

### ABSTRACT

**Context** Pancreas divisum is a congenital anomaly in which the ventral and dorsal pancreatic ducts do not communicate.

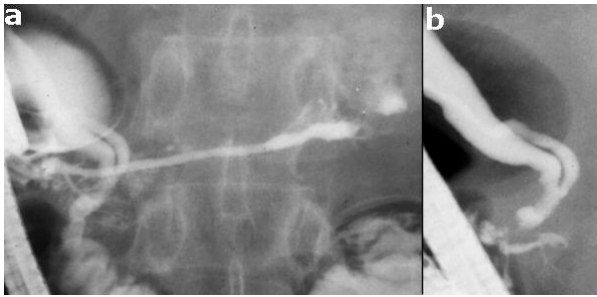
**Case report** Autopsy case of pancreas divisum with a history of heavy consumption of alcohol was presented. Pancreatography via the major duodenal papilla showed a short ventral pancreatic duct of 1 cm in length, and hypoplasia of the ventral pancreas was suspected. As large cysts were confined to the dorsal pancreas, isolated dorsal pancreatitis was also suspected. At autopsy, extensive fibrosis was detected in both the ventral and dorsal pancreas. Immunohistochemical examination revealed that PP-rich islets were scattered in the fibrotic area between the ventral pancreatic parenchyma and the neck of the pancreas, suggesting that this fibrotic area originated from the ventral pancreas. These facts suggest that the short ventral pancreatic duct was not induced by hypoplasia of the ventral pancreas but was shortened secondarily by the alcohol-induced fibrosis.

**Conclusions** In pancreas divisum, a short ventral pancreatic duct resulting from secondary factors may be confused with that originating from hypoplasia of the ventral pancreas.

### INTRODUCTION

Pancreas divisum is a ductal embryological anomaly of the pancreas, which is defined as a complete separation of the pancreatic ductal system in a grossly undivided gland. It results from the failure of the dorsal and ventral pancreatic ducts to fuse, which normally occurs in the second month in utero. The main portion of the pancreas, including the superior-anterior part of the head, the body, and the tail, is drained by the dorsal pancreatic duct through the minor duodenal papilla [1]. In cases of pancreas divisum, a short 2- to 4-cm ventral pancreatic duct with fine terminal arborization in the caudal portion of the pancreatic head is typically seen on cannulation of the major duodenal papilla although, in some cases, the duct can be very short and rudimentary [2].

The existence of a causal relationship between pancreas divisum and pancreatitis has been the subject of controversy [3, 4]. In the majority of patients, the existence of pancreas divisum alone does not cause pancreatitis. However, pancreatitis sometimes results from the presence of another factor such as alcohol in addition to pancreas divisum [5, 6]. In pancreas divisum, the anatomy of the minor duodenal papilla, particularly the relatively small orifice for the drainage of dorsal pancreatic duct secretions, sometimes leads to dilatation of the dorsal



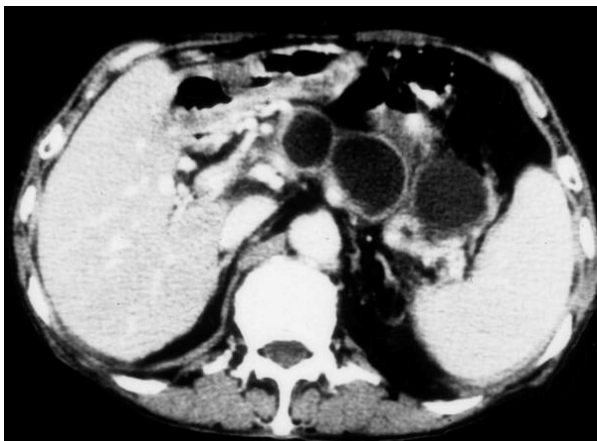
**Figure 1. a.** Pancreatography via the minor duodenal papilla showing a slightly irregular dorsal pancreatic duct with a large cyst. **b.** Pancreatography via the major duodenal papilla showing a very short ventral pancreatic duct.

pancreatic duct alone (isolated dorsal pancreatitis) [6, 7].

This paper describes the histopathologic findings of the autopsied ventral pancreas in a patient with pancreas divisum, in whom pancreatography had led to the diagnosis of isolated dorsal pancreatitis. The embryology of pancreas divisum is also discussed.

## CASE REPORT

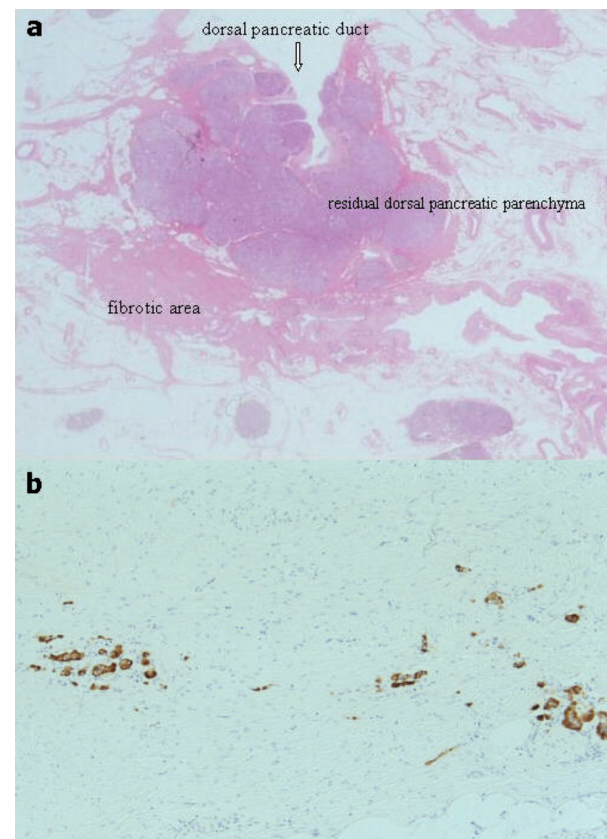
A 72-year-old male with a history of heavy consumption of alcohol (ethanol 150 g/day for 50 years) suffered from diabetes mellitus, chronic pancreatitis, and alcoholic chronic hepatitis. Pancreatography via the minor duodenal papilla revealed a slightly irregular dorsal pancreatic duct with a large cyst (Figure 1a). On cannulation of the major duodenal, a very short ventral pancreatic duct (1 cm in length) was apparent (Figure 1b). A



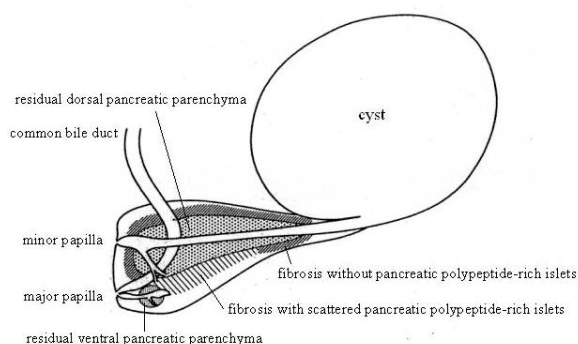
**Figure 2.** Abdominal CT showing three large cysts in the dorsal pancreas.

CT demonstrated several large cysts in the dorsal pancreas (Figure 2). The patient died from hypoglycemic shock and an autopsy was performed on the same day.

On dissection, the pancreas was found to be atrophic and hard, and several cysts were identified in the pancreatic body and tail. The pancreas, duodenum, and common bile duct were removed en bloc and examined. Gross dissection of the dorsal pancreatic duct was performed, after which the pancreatic tissues were fixed in 17% formaldehyde solution, dehydrated, and embedded in paraffin. The blocks were cut serially and vertically to give sections having a thickness of between 3 and 4  $\mu$ m. Sections for histological analysis were subjected to hematoxylin-eosin staining and pancreatic polypeptide (PP) immunostaining. Cross sections demonstrated the dorsal and ventral pancreas to exhibit different



**Figure 3. a.** Low power view of cross section of the pancreatic head (Haematoxylin and eosin, x1). **b.** pancreatic polypeptide-rich islets were scattered in the fibrotic area between the ventral pancreatic area and the neck of the pancreas (Immunostaining for pancreatic polypeptide, x16).



**Figure 4.** Schematic illustration showing the histological and immunohistochemical findings of the pancreatic head.

histological features. Considerable pancreatic parenchyma remained around the dorsal pancreatic duct, while only a little was detected around the short ventral duct. Fibrotic lesions with acinar atrophy surrounded the pancreatic parenchyma of the dorsal pancreas (Figure 3a). Four unilocular cysts detected in the dorsal pancreas were histologically found to be pseudocysts. Immunohistochemically, the pancreatic parenchyma remaining around the dorsal pancreatic duct represented the dorsal pancreas with islets that stained sparsely for PP, and the small area around the short ventral pancreatic duct was the ventral pancreas with islets that were rich in PP [8]. Although most of the fibrotic area showed no PP-positive cells, scattered PP-rich islets were observed in the fibrotic area between the ventral pancreatic parenchyma and the neck of the pancreas (Figures 3b, 4).

## DISCUSSION

Pancreas divisum results from the embryological failure of the duct systems of the ventral and dorsal pancreas to fuse. This failure forces the dorsal pancreatic duct to become the major drainage channel for pancreatic secretions, draining the body and tail through its outlet at the minor papilla [1, 2, 3, 4, 5]. In the presence of this malformation, a relative obstruction at the dorsal duct orifice can sometimes induce isolated dorsal pancreatitis [6, 7].

Embryologically, two mechanisms are suspected in the formation of pancreas divisum. One is anterior or posterior dislocation of the ventral and dorsal pancreatic ducts, shown by pancreatography as the superior branch of the ventral pancreatic duct bypassing the dorsal pancreatic duct [9]. The other is hypoplasia of the ventral pancreas, which appears to be the causative mechanism in cases with a markedly short and rudimentary ventral duct. In the present case, pancreatography performed on cannulation of the major duodenal papilla showed a short ventral pancreatic duct of 1 cm in length, and hypoplasia of the ventral pancreas was therefore suspected embryologically. Furthermore, as cysts were confined to the dorsal pancreas, isolated dorsal pancreatitis was thought likely. However, extensive fibrosis was observed in both the ventral and dorsal pancreas. This could be explained by heavy alcohol intake, resulting in chronic fibrotic change in the entire pancreas. Immunohistochemically, the presence of PP-rich islets scattered in the fibrotic area between the ventral pancreatic parenchyma and the neck of the pancreas suggests this fibrotic area to have originated from the ventral pancreas embryologically. We would stress that the short ventral pancreatic duct was not induced by hypoplasia of the ventral pancreas but was instead shortened secondarily by the alcohol-induced fibrosis in this case.

In pancreas divisum, a short ventral pancreatic duct resulting from secondary factors may thus be confused with that originating from hypoplasia of the ventral pancreas.

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**Keywords** Fibrosis; Pancreas; Pancreatic Polypeptide; Pancreatitis

**Abbreviations** PP: pancreatic polypeptide

### Correspondence

Terumi Kamisawa  
Department of Internal Medicine  
Tokyo Metropolitan Komagome Hospital  
3-18-22 Honkomagome  
Bunkyo-ku  
113-8677 Tokyo  
Japan  
Phone: +81-3.3823.2101  
Fax: +81-3.3824.1552  
E-mail address: [kamisawa@cick.jp](mailto:kamisawa@cick.jp)

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