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An Informative Case under Total Pancreatic Duct Drainage Procedure after Pancreatoduodenectomy

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Abstract Total pancreatic duct drainage has been recognized as a safe and leak-proof procedure after pancreatoduodenectomy and this procedure has improved morbidity and mortality. However, the impact of tube complications remains unknown. We treated a patient with an obstructed tube that impaired pancreatic drainage for 23 days. During this period, although serum amylase levels were elevated, the patient was asymptomatic. On the 24th postoperative day (POD), a moderate amount of clear pancreatic juice was excreted abruptly and subsequent drainage was uneventful. During the late postoperative period, the response of the pancreatic juice to an oral diet was sustained and oral glucose tolerance was also maintained. These findings suggest that the effects of obstruction of the main pancreatic duct for 23 days on the residual pancreas are reversible in humans. Thus, in a case with tube complication, one possible strategy is to allow the matter to take its own course. This case illustrates the importance of careful ligature of the pancreatic tube. It is necessary to recheck the patency with a suitable guide-wire, especially one with a small inner diameter.

Key words : total pancreatic duct drainage ; pancreatic duct obstruction.

Introduction

Total pancreatic duct drainage has been recognized as a safe and leak-proof procedure after pancreatoduodenectomy, since even if leakage does occur, the intestinal fluid contains no pancreatic juice ; this is based on the hypothesis that anastomotic leakage is worsened when intestinal fluid containing bile or enterokinase activates pancreatic juice[1]. Total drainage allows the pancreatic juice to be sufficiently drained by the pressure produced by its accumulation and the effect of gravity. If tube obstruction occurs during this procedure, the situation seems dangerous because the intraductal pressure may increase abruptly, leading to acute pancreatitis or breakdown of the pancreatojejunostomy, especially in a patient with a soft residual pancreas. However, the actual consequences of tube obstruction remain unknown.

We treated a patient whose pancreatic duct tube became obstructed for more than 3 weeks. This case offers some instructive information related to tube management.

Case report

A 71-year-old woman was referred to our hospital with jaundice. She had been

diagnosed with lower bile duct cancer and underwent a standard Whipple resection with Billroth-I type reconstruction. Total pancreatic duct drainage was performed after pancreatojejunostomy. In this case, it was difficult to identify the main pancreatic duct because it was small and thin and located in a soft gland. Five French-sized polyvinyl chloride tube with an expanded segment to prevent slippage (Pancreatic duct tube®, Sumitomo Bakelite Co., Ltd., Tokyo, Japan), was advanced distally to the residual main pancreatic duct. It was recognized that the clear pancreatic juice flowed back into the tube which was fixed tightly with an absorbable ligature (3-0 Coated Vicryl®, Ethicon, Inc., Edinburgh, U.K.). The cut end of the remnant pancreas was not closed. Then, the jejunum was prepared for end-to-side pancreatojejunostomy as follows. An appropriate spindle-shaped incision was made on the seromuscular layer of the jejunum and the submucosa was exposed around the spindle-shaped of full-thickness jejunal wall. The other end of the pancreatic tube, mounted on a trocar, penetrated through this full-thickness island into the jejunal lumen and was drawn out extra corporeally via the anterior wall of the stomach. The pancreas stump was attached to the submucosa of the jejunum using interrupted sutures with polypropylene ligatures (3-0 Prolene®, Ethicon, Inc.) between the remnant pancreas and the margin of the jejunal wall. The scheme of the operative procedure is shown in (Fig 1.)

The postoperative course is shown in Figure 2. No fluid drained through the pancreatic tube just after surgery. The serum amylase levels remained over 130 IU/L until the 3rd POD, but decreased to within normal limits after the 4th POD. We tried to recanalize the tube with gentle injection of a very small amount of water (0.5 ml of water via 1.0-ml syringe) on the 5th POD and failed due to

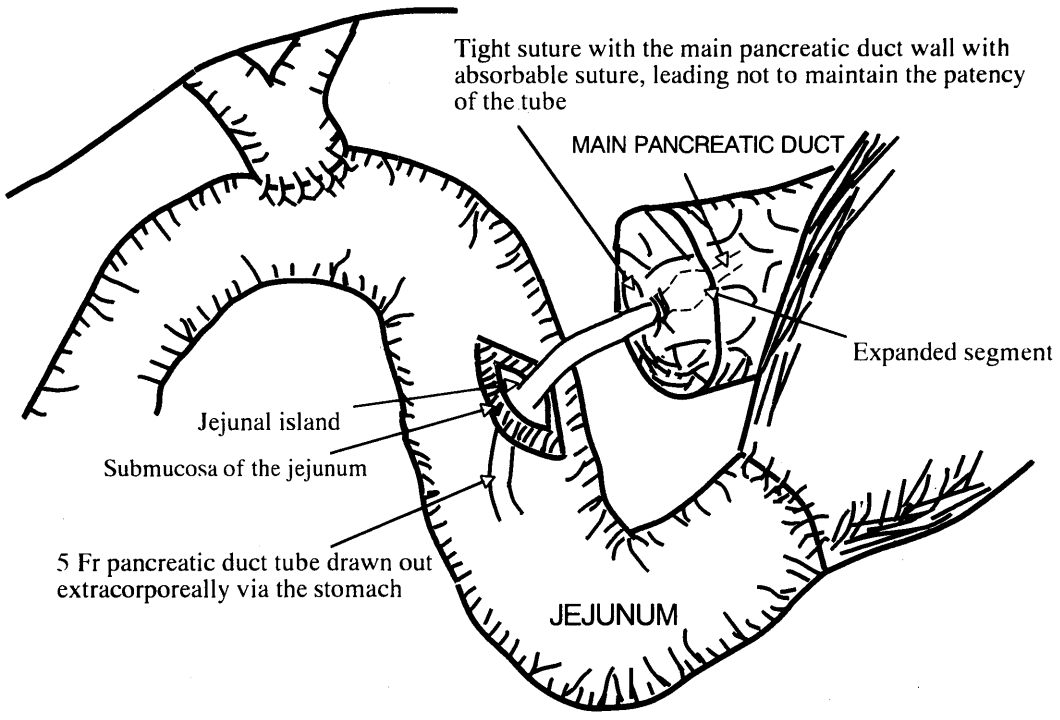

Fig. 1 Schematic illustration of total pancreatic duct drainage procedure after pancreatoduodenectomy with Billroth I type of reconstruction. The main pancreatic duct was small and thin. Five French-sized pancreatic duct tube was advanced up to the expanded segment and attached tightly to the main pancreatic duct wall with absorbable ligatures

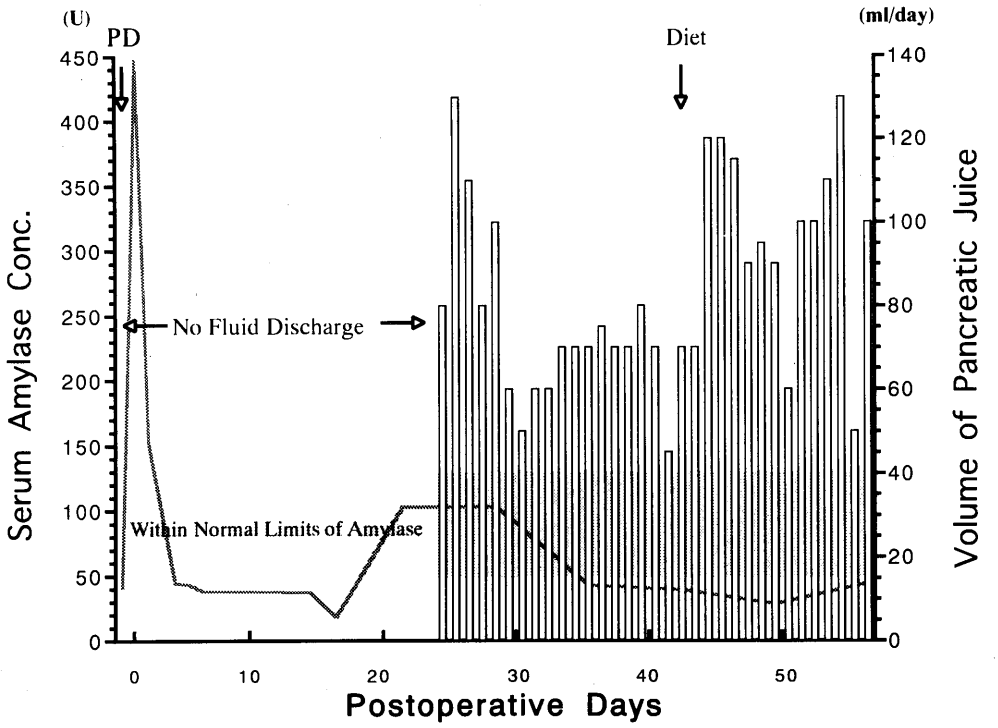

Fig. 2 The relationship between the serum amylase concentration and total volume of the pancreatic juice excreted during the postoperative course. A high serum amylase concentration was observed just after pancreatoduodenectomy (PD). The serum amylase levels decreased to within normal limits by the 4th postoperative day (POD). No fluid discharge was observed for 23 days. On the 24th POD, a moderate amount of pure and clear pancreatic juice was excreted. Two peaks were observed in the volume of pancreatic juice excreted. The first peak occurred after the release of the tight knot, and the second was observed after the beginning of the oral diet.

strong resistance of the injector. On physical examination the abdomen was soft and flat, and the patient reported no abdominal pain. Therefore, we decided to observe this case, proving only total parenteral nutrition with nafamostat mesilate (Futhan® , Banyu Pharmaceutical Co., Ltd., Tokyo, Japan).

Pancreatic drainage was impaired for a period of 23 days. On the 24th POD, a moderate amount of pure and clear pancreatic juice drained spontaneously and abruptly. After that, the drainage was uneventful. Histopathology showed normal pancreas tissue without fibrosis in the non-cancerous pancreatic region of the resected specimen. An oral diet was started on the 43rd POD. In the late postoperative period, oral glucose tolerance was maintained and the oral pancreatic function test using N-benzoyl-L-tyrosyl - para - aminobenzoic acid (BT - PABA) showed recovery of pancreatic function after removal of the pancreatic duct tube.

Three years after the operation, the patient did not complain of weight loss, limitations to her normal diet, or diarrhea, in answering a questionnaire about her quality of life.

Discussion

It has been reported that the output of pancreatic juice during the postoperative period clearly depends on the extent of fibrotic change and the volume of the remnant pancreas, which supported by the observation that a pancreatic body and tail without fibrosis produce an average of 205 ml (range, 43.6-593.2 ml) of juice per day, compared with less than 10 ml a day from a severely fibrotic tail alone[1].

If the pancreatic duct tube becomes insuffi-

cient for total pancreatic duct drainage due to obstruction, it seems dangerous to delay intervention and simply observe the course, because the intraductal pressure may increase abruptly, leading to acute pancreatitis or breakdown of the pancreatojejunostomy, especially in a patient with a soft pancreas. However, the actual consequences of tube obstruction remain uncertain.

Experimentally, it has been reported that obstruction of either the pancreatic duct or the combined biliopancreatic duct in most species does not induce severe acute pancreatitis (2-5). Rather, a mild and transient phase of pancreatic edema ensues that eventually leads to atrophy of the exocrine pancreas. Islet tissue is preserved, but acinar cells progressively disappear, and the exocrine glandular lobules are reduced to groups of small ductules within a fibrous stroma[6]. Recent reports indicate that the American opossum may be an exception to this rule ; ligation of the combined biliopancreatic duct of this animal leads to severe hemorrhagic necrotizing pancreatitis[2,7,8].

In the present case, it is possible that the ligation was too tight to maintain the patency of the pancreatic duct tube, and that this led to tube obstruction. Mild acute pancreatitis was reflected by elevation of the serum amylase levels, which might have been caused by the operative procedure itself or the ligation of the main pancreatic duct. After a while, the absorbable loose knot apparently enabled pancreatic juice to be drained without difficulty. Tube cannulation to the main pancreatic duct appeared to be successful since we obtained pure and clear pancreatic juice without bile-colored juice or air bubbles.

After recanalization of the tube, we observed two peaks in the total volume of pancreatic juice excreted. The first peak involved an abrupt discharge of the retained fluid in the main pancreatic duct. The second peak appeared after the oral diet was started, indicating the survival of reactive acinar cells that responded to oral intake in spite of 23 days of obstruction of the main pancreatic duct.

The BT-PABA test has been shown to reflect the impairment of exocrine pancreatic function induced by pancreatic duct ligation in animals[9]. In the late postoperative period, our patient recovered adequate glucose tolerance and normal values on the BT-PABA test. These findings suggest that the effects of 23 days of obstruction of the main pancreatic duct on the residual pancreas are reversible in humans.

This case illustrates the importance of careful ligature of the pancreatic tube. It is necessary to recheck the patency with a suitable guide-wire, especially the tube with a small inner diameter. It also shows that a case with an obstructed tube may be observed with no tube management when the patient is asymptomatic. We have encountered only one patient with tube obstruction during a total pancreatic duct drainage procedure since 1988. Tube obstruction is a difficult complication, so we should take care to avoid such sequelae. This informative case may simplify the management of obstruction of the pancreatic duct tube during a total pancreatic duct drainage procedure.

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