

The Frey Procedure with the Use of 2 Types of Ultrasonically Activated Scalpels for Chronic Pancreatitis: Report of a Case

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Abstract

A surgical procedure is the only way to relieve intractable pain in patients with chronic pancreatitis and an inflammatory mass in the pancreas head. Although the Frey procedure is safer and more effective for pain relief than is standard pancreaticoduodenectomy, it is often associated with such complications as pancreatic fistula and postoperative hemorrhage. A 64-year-old man was admitted to our hospital because of increasingly frequent episodes of epigastralgia. This patient had continued to abuse alcohol until recently and was regularly using painkillers to relieve severe pain due to chronic pancreatitis. The patient underwent the Frey procedure with the use of 2 types of ultrasonically activated scalpel. There were no surgery-related complications. The patient was discharged 18 days after the operation. Neither recurrence of pain nor locoregional complications have been observed for 2 years after the procedure. Herein we report the use of the Frey procedure to treat an enlarged mass of the pancreatic head and discuss the efficacy of the ultrasonically activated scalpel for excavation of the pancreatic head and long dichotomy of the pancreatic duct.

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Key words: chronic pancreatitis, Frey procedure, ultrasonically activated scalpel

Introduction

An inflammatory mass in the head of the pancreas causes intractable pain because the “pacemaker” of chronic pancreatitis pain is believed to exist in this region^{1,2}. Although an inflammatory mass has long been considered an indication for pancreaticoduodenectomy (PD), Frey and Smith introduced the local resection of the pancreatic head by means of lateral pancreaticojejunostomy that

combined the options of resection and drainage of the entire duct³. The Frey procedure is safer and more effective for pain relief than is PD. However, this procedure is often associated with such complications as pancreatic fistula and postoperative hemorrhage^{4,5}. The ultrasonically activated scalpel (UAS) is an innovative device that causes 3 synergistic effects—cavitation, coagulation, and cutting—to achieve effective hemostasis and tissue dissection at a precise point⁶. Moreover, use of the UAS has decreased the incidence of postoperative

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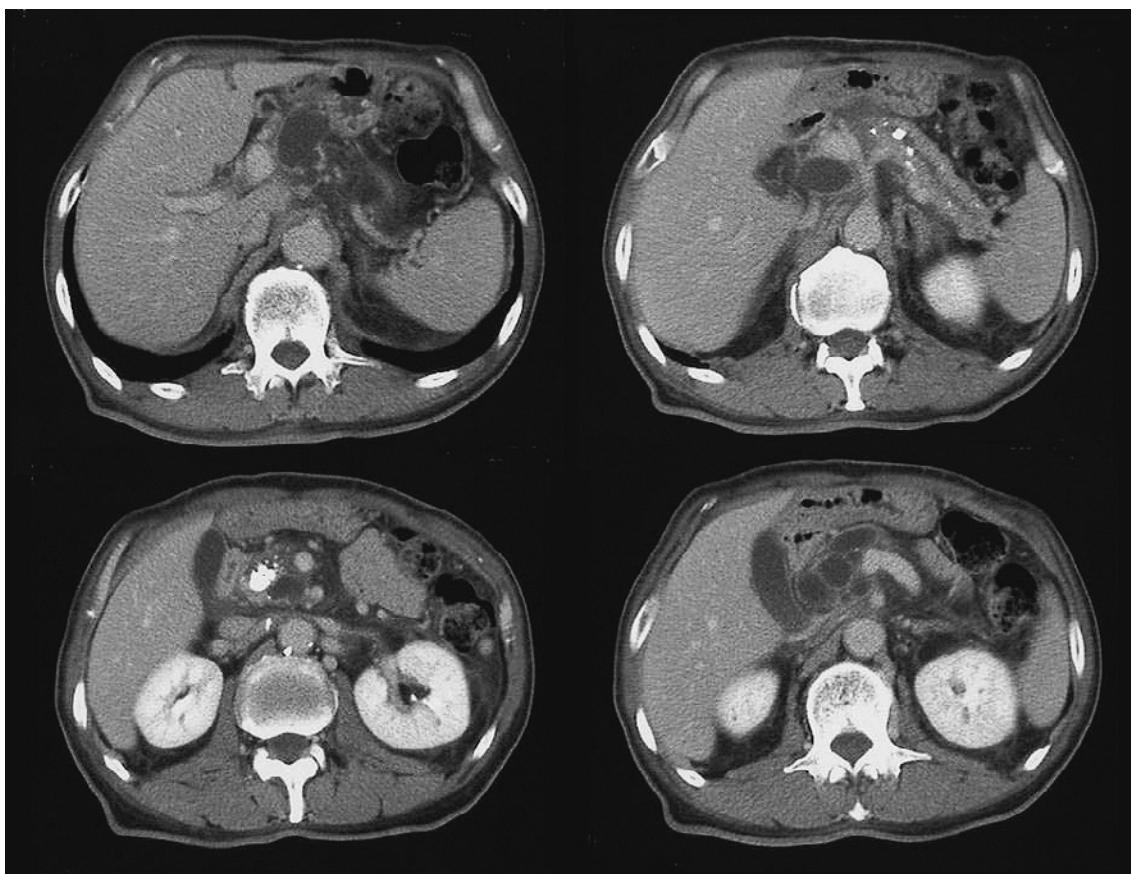


Fig. 1 Computed tomography demonstrates pancreatic pseudocysts in the pancreatic head and a large calcification in the uncinate process. The pancreatic body and tail contain multiple small calcifications in the dilated main pancreatic duct.

complications, including pancreatic fistula, after pancreatic resection⁷.

Herein we report the use of the Frey procedure for treating an enlarged mass of the pancreatic head and discuss the efficacy of the UAS for excavating the pancreatic head and long dichotomy of the pancreatic duct.

Case Report

A 64-year-old man was admitted to our hospital in 2010 because of increasingly frequent episodes of epigastralgia. This patient had continued to abuse alcohol until recently and was regularly using painkillers to relieve severe pain due to chronic pancreatitis. Pain control required class 3 analgesics.

Results of laboratory studies were as follows: white blood cell count, 6,700/mm³ (normal value, 4,000–9,000/mm³); C-reactive protein, 6.9 mg/dL (normal, <0.1 mg/dL); serum amylase, 672 IU/L

(normal, <127 IU/L); urine amylase, 4,318 IU/L (normal, <2,104 IU/L); total serum bilirubin, 1.85 mg/dL (normal, <1.2 mg/dL); aspartate aminotransferase, 17 IU/L (normal, <35 IU/L); alanine aminotransferase, 19 IU/L (normal, <40 IU/L); alkaline phosphatase, 360 IU/L (normal, <338 IU/L); gamma glutamyl transferase, 195 IU/L (normal, <50 IU/L); and serum albumin, 2.4 g/dL (normal, <3.9 g/dL). The result of the pancreatic function diagnostic test was 78% (<70%).

Computed tomography demonstrated an enlarged pancreatic mass, dilatation of the main pancreatic duct, and calcifications in the body and tail (**Fig. 1**). Magnetic resonance cholangiopancreatography showed retention cysts in the proximal pancreas and stenosis of the lower common bile duct (**Fig. 2**). The patient underwent the Frey procedure. There were no surgery-related complications. The patient was discharged 18 days after the operation. Neither recurrence of pain nor locoregional complications



Fig. 2 Enlarged pseudocysts and extensive calcification are prominent in the pancreatic head. Stenosis of the intrapancreatic bile duct and narrowed proximal main pancreatic duct (**arrowhead**) are visualized on magnetic resonance cholangiopancreatography.

have been observed in the 2 years after the procedure.

Surgical Technique

A long dichotomy of the pancreatic duct in the body and tail was performed with a scissor-shaped UAS (**Fig. 3a**) in blunt mode at a power output level of 3. Little blood was lost during this procedure because the vessels and small branches of the pancreatic ducts were completely sealed.

Excavation of an enlarged mass in the pancreatic head was performed with a sharp hook-shaped UAS (**Fig. 3b**). During this procedure, it is important to find the lower bile duct and portal vein without causing thermal damage to them. With the sharp hook-shaped UAS we could detect the common bile duct and main pancreatic duct more easily than with a conventional UAS because this device allowed us to dissect tissues precisely and delicately as with electrocautery. Coring out an inflammatory mass and long dichotomy of the pancreatic duct could be achieved safely (**Fig. 4**). The operative time was 150 minutes, and total blood loss was 52 mL. On histopathological examination, heat denaturation was observed only within a distance of 350 to 500 μm from the cutting surface, whereas protein

denaturation caused formation of a sticky coagulum, which sealed vessels and the ends of small branches of the pancreatic duct. Closed suction drains were placed around the lateral pancreaticojejunostomy, and the amylase concentration of drained fluid was always less than that of the serum.

Discussion

In 1987, Frey and Smith described the local resection of the pancreatic head by means of lateral pancreaticojejunostomy that combined the options of resection and drainage of the entire pancreatic duct³. In general, the Frey procedure appears to be a safe and effective technique for pain relief in patients with chronic pancreatitis and is associated with low rates of mortality and morbidity^{2,5,8}. However, the Frey procedure is technically challenging because of chronic inflammation and the hard texture of pancreatic parenchyma^{9,10}. Therefore, coring out an enlarged mass without injuring the bile duct and portal vein may require not only experience and specialized skills but also the use of a novel, efficient device that can avoid injury and decrease intraoperative blood loss^{5,11}.

The harmonic scalpel (Ethicon Endo-Surgery, Inc., Cincinnati, OH, USA) was introduced as an

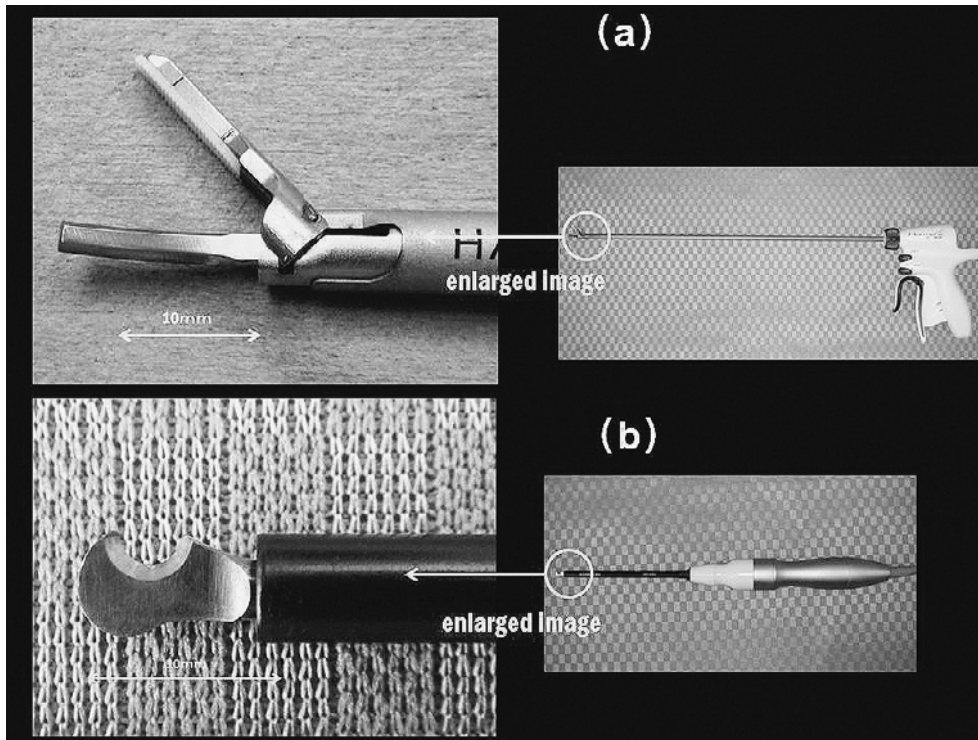


Fig. 3 (a) The scissor-shaped scalpel is more appropriate for use in thick tissue than in fragile structures. (b) We use the sharp hook-shaped scalpel just as if we were writing with a pencil. The head of the hook-shaped scalpel is suitable for such work as carving.

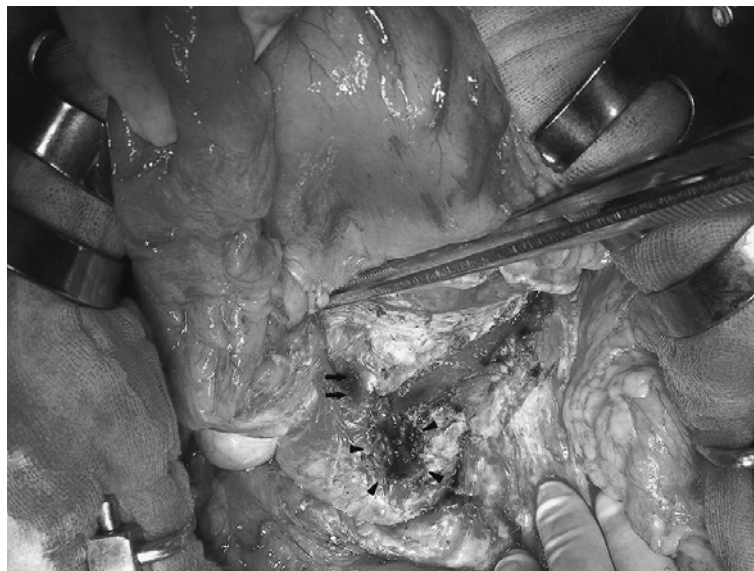


Fig. 4 The intraoperative view shows coring out of the pancreatic head mass (**arrowhead**) and longitudinal opening of the dilated main pancreatic duct in the body and tail (**arrow**). The intrapancreatic bile duct is exposed on the transected surface (**arrowhead**).

alternative to conventional method of hemostasis during surgical procedures. This instrument is used for cutting and coagulating tissues by producing high-frequency vibrations within the harmonic

frequency range^{6,7}. This tool has often been associated with a shorter operative time, less blood loss, and less postoperative pain^{7,12,13}. There are 2 types of blade head in the UAS: the scissor-shaped

scalpel and the sharp hook-shaped scalpel¹⁴.

In particular, the scissor-shaped UAS is effective for sealing vessels and the ends of small branches of the pancreatic duct and is safe and useful for dissecting the anterior wall of the main pancreatic duct in the body and tail. The scalpel blade moves longitudinally at 55,000 vibrations per second, thereby denaturing protein, which seals vessels and small pancreatic ducts by friction-induced heat^{6,7}. Takao et al have reported that the UAS helps decrease the incidence of postoperative pancreatic fistula⁷. On the other hand, the degree of tissue injury remains minimal because the temperature of cutting tissue is less than 150°C⁶. Recent studies have demonstrated that the extent of tissue damage is significantly less than that caused by electrocautery. In the present case, use of the scissor-shaped UAS led to less blood loss and to a shorter operative time¹²⁻¹⁴.

The sharp hook-shaped UAS has the advantages of avoiding thermal damage to surrounding tissues and allowing precise and delicate procedures because tissues are dissected under traction as an electrocautery. Therefore, use of the sharp hook-shaped UAS is considered to have become the gold standard for pancreatic parenchyma resection, including excavation of an enlarged mass. Several studies have demonstrated that the heat denaturation caused by the sharp hook-shaped UAS is restricted to within 500 µm from the cut end. Moreover, the sticky coagulum formed by protein denaturation can seal vessels and the ends of small branches of the pancreatic duct, although the sealing power of this scalpel is inferior to that of the scissor-shaped UAS^{6,7,12}. Okabayashi et al have reported that pancreatic transection with the sharp hook-shaped UAS is an easy and useful method that facilitates detection of the main pancreatic duct and minimizes blood loss. Takao et al have also reported that this scalpel can be used to easily separate fragile structures from the surrounding parenchyma. Recently, this device has been used for several delicate procedures, such as coronary artery bypass grafting and neck surgery. In the present case, the sharp hook-shaped UAS allowed us to core out an inflammatory mass easily and with minimal blood

loss. Moreover, pathological examination showed that thermal damage remained minimal, and there was no evidence of postoperative pancreatic fistula¹⁴.

The Frey procedure is technically challenging because of chronic inflammation and the hard texture of pancreatic parenchyma. We believe that the combination of the scissor-shaped and sharp hook-shaped UAS helped us to perform the Frey procedure safely and precisely.

Conflict of Interest: None

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Devices for Frey's Operation

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