Total closure of pancreatic section for end-to-side pancreaticojejunostomy decreases incidence of pancreatic fistula in pancreaticoduodenectomy

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BACKGROUND: Postoperative pancreatic fistula (POPF) is a serious complication and results in prolonged hospitalization and high mortality. The present study aimed to evaluate the safety and effectiveness of total closure of pancreatic section for end-to-side pancreaticojejunostomy in pancreaticoduodenectomy (PD).

METHODS: This was a prospective randomized clinical trial comparing the outcomes of PD between patients who underwent total closure of pancreatic section for end-to-side pancreaticojejunostomy (Group A) vs those who underwent conventional pancreaticojejunostomy (Group B). The primary endpoint was the incidence of pancreatic fistula. Secondary endpoints were morbidity and mortality rates.

RESULTS: One hundred twenty-three patients were included in this study. The POPF rate was significantly lower in Group A than that in Group B (4.8% vs 16.7%, $P<0.05$). About 38.3% patients in Group B developed one or more complications; this rate was 14.3% in Group A ($P<0.01$). The wound/abdominal infection rate was also much higher in Group B than that in Group A (20.0% vs 6.3%, $P<0.05$). Furthermore, the average hospital stays of the two groups were 18 days in Group A, and 24 days in Group B, respectively ($P<0.001$). However, there was no difference in the probability of mortality, biliary leakage, delayed gastric emptying, and pulmonary infection between the two groups.

CONCLUSION: Total closure of pancreatic section for end-to-side pancreaticojejunostomy is a safe and effective method for pancreaticojejunostomy in PD.

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KEY WORDS: periampullary tumor; pancreatic fistula; pancreaticoduodenectomy; pancreaticojejunostomy; biliary leakage

Introduction

Pancreaticoduodenectomy (PD) is the predominant therapy for periampullary tumors such as Vater's tumors of the choledochus duct, pancreatic head carcinomas, and cancers of the duodenal papilla.[1] Over the years, surgeons have advanced many considerable techniques to greatly reduce the mortality in PD. Many techniques for pancreaticojejunostomy such as duct-to-mucosa technique, bundle-invagination dunking pancreaticojejunostomy, sutured-invagination dunking pancreaticojejunostomy, and pancreatic stump to the stomach technique have been created and widely applied in practice.[2-4] However, the incidence of postoperative pancreatic fistula (POPF) is still high (3.2% to 36.4%).[5,6] The complication rate after PD remains relatively high.[7,8]

Because POPF is usually the most serious complication of PD, how to decrease POPF in pancreaticojejunostomy is the key point for the success of this operation. In this study, we aimed to evaluate the safety and effectiveness of a new method of pancreaticojejunostomy—total closure of pancreatic section for end-to-side pancreaticojejunostomy technique in PD.

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Methods

Patients

Patients with PD between March 2013 and May 2016 in our department were eligible for the present study. Periampullary tumor was diagnosed by clinical examination and confirmed by imaging techniques (multi-slice computed tomography, magnetic resonance imaging and/or angiography, and magnetic resonance cholangiopancreatography). The inclusion criterion is a periampullary tumor without surgery contraindications. Patients with ascites, cardiopulmonary dysfunction, tumor invasion of the portal vein or mesenteric vascular, merging distant organ metastases were excluded from this study.[7, 9, 10] Informed consent was obtained from all patients before surgery. The study was approved by the Ethics Committee of the First Affiliated Hospital of Zhengzhou University, and registered at http://www.chictr.org.cn (identifier: ChiCTR-IOR-15006261).

Using a sealed envelope method, patients were randomized into total closure of pancreatic section for end-to-side pancreaticojejunostomy (Group A) and a conventional pancreaticojejunostomy (Group B). An assistant who was blinded of any clinical information performed the randomization. Excepting the pancreaticojejunostomy, the remaining surgical procedures and treatments were all the same. The histology of the specimens were reviewed by two independent pathologists. The outcomes were evaluated by two independent doctors who were blinded to the surgical treatment.

Sample size

On the basis of previous evidence, we estimated that the POPF rate after conventional pancreaticojejunostomy was 30%. We hypothesized that with total closure of pancreatic section for end-to-side pancreaticojejunostomy, POPF might be reduced to 10%. Based on a 5% level of significance and 80% statistical power, we calculated that a total of 118 patients would be required.

Surgical procedure for total closure of pancreatic section for end-to-side pancreaticojejunostomy

All the procedures were performed by the same surgeon team specialized in hepatopancreatobiliary surgery. The total closure of pancreatic section for end-to-side pancreaticojejunostomy was performed as follows (Fig.). The anastomosis was performed in one layer using 4-0 Prolene (20 mm, 1/2c; Ethicon, LLC. San Lorenzo, Puerto Rico). A 5-6 cm tube adjusted to the diameter of pancreatic duct was inserted into the pancreatic duct and sutured to the surrounding pancreatic tissue with 5-0 Prolene (17 mm 1/2c, Ethicon, LLC.) for pancreatic fluid drainage. An intestinal loop was made behind the colon to the pancreatic stump. Then, a whole layer incision was made in the jejunal wall against the mesangial margin. The incision in the jejunum was adjusted to approximately the diameter of the pancreatic stump. It was sterilized and sutured with 4-0 Prolene (20 mm 1/2c, Ethicon, LLC.) from the inferior jejunal wall to the pancreatic inferior border via the inside-out to outside-in method (Fig. A). The first suture was ligated, and then one of the needles was guided to the outside of the adjacent jejunum (if the pancreatic tissue was fragile, the suture was slowly tightened after several continuous sutures). The other suture was inserted through the edge of the jejunal incision with a full-thickness bite in a continuous manner, according to the order of the enteric cavity

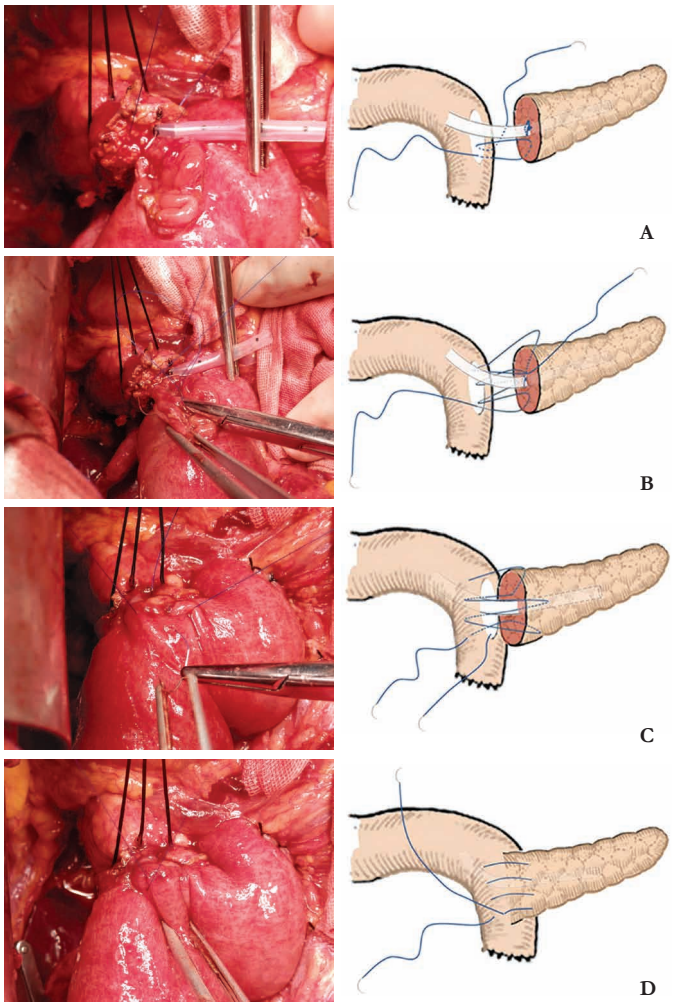

Fig. Procedure for total closure of pancreatic section for end-to-side pancreaticojejunostomy. **A**: A short internal drainage tube was inserted into the main pancreatic duct and the first suture was performed via the inside-out to outside-in method; **B**: Inverted suturing of the posterior intestinal wall and the section of pancreas; **C**: Continuous whole layer inverted suturing of the jejunal anterior wall and the section of pancreas; **D**: Completed stump closed pancreaticojejunostomy with total closure of pancreatic section for end-to-side pancreaticojejunostomy.