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Pancreatic fistula after laparoscopic splenectomy in patients with hypersplenism due to liver cirrhosis: effect of fibrin glue and polyglycolic acid felt on prophylaxis of postoperative complications

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Postoperative complications

Abstract

BACKGROUND: This study aimed to determine the effect of fibrin glue and polyglycolic acid (PGA) felt on prevention of pancreatic fistula (PF) after laparoscopic splenectomy in patients with hypersplenism due to liver cirrhosis.

METHODS: Fifty consecutive patients were enrolled in this prospective study. Twenty-three patients underwent laparoscopic splenectomy with a fibrin sheet (fibrin sheet group). The sealing ability of each treatment was evaluated by an ex vivo pressure test model. Based on the results from ex vivo experiments, 27 patients received prophylaxis using fibrin glue and PGA felt (PGA with fibrin group). The primary endpoint was the incidence of PF.

RESULTS: Significantly more (5, 22%) patients developed PF in the fibrin sheet group than in the PGA with fibrin group (0%, $P = .037$).

CONCLUSIONS: Our new application of fibrin glue and PGA felt is an effective prophylactic procedure for preventing development of PF after laparoscopic splenectomy.

Pancreatic fistula (PF) is not a rare complication in patients after laparoscopic splenectomy. The prevalence of PF after splenectomy ranges from 4.5% to 16% in patients with hematological diseases.[1–3] Hypersplenism is an

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enlarged splenic volume secondary to portal hypertension, which is attributed to increased difficulty of surgery because of limited retraction and hilar visualization. Hypersplenism is considered a risk of PF, bleeding, and capsular disruption.

Laparoscopic splenectomy has become the standard for removal of the spleen in benign hematological disorders.[4,5] Recently, splenectomy has been performed to improve thrombocytopenia in cirrhotic patients before the induction of pegylated-interferon plus ribavirin therapy for hepatitis C infection, and in patients with cirrhosis undergoing treatment for hepatocellular carcinoma.[6,7] Recent advances in laparoscopic instrumentation and procedures have showed laparoscopic splenectomy as a safe and effective treatment, even in cirrhotic patients with hypersplenism.[6–10] Although splenectomy is growing in importance for cirrhotic patients with hypersplenism, the indications for splenectomy remain controversial.[11] One of the reasons for this controversy is that postoperative complications after splenectomy for cirrhotic patients are not rare and can be fatal in patients with hypersplenism.[12–14] There are few reports of pancreatic complications after laparoscopic splenectomy for cirrhotic patients using the International Study Group on Pancreatic Fistula (ISGPF) grading for assessing PF. Therefore, recognizing the true incidence of PF, and effective therapy for PF after laparoscopic splenectomy, are important. This study aimed to determine the incidence of PF after laparoscopic splenectomy in patients with hypersplenism due to cirrhosis, and to determine an effective prophylactic procedure for preventing development of PF.

Methods

Sealing effect of combined fibrin glue and polyglycolic acid felt

The sealing ability of each treatment was evaluated by an ex vivo pressure test model. As shown in Fig. 1, a 22-mm diameter steel bottle was covered with skin from 11 to 20-week-old female Japanese white rabbits. The skin had five 19-G diameter pinholes in the center. The pinholes were repaired with each treatment. The inside of the bottle was pressurized through a connected pressure syringe that was filled with saline. Seal-breaking pressure was measured with an interconnected manometer (PG208-102GH-S; Nidec Copal Electronics Co., Tokyo, Japan). All the animals received humane care in accordance with the Japanese Government Animal Protection and Management Law.

Methods of application for comparison of the sealing effect

The sealing effect was then compared with the following 2 methods of application. Method 1 was a newly devised method with polyglycolic acid (PGA) felt with dropped fibrinogen and sprayed fibrin. The PGA felt (3 × 3 cm, Neoveil; Gunze Ltd., Kyoto, Japan) was laid on the tissue and a half volume of fibrinogen (Bolheal; Chemo-Sero Therapeutic Research Institute, Kumamoto, Japan) was dropped onto the felt. Finally, the remaining fibrinogen and thrombin were sprayed onto the tissue simultaneously. The total amounts of fibrinogen and thrombin that were applied were .1 mL/cm^2 and .05 mL/cm^2, respectively. In method 2, a fibrin collagen sheet (TachoSil; Tissue Sealing Sheet, CSL Behring, Tokyo, Japan) was applied to an area measuring 3 ×3 cm.

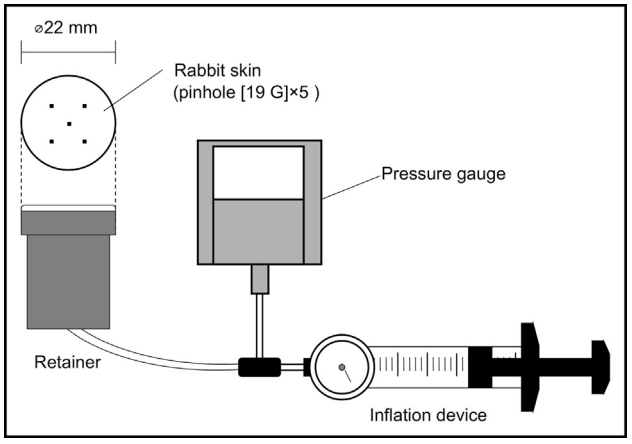

Figure 1 Experimental equipment used for the sealing test. The equipment includes a 22-mm diameter steel bottle that is covered with rabbit skin. The bottle has five 19-G diameter pinholes in the center, an inflation device, and an interconnected pressure gauge for measuring bursting pressure.

Patients

Fifty consecutive patients (29 men and 21 women) with hypersplenism who underwent laparoscopic splenectomy at the National Hospital Organization Kyushu Medical Center, and at Kyushu University Hospital from April 2009 to March 2014, were prospectively assessed. The mean age of the patients was 55.1 ± 12.5 years (range, 40 to 77 years). The etiologies were hepatitis C virus–related cirrhosis (n = 43), hepatitis B virus–related cirrhosis (n = 4), alcoholic cirrhosis (n = 2), and cirrhosis of unknown origin (n = 1). Indications for laparoscopic splenectomy included difficulties in induction or continuation of pegylated-interferon therapy plus ribavirin due to thrombocytopenia (n = 31), difficulties with therapies for hepatocellular carcinoma due to thrombocytopenia (n = 12), and a bleeding tendency due to thrombocytopenia (n = 7). Patients who had converted open surgery, those who had emergency surgery, and those who had nonstandardized laparoscopic splenectomy performed were excluded from this study.

During the 1st period (April 2009 to August 2010), 23 consecutive patients underwent laparoscopic splenectomy with a fibrin collagen sheet (fibrin sheet group). During the