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Hand-assisted Laparoscopic Splenectomy and Devascularization of the Upper Stomach in the Management of Gastric Varices

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Abstract

Background: Bleeding from esophagogastric varices is the major cause of death in patients with portal hypertension. Although esophageal varices can be treated with endoscopic procedures, the treatment for gastric varices is still controversial. The aim of this study was to describe a surgical technique and our preliminary results of hand-assisted laparoscopic Hassab's procedure.

Methods: Between February 2002 and May 2005, we performed 7 cases of gastric varices with this type of operation. The patients included 4 men and 3 women who ranged in age from 23 to 74 years (underlying liver disease: 5 case of liver cirrhosis, 1 case of polycystic disease, 1 case of extrahepatic portal vein obstruction). After splenctomy was performed, we devascularized the vessels of the upper stomach and the esophagus 5 cm away from the esophago-cardia junction.

Results: The operative time ranged from 132 to 290 minutes. Intraoperative blood loss was estimated to be from 50 ml to 475 ml. The weight of removed spleen ranged from 110 g to 800 g. During the follow-up period, all gastric varices disappeared and no bleeding from varicose veins was observed. All patients had hypersplenism with thrombocytopenia before surgery (mean: $11.1 \pm 7.4 \times 10^4$/ml), which was improved postoperatively (mean: $30.8 \pm 19.0 \times 10^4$/ml). This data were statistically significant ($P = 0.033$). One patient died of aspiration pneumonia related to postoperative pyloric stricture.

Conclusions: Although there is no agreement concerning the best treatment of gastric varices, the hand-assisted laparoscopic Hassab's operation is a safe, moderately invasive method, and its outcome appears to be equal to that of other open procedures.

Bleeding from esophagogastric varices is the major cause of death in patients with portal hypertension. Although esophageal varices can be treated with endoscopic sclerotherapy and ligation therapy, the endoscopic treatment for gastric varices is still controversial.[1–3] Several reports recommend surgical interventions such as a portosystemic shunt, esophageal transection, distal splenorenal shunt, transjugular intrahepatic portosystemic stent shunt (TIPS), balloon-occluded retrograde transvenous obliteration (B-RTO), or devascularization with splenectomy (Hassab's procedure) (Table 1)

Here we describe a surgical technique performed at our institution and our preliminary results of the hand-assisted laparoscopic Hassab's procedure.

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MATERIALS AND METHODS

Between February 2002 and May 2005, we treated 7 patients with gastric varices with this type of operation.

Table 1.
Surgical interventions for gastric varices

Procedures	Rebleeding rate (%)	Complications	References
Sclerotherapy	20–53	Systemic embolization	1, 4, 5
TIPS	20–50	Stent stenosis/thrombosis	6, 7
		Hepatic dysfunction	8, 9
B-RTO	0–10	Worsening of esophageal varices	4, 10, 11, 12
DSRS	0–11	Shunt occlusion	13, 14
		Encephalopathy	15
Esophageal transection	0–37	Anastomotic leakage	16, 17
		Anastomotic stenosis	18
Hassab's operation	11–12	Gastric outlet obstruction	14, 19

TIPS: transjugular intrahepatic portosystemic shunt; B-RTO: balloon-occluded retrograde transvenous obliteration; DSRS: distal spleno-renal shunt.

Table 2.
Clinical factors in patients who underwent Hand-assisted laparoscopic Hassab's operation

Patient no.	Gender	Age	Underlying disease	Hepatitis	Child's class	Initial treatment forgastric varices	Indication for the operation
1	Female	23	Polycystic disease	None	B	Balloon tamponade	Active bleeding
2	Male	50	Alcoholic liver cirrhosis	None	A	EVL	Red spot
3	Male	63	Alcoholic liver cirrhosis	None	A	–	Increasing size
4	Male	63	Liver cirrhosis	HCV	C	–	Red spot
5	Female	74	Liver cirrhosis, hepatoma	HCV	C	–	Red spot
6	Female	59	Extrahepatic portal vein obstruction	None	B	–	Increasing size
7	Male	38	Liver cirrhosis	HBV	A	EIS	Increasing size

EVL: endoscopic variceal ligation; EIS: endoscopic injection sclerotherapy; HCV: hepatitis C virus; HBV: hepatitis B virus.

The indications for the operation are fundal isolated gastric varices, the presence of red spots, and increasing size of the varices. When present, these findings are considered significant risk factors for acute bleeding.[4] Patients included 4 men and 3 women, and they ranged in age from 23 to 74 years. The procedure and clinical results were evaluated from various points (Table 2)

Surgical Technique

This operation is performed in two stages. After induction of general anesthesia, the patient is placed on the surgical bed in the right semi-lateral recumbent position. To facilitate manual access, a 6-cm horizontal skin incision is made in the right upper quadrant. The location of this skin incision depends on the patient's body habitus and/or the size of the spleen. When the patient has splenomegaly, a laparoscope is introduced through the subumbilical port. After the laparotomy incision is made, a hand port (LAP DISC, Ethicon Endo-Surgery, Cincinnati, OH, USA) is introduced through that incision. A second 12-mm port is then introduced 7 cm to the left of the umbilicus.

By means of a vessel-sealing system (Liga-Sure Atlas, Valleylab, Boulder, CO, USA), we can approach the inferior pole of the spleen and divide the splenocolic ligament with minimal hemorrhage. The surgeon's left hand is used to increase tension between the spleen and the greater curvature of the stomach, which makes the approach much easier and safer than the standard laparoscopic approach.[20] The division of the gastrosplenic ligament and devascularization of the short gastric vessels are accomplished with the same device. After the aforementioned steps are completed, the surgeon's finger can pass through the dorsal side of the splenic hilum. Using that hand to assist, the operator can directly palpate the pulsation of arteries during the operation. In doing so, if there is a rupture of the collateral vessels during the procedure, the operator can place direct pressure to achieve immediate hemostatic control. Immediate and direct hemostatic control with the surgeon's hand is an important advantage of the hand-assisted technique. A 40-mm linear stapler (white color) (Endo-GIA, United States Surgical, Norwalk, CT, USA) is inserted into the splenic hilum. Both the splenic artery and vein are divided together by this procedure. In patients with liver cirrhosis,

the splenic artery and vein are sometimes dilated and run irregularly. As it is always difficult to isolate these vessels, we divide them together using a linear stapler. The spleen is then mobilized from the retroperitoneum. The freely mobile spleen is removed from the abdominal cavity by bag via a minilaparotomy incision.

For the second stage of the procedure, the patient is turned to the supine position. A 30-degree laparoscope is inserted into the port made in stage 1. Devascularization is performed in an inferior-to-superior manner, starting at the middle of the greater curvature of the stomach. The devascularization is performed between the gastric serosa and dilated veins. With the use of a Liga-Sure Atlas device, this procedure can be performed without significant bleeding. Then the gastrohepatic ligament is opened and devascularization of the lesser curvature is performed by the same method. At this point in a patient with gastric varices, a large draining vein will be seen in the area of upper gastric fundus. This vessel is ligated with laparoscopic clips. Then, after isolation of the anterior and posterior vagus nerves with the surgeon's finger, the esophagus is pulled downward. Vessels are dissected superior to a point 5 cm away from the esophagocardia junction.

Injury of vagus nerves during this procedure sometimes results in pyloric stricture, which can cause delayed gastric emptying and may lead to aspiration. To minimize these complications we suggest a technique that can be performed by the surgeon during the operation. A gastric drainage procedure is usually recommended to prevent subsequent postovagotomy gastric outlet obstruction from pylorospasm. To perform this technique, the surgeon reaches into the pylorus and grasps the sphincter muscle, which can then be crushed to facilitate gastric emptying postoperatively (finger bougie method). This procedure has been reported to be successful after truncal vagotomy.[21,22] Finally, a closed suction drain is placed into the splenic fossa and the operation is completed.

Statistical Analysis

Data are reported as mean ± SEM. Statistical analysis was performed using the paired Student's *t*-test for comparison between preoperative and postoperative status. Differences were considered as significant if $P < 0.05$.

RESULTS

The operative time ranged from 132 to 290 minutes (mean: 184.3 ± 54.9 minutes). Intraoperative blood loss ranged from 50 to 475 ml (mean: 166.4 ± 152.7 ml). The weight ranged from 110 to 800 g (mean: 422.1 ± 227.2 g).

All patients resumed food intake on postoperative day 5. There were no episodes of postoperative bleeding. There was one death (case 5). The patient suffered from pyloric stricture and delayed gastric emptying. Ten days after the operation, we dilated her pylorus with a balloon dilator via endoscopy. After the initial treatment the patient's condition improved and gastric function resumes. However, 20 days later another pyloric stricture developed with concomitant aspiration pneumonia. The patient died on postoperative day 40 as a result of acute respiratory distress syndrome (ARDS) secondary to aspiration pneumonia.

In the remaining patients, during the follow-up period, all gastric varices disappeared and no bleeding from varicose veins was observed. To date, one patient (case 2), at 1 year and 10 months after the surgery, has developed esophageal varices. The varices are small and no treatment has been necessary.

All patients had hypersplenism with pancytopenia before the surgery and the preoperative platelet count ranged from 5.9 to 27.5 $\times$ 10^4/ml (mean: 11.1 ± 7.4/ml). At postoperative week 1 the platelet count ranged from 10.7 to 65.5 $\times$ 10^4 /ml (mean, 30.8 ± 19.0/ml). This finding was statistically significant ($P = 0.033$) (Table 3).

CONCLUSIONS

Patients with portal hypertension have a mortality rate of 30%–50% at the first episode of esophgogastric variceal rupture.[4] The associated 1-year mortality rate is reported to be 75%.[23,24] The ideal treatment for gastric varices should effectively control bleeding and improve the liver function to optimum levels. Recently, endoscopic treatments, such as injection sclerotherapy (EIS) and endoscopic variceal ligation therapy (EVL), have showed great promise for esophageal varices; however, there is still controversy regarding the treatment of gastric varices.[5]

Transjugular intrahepatic portosystemic stent shunt (TIPS) may be one of the choices for portal decompressive surgery; however, the long-term results of TIPS present some problems. Hepatic dysfunction may progress after TIPS with radical portal diversion. The failure rate of TIPS, including blockage of the stent, is reported to be as high as 30%–80% at 1 year post-TIPS,[6,7] and it often leads to clinically significant variceal hemorrhage.[25]

Table 3.
Operative and postoperative results

Patient no	Operation time (min)	Estimated blood loss (ml)	Spleen weight (g)	Food intake	Platelet count before operation	Platelet count 1 week after operation	Postoperative events	Duration of follow-up (months)	Recent platelet count
1	143	50	535	POD 2	7.9	65.5	No bleeding	41	22.1
2	290	475	370	POD 4	27.5	55.8	Esophagal varices 1 years 10 months	24	21.6
3	200	220	280	POD 3	11.1	16.8	No bleeding	21	13.3
4	132	70	300	POD 5	10.4	30.4	No bleeding	21	16.7
5	150	50	110	POD 3	7.2	10.7	Pyloric stricture Aspiration pneumonia	1[a]	13
6	165	100	800	POD 4	5.9	22	No bleeding	7	19.6
7	210	200	560	POD 5	8	26	No bleeding	5	22.4

[a]The patient died of acute respiratory distress syndrome due to aspiration pneumonia on POD 40.
POD: postoperative day.

Balloon-occluded retrograde transvenous obliteration (B-RTO) has recently been accepted in Japan for its relative effectiveness and safety in the treatment of gastric varices.[10] This procedure includes the occlusion of the portosystemic blood shunt. This shunting may cause great changes in portal blood flow, which sometimes results in the development of esophageal varices after this procedure.[11] Particular attention should be taken in the selection of patients for this procedure.

In the past 10 years, corrective surgical options have lost their value because of the increasingly widespread use of noneoperative interventions.[26] A selective shunt operation, such as a distal splenorenal shunt (DSRS), has been widely accepted in Western countries. This procedure was first practiced and introduced by Warren and colleagues in 1967.[27] It involves selective drainage of the esophagogastric venous complex into the systemic circulation. In experienced hands, DRSR is quite effective in decompressing the portal pressure and arresting active variceal bleeding. However, the procedure is technically complicated, and unfortunately few centers have adequate expertise. A meta-analysis has shown that the incidence of hepatic encephalopathy and mortality was increased significantly either in nonselective or selective shunt operations.[13] Recently, a small-diameter interposition portocaval shunt using a polytetrafluoroethylene graft (H-graft portocaval shunt, HGPCS) has been described. Rosemurgy *et al.*[8] have reported that the H-graft maintains its patency much better than TIPS, and they concluded that surgical shunting using HGPCS should have a greater role for decompressing portal hypertension.

In 1964, Hassab reported a successful technique of esophagogastric decongestion and splenectomy, which was performed mostly for schistosomiasis.[28] In 1977, Sugiura and Futagawa introduced extensive esophagogastric devascularization with esophageal transaction.[29] According to Japanese case reports, the result of this procedure have been excellent, with a re-bleeding rate of less than 10%.[26,30] However, this technique has not been widely accepted in the Western countries because of its high postoperative morbidity and mortality.[16–18] Gastric devascularization and splenectomy without transection of the esophagus (Hassab's procedure) is a less invasive method. One disadvantage of the Hassab operation is that esophageal varices may occur because the Hassab procedure cannot block venous blood flow in the esophageal wall. However, in a recent study, this disadvantage was minimized by combining the Hassab operation with endoscopic sclerotherapy which has had satisfactory results.[31,32] A significant merit

of the Hassab operation compared with other interventions is that when combined with splenectomy, the development of thrombocytopenia can be avoided. It is known that after splenectomy, there is an elevation of platelet count.[14] This expected rise in platelet count may be of great benefit to the surgeon, especially in the event that the patient needs further surgical intervention, for example in the case of hepatoma with liver cirrhosis. Hassab's operation can preserve portal blood flow, which produces lower incidence of hepatic encephalopathy. This surgical intervention should be considered to be one of the safest techniques currently in use for these cases.

Laparoscopic surgery is a less invasive method than open surgery, but the laparoscopic surgery for portal hypertension is still considered a high-risk operation, with collateral venous change and severe splenomegaly and a bleeding tendency.[33] However, with the advancement of laparoscopic surgical devices, such as the ultrasonically activated coagulating shears (Harmonic Scalpel, Ethicon EndoSurgery, Cincinnati, OH, USA), the vessel-sealing system (Liga-Sure-Atlas), and the autosuture device (Endo-GIA), the outcome has improved. In our institution, with the surgeon's use of one hand in the hand-assisted laparoscopic Hassab operation, this procedure has for us become a much easier and a safer method.[34,35]

It should be noted that in our series we had one death in the early postoperative course, on day 40. The patient suffered from pyloric stricture and delayed gastric emptying. This complication may have been due to inadvertent vagus nerve injury. To avoid this complication, pyloroplasty should be considered.

Although there is no agreement about the best treatment of gastric varices, the hand-assisted laparoscopic Hassab's operation should be considered a safe and effective method, and its outcome appears to be equal to that of other open surgeries. Additional comparative studies are necessary to further delineate the optimum treatment of gastric varices.

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