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Laparoscopy-Assisted Hepatectomy for a Large Tumor of the Liver

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ABSTRACT

We performed a laparoscopy-assisted hepatectomy on a 52-year-old woman with a large hepatic cavernous hemangioma (longest diameter, 8.5cm). With the use of Pringle's maneuver, the left lateral segment of the liver was resected with a Cavitron ultrasonic surgical aspirator (CUSA) while lifting the abdominal wall. Postoperative hepatic dysfunction was mild and transient, resolving spontaneously early after surgery. We intend to expand the indications of this minimally invasive procedure for hepatic resection.

Key words: *Laparoscopy, Liver tumor, Hepatectomy*

Recently, minimally invasive operations are often used in the management of benign diseases, and laparoscopic surgery is now considered the procedure of choice for cholelithiasis. Here we describe a patient with hemangioma of the liver who underwent a laparoscopy-assisted hepatectomy and we discuss related cases reported in the literature.

CASE REPORT

The patient was a 52-year-old woman with left hypochondralgia whose mother had a history of hepatic cirrhosis. The patient had a total hysterectomy at 43 years of age. Around 1995, she began to have occasional pain in the left hypochondrium. Abdominal distension developed subsequently. She had malaise during the last 10 days of July 1996 and consulted a local clinic, where an ultrasonographic examination and a computed tomography (CT) scan of the abdomen disclosed multiple tumors in the liver. She was referred and admitted to our hospital in August 1996.

On physical examination, there was no evidence of anemia or jaundice. No abnormalities were present in the heart or lungs. The abdomen was flat and soft. Palpation of the left upper abdomen revealed an elastic hard, tender mass. A surgical scar was noted in the midline of the lower abdomen.

Blood chemical analysis demonstrated a slightly elevated serum cholesterol concentration. There was no anemia or jaundice. Liver and kidney functions were normal (Table 1).

Ultrasonographic examination disclosed 5 hyperechoic masses in the liver (Fig. 1). Their dimensions were 6.3×6.5×6.7cm in segment II, 4.5×4.9×4.5cm in segment VII, 3.5cm (maximal diameter) in segment V, 2.0cm in segment VIII, and 1.0cm in segment IV. Digital subtraction angiography (DSA) revealed cotton-wool-like, well-staining lesions in the early arterial phase in segment II, segment VII, segment V, and segment VIII (Fig. 2). These lesions were diagnosed as hemangiomas. In addition, many small hemangiomas were noted. The hemangioma in segment V was treated by transcatheter arterial embolization (TAE) with Spongel during DSA. After TAE, a CT scan demonstrated two 3-cm uniform masses in the dome of the right lobe, a 4-cm mass in the posterior segment, and a 7-cm uniform mass below the left diaphragm. A magnetic resonance imaging (MRI) examination showed a mass with an irregular rim and uniform interior in the same position as did the CT examination after TAE. Its intensity decreased on T1 images and increased on T2 images.

These findings indicated the presence of multiple hemangiomas of the liver. We decided that surgi-

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Table 1. Laboratory data on admission

WBC (/mm³)	3800	Total bilirubin (mg/dl)	1.0
RBC (×104/mm³)	403	AST (IU/liter)	16
Hgb (g/dl)	12.9	ALT (IU/liter)	20
Hct (%)	37.2	LDH (IU/liter)	332
Platelet (×10³/mm³)	139	Ch-E (IU/liter)	330
PT (%)	77	ALPH (IU/liter)	174
		γ GTP (IU/liter)	24
ICG R15 (%)	1.6	T.P (g/dl)	6.8
ICG K	0.207	Albumin (g/dl)	4.4
		Total Cholest. (mg/dl)	257
AFP (mg/ml)	–	BUN (mg/dl)	13
PIVKA-II (AU/ml)	–	Creatinin (mg/dl)	0.59
		Na (mEq/liter)	140
HCV Ab	–	K (mEq/liter)	4.4
HBsAg	–	CL (mEq/liter)	106

PT; Prothrombin time; ICG R15: Indocyanin green retention rate at 15 min; AFP: alphafetoprotein; PIVKA-II: protein induced Vitamin K deficiency and antagonist II; HCV Ab: anti hepatitis C antibody; HBs Ag: hepatitis B surface antigen

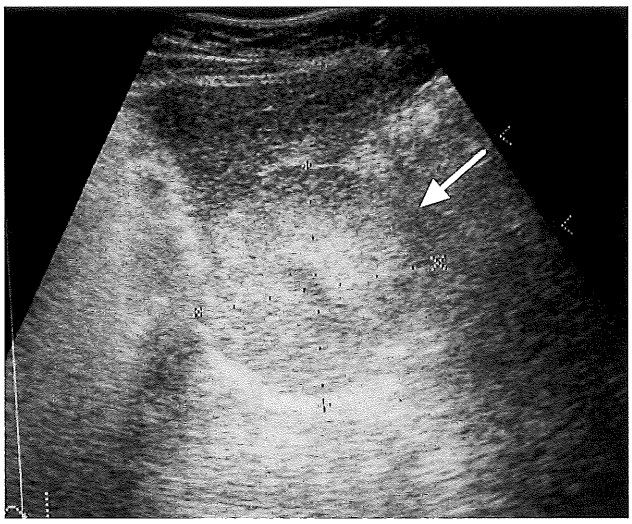

Fig. 1. Ultrasonography on admission noted 5 high echogenic masses in the liver. The largest was observed at 6.3×6.5×6.7cm in the lateral segment (segment II)

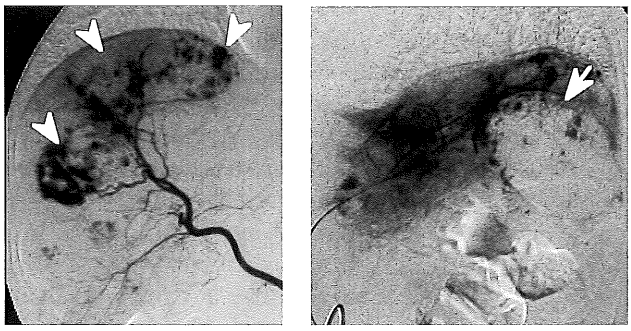

Fig. 2. Digital subtraction angiography revealed a cotton-wool-like appearance in segments II (arrow), V, VII and VII (arrow head) during early arterial phases.

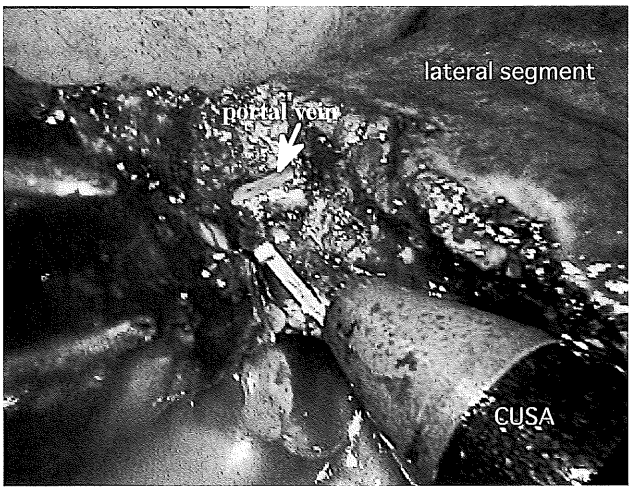

Fig. 3. Parenchymal transection of the liver was conducted by CUSA

cal treatment was indicated for the tumor located in the left lateral segment, which was associated with symptoms. A partial hepatectomy was performed with the assistance of a laparoscope.

Operative findings: Under general anesthesia, the abdomen was inflated with CO_2 gas, and a trocar was inserted through the lower umbilical region. Exploration of the peritoneal cavity revealed no abnormalities, such as adhesion. Trocars were then inserted through the epigastrium and the right hypochondrium. The hepatoduodenal ligament was secured by tape, used as a tourniquet for Pringle's maneuver. The abdominal wall was then lifted instead of being inflated. Three trocars were inserted through the left hypochondrium, and resection of the liver with a Cavitron ultrasonic surgical aspirator (CUSA) was initiated (Fig. 3). After partial hepatectomy via Pringle's maneuver was approximately three quarters completed, the incision of the epigastrium was extended to about 10cm, and the abdomen

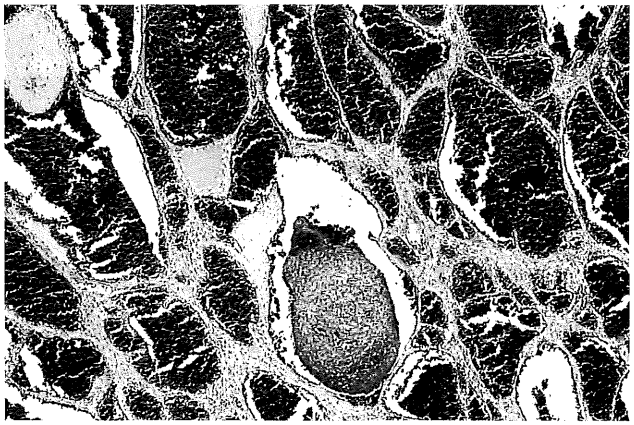

Fig. 4. Pathological findings: There are many proliferations of the vessel showing irregular dilatation. Proliferations are covered by endothelium without atypia, and filled with blood which partially organized. This tumor is diagnosed as a cavernous hemangioma of the liver (HE × 40).

was opened; hepatectomy was completed macroscopically. The Glisson sheeth and the hepatic vein were clipped and cut. There was no bleeding of the stump, and fibrin glue was applied. A penrose drain was placed in the stump, and the wound was closed to complete the operation. The operation lasted 6 hours 25 minutes; blood loss was 350ml.

The resected portion of the liver measured 11.5×6.0cm and weighed 98g. The tumor measured 8.5×6.0×4.0cm and was whitish. The cut section of the liver was dark red with a white compact lesion. The resected specimen had a dense layer of endothelium with wide vessels containing erythrocytes, indicating cavernous hemangioma (Fig. 4). The whitish part was coagulation necrosis.

The patient's aspartate aminotransferase (AST) and alanine aminotransferase (ALT) temporarily increased, but returned to normal range spontaneously. There was no evidence of infection, although she experienced mild pain. The patient began to eat orally 5 days after surgery and was discharged 22 days after surgery. She is being followed up on an out patient basis and is symptom free as of 1 year and 10 months after surgery.

DISCUSSION

Laparoscopic cholecystectomy was first performed in Japan in 1990 and became the standard procedure for cholecystectomy several years later. Laparoscopy-assisted procedures, including gastrectomy, colectomy, and appendectomy, were subsequently developed for surgery of the gastrointestinal tract. Laparoscopy-assisted operations are now used for surgery of parenchymal organs such as the spleen but laparoscopipc hepatectomy is not yet performed routinely. Several factors have discouraged the use of laparoscopic procedures for hepatectomy: 1) the liver crosses the abdomen and covers a wide area; 2) hepatectomy involves resection of a parenchymal organ; 3) only a limited visual field can be obtained beneath the diaphragm; and 4) inflation of the abdomen can cause air embolism through the damaged hepatic vein. We believe that surgical invasion should be minimized even in hepatectomy and that laparoscopy can facilitate operation in selected patients. The indications for laparoscopy-assisted hepatectomy are controversial. Yamanaka et al[5] recommended laparoscopy-assisted hepatectomy for the management of hepatocellular carcinoma measuring 4cm or less in diameter in patients who concurrently have severe liver cirrhosis. Because the objective of cancer surgery is cure, laparoscopy-assisted hepatectomy should be used only in patients whose tumors have a limited growth pattern. In brief, laparoscopic hepatectomy is feasible for 1) hepatic tumors located immediately below the liver surface; 2) single, nodular type tumors with no or limited evidence of spread; and 3) tumors with no preoperative evidence of vascular invasion. However, Katoh et al[2] reported that the indications for laparoscopic hepatectomy are similar to those for open hepatectomy, excluding tumors involving upper segments of the liver such as SVII and SVIII. This applies to patients whose liver has sufficient potential for regeneration after resection[4].

We performed laparoscopy-assisted hepatectomy in our patient because the tumor was 1) benign; 2) superficial with a well defined location; 3) was located in the lateral segment and could be easily mobilized, and; 4) located at the margin of the liver - thus, only a small volume of the liver had to be resected. Before laparoscopic hepatectomy is routinely used for curative resection of malignant tumors, many issues have to be critically evaluated. In our patient we performed laparoscopic hepatectomy using a tourniquet for Pringle's maneuver. A microwave coagulator has been used to perform hepatectomy[3-5], but this can cause postoperative complications, such as biliary fistula and infection of the resection stump[1,2]. The estimated number of laparoscopic hepatectomies performed with CUSA is small because of the need for meticulous hemostasis at the resection margin of the hepatic parenchyma. Hepatectomy can be easily performed laparoscopically by means of CUSA, often during Pringle's maneuver, thereby preventing biliary fistula and infection in the resection stump. We can identify and cut small vessels more accurately than with the use of a microwave coagulator. We therefore believe that laparoscopic hepatectomy performed by CUSA is safer than that performed by microwave coagulation. Since the tumor diameter in our patient was relatively large (8.5×6.0×4.0cm), a small incision was made in the last quarter of the operation to facilitate

removal of the resected tumor from the abdominal cavity and it was necessary to be careful to manage the hepatic vein at the end of the hepatectomy. However, laparoscopic hepatectomy with no incisions is possible for small tumors arising in the liver. With better definition of its indications, laparoscopy-assisted hepatectomy is expected to contribute substantially to the safe management of liver tumors.

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