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The evolving influence of laparoscopy and laparoscopic ultrasonography on patients with hepatocellular carcinoma

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Abstract

BACKGROUND: With the recent introduction of laparoscopic partial hepatectomy and laparoscopic/open radiofrequency ablation for hepatocellular carcinoma (HCC), the role of preoperative laparoscopic staging may be expanded. The objective of this study was to determine the role of preoperative laparoscopy and laparoscopic ultrasonography (USG) in patients with HCC.

METHODS: From January 2001 to April 2007, a cohort of 122 consecutive patients with a diagnosis of potentially resectable HCC underwent staging laparoscopy with laparoscopic USG before performing a major laparotomy in a tertiary referral center. The patients' data were collected prospectively. We have retrospectively analyzed the effect of implementation of this staging technique in our center.

RESULTS: Preoperative laparoscopy and laparoscopic USG was successful in 119 patients (97.5%). Forty-four patients were found to be unresectable after laparoscopic staging, whereas 2 patients were found to be unresectable after exploratory laparotomy. The total number of patients who underwent curative liver resection was 73 (laparoscopic partial hepatectomy, 22 patients; open partial hepatectomy, 51 patients). The median hospital stay of the laparoscopic liver resection group was significantly shorter than that of the open resection group (8 vs 13 d; $P = .002$). Intraoperative treatment for patients with unresectable HCC, including local ablative therapy, or combined liver resection and local ablative therapy, was performed in 27 of 45 inoperable patients (60%) (laparoscopic approach, 8 patients; open approach, 19 patients). The median hospital stay of the laparoscopic treatment group was significantly shorter than for the open treatment group for patients with unresectable HCC (5 vs 7 d; $P = .003$). In this study, a laparoscopic treatment approach for HCC was performed in 25.2% of the study population.

CONCLUSIONS: Laparoscopy and laparoscopic USG have a significant effect both on identifying surgically untreatable disease and in selecting the optimal treatment strategy. Some patients will benefit from a laparoscopic therapy approach. Therefore, it argues for more widespread use in laparoscopic staging procedures for patients with potentially resectable HCC.

Hepatocellular carcinoma (HCC) is the fifth most common cancer in the world. It accounts for 5.6% of all human cancers. The number of new cases is estimated to be 564,000 per year. Eighty percent to 90% of HCC develops in cirrhotic liver.[1–3] Liver resection and liver transplantation remain the options that give the best chance of a cure.

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However, only a small percentage of patients are surgical candidates. Determining the operability of HCC requires an assessment of the extent of the disease, liver functional reserve, and the patient's general condition.

Laparoscopy and laparoscopic ultrasonography (USG) have been found to be useful in staging a variety of intra-abdominal malignancies. However, this practice is not universal for patients with HCC. Advances in the quality of preoperative imaging have led to accurate radiologic prediction of resectability and this also may diminish the usefulness of preoperative laparoscopic staging for HCC. Until now, only a few studies have evaluated the role of laparoscopy and laparoscopic USG specifically in patients with HCC.[4–7] Laparoscopic USG is a technique that combines the principles of high-resolution intraoperative contact ultrasound with those of the laparoscopic examination, and thus allows the surgeon to perform a detailed assessment of the liver. With their use in patients with HCC, unnecessary laparotomy also may be avoided with the detection of peritoneal metastatic nodules, major vessel invasion, severe cirrhotic status of the liver, and insufficient liver remnant. Patients with unresectable HCC can benefit from a shorter hospital stay, a lower surgical morbidity rate, and an earlier intervention with another palliative procedure.

With the recent introduction of laparoscopic partial hepatectomy and laparoscopic/open radiofrequency ablation (RFA) for HCC, the role of preoperative laparoscopic staging may be expanded. Laparoscopic partial hepatectomy of HCC is still a matter of debate because the long-term results are not known yet. Currently, the laparoscopic approach is used mainly for minor hepatic resections, wedge resections, segmentectomy, and bisegmentectomy.[8,9] Open partial hepatectomy is still the standard of curative resection. In addition, RFA recently has gained attention as a promising technique for the treatment of HCC. It induces temperature change by using high-frequency alternating current applied via electrodes placed within the tissue to generate areas of coagulative necrosis and tissue dessication.[10] RFA has been shown to require significantly less sessions than percutaneous ethanol injection to obtain the same response rate and is proposed to better control the local disease. RFA of HCC can be accomplished by an open, laparoscopic, or percutaneous approach. The open and laparoscopic approaches have the potential advantages of the ability to more precisely stage the disease and the ability to use intraoperative ultrasonography to detect additional tumors not seen by imaging before.[11] RFA is indicated in patients with small HCC confined to the liver, especially when the tumors are unresectable owing to the poor general condition of the patient or because of compromised liver function. The application of RFA has a number of potential advantages in patients with unresectable HCC. The procedure is relatively safe and well tolerated and its complication rates in most series have been low.

Preoperative laparoscopy and laparoscopic USG may have a significant effect both on identifying surgically untreatable disease and in selecting the optimal treatment strategy. The objective of this study was to determine the role of preoperative laparoscopy and laparoscopic USG in patients with HCC.

Methods

The study population was a consecutive series of patients with HCC presenting to a tertiary care referral center. All patients had a chest radiograph, USG of the abdomen, and contrast computed tomography (CT) scan of abdomen. A hepatic artery angiogram with follow-up lipiodol-CT scan was performed in selected patients. Laboratory blood tests including hepatitis B surface antigen, antibodies to hepatitis C, serum α-fetoprotein level, serum albumin level, serum total bilirubin level, aspartate aminotransferase level, alanine aminotransferase level, and prothrombin time were obtained and the Pugh's modification of Child's grading was determined. Further investigations were performed only when there was clinical suspicion of extrahepatic metastases. Radiologic studies were reviewed in a multidisciplinary case management meeting held weekly.

A subumbilical open technique was used to insert a 10-mm port, and pneumoperitoneum was established with carbon dioxide insufflation to a maximum pressure of 12 mm Hg. By using a 30° laparoscope, the liver surface, porta hepatic region, and peritoneal surface were inspected. A second access port was inserted into the right upper quadrant at the midclavicular line under video guidance. The laparoscopic USG (flexible probe, 7.5 MHz; Aloka, Tokyo, Japan) was inserted through this port and was placed in contact with the liver and the porta hepatis.

Treatment options represented a continuum ranging from open or laparoscopic partial hepatectomy, combined partial hepatectomy plus local ablative therapy, local ablative therapy alone, transarterial chemoembolization (TACE), or no treatment.

Partial hepatectomy was the choice of treatment for resectable disease. Laparoscopic liver resection is used mainly for minor hepatic resections, wedge resections, segmentectomy, and bisegmentectomy. We only recruited those patients with liver tumor less than 5 cm in size at anterior inferior peripheral segments (Couinaud segments 2, 3, 4b, 5, and 6) for laparoscopic resection. The liver functional reserve was assessed by a combination of Child-Pugh grading, liver biochemistry, and the predicted liver remnant volume after resection. The general criteria of unresectability of HCC included large size tumor with insufficient hepatic remnant after liver resection, extensive and multifocal bilobar tumors, extrahepatic spread of the disease, and tumor with main portal vein tumor thrombus/hepatic vein/inferior vena cava involvement.

Those patients with early HCC (<5 cm) who were not suitable for liver resection or transplantation underwent local ablative therapy. RFA was the first choice of local