Laparoscopic Liver Resection in the Treatment of Hepatocellular Carcinoma

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KEYWORDS

- Laparoscopic hepatic resection • Hepatocellular carcinoma
- Cirrhosis • Noncirrhotic HCC

Laparoscopic liver resection is an emerging technique in liver surgery. Although laparoscopy is well established for several abdominal procedures and is for some even considered the preferred approach, laparoscopic hepatic resection has been introduced into clinical practice more widely since 2000. Although the feasibility and efficacy of laparoscopic resections has been reported often, these procedures are performed only in experienced centers and only in a select group of patients. While initially performed only for benign hepatic lesions, the indications for laparoscopic resection have gradually broadened to encompass all kinds of malignant hepatic lesions, including hepatocellular carcinoma (HCC) in patients with cirrhosis. It is in cirrhotic patients that the advantages of the minimally invasive approach may be most evident.

The roles of transplantation, local ablation, chemoembolization, and chemotherapy in the treatment of HCC are addressed elsewhere in this issue. Surgical resection is the oldest therapeutic approach to hepatic malignancy. The treatment algorithm has grown increasingly complex over the years, and reflects both the complexity of the disease and the myriad of therapeutic options. For HCC, more than for any other abdominal malignancy, the role of each treatment option remains controversial, and for many patients there is no one correct answer. The decision has to take into account not only the extent of disease and patient-specific factors but the availability of other treatments and donor organ availability as well as the criteria for liver transplantation.

The purpose of this article is to report the worldwide experience with laparoscopic resection for HCC and to delineate its role compared with the “open” or laparotomy

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approach. The anatomic and surgical terminology in this article follows the International Hepato-Pancreato-Biliary Association (IHPBA) consensus *Brisbane 2000 Terminology of Liver Anatomy and Resections* as reviewed by Strasberg.[1] The terminology regarding technical aspects and types of laparoscopic resections is in concordance with the 2008 International Position on Laparoscopic Liver Surgery, namely The Louisville Statement 2008.[2]

HISTORY OF LAPAROSCOPIC LIVER RESECTION

The initial development of laparoscopic liver surgery was mostly driven by groups in France, Italy, and Great Britain. The first laparoscopic liver resection was reported by Gagner and colleagues[3] in 1992, who performed a wedge resection of a focal nodular hyperplasia. A few reports on laparoscopic wedge resections of rather peripheral and mostly benign lesions then ensued. The first reported resection of an HCC was published in 1995 by Hashizume and colleagues,[4] and the first anatomic laparoscopic resection, a left-lateral sectionectomy in 1996, by Azagra and colleagues.[5]

From a technical standpoint, these first efforts were all resections limited to the anterior, or "laparoscopic", liver segments 2, 3, 4b, 5, and 6, which are comparatively easier to access laparoscopically than the more posterior segments 1, 4a, 7, and 8. The first laparoscopic hemihepatectomy was performed by Huscher and colleagues in 1998.[6] It was not until 2000 that Cherqui and colleagues[7] published a prospective cohort of 30 laparoscopic resections, which was the first in a series of larger studies demonstrating the feasibility and safety of the laparoscopic approach. Since then, highly specialized centers have published their experience with laparoscopic wedge and minor resections, laparoscopic hemihepatectomies, extended resections, trisectionectomies, and resections in the laparoscopically difficult posterior segments (**Table 1**). In 2000, Fong and colleagues[8] described the hand-assisted laparoscopic approach to manually examine the liver for additional tumors and to rule out extrahepatic metastases, and Inagaki and colleagues[9] performed the first hand-assisted left-lateral sectionectomy in a cirrhotic patient. The first laparoscopic procurement of a living donor graft was reported in France in 2002.[10] The Glissonian approach, a selective intraparenchymal dissection to gain control of the vasculobiliary pedicle, was safely demonstrated by Topal and colleagues,[11] and a single-incision laparoscopic technique was first introduced in 2010.[12,13]

The development of laparoscopic liver resection and its clinical application has been closely linked to technical innovations especially regarding parenchymal transection. The first use of a disposable stapler to laparoscopically transect the hepatic parenchyma was published in 1993.[14] Mechanical fragmentation and argon beam coagulation were reported in 1994,[15] use of a hydrojet dissector and a Cavitron Ultrasonic Surgical Aspirator (CUSA; Tyco, Mansfield, MA) both in 1995,[16,17] the ultrasonic scalpel in 1998,[18] and the LigaSure device (Covidien, Boulder, CO) in 2005.[16,19] As in open liver surgery, the choice of one or other transection technique is mostly center-specific or surgeon-specific, and no single method has been show to be superior.

TERMINOLOGY AND TYPES OF LAPAROSCOPIC LIVER RESECTIONS

According to the 2008 International Louisville Consensus, there are 3 types of laparoscopic liver resections[2]:

1. Pure laparoscopic procedures
2. Hand-assisted laparoscopic liver resections
3. The hybrid technique.

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