Laparoscopic Liver Resection—Current Update

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KEYWORDS

• Laparoscopic liver resection • Laparoscopic hepatic resection
• Liver cancer • HCC • Colorectal cancer metastases

Laparoscopic hepatic resection is an emerging option in the field of hepatic surgery. With almost 3000 laparoscopic hepatic resections reported in the literature for benign and malignant tumors, with a combined mortality of 0.3% and morbidity of 10.5%, there will be an increasing demand for minimally invasive liver surgery.[1] Multiple series have been published on laparoscopic liver resections; however, no randomized controlled trial has been reported that compares laparoscopic with open liver resection. Large series, meta-analyses, and reviews have thus far attested to the feasibility and safety of minimally invasive hepatic surgery for benign and malignant lesions.[2–17] The largest single-center experience was published by Koffron and colleagues[3] and describes various minimally invasive approaches to liver resection, including pure laparoscopic, hand-assisted laparoscopic, and laparoscopic-assisted open (hybrid) techniques. The choice of the minimally invasive approach should depend on surgeon experience, tumor size, location, and the extent of liver resection.

This article reviews the literature on reports comparing laparoscopic with hepatic resections. Special emphasis is on the cumulative world literature on laparoscopic liver surgery, the consensus meeting on laparoscopic liver resection, the learning curve on laparoscopic liver resection, laparoscopic major hepatectomies, short-term benefits after laparoscopic liver resection, and survival outcomes for laparoscopic liver resection of hepatocellular carcinoma (HCC) and colorectal liver metastasis. Finally, financial cost comparisons are evaluated to determine the cost advantages or disadvantages of the laparoscopic approach.

WORLD REVIEW

Since the first laparoscopic liver resection was reported in 1992, there has been an exponential increase in the number of reported laparoscopic liver resection, with more than 127 published articles, totaling almost 3000 reported cases of laparoscopic liver resection.[1] Half of the reported cases were performed for malignant lesions and 45% for

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benign lesions. In addition, laparoscopic live donor hepatectomy was performed in 1.7% of cases. Several variations of the minimally invasive approach have been described, with the most commonly performed variation the pure laparoscopic approach (75%), followed distantly by the hand-assisted approach (17%) and the hybrid approach (2%). A hybrid approach is when the operation is started laparoscopically to mobilize the liver and perform the initial hilar dissection. Then, the parenchymal transection is completed through a small open incision or slight extension of the hand port incision.[18] The conversion rate from a laparoscopic approach to an open procedure was 4.1%. The most common type of laparoscopic liver resection performed is a wedge resection or segmentectomy (45%), followed by left lateral sectionectomy (20%). Major anatomic hepatectomies are still less frequently performed: right hepatectomy (9%) and left hepatectomy (7%). Cumulative morbidity and mortality was 10.5% and 0.3%.

INTERNATIONAL CONFERENCE ON LAPAROSCOPIC LIVER SURGERY

The first consensus meeting on laparoscopic liver surgery was held at the University of Louisville in Louisville, Kentucky, in November 2008, incorporating the opinions of the world's experts in laparoscopic and open liver surgery. The conference consisted of more than 125 liver surgeons from more than a dozen countries with 25 invited faculty members. From this meeting, consensus statements on laparoscopic liver surgery were formulated[19]:

1. Three terms should be used to describe laparoscopic liver resection: pure laparoscopy, hand-assisted laparoscopy, and the hybrid technique.
2. As in open hepatic resection, several different technical approaches for performing major laparoscopic liver resection have evolved. Similar to open liver surgery, no single method of parenchymal transection has been shown superior.
3. Major laparoscopic liver resections have been performed with safety and efficacy equal to that of open surgery in highly specialized centers.
4. The best indications for laparoscopic liver resection are in patients with solitary lesions, 5 cm or less, located in peripheral liver segments (segments 2–6). Major liver resections should be reserved for experienced surgeons already facile with more limited laparoscopic resections.
5. Conversion to an open liver resection should be performed for lack of case progression or patient safety.
6. Indications for surgery for benign hepatic lesions should not be expanded.
7. Resection (laparoscopic or open) remains the gold standard for the treatment of colorectal liver metastases.
8. When local resection for HCC is undertaken, it should be an anatomic segmental resection because this is associated with reduced local recurrence.
9. Laparoscopic live-donor hepatectomy remains the most controversial application of laparoscopic liver surgery and should only proceed in the confines of a worldwide registry.
10. A prospective randomized trial may be impractical due to difficulties defining the relevant study questions, the size of the study population, and the length of time to perform the trial. A cooperative patient registry may be more practical to help understand the role and safety of laparoscopic liver surgery.

THE LEARNING CURVE OF LAPAROSCOPIC LIVER RESECTION

Successful laparoscopic liver surgery requires expertise in advance laparoscopy and hepatobiliary surgery. An unknown number of cases, however, need to be performed