

# Safety and Efficiency of Laparoscopic Procedure for Liver Resection (Hepatectomy)

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**Abstract:** The aim of this review was to evaluate the safety and efficacy of laparoscopic liver resection surgery according to evidence based trails that were obtain to support our study. Conducted electronic search using MEDLINE and Embase database, searching published studies were identified by searching the (up to January ,2017). Restriction was applied during search strategy to English language articles only, search was performed using the keywords: ‘laparoscopy’, ‘liver resection’, and ‘liver surgery’ combined with ‘saefy’ and benefits” to identify all reports that may concerned to laparoscopic liver surgery. Furthermore, References lists of selected studies were searched for more relative articles to our concerned topic. Laparoscopic liver surgical procedure is a complex procedure requiring competence in both the laparoscopic strategy as well as liver surgical treatment. At the here and now time, it is constrained to few professional centers, but its diffusion is raising, as verified by the soaring number of just recently released documents on this topic. Indicators for laparoscopic hepatectomy do not vary from those for open surgery, and also technical expediency has been reported as the only restricting factor. Laparoscopic resections are practical and secure in selected patients with left-sided and also right-peripheral sores needing limited resection. Young patients with benign disease plainly benefit from preventing a major abdominal incision, as well as cirrhotic patients might have a lowered difficulty price.

**Keywords:** Laparoscopic Liver Resection Surgery, Hepatectomy.

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## 1. INTRODUCTION

Laparoscopic hepatectomy is significantly being carried out for malignant and benign liver lesions. Laparoscopic wedge resection (WR) and anatomic left side sectionectomy (LLS) of the liver are both most frequently performed hepatic laparoscopic treatments <sup>(1,2)</sup>. Laparoscopic significant hepatectomy, on the other hand, is a lot more practically demanding and is just executed as routine in a picked number of knowledgeable centres <sup>(3)</sup>. Laparoscopic liver resection (LLR) is just one of the last locations of resistance to the offensive of laparoscopic surgical treatment. Fifteen years after the initial reported LLR <sup>(4)</sup>, its diffusion is still restricted to few centers, as well as its results are not yet cleared up. The huge bulk of hepatic resections are stand-alone treatments, without any requirement for reconstruction, which ought to make them excellent prospects for a laparoscopic approach. The factors for the limited growth of such an approach to date are threefold <sup>(5)</sup>. First, technical troubles are anticipated as well as, undoubtedly, the primary maneuvers of open hepatic surgical treatment (consisting of hands-on palpation, organ mobilization, vascular control, and parenchymal transection) are believed to be tough to recreate laparoscopically. Second, there are expected dangers; hemorrhage may be more difficult to regulate laparoscopically, and also the risk of gas embolism could be boosted by the use of pneumoperitoneum. The 3rd problem is a worry of oncological inadequacy and also tumor spread <sup>(4,5)</sup>. Numerous research studies have clearly validated the security and expediency of LLR for the treatment of hepatocellular cancer (HCC) with a tumor dimension of  $\leq 5$  centimeters. The known advantages of laparoscopic surgical procedure in general consist of: (A) smaller marks and minimized medical injury; (B) decreased need for numbing pain relief, which helps with early ambulation; (C) shorter healthcare facility keep as well as earlier go back to function; (D) lowered price of complications such as ascites and liver failing, specifically in patients with liver cirrhosis and portal high blood pressure; (E) decreased physiological stress and anxiety and impact on immunological feature. The short-term end results of LLR transcend to

those of open liver resection (OLR) for HCC with a tumor size of  $\leq 5$  cm, and also long-term as well as intermediate-term end results are comparable between the two strategies <sup>(6,7)</sup>.

**The aim of this review was to evaluate the safety and efficacy of laparoscopic liver resection surgery according to evidence based trails that were obtain to support our study.**

## 2. METHODOLOGY

Conducted electronic search using MEDLINE and Embase database, searching published studies were identified by searching the (up to January ,2017). Restriction was applied during search strategy to English language articles only, search was performed using the keywords: ‘laparoscopy’, ‘liver resection’, and ‘liver surgery’ combined with ‘safety’ and ‘benefits’ to identify all reports that may concerned to laparoscopic liver surgery. Furthermore, References lists of selected studies were searched for more relative articles to our concerned topic.

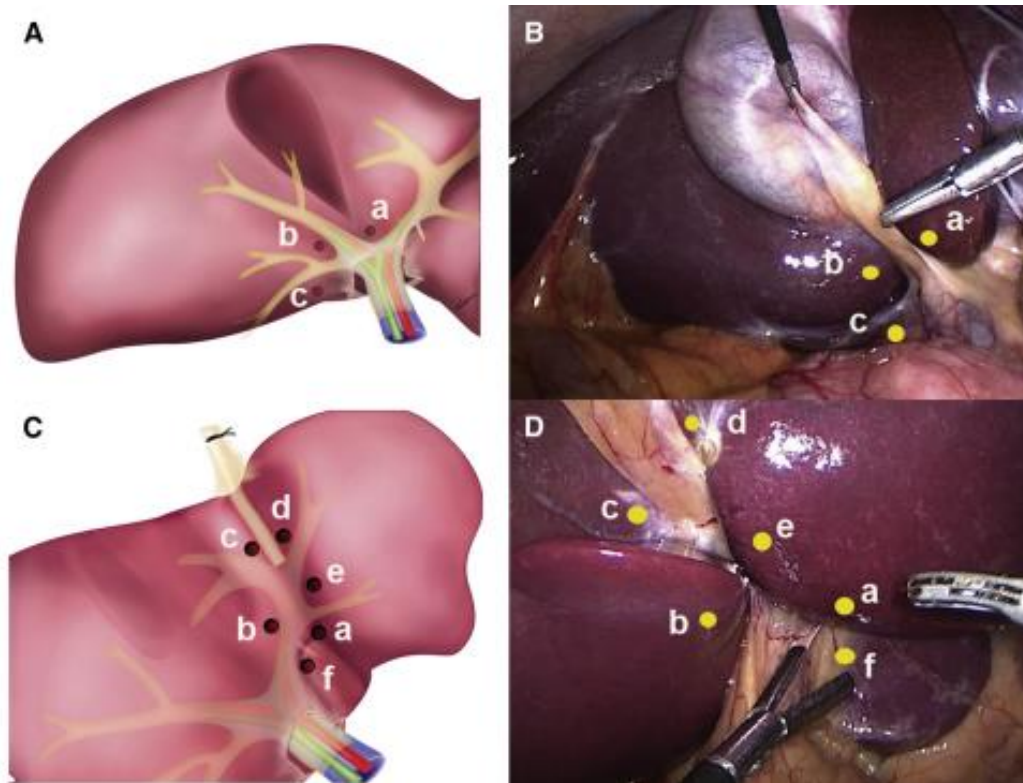
## 3. RESULTS

### ○ Overview of Laparoscopic hepatectomy:

The role of laparoscopy in surgery is an expanding field. Presently it is currently made use of in liver resections in establishments experienced with minimally intrusive medical strategies. There are numerous various minimally invasive strategies varying from total laparoscopic, hand assisted laparoscopic, to the more current robotic assisted liver resections. There have to do with 3000 reported laparoscopic liver resections in the literary works <sup>(7)</sup>. Most of instances have actually been done overall laparoscopic followed by hand aided laparoscopic. The most typical liver resections executed laparoscopically are wedge resections, followed by left side segmentectomy <sup>(7,8)</sup>. Normally, tumors in the perimeter of the liver are likewise thought about open to resection. Major hepatectomies (left or best hepatectomy) are not as typically performed. In the series reviewed by Nguyen et al., just concerning 9% of cases were left or right hepatectomy. Conversion price to open in one of the most knowledgeable hands is reported at 4.1% (8). In 2008 a consensus conference at the University of Louisville established guidelines for minimally intrusive liver surgical treatment <sup>(7,9)</sup>. Indications for minimally intrusive method include strong tumors  $<5$  centimeters, peripherally situated tumors in sectors 2-6, as well as major liver resections ought to be executed in very knowledgeable centers. The learning curve for minimally intrusive laparoscopic liver resections currently remains at 60 instances. Data currently shows the advantage of minimally invasive strategy to be lowered blood loss, shorter medical facility stay, as well as decrease use of pain medicine <sup>(8)</sup>. In metastatic colorectal cancer, the reported unfavorable margin is 94.4%, with overall survival of 50% at 5 years in patients <sup>(7,8,9)</sup>. In skilled centers, there does not appear to be any kind of distinction in disease total or cost-free survival in between open versus laparoscopic liver surgery. The technique includes utilizing ultrasonic shears to dissect parenchyma with positioning of clips on vessels or use of endo-GIA staplers for ligation of vasculature <sup>(9)</sup>.

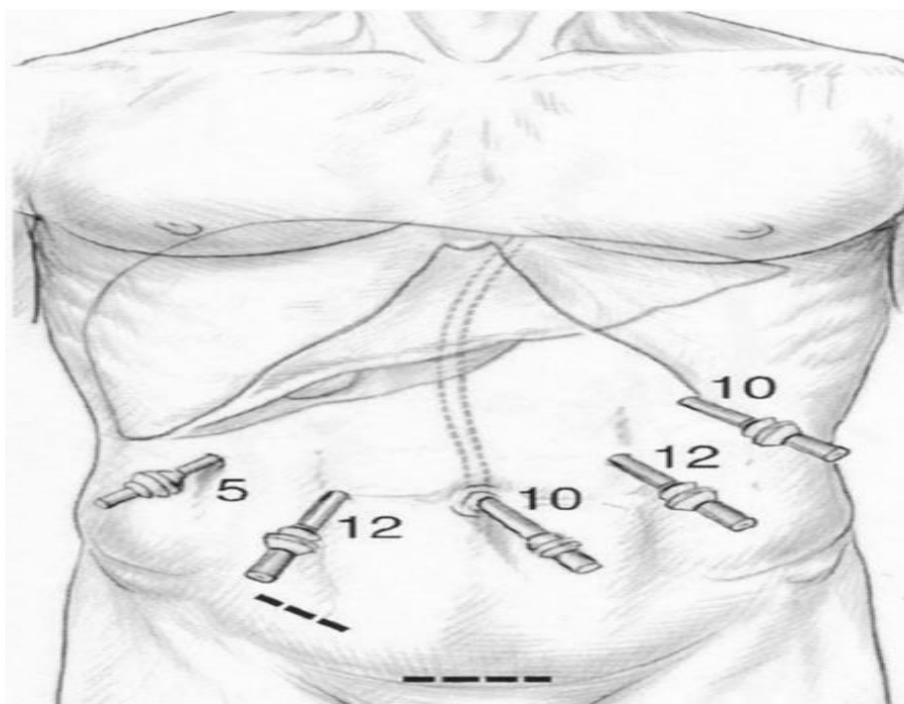
### **Surgical technique:**

Expedition of an ultrasonographic liver and the stomach cavity exam has to be done in all situations. Patients are put in the "French setting" with legs spread as well as curved at the knees with the specialist standing in between the patient's legs. 4 trocars are put as explained previously <sup>(10,11)</sup>. If the gallbladder is in place, a cholecystectomy is done, however the gallbladder may be maintained for grip and also exposure until completion of the treatment. The basic method is executed by studying and transecting the particular hepatic artery as well as portal blood vessel in right and also left hemihepatectomies <sup>(12,13)</sup>. For all various other segmental resections, anatomic estimation was utilized with laparoscopic ultrasonography for resolution of resection lines and parenchymal transection performed without hilar control. Parenchymal transection is executed making use of the harmonic scalpel (Ethicon, Cincinnati, OH), a bipolar clamp, as well as scissors with occasional ligaclips (Ethicon), and also endostaplers (Ethicon) for large blood vessels or Glissonian structures. In the Glissonian technique, we used 3 small liver lacerations around the hilar plate in accordance with specific structural spots <sup>(10,14)</sup>. A little (3-mm) incision is done directly cranial to the hilum, and a 2nd cut (**Figure 2, A**) is executed on the ideal side of the gallbladder bed. A 3rd cut is made vertical to the hepatic hilum in the shift area in between sections 7 as well as 1 (**Figure 1, A**). By a mix of these 3 incisions (**Figure 2, B**), it is feasible to control intrahepatically the Glissonian pedicle of the whole ideal hemiliver (a to c) or, selectively, the former (a to b) or posterior (b to c) areas of the ideal hemiliver <sup>(14)</sup>.

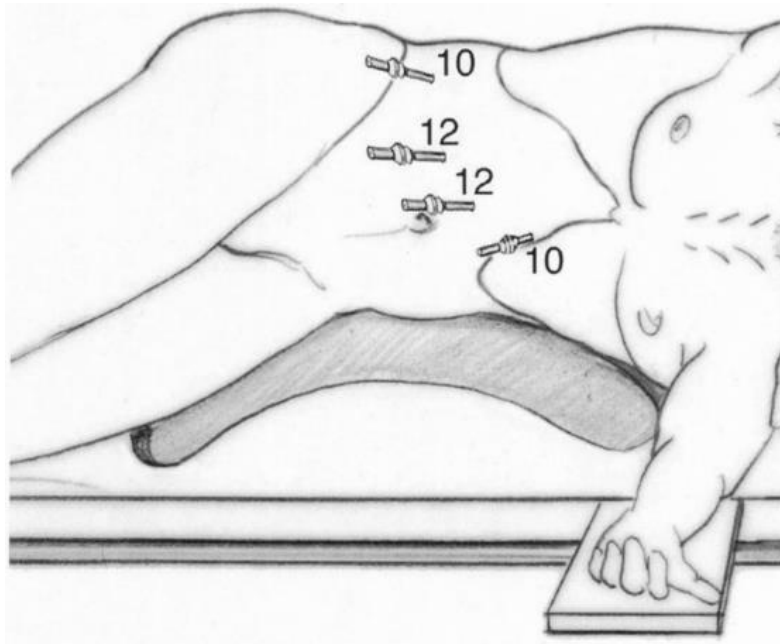


**Figure 1: Diagrams and intraoperative view of the anatomic landmarks for laparoscopic right and left liver resections.**

For resection of lesions in segments 2 with 5, the patient was placed in the supine placement, with reduced limbs apart. The surgeon was between the legs with one assistant on each side <sup>(15)</sup>. Port sites are shown in **(Figure 2)**. For sores in sector 6, the patient was put in the left side decubitus position to expose the posterior and also side aspect of the ideal wattle, as described for appropriate adrenal resections **(Figure 3)** <sup>(16)</sup>. The doctor was on the ventral side of the patient, with one assistant on the right as well as one more beyond of the table. Two monitors were utilized for the most parts <sup>(15,16)</sup>.



**Figure 2: Typical port placement for resection of lesions located in segments 2 through 5.**



**Figure 2. Typical port placement for resection of lesions in segment 6**

### **Complications:**

The certain difficulties associated with laparoscopic liver surgical treatment consist of threats of hemorrhage, biliary wounds, as well as gas embolism<sup>(17)</sup>. Hemorrhage and also biliary wounds are straight related to the specialist's experience and medical skill. The cosmetic surgeon should recognize ways to stay clear of as well as control these issues: appropriate intraoperative positioning during parenchymal transection as well as first breakdown of the biliary merging before significant hepatectomy is a requirement to safe surgical treatment. Because of this, we put five to six trocars, as defined in the methods section, high in the best flank, to allow far better visualization as well as to manage the very deep anatomical frameworks, notably the vena cava and hepatic veins. Concerns of gas embolism as a significant challenge to liver resection by laparoscopy<sup>(18,19)</sup> were based upon a hypothetic risk because of enhanced stomach stress. In an exhaustive testimonial of the literary works on hepatic surgical treatment, just two cases of extreme gas blood clot could be found<sup>(20)</sup>. Both cases were defined with using the argon light beam, which has actually because been specifically contraindicated (20).

### **Gas embolism as a complication of LP liver resection:**

A problem closely related to laparoscopic liver surgery is the pneumoperitoneum itself. The risk of gas embolism because of lesions of the hepatic blood vessels during parenchymal transection has been suggested. A transesophageal echocardiography research in a pet version demonstrated gas embolism in mostly all pets undertaking LLR, with cardiac arrhythmia in two-thirds of the situations<sup>(21)</sup>. A gasless laparoscopy has actually been suggested to prevent gas embolism<sup>(22)</sup>. The incident of gas blood clot in clinical method is extremely low. In 2002, Biertho et al.<sup>(23)</sup> examined published situations of LLRs and also reported just 2 instances of possible gas embolism in roughly 200 treatments. In recent collection<sup>(24,25)</sup> and also in various other research study experience<sup>(26)</sup>, only few instances of short-term moderate cardiovascular change due to embolism took place, without professional consequences. Co<sub>2</sub> pneumoperitoneum reduces the risk of gas embolism as compared with air, and low pneumoperitoneum pressure even more minimizes its occurrence<sup>(27)</sup>. The occurrence of gas embolism has been additionally associated with argon beam of light coagulation, which boosts endoabdominal pressure resulting in an enhanced risk of gas embolism<sup>(28)</sup>.

### **o Safety and benefits:**

Kaneko et al (29) reported that LLR may be a suitable alternative to OLR for the treatment of HCC with a tumor size of ≤5 cm. However, LLR has been considered to be contraindicated in patients with HCC with a tumor size of ≥10 cm, because of concerns that the radical resection rate may be lower and the inherent limitations of the procedure. It is currently unclear whether LLR is suitable for the treatment of HCC with a tumor size of 5–10 cm, and few studies have compared LLR and OLR in these patients. It is therefore essential to further investigate the safety and feasibility of LLR

for the treatment of HCC with a tumor size of 5–10 cm. In the present study, the clinical data of patients treated at our center of hepatobiliary surgery were retrospectively analyzed to confirm the feasibility of using LLR for the treatment of HCC with a tumor size of 5–10 cm, by evaluating parameters such as the rates of conversion to open surgery and complications. LLR and OLR were also compared to evaluate safety by analyzing survival and recurrence rates and the advantages of minimally invasive surgery. (Table 1) summarize most beneficial aspects of laparoscopic liver resection.

**Table 1: Benefits of Laparoscopic Liver resection:**

Benefits	Details
▪ <b>Smaller incisions</b>	▪ Surgeons make three or four tiny incisions, versus one large incision.
▪ <b>Faster recovery</b>	▪ Most people can usually leave the hospital after one or two days following surgery.
▪ <b>Less pain and scarring</b>	▪ You'll return home with three or four small adhesive bandages covering the tiny incisions.

Safety was not endangered, as demonstrated by the low price of significant postoperative problems. One research <sup>(30)</sup> results contrast extremely positively with the biggest open liver surgical procedure collection reporting bile leakage in 4%, perihepatic abscess in 3%, and also postoperative hemorrhage in 2.7% of patients, with a postoperative death rate varying from 0% to 6.6% <sup>(30)</sup>. The only postoperative death they observed was because of an extreme hemorrhage from esophageal varices in a patient that undertook sector 5 wedge resection for HCC. The oncological controversies in laparoscopic liver resection relate to the risk of port-site metastasis and the risk of medical resection margin compromise <sup>(30)</sup>. In this series, other research studies did not observe port-site deadly seeding. Recent large series analyzing surgical margin condition after open liver resections for CRCLM reported favorable margins in approximately 46% of patients <sup>(31,32,33)</sup>. They regularly used laparoscopic ultrasonography and successfully gotten an average healthsome margin of 12 mm as well as an R1 resection percentage of 3% (4% when taking into consideration CRCLM), excluding patients with NET transition. In the patients with NET transition, 35% had positive resection margins. A lot of the patients with NET transition went through debulking and cytoreductive surgery, with 65% having 3 or even more sores. The mean survival of patients with CRCLM is 6 to 9 months <sup>(34)</sup>. Hepatic resection provides long-term total survival in as much as 60% of cases, and also the present sign for medical resection of CRCLM ought to include all disease patterns that can be excised entirely with an appropriate residue liver volume that prevents hepatic failure <sup>(35)</sup>. Herein, A report a big single-center collection of laparoscopic CRCLM resections confirming exceptional temporary outcomes regarding morbidity and also conversion price. When extra severe repeated hepatectomies for reoccurring CRCLM or 2-stage laparoscopic liver resections for bilobar CRCLM are required, we showed that the laparoscopic technique is practical as well as secure even. Survival data approach other series consisting of significant as well as small liver resections, revealing that the laparoscopic method is connected with appropriate midterm survival <sup>(36)</sup>. The minimally invasive strategy has actually been suggested to be especially appropriate for the surgical therapy of HCC in patients with cirrhosis because the security veins of the stomach wall surface are more quickly preserved, resulting in much less portal hypertension and also improved reabsorption of ascites <sup>(37)</sup>.

#### 4. CONCLUSION

Laparoscopic liver surgical procedure is a complex procedure requiring competence in both the laparoscopic strategy as well as liver surgical treatment. At the here and now time, it is constrained to few professional centers, but its diffusion is raising, as verified by the soaring number of just recently released documents on this topic. Indicators for laparoscopic hepatectomy do not vary from those for open surgery, and also technical expediency has been reported as the only restricting factor. Patient selection must be precise and also take both tumor place and size into consideration. Gas embolism is uncommon as well as without medical value in majority of instances. Blood loss is still the major intraoperative worry, however, if handled by a specialist surgeon, does not intensify end results. Hand assistance can be handy in chosen cases. Laparoscopic resections are practical and secure in selected patients with left-sided and also right-peripheral sores needing limited resection. Young patients with benign disease plainly benefit from preventing a major abdominal incision, as well as cirrhotic patients might have a lowered difficulty price.

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