# Open Hepatoctomy versus Laparscopic Hepatoectomy in Patients with Benign Hepatic Lesions

**Sara Salem[1], Haidi A. Mohammed[1], Emad Hokkam[1], Ibrahim Abd El Kader[2], Soliman El Kammash[1], Ahmed Gomaa[1]**

[1]Surgical Oncology, Faculty of Medicine, Suez Canal University, Ismailia, 411522, Egypt

[2]National Liver Institute, Menufia University, Shebein El-koom, 32626, Menufia, Egypt

**Corresponding author:** Sara Salem,**Email:** ptrservices2022@gmail.com, **Tel.:** +201050366830

## ABSTRACT

**Background:** At facilities with qualified surgeons, laparoscopic methods for liver resection have gained recognition. The safety and viability of laparoscopic liver resection have improved thanks to improved methods and technological developments that have/ made it possible to regulate intrahepatic blood vessels and bile ducts better. Liver resection by minimally invasive techniques is still up for discussion. **Aim:** The goal of this study is to assess the immediate postoperative results of hepatic resection for benign hepatic lesions.

**Patients and methods:** One hundred patients with a benign hepatic focal lesion participated in this cross-sectional study, 85 patients underwent open hepatoectomy and 15 patients underwent laparoscopic hepatoectomy. **Results:** There was no significant difference found among study groups in operative time and intraoperative complications however, bleeding was insignificantly greater among open group. Postoperative complications were higher among open group as post hepatoectomy liver failure, bile leak, chest infection, wound infection and cardiac complications but with statistically insignificant differences (p>0.05). **Conclusion:** This research compared the effectiveness of laparoscopic versus open liver resections, the laparoscopic group experienced fewer problems and had lower morbidity.

**Keywords:** Benign hepatic lesions, Hepatoectomy, Laparoscopic

## INTRODUCTION

A wide range of benign neoplastic and regenerative processes are present in benign hepatic tumours. Owing to improvements in immunohistochemistry and imaging techniques like MRI, CT-scan, and ultrasound, a high percentage of patients receive the correct diagnosis without laparotomy or resection **(1)**.

The two primary methods used nowadays for hepatectomy are open and laparoscopic. The liver's vascular structure was discovered, and its several sections with their own blood supply were identified. The practise of liver resection spread to numerous global centres **(2)**.

With increased experience and better technical tools, surgeons were able to do liver resections with greater effectiveness and safety. To better access liver abnormalities, laparoscopy was routinely used with hand aid. In accordance with current NICE guidelines, laparoscopic resection should be used to treat hepatocellular carcinoma (HCC), benign liver tumours, and cysts, as well as solitary liver metastases from colorectal cancer. Nowadays, Laparoscopic liver resection (LLR) is used to treat both benign and malignant liver tumours. It is frequently used to treat peripheral tumours, especially left lateral sectionectomy **(3–6)**. Hepatectomy has been linked in recent years to lower morbidity and mortality rates. This has caused the surgical procedure to be used more widely, individuals with benign liver lesions are now included in its indications. The removal of the liver is still a major operation **(7)**.

This research aimed to assess short term surgical outcome of hepatic resection surgeries of benign hepatic lesions**.**

## PATIENTS AND METHODS

One hundred patients with benign hepatic focal lesion were enrolled in this cross-sectional study from the Oncology Department at Suez Canal University Hospital in Ismailia, Egypt and Surgery Division, Egyptian National Liver Institute, Menufia.

Cases with symptoms, a mass effect on the biliary tree or the gastrointestinal tract, an inflammatory response, spontaneous rupture, pedunculated lesions because of the risk of pedicle torsion and when the diagnosis cant be made using the imaging techniques currently in use, were all inclusion criteria. Patients with ASA III and IV, cardiovascular disease, asymptomatic patients, minor benign lesions, and cirrhotic liver were all excluded from consideration.

All study participants underwent hepatectomy procedures at either the Suez Canal University Teaching Hospital or the National Liver Institute in Menofia, both of which have renowned surgical departments. Diagnostic methods and preoperative hepatic functional evaluation included ultrasound, CT and MRI.

Contrast-enhanced exams were performed to distinguish the hemangioma from other lesions when normal ultrasound was unable to make a clear diagnosis. This type of contrast-enhanced imaging typically shows rapid peripheral and nodular enhancement on arterial phases, followed by centripetal filling of the lesion **(4)**.

Patients were evaluated through a subcostal incision that was strategically positioned in relation to the tumor and the liver that needed to be removed. For large or central tumors, an incision was made from the sternum to the xiphoid cartilage on both sides. The costal margins were elevated using either an Omni-tract or a Thompson fixed body wall retractor.



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The tumor's connection to vascular structures such the portal veins, hepatic veins and inferior vena cava was determined using intraoperative ultrasound (IVC). As necessary for the intended resection, the liver was mobilised by dividing the peritoneal attachments. The appropriate hemi liver was totally mobilised for right-sided sectoral resections and hemi hepatectomy procedures, exposing the retro hepatic IVC and extrahepatic hepatic veins. Using a Cavitron Ultrasonic Surgical Aspirator (CUSA) Söring Ultrasonic Generator Sonoca 300, Germany. Using diathermy, the plane of the planned parenchymal transection was marked on the liver's surface. Conmed System 7550, French, (CONMED SYSTEM 7550 ELECTROSURGICAL GENERATOR + ABC MODES @ (295260)) and suture or clip ligation for bigger vessels were used to secure hemostasis. Early vascular inflow control was employed for formal right or left hemi hepatectomy. Depending on the amount of blood lost during parenchymal transection, only minor resections required the cyclical application and removal of inflow occlusion (which lasted 20 and 10 minutes, respectively). When the procedure was finished, the surface of the transected liver was examined for bile leakage and repaired with fibrin sealant or an Argon beam laser. Using closed silastic suction drains, the resection region was routinely drained. As a preventative measure against deep vein thrombosis, clexane (40 mg daily) was administered subcutaneously, and intermittent calf compression stockings were worn.

Anesthetic intervention: Peripheral arterial and central venous pressures (CVP) were continually monitored after radial artery and central venous catheters were placed. To decrease hepatic venous congestion and minimise blood loss, during extrahepatic dissection, the CVP was kept at 5 cm $H_2O$ (low CVP anesthesia) by restricting IV fluids to 1-1.5 mL/kg/h. To restore the intravascular volume and maintain renal function, the cumulative fluid deficit was restored once parenchymal transection was complete.

Postoperative management: The early postoperative morbidity and length of hospital stay were observed. Ultrasonography was used for postoperative monitoring following resection on the first postoperative day, just before the drains were removed.

**Ethical Approval:**

**The study was approved by the Ethics Board of Suez Canal University and the patients were given all the information they need about the trial. An informed written consent was taken from each participant in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.**

**Statistical Analysis:** The information was gathered, categorized, and input into the computer using the Microsoft Excel 2013 application. In order to analyze the collected data, we utilized SPSS 20.0 for Windows (SPSS, Chicago, IL, USA). Statistical significance was set at a p value of 0.05. Quantitative data were presented as mean and standard deviation (SD) and were compared by the independent t-test or Mann-Whitney test as non parametric test. Qualitative data were presented as frequency and percentages and were compared by chi-square test.

## RESULTS

Eighty-five patients had open hepatectomy and fifteen had laparoscopic hepatectomy in this cross-sectional study of 100 patients with benign hepatic focal lesion. In terms of sex, age, body mass index, and the incidence of hepatitis B and C, there was no statistically significant difference between the groups (Table 1).

**Table (1): Demographic characteristics of the study groups**

| | **Open resection (n=85)** | **Laparo-scopic resection (n=15)** | P-value |
|---|---|---|---|
| **Age (years), mean ± SD** | 55.7 ± 8.6 | 59.2 ± 4.9 | 0.13 |
| **Gender, n (%)** | | | |
| **Male** | 15(17.6%) | 2(13.3%) | 0.682 |
| **Female** | 70(82.4%) | 13(86.7%) | |
| **Body weight (Kg), mean ± SD** | 77.8 ± 12.3 | 80.9 ± 13.9 | 0.371 |
| **HBV, n (%)** | 5(5.0%) | 0(0%) | 0.335 |
| **HCV, n (%)** | 71(83.5%) | 15(100%) | 0.090 |

**HBV: Hepatitis B Virus, HCV: Hepatitis C Virus.**

Baseline clinical data as spleen size, tumor size, and esophageal varices had no statistically significant difference between groups (Table 2).

**Table (2): Basic clinical data of the study groups**

| | **Open resection (n=85)** | **Laparoscopic resection (n=15)** | P-value |
|---|---|---|---|
| **Spleen size (cm), mean ± SD** | 14.2 ± 2.4 | 14.6 ± 2.2 | 0.549 |
| **Esophageal varices, n (%)** | 32(37.6%) | 6(40%) | 0.863 |
| **Tumor number, n (%)** | | | |
| **One** | 76(90.5%) | 14(93.3%) | 0.641 |
| **More than one** | 9(9.5%) | 1(6.7%) | |
| **Tumor size (cm), mean ± SD** | 4.3 ± 2.7 | 3.6 ± 1.3 | 0.180 |
| **Vascular invasion, n (%)** | 1(1.2%) | 0(0%) | 0.673 |

No significant difference was found among groups in preoperative clinical laboratory data (Table 3).

**Table (3): Preoperative laboratory data of the study groups**

| | Open resection (n=85) | Laparo-scopic resection (n=15) | P-value |
|---|---|---|---|
| **Bilirubin, mg/ dl** | 0.82 ± 0.2 | 0.71 ± 0.2 | 0.247 |
| **Albumin (gm/ dl)** | 3.8 ± 0.38 | 3.6 ± 0.32 | 0.067 |
| **Serum Creatinine, mg/ dl** | 0.79 ± 0.22 | 0.71 ± 0.18 | 0.189 |
| **PLT count** | 149.1 ± 9.9 | 107.9 ± 4.5 | 0.055 |
| **INR** | 1.11 ± 0.13 | 1.12 ± 0.14 | 0.787 |
| **PC (%)** | 71 ± 2.7 | 68.1 ± 2.5 | 0.624 |
| **Hemoglobin, mg/ dl** | 14.9 ± 1.4 | 14.6 ± 1.3 | 0.189 |

**PLT: Platelets, INR: international normalised ratio.**

No significant variance was found among study groups in operative time and intraoperative complications however, for bleeding which was insignificantly higher among open group (Table 4).

**Table (4): Intraoperative data of the study groups**

| | Open resection (n=85) | Laparo-scopic resection (n=15) | P-value |
|---|---|---|---|
| **Operative time, mean ± SD** | 3.7 ± 1.15 | 3.30 ± 0.5 | 0.407 |
| **Blood transfusion, n (%)** | 4(4.7%) | 0(0%) | 0.391 |
| **Associated operations, n (%)** | 25(29.4%) | 4(26.6%) | 0.829 |
| **Intraoperative complication, n (%)** | | | |
| **Bleeding** | 13(11%) | 0(0%) | 0.104 |
| **Diaphragmatic tear** | 1(1.2%) | 0(0%) | 0.673 |
| **LHD injury** | 1(1.2%) | 0(0%) | 0.673 |

Postoperative complications were higher among open group but with statistically insignificant differences (Table 5).

**Table (5): Postoperative data of the study groups**

| | Open resection (n=85) | Laparoscopic resection (n=15) | P-value |
|---|---|---|---|
| **Chest infection** | 9(10.6%) | 3(20%) | 0.301 |
| **Post hepatoectomy liver failure (PHLF)** | | | 0.421 |
| **Grade A** | 4(4.7%) | 0(0%) | |
| **Grade B** | 5(5.9%) | 2(13.3%) | |
| **Wound infection** | 5(5.9%) | 0(0%) | 0.335 |
| **Bile leak (grade I)** | 3(3.5%) | 0(0%) | 0.460 |
| **Cardiac complications** | 1(1.2%) | 0(0%) | 0.673 |

The complication rate in the laparoscopic group was interestingly only 15.5%, a lot lower than in the open cases.

## DISCUSSION

The biggest parenchymatous organ in the body, the liver is located deep within the epigastrium and is shielded from external damage by the bony thorax. The "forbidden zone", or organ with abundant blood flow, is the liver. In the latter half of the 20$^{th}$ century, liver surgery became feasible, and in the last 20 to 30 years, it has advanced quickly. As a result, there are now additional reasons to remove more advanced liver cancer. Moreover, laparoscopic and robot-assisted liver resections are steadily expanding in popularity [(8)].

Hepatectomy is only appropriate for specific malignant tumours, and the expected outcome is poor, therefore the mortality is relatively high in the initial stage of liver surgery. Nonetheless, liver procedures are now doable thanks to advancements in surgical methods. Compared to other significant intra-abdominal surgeries, the safety is comparable. It was claimed that liver tumour patients' mortality may be reduced to a bare minimum or even to nil [(9,10)].

Today, surgery is a common form of treatment for benign liver lesions. The likelihood of liver resection is often determined by the volumetric and functional potential of the future liver residual as well as the technical feasibility of radical surgery. Liver excision is now safer thanks to new developments in surgical methods and after care [(9,10)].

Acchording to the findings presented, well-selected patients can undergo resection of benign lesions with minimal risk of complications. Our study's total complication rate was in line with literature. In the open group, post hepatoectomy liver failure, bile leak, chest infection, wound infection and cardiac complications were minimal. In this study, there were fewer patients with substantial bleeding than in some literature studies [(11,12)]. It is known that there is a higher risk of bleeding in lesions that are close to or invade big hepatic veins [(13)].

This clearly affects how patients with benign liver tumours are managed. Hepatic resection is typically described in one of the following two contexts: first, as a previously reported benign liver lesion that has grown in size with or without clinical symptoms, and second, as a newly discovered liver lesion with a questionable diagnosis [(14)].

This is also consistent with a research done on 144 patients at the Mansoura Center, where 32 (22.2%) of the patients experienced postoperative problems. Twenty (8.3%) patients experienced GI complications, seven (4.9%) experienced GII complications, twelve (8.3%) experienced GIII complications, and one (0.7%) experienced GV complications [(15)].

The size and location of the lesion are the two main risk factors for substantial or uncontrolled bleeding. Expertise and available technology are acknowledged as key elements in maintaining vascular control, although being challenging to quantify [(16)].

In benign liver resections, morbidity rates of 25–30% shouldn't be tolerated. Malignant liver resection postoperative morbidity should be weighed against the danger of failing to treat a patient with a life-threatening condition. They also show how hard the surgeon worked to increase the long-term survival of their high-risk patients. In cases of non-malignant illness, these factors are irrelevant. Parenchyma-sparing liver resection allows for less invasive surgery and may be provided to more patients with benign disease as a result [(17)]. The need for transfusions is the last active endpoint used to evaluate the risk of liver surgeries. Our patients needed blood transfusions in 4.7% of cases.

Less blood loss during laparoscopic surgeries is thought to be caused in part by the pneumoperitoneum's function in homeostasis and the precise dissection made possible by laparoscopic magnification. Large hepatic vein dissection during laparoscopic surgery may be safer than open laparotomy due to magnification [(10)].

## CONCLUSION

The need for specific surgical training and concern over vascular management are limiting the use of laparoscopy for liver resection, but its application will continue to broaden until it is deemed appropriate for any resection of hepatic tumors. Significant effects on overall morbidity and health care costs are seen as a result of the lower operative and postoperative blood loss, complications and postoperative morbidities.

## DECLARATIONS

- **Consent for publication:** I attest that all authors have agreed to submit the work.
- **Availability of data and material:** Available
- **Competing interests:** None
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