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(RESEARCH ARTICLE)

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Minimally invasive laparoscopic surgery versus open surgery for Hepatocellular Carcinoma (HCC)

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Abstract

Background: The application of laparoscopic liver resection (LLR) has expanded rapidly in recent decades. Although multiple authors have reported LLR shows improved safety and efficacy in treating hepatocellular carcinoma (HCC) compared with open liver resection (OLR), laparoscopic and open major liver resections for HCC treatment remain inadequately evaluated.

Objective: To determine minimally invasive laparoscopic surgery versus open surgery for HCC

Methods: A cross-sectional study was conducted at Fatima Memorial Hospital Lahore, Pakistan, which was performed between August 2022 to February 2024, The total number of patients in our study were 100. The number of female patients in our study were 29 and males were 71. For all patients, we did diagnostic tests before surgery blood test, Ultrasound and biopsy. Our main focus was on open surgery versus minimally invasive laparoscopic surgery for hepatocellular carcinoma (HCC). We excluded pregnant women in our study. Data was tabulated and analyzed by SPSS version 27.

Result: In a current study total 100 patients were enrolled. The minimum age of patients were 52 years and the maximum age of the patients were 92 years. The mean age were 65.95±8.428 years. The minimum BMI of patients were 21 kg/m2 and the maximum BMI of the patients were 39 kg/m2. The frequency of mass size on ultrasound 2 cm patients were 39, The frequency of mass size on ultrasound 3 cm patients were 39, The frequency of mass size on ultrasound 4 cm patients were 3, The frequency of mass size on ultrasound 5 cm patients were 19. The frequency of open HCC surgery who have large scar, more bleeding and more pain were 50 patients and the frequency of minimally invasive HCC surgery who have less scar, less bleeding and less pain were in 50 patients. The frequency of early detection of HCC on CT scan were in 20 patients and on ultrasound were in 80 patients. Complications of HCC, Ascites were 8%, Blood loss were 11 %, Pleural effusion were 8% and no complications in 73 % of patients. In our study P-Value were less than (< 0.05).

Conclusion: We concluded in our study that minimally invasive hepatocellular carcinoma (HCC) surgery patients recover faster as compare to open surgery. Minimally invasive procedures patients stay less in hospital as compared to open surgery. HCC is common in the right lobe of the liver as compared to the left lobe of the liver. Comparing minimally invasive surgery to open surgery for patients undergoing liver resection, the patient has a lower incidence of surgical wound and organ infections after the procedure. Hepatocellular carcinoma (HCC) was mostly diagnosed in old age people. Male patients were more in our study as compared to females.

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Keywords: Hepatocellular carcinoma (HCC); Minimally invasive liver surgery (MILS); Percutaneous radiofrequency ablation (pRFA); Ultrasound (US) and Open surgery (OS)

1. Introduction

Hepatocellular carcinoma (HCC) is the most common primary liver tumor and the third leading cause of cancer-related death worldwide [1-2]. East Asian nations have the highest rates of both incidence and mortality from the disease; in the West, its incidence is also sharply rising, and it may soon overtake all other causes as the third largest cause of cancer-related deaths [3–4]. The most common cause of HCC development is chronic liver disease, particularly in cases of cirrhosis, which is the ultimate consequence of any persistent hepatic injury. The most frequent contributing variables include alcohol, metabolically-associated liver illness, hepatitis B and C viruses, and hepatitis C [5]. Surgery is typically used to treat hepatic cancer, most frequently through liver transplantation or hepatic resection [6-7].One of the most effective surgical procedures for hepatic cancer is considered to be hepatic resection. In the 1990s, there was a report on the first microinvasive hepatic resection procedure. Subsequently, several more specialists have provided reports regarding the use of minimally invasive methods for hepatic resection [8]. Liver cirrhosis is a condition that underlies about 80% of HCC cases [9].As a result, surgical excision has become more important in the treatment of localized HCC [10]. Surgery was previously only advised for patients with solitary nodules measuring less than 3 cm. Updated guidelines, however, propose surgical excision as the first option of treatment for individuals with a single tumor of any size or up to three nodules measuring less than 3 cm [11]. Surgeons started performing a range of difficult liver resections using minimally invasive surgical techniques as their experience increased [12]. Currently, laparoscopic major liver resection and isolated lesions (≤5 cm) in segments 2 through the most acceptable LLR indication have been carried out [13-14-15]. Most people with HCC typically have chronic hepatitis and cirrhosis. Patients with cirrhosis have difficult liver resections because of high portal pressure and compromised coagulation [16]. On the other hand, cirrhosis patients classified as Child-Pugh class B were found to have worse long-term results, as well as more hospitalized complications and deaths [17–18]. In reality, minimally invasive liver surgery (MILS) has become a viable option for patients with HCC in place of open surgery. MILS methods include robotic, laparoscopic, and image-guided ablation therapies [19-20]. It is still up for debate, though, whether the minimally invasive technique yields any further benefits in terms of changing the HCC treatment strategy, extending the surgical justifications for the condition, and improving long-term oncological outcomes. The effectiveness of laparoscopic and robotic procedures has been shown in lowering the risk of liver failure following a hepatectomy and minimizing surgical complications [21–22]. Another minimally invasive surgical method that may expand the rationale for surgery is laparoscopic ablation (LA) of HCC. When patients are not suited for percutaneous radiofrequency ablation (pRFA) or formal liver resection, LA may be employed. Microwave ablation using laparoscopy resolves a number of technological challenges. The first clear benefit is the potential for more flexible access to the liver, providing multiple operating angles for the ultrasonography probe and the needle [23]

2. Material and methods

A cross-sectional study was conducted at Fatima Memorial Hospital Lahore, Pakistan, which was performed between August 2022 to February 2024, The total number of patients in our study were 100. The number of female patients in our study were 29 and males were 71. For all patients, we did diagnostic tests before surgery blood test, Ultrasound and biopsy. Our main focus was on open surgery versus minimally invasive laparoscopic surgery for hepatocellular carcinoma (HCC). We excluded pregnant women in our study. Data was tabulated and analyzed by SPSS version 27.

- **Inclusion Criteria:** All patients diagnosed with HCC.
- **Exclusion Criteria:** Pregnant women

3. Results

Table 1 Mean Age, BMI and Hospital stay of all the enrolled patients (n=100)

Variables	Minimum	Maximum	Mean±SD
Age (Years)	52	92	65.95±8.428
BMI (Kg/m2)	21	39	34.55±2.583
Hospital Stay (Days)	2	8	4.90±2.312

In a current study total 100 patients were enrolled. The minimum age of patients were 52 years and the maximum age of the patients were 92 years. The mean age were 65.95±8.428 years. The minimum BMI of patients were 21 kg/m2 and the maximum BMI of the patients were 39 kg/m2 . The mean BMI were 31.55±2.583 kg/m2.

The minimum hospital stay of patients were 2 days and maximum were 8 days. The mean of hospital stay were 4.90±2.312.

Table 2 Frequency and Percentage of Gender (n=100)

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
F	29	29.0	29.0	29.0
M	71	71.0	71.0	100.0
Total	100	100.0	100.0	

In the above table 2, the frequency of Female patients were 29 and the percentage were 29. The cumulative percent were the same 29. The frequency of male patients were 71 and the percentage were 71. Total number of patients were 100 (100 %) in our study.

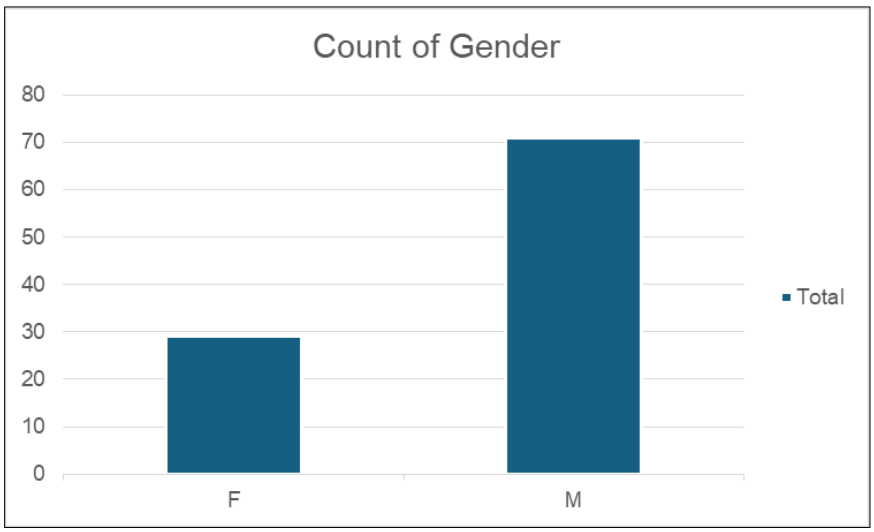

Figure 1 Bar chart of gender distribution

In Figure 1, we did a gender distribution, we can see the male and female patient frequency in the above bar chart.

Table 3 Patient characteristics of enrolled patients (n=100)

Variables	Frequency	Percentage	P-Value
Causes			
HBV	65	65.0	0.04
HCV	35	35.0	
Weight Loss			
NO	46	46.0	
YES	54	54.0	
Loss of Appetite			
NO	65	65.0	

YES	35	35.0	
Abdominal Discomfort			
NO	81	81.0	
YES	19	19.0	
Liver Biopsy			
NO	69	69.0	
YES	31	31.0	
HCC Location			
Left Lobe	20	20.0	0.02
Right Lobe	80	80.0	
Early detection of HCC on			
CT Scan	20	20.0	
Ultrasound	80	80.0	
Mass size on Ultrasound (cm)			
2 cm	39	39.0	0.03
3 cm	39	39.0	
4 cm	2	2.0	
4cm	1	1.0	
5 cm	19	19.0	
Open HCC Surgery			
Large scar, more bleeding, more pain	50	50.0	
Minimally invasive HCC Surgery			
Less scar, Less bleeding, Less pain	50	50.0	
Color Doppler Ultrasound			
Hypoechoic mass with central vascularity	100	100.0	
Treatment			
Laproscopic RFA	35	35.0	
Laparoscopic surgery	5	5.0	
Laparoscopic Surgery	5	5.0	
Open Surgery	50	50.0	
Surgical resection	5	5.0	

The current study included a total of 100 patient's Minimally invasive laparoscopic surgery versus open surgery for HCC whose characteristics are summarized in Table 3. The frequency of causes of HBV were in 65 patients and its percentage were 65%. The frequency of causes of HCV were in 35 patients and its percentage were 35%. P-Value were <0.04.

The frequency of weight loss were not present in 46 patients and were present in 54 patients. The frequency of loss of appetitie were not present in 65 patients and were present in 35 patients.

The frequency of abdominal discomfort were not present 81 patients and were present in 19 patients. The frequency of liver biopsies were not done in 69 patients and were biopsies done in 31 patients.

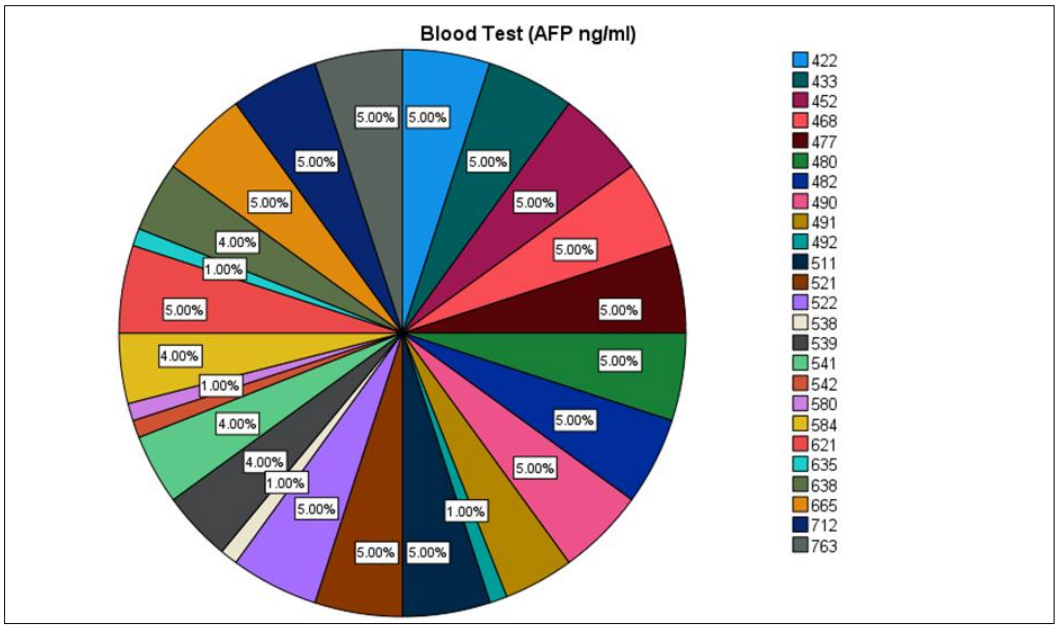

Figure 2 In the above figure 2, Pie chart of blood test (AFP) Results

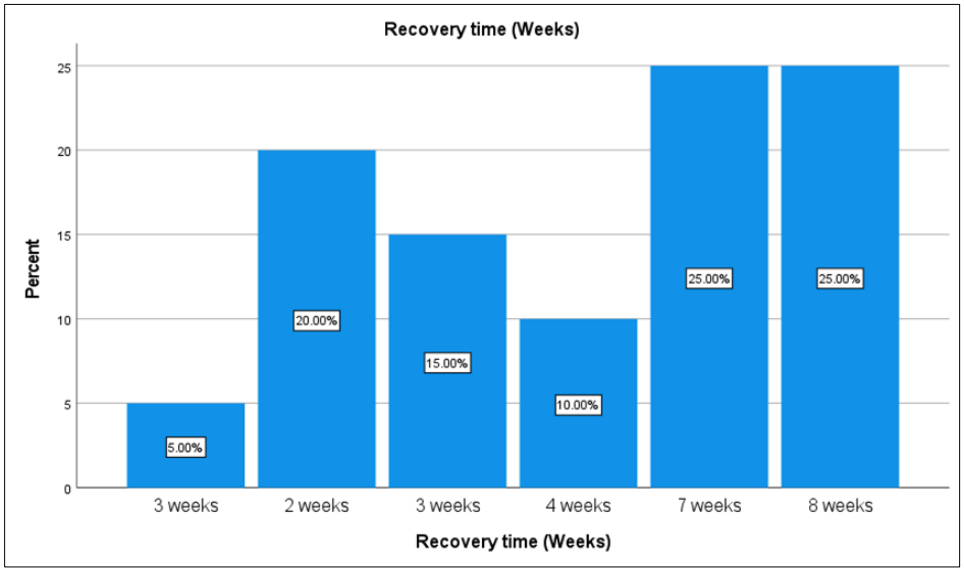

Figure 3 In Figure, 3 we can see the recovery time in weeks in percentage

The frequency of HCC location in left lobe were 20 and were in right lobe in 80 patients. P-Value were <0.02.

The frequency of early detection of HCC on CT scan were in 20 patients and on ultrasound were in 80 patients.

The frequency of mass size on ultrasound 2 cm patients were 39, The frequency of mass size on ultrasound 3 cm patients were 39, The frequency of mass size on ultrasound 4 cm patients were 3, The frequency of mass size on ultrasound 5 cm patients were 19. P-Value were less than 0.03.

The frequency of open HCC surgery who have large scar, more bleeding and more pain were 50 patients and the frequency of minimally invasive HCC surgery who have less scar, less bleeding and less pain were in 50 patients. The frequency of color doppler ultrasound who have hypoechoic mass with central vascularity were 100 patients.

The frequency of treatment laparoscopic RFA were done in 35 patients. The frequency of Laparoscopic surgery were done in 10 patients. The frequency of open surgery were were done in 50 patients. The frequency of surgical resection were done in 5 patients.

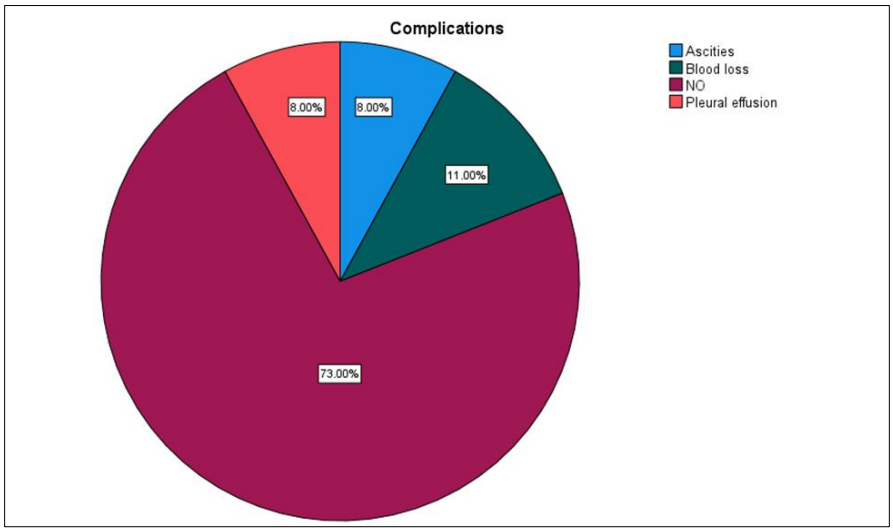

Figure 4 In Figure 4, we can see the pie chart in which we see the percentage of complications of HCC. Ascites were 8%, Blood loss were 11 %, Pleural effusion were 8% and no complications in 73 % of patients

4. Discussion

While less than one in four liver resections are currently performed in Europe, Minimally invasive surgical techniques are used in the US and other developed economies [24–25]. Although surgical resection is still the mainstay of care for patients with locally advanced HCC, opinions on the best surgical technique for both short- and long-term results are divided [26]. There are recognized procedures for the excision of different gastrointestinal cancers that involve minimally invasive surgery (MIS). Multicenter randomized data from the COMET trial, which evaluated laparoscopic versus open surgery for 280 patients with colorectal liver metastases, is available for liver malignancies [27]. While intraoperative blood loss, operating time, and perioperative mortality did not significantly differ between the two groups, this research showed reduced postoperative problems and hospital stays for patients in the laparoscopic surgery arm. The advantage of MILR for patients' perioperative recovery is confirmed by the findings of our investigation of HCC patients, which show a noticeably shorter hospital stay. These data expand the benefits of MILR on postoperative recovery to patients with HCC, joining the findings of numerous other studies that showed reduced pain, earlier mobilization, and a faster return of gastrointestinal function following minimally invasive compared to open surgery for various abdominal malignancies. A background of advanced fibrosis or cirrhosis is present in about 80–90% of cases of HCC due to prolonged parenchymal liver injury. [28]. Although there is still disagreement over the minimum necessary margin width in HCC, laparoscopic measurement of the margin distance is more difficult and may have contributed to a higher rate of positive margins. Furthermore, it has recently been reported that tumor detachment from major intrahepatic arteries in HCC is oncologically appropriate, with survival and recurrence rates that are comparable to R0 resections [29]. The development of equipment and expertise in technology is linked to the expansion of LLR procedures. Two worldwide consensus conferences during this time have outlined the present state and potential directions of LLR [30-31].

5. Conclusion

We concluded in our study that minimally invasive hepatocellular carcinoma (HCC) surgery patients recover faster as compared to open surgery. Minimally invasive procedures patients stay less in hospital as compared to open surgery. HCC is common in the right lobe of the liver as compared to the left lobe of the liver. Comparing minimally invasive surgery to open surgery for patients undergoing liver resection, the patient has a lower incidence of surgical wound and organ infections after the procedure. Hepatocellular carcinoma (HCC) was mostly diagnosed in old age people. Male patients were more in our study as compared to females.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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