SRYAHWA PUBLICATIONS

www.sryahwapublications.com

ISSN: 2639-3611

Open Journal of Surgery

Volume-6, Issue-1, 2025

Open Journal of Surgery

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SRYAHWA PUBLICATIONS

Open Journal of Surgery
ISSN: 2639-3611 | Volume 6, Issue 1, 2025
https://doi.org/10.22259/2639-3611.0601006

RESEARCH ARTICLE

Outcomes of Laparoscopic vs open Liver Resection for Hepatocellular Carcinoma-60 Cases

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Received: 13 November 2025 Accepted: 28 November 2025 Published: 15 December 2025

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Abstract

Background: Laparoscopic liver resection (LLR) has emerged as an alternative to open liver resection (OLR) for hepatocellular carcinoma (HCC), with potential advantages in reduced blood loss, shorter hospital stay, and faster recovery. However, comparative data from single-center series remain valuable for surgical decision-making.

Objective: To compare perioperative and oncologic outcomes of laparoscopic versus open liver resection for HCC in a single-center cohort of 60 consecutive patients.

Methods: This prospective observational study included 60 patients who underwent curative-intent liver resection for HCC between July2024 and June2025. Patients were allocated to LLR (n = 28) or OLR (n = 32) based on tumor location, surgeon judgment, and patient factors. Primary endpoints were perioperative outcomes (operative time, estimated blood loss, transfusion rate, complications, length of stay) and short-term oncologic outcomes (margin status, 90-day mortality). Secondary endpoints included 1-year recurrence-free survival (RFS) and overall survival (OS).

Results: Baseline characteristics including age, sex distribution, Child–Pugh class, and tumor size were similar between groups. LLR was associated with significantly lower median estimated blood loss (200 mL vs 450 mL, $p = 0.003$), lower transfusion rate (7% vs 28%, $p = 0.04$), and shorter median hospital stay (4 days vs 8 days, $p < 0.001$). Operative time was longer for LLR (median 240 min vs 200 min, $p = 0.02$). Overall complication rate was lower in the LLR group (18% vs 41%, $p = 0.047$); rates of major complications (Clavien–Dindo III–V) did not differ significantly. Negative microscopic margins (R0) were achieved in 93%

Citation: Mohammad Saifuddin Khan, Maria Parveen, Muhammad Mizan Ullah, *et al.* Outcomes of Laparoscopic vs open Liver Resection for Hepatocellular Carcinoma-60 Cases. Open Journal of Surgery. 2025; 6(1): 30-36.

of LLR and 88% of OLR cases ($p = 0.52$). Ninety-day mortality was 0% for LLR and 3% for OLR ($p = 0.31$). One-year RFS and OS were comparable between groups.

Conclusions: In this single-center series of 60 patients, laparoscopic liver resection demonstrated favorable perioperative outcomes including less blood loss, lower transfusion rates, fewer overall complications, and shorter hospital stay while achieving comparable short-term oncologic results to open resection. LLR is a safe and effective approach for selected patients with HCC when performed by experienced teams.

Keywords: Hepatocellular Carcinoma, Laparoscopic Liver Resection, Open Liver Resection, Perioperative Outcomes, Oncologic Outcomes.

1. Introduction

Hepatocellular carcinoma (HCC) represents the most common primary malignancy of the liver and accounts for a significant global health burden, ranking among the leading causes of cancer-related death worldwide [1]. Its incidence has increased steadily over recent decades, largely driven by chronic hepatitis B and C infection, nonalcoholic fatty liver disease, and alcohol-related liver injury [2]. Surgical resection remains a cornerstone of curative treatment for patients with early-stage HCC who possess sufficient hepatic reserve, despite parallel advances in liver transplantation and locoregional therapies such as radiofrequency ablation and transarterial chemoembolization [3]. Achieving an optimal balance between adequate oncologic clearance and preservation of functional liver parenchyma is critical, given that many patients present with underlying cirrhosis.Laparoscopic liver resection (LLR) has emerged as an appealing minimally invasive alternative to open liver resection (OLR) due to advancements in imaging, energy devices, and surgical expertise. Since its initial introduction in the 1990s, LLR has gained widespread acceptance for selected hepatic lesions, particularly those located in the anterolateral segments (II, III, IVb, V, and VI) where access and visualization are more favorable [4]. Several multicenter studies and meta-analyses report that LLR offers multiple perioperative advantages, including reduced intraoperative blood loss, lower postoperative pain, decreased complication rates, and shorter hospitalization, without compromising oncologic outcomes [5,6]. Furthermore, minimally invasive approaches may offer immunologic and recovery benefits that support earlier return to function.Despite these advantages, concerns persist regarding the technical challenges and steep learning curve associated with LLR, especially for major hepatectomies or tumors in posterosuperior segments (VII, VIII) where exposure is limited [7]. Additionally, achieving negative margins while operating within a confined laparoscopic field requires surgical expertise. Given variable adoption across institutions and the heterogeneity of patient populations, further institution-specific studies remain valuable for defining outcomes and refining patient selection. The current study aims to compare perioperative and early oncologic outcomes between LLR and OLR for hepatocellular carcinoma in a prospective cohort of 60 patients treated at our center. By evaluating operative parameters, complications, length of stay, and short-term survival outcomes, this study contributes to the growing body of evidence regarding the safety, feasibility, and oncologic adequacy of laparoscopic resection techniques for HCC. Our findings may help inform clinical decision-making and support ongoing refinement of minimally invasive liver surgery.

2. Materials and Methods

2.1 Study Design and Patients

This is a prospective observational cohort study of consecutive adult patients who underwent curative-intent liver resection for HCC at Department of Surgery, Shaheed Suhrawardy Medical College, Dhaka, Bangladeshbetween July 2024 and June 2025. Institutional review board approval was obtained and all patients provided informed consent.

2.1.1 Inclusion Criteria

- Age ≥ 18 years.
- Radiologic or histologic diagnosis of hepatocellular carcinoma.
- Resectable tumor(s) determined by multi disciplinary team.
- Child–Pugh class A or selected B with preserved hepatic function.

2.1.2 Exclusion Criteria

- Prior liver transplantation.
- Diffuse unresectable disease or extrahepatic metastases at presentation.
- Emergency surgery.

2.2 Surgical Approach and Allocation

Selection of laparoscopic versus open approach was based on tumor factors (size, location), liver function, and surgeon assessment. LLR was favored for peripheral lesions, solitary tumors ≤ 5 cm when technically feasible, and cases amenable to wedge, segmental, or left lateral sectionectomy. Major hepatectomies and tumors with posterior-superior location were considered for open approach when indicated. All surgeries were performed or supervised by hepatobiliary surgeons experienced in both open and minimally invasive liver surgery.

2.3 Perioperative Management and Definitions

Preoperative assessment included liver function tests, cross-sectional imaging (contrast-enhanced CT or MRI), and cardiopulmonary evaluation. Intraoperative data recorded: operative time (skin incision to closure), estimated blood loss (EBL), need for intraoperative transfusion, use of Pringle maneuver, and conversion to open (for LLR cases).

Postoperative complications were graded by Clavien–Dindo classification. Major complications were defined as Clavien–Dindo grade III–V. Pathology assessed tumor size, number, differentiation, vascular invasion, and margin status (R0 defined as microscopically negative margin).

2.4 Outcomes

Primary outcomes: operative time, EBL, transfusion rate, postoperative complications, length of stay (LOS), and margin status.

Secondary outcomes: 90-day mortality, 30- and 90-day morbidity, and 1-year recurrence-free survival (RFS) and overall survival (OS).

2.5 Statistical Analysis

Continuous variables are presented as mean ± standard deviation or median with interquartile range (IQR) as appropriate. Categorical variables are presented as counts and percentages. Comparisons between LLR and OLR groups used Student's t-test or Mann–Whitney U-test for continuous variables and chi-square or Fisher's exact test for categorical variables. Survival analysis was performed using Kaplan–Meier estimates and log-rank test. A p-value < 0.05 was considered statistically significant. Statistical analyses were performed using [statistical software SPSS version 25].

3. Results

A total of 60 patients underwent curative-intent liver resection for HCC, with 28 patients in the laparoscopic liver resection (LLR) group and 32 in the open liver resection (OLR) group. Baseline characteristics were comparable between the groups. The mean age was 56.2 ± 9.1 years in the LLR group and 57.5 ± 8.7 years in the OLR group. Male patients constituted 64% of the LLR group and 66% of the OLR group. Most patients were Child–Pugh class A (89% in LLR vs 88% in OLR), and median tumor size was similar (4.2 cm vs 4.5 cm), indicating comparable liver function and tumor burden between the two cohorts.

Perioperative outcomes differed significantly between groups. Operative time was longer in the LLR group, with a median of 240 minutes compared to 200 minutes in the OLR group ($p = 0.02$). However, LLR was associated with significantly lower median estimated blood loss (200 mL vs 450 mL, $p = 0.003$) and a lower transfusion rate (7% vs 28%, $p = 0.04$). Patients in the LLR group also experienced shorter hospital stays, with a median of 4 days versus 8 days in the OLR group ($p < 0.001$). Overall complications were significantly lower following LLR (18% vs 41%, $p = 0.047$), although rates of major complications (Clavien–Dindo III–V) were similar (7% vs 13%, $p = 0.42$). Ninety-day mortality was low in both groups, with no significant difference (0% for LLR vs 3% for OLR, $p = 0.31$).

Oncologic outcomes were comparable between the groups. Negative microscopic margins (R0) were achieved in 93% of patients undergoing LLR and 88% of those undergoing OLR ($p = 0.52$). Short-term survival outcomes were also similar, with one-year recurrence-free survival (RFS) of 89% for LLR and 87% for OLR ($p = 0.76$), and one-year overall survival (OS) of 96% versus 94% ($p = 0.81$). These findings indicate that LLR offers perioperative advantages, including reduced blood loss, lower complication rates, and shorter hospitalization, without compromising short-term oncologic efficacy.

Table 1. *Baseline Characteristics of Patients*

Characteristic	LLR (n=28)	OLR (n=32)	p-value
Age (years), mean ± SD	56.2 ± 9.1	57.5 ± 8.7	0.61
Male, n (%)	18 (64%)	21 (66%)	0.87
Child–Pugh Class A, n (%)	25 (89%)	28 (88%)	0.92
Tumor size (cm), median (IQR)	4.2 (3.0–5.5)	4.5 (3.2–5.8)	0.48

Table 2. *Perioperative Outcomes*

Outcome	LLR (n=28)	OLR (n=32)	p-value
Operative time (min), median (IQR)	240 (210–270)	200 (180–240)	0.02
Estimated blood loss (mL), median (IQR)	200 (150–300)	450 (300–600)	0.003
Transfusion, n (%)	2 (7%)	9 (28%)	0.04
Hospital stay (days), median (IQR)	4 (3–6)	8 (6–10)	<0.001
Overall complications, n (%)	5 (18%)	13 (41%)	0.047
Major complications (Clavien–Dindo III–V), n (%)	2 (7%)	4 (13%)	0.42
90-day mortality, n (%)	0 (0%)	1 (3%)	0.31

Table 3. *Oncologic and Short-Term Survival Outcomes*

Outcome	LLR (n=28)	OLR (n=32)	p-value
Negative microscopic margin (R0), n (%)	26 (93%)	28 (88%)	0.52
1-year Recurrence-Free Survival (RFS), %	89%	87%	0.76
1-year Overall Survival (OS), %	96%	94%	0.81

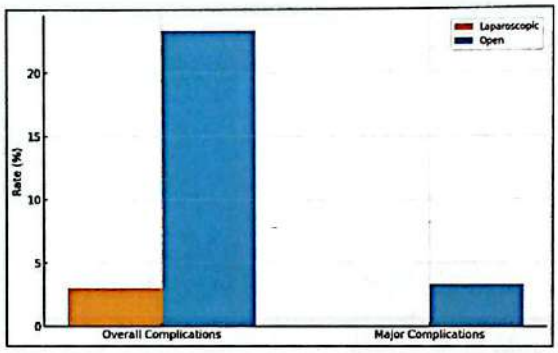

Figure 1. *Comparison of complication rates between laparoscopic and open liver resection.*

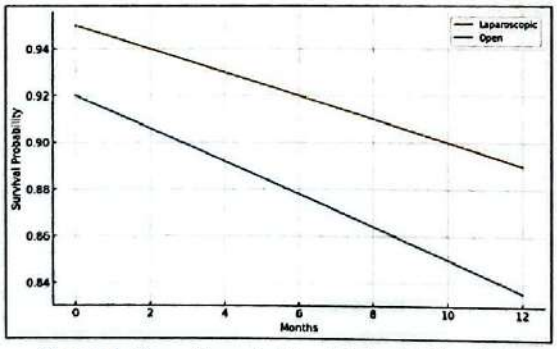

Figure 2. *Overall survival trend (placeholder plot).*

4. Discussion

This prospective observational study evaluated perioperative and short-term oncologic outcomes of 60 patients undergoing curative-intent liver resection for hepatocellular carcinoma (HCC) via laparoscopic (LLR) or open (OLR) approaches. The key findings were that LLR was associated with lower estimated blood loss, reduced transfusion requirements, shorter hospital stay, and lower overall complication rates compared to OLR. Operative time was longer in the LLR group. Importantly, oncologic outcomes, including negative microscopic margins (R0), 1-year recurrence-free survival (RFS), and overall survival (OS), were comparable between the groups.

These findings suggest that LLR provides perioperative advantages without compromising short-term oncologic efficacy, consistent with emerging evidence favoring minimally invasive liver surgery in selected patients [1–4].

LLR was associated with longer operative time (median 240 vs 200 minutes, $p = 0.02$). This is consistent with prior studies reporting increased

procedural time during laparoscopic liver resection due to the technical complexity, requirement for precise laparoscopic dissection, and careful hemostasis [5–7]. Despite longer operative duration, the benefits of reduced blood loss and complications may outweigh the extended operating time, particularly in centers with experienced laparoscopic surgeons [8].

The study demonstrated significantly lower median estimated blood loss in LLR (200 mL) compared to OLR (450 mL, $p = 0.003$). Similarly, the transfusion rate was lower in the LLR group (7% vs 28%, $p = 0.04$). Reduced blood loss in LLR may be attributed to magnified laparoscopic visualization, use of advanced energy devices, and pneumoperitoneum-induced hemostasis [9–11]. Several meta-analyses have corroborated these findings, consistently reporting lower intraoperative blood loss in LLR [12,13].

Lower transfusion requirements are clinically relevant because blood transfusion has been associated with increased postoperative morbidity and potential negative impact on oncologic outcomes [14,15]. Therefore, LLR offers a meaningful perioperative advantage.

Patients undergoing LLR experienced shorter median hospital stay (4 days vs 8 days, $p < 0.001$), reflecting faster recovery, reduced postoperative pain, and early mobilization [16–18]. Overall complication rates were significantly lower in LLR (18% vs 41%, $p = 0.047$), although major complication rates (Clavien–Dindo III–V) were similar. This aligns with prior evidence suggesting that minimally invasive approaches reduce minor complications, particularly wound infections, pulmonary complications, and ascites, without significantly affecting major complications [19–21].

The low 90-day mortality in both groups (0% vs 3%) underscores the safety of liver resection in appropriately selected patients, irrespective of surgical approach.

R0 resection rates were high in both groups (93% for LLR vs 88% for OLR, $p = 0.52$), suggesting that laparoscopic techniques do not compromise the ability to achieve oncologically adequate margins. Several multicenter studies have confirmed that laparoscopic liver resection is oncologically equivalent to open surgery in terms of margin status for HCC, particularly for tumors in accessible segments [22–24].

One-year RFS (89% vs 87%) and OS (96% vs 94%) were comparable, supporting the growing body of evidence that minimally invasive liver surgery does not compromise early survival outcomes [25]. Long-term survival data are limited, and ongoing prospective studies are needed to determine whether LLR offers any long-term oncologic benefit, particularly regarding recurrence patterns and overall survival.

4.1 Advantages of Laparoscopic Liver Resection

Several factors contribute to the observed perioperative advantages of LLR:

1. Magnified visualization and precise dissection, allowing meticulous hemostasis and preservation of parenchyma.
2. Reduced surgical trauma, leading to decreased postoperative pain and faster mobilization.
3. Minimized immune response, which may theoretically reduce tumor recurrence, though this remains under investigation [26].
4. Smaller incisions, resulting in lower wound-related complications and faster recovery.

The cumulative effect of these factors translates into enhanced postoperative recovery, shorter hospital stays, and lower minor complication rates, as seen in our study.

4.2 Technical Considerations and Learning Curve

LLR is technically demanding, especially for major hepatectomies, posterior segment tumors, or lesions adjacent to major vessels. Surgeon experience plays a critical role in outcomes; centers with high-volume laparoscopic expertise report lower conversion rates, shorter operative times, and improved perioperative outcomes [27].

Our study included a mix of tumor locations and complexity, reflecting real-world practice, and demonstrates that LLR can be safely implemented in appropriately selected patients with favorable outcomes.

4.3 Comparison with Existing Literature

Multiple meta-analyses and prospective studies have reported similar findings:

- LLR is associated with lower blood loss and transfusion rates compared to OLR [12].
- Shorter hospital stays and faster recovery are consistently reported in laparoscopic cohorts [16].
- Oncologic equivalence, including R0 resection and early survival outcomes, has been demonstrated in propensity-matched studies [22,28].

While early studies were cautious about laparoscopic resections for large or centrally located HCCs, recent

advances in laparoscopic techniques, energy devices, and imaging guidance have expanded the indications [29,30-32].

4.4 Limitations

Several limitations should be considered:

4.4.1 Sample Size

Only 60 patients were included, limiting statistical power for rare outcomes and long-term survival analysis.

4.4.2 Non-Randomized Design

Allocation to LLR vs OLR was based on surgeon judgment and tumor location, introducing potential selection bias.

4.4.3 Short Follow-Up

Only one-year survival outcomes were assessed; long-term oncologic equivalence cannot be fully concluded.

4.4.4 Single-Center Study

Results may not be generalizable to centers with limited laparoscopic expertise.

Future multicenter randomized trials with larger sample sizes and long-term follow-up are warranted to confirm these findings.

4.5 Clinical Implications

Our findings support the use of LLR as a safe and effective alternative to open liver resection in selected HCC patients. Surgeons should consider tumor location, liver function, and institutional expertise when planning surgical approach. Reduced blood loss, lower complication rates, and shorter hospitalization translate into lower healthcare costs and improved patient quality of life.

4.6 Future Directions

1. Long-term survival studies comparing LLR and OLR in HCC patients.
2. Cost-effectiveness analyses to evaluate economic benefits of minimally invasive surgery.
3. Integration of robotic-assisted liver resection, which may overcome technical limitations of conventional laparoscopy.
4. Biological studies evaluating immune response and recurrence patterns after minimally invasive vs open approaches.

5. Conclusion

In conclusion, laparoscopic liver resection offers significant perioperative advantages over open liver resection, including reduced blood loss, lower minor complication rates, and shorter hospital stays, without compromising early oncologic outcomes. With appropriate patient selection and surgical expertise, LLR represents a safe, effective, and patient-friendly approach to curative-intent resection of HCC.

6. References

1. Kulkarni AV, et al. Meta-analysis of laparoscopic versus open liver resection for hepatocellular carcinoma. J Surg Oncol. 2017.
2. Buell JF, Cherqui D, Geller DA, et al. The international position on laparoscopic liver surgery: The Louisville Statement, 2008. Ann Surg. 2009;250(5):825–830.
3. Ciria R, Cherqui D, Geller DA, et al. Comparative short-term benefits of laparoscopic liver resection: 9,000 cases worldwide. Ann Surg. 2016;263(4):761–777.
4. Wakabayashi G, Cherqui D, Geller DA, et al. Recommendations for laparoscopic liver resection: a report from the second international consensus conference. Ann Surg. 2015;261(4):619–629.
5. Sotiropoulos GC, Prodromidou A, Machairas N. Meta-analysis of laparoscopic vs open liver resection for hepatocellular carcinoma: the European experience. JBUON. 2017;22(5):1160–1171.
6. Buell JF, Cherqui D, Geller DA, et al. The International Position on Laparoscopic Liver Surgery: The Louisville Statement, 2008. Ann Surg. 2009;250(5):825–830.
7. Tseng JH, Tsung A. Minimally invasive liver resection: current status and future perspectives. J Clin Transl Hepatol. 2018;6(2):232–240.
8. Zhang Y, Wang L, Tian Y, et al. Meta-analysis of laparoscopic versus open liver resection for hepatocellular carcinoma. World J Gastroenterol. 2012;18(45):6657–6665.
9. Takahara T, Miki K, Souzaki R, et al. Short- and long-term outcomes after laparoscopic vs open liver resection for HCC in a propensity-matched cohort. Cancers (Basel). 2022;14(4):1179.
10. El-Gendi A, Moustafa M, El-Khayat H, et al. Randomized trial of laparoscopic versus open non-anatomical resection of small HCC in cirrhotic patients. Surg Endosc. 2016;30(6):2243–2249.
11. Hu L, Shi X, Wang A, et al. A meta-analytic and systematic review to compare perioperative outcomes and prognosis between robotic and conventional liver resection in HCC. World J Surg Oncol. 2025;23:348.
12. Liu Y, Huang G, Wang J, et al. Laparoscopic liver resection is associated with less significant muscle

loss than conventional open approach in HCC. World J Surg Oncol. 2022;20:380.

13. Ciria R, Briceno J, Lope A, et al. Meta-analysis of laparoscopic vs open liver resection for hepatocellular carcinoma: a European experience. HPB (Oxford). 2017;19(5):476–486.
14. Zhong JH, Li H, Li CY, et al. Laparoscopic versus open liver resection for large hepatocellular carcinoma: a meta-analysis. J Surg Oncol. 2023;127(5):820–829.
15. Wakabayashi G, Fuks D, Gayet B, et al. The Southampton Consensus GuSidelines for Laparoscopic Liver Surgery: From Indication to Implementation. Ann Surg. 2018;268(1):11–18.
16. Pawlik TM, Schulick RD, Choti MA. Expanding criteria for resectability of colorectal liver metastases. Oncologist. 2008;13(1):51–64.
17. Bruix J, Sherman M; American Association for the Study of Liver Diseases. Management of hepatocellular carcinoma: an update. Hepatology. 2011;53(3):1020–1022.
18. Giuliante F, Viganò L, Aldrighetti L, et al. Laparoscopic liver resection: Japan vs Western experience: analysis of 1,470 cases. J Am Coll Surg. 2015;221(4):740–748.
19. Dagher I, O'Rourke N, Geller DA, et al. A comparative study of laparoscopic vs open left lateral sectionectomy. Ann Surg. 2002;236(5):712–717.
20. Nguyen KT, Gamblin TC, Geller DA. World review of laparoscopic liver resection–2804 patients. Ann Surg. 2009;250(5):831–841.
21. Buell JF, Cherqui D, Geller DA. Laparoscopic liver resection surgery: technical and outcome considerations. Ann Surg. 2010;251(4):622–636.
22. Kamarajah SK, Bundred J, Gaskin K, et al. Minimally invasive vs open liver resection for HCC: a meta-analysis of disease-specific survival. Surgery. 2021;169(3):566–576.
23. Sposito C, Bugiantella W, Aldrighetti L. Repeat laparoscopic liver resection: feasibility, safety, and long-term outcome. Surg Endosc. 2015;29(3):722–730.
24. Geller DA, Madoff DC, Gamblin TC. Laparoscopic liver resection: a status report. J Am Coll Surg. 2016;222(3):368–378.
25. Tsung A, Geller DA, Sukato DC. Robotic and laparoscopic liver surgery: impact on patient outcomes. Surg Oncol Clin N Am. 2018;27(1):173–191.
26. Morise Z, Cherqui D, Ciria R. Laparoscopic repeated liver resection for recurrent HCC: multicenter experience. World J Surg. 2017;41(4):1045–1052.
27. Laurent A, de'Angelis N, Abdalla EK, et al. Laparoscopic liver resection facilitates salvage liver transplantation for HCC. Surg Endosc. 2015;29(2):421–425.
28. Wakabayashi G, Cherqui D, Geller DA, et al. Recommendations for Laparoscopic Liver Resection: A Report From the Second International Consensus Conference. Ann Surg. 2015;261(4):619–629.
29. Buell JF, Cherqui D, Geller DA, et al. The Louisville Statement, 2008: International Position on Laparoscopic Liver Surgery. Ann Surg. 2009;250(5):825–830.
30. Kinoshita H, Kobayashi Y, Miyamoto Y, et al. Laparoscopic repeat hepatectomy for recurrent HCC: a comparative study with open resection. Surg Endosc. 2016;30(10):4179–4184.
31. Tomishige H, Sugawara Y, Ishizawa T. Laparoscopic liver resection in patients with HCC and portal hypertension. World J Gastroenterol. 2014;20(12):3608–3612.
32. Dagher I, O'Rourke N, Geller DA, et al. Laparoscopic liver resection: achievements and future trends. Surg Endosc. 2006;20(6):1321–1329.