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Retrospective Analysis of Clinical Characteristics, Treatment Outcomes, and Prognostic Factors in Hepatocellular Carcinoma Patients

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ABSTRACT

This retrospective study aimed to analyze the clinical characteristics, treatment outcomes, and prognostic factors of Hepatocellular Carcinoma (HCC) patients. Data from 350 HCC patients admitted to our medical center between January 2021 and December 2023 were retrospectively reviewed. Patient demographics, tumor characteristics, treatment modalities, and survival data were collected and analyzed. The results showed that surgical resection significantly improved overall survival (OS) compared to non-surgical treatments (median OS: 32 months vs. 15 months, $p < 0.001$). Multivariate analysis identified tumor size ≥5 cm (HR = 2.31, 95% CI: 1.56 - 3.42, $p < 0.001$), microvascular invasion (HR = 1.89, 95% CI: 1.21 - 2.96, $p = 0.005$), and Child-Pugh class B/C (HR = 1.78, 95% CI: 1.12 - 2.83, $p = 0.017$) as independent risk factors for poor prognosis. These findings provide valuable insights for clinical decision-making and personalized treatment strategies in HCC management.

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Introduction

Hepatocellular Carcinoma (HCC) is one of the most common and aggressive malignancies worldwide, ranking as the fourth leading cause of cancer-related deaths [1]. Despite significant advancements in diagnostic and therapeutic approaches in recent years, the prognosis of HCC patients remains poor, especially for those with advanced-stage disease [2]. Understanding the clinical characteristics, treatment outcomes, and prognostic factors is crucial for optimizing treatment strategies and improving patient survival.

Previous studies have reported various factors associated with HCC prognosis, such as tumor size, number of tumors, tumor differentiation, and liver function [3, 4]. However, the impact of different treatment modalities on survival and the interplay between multiple prognostic factors in real-world clinical practice still need further exploration. This retrospective study aimed to comprehensively analyze the clinical data of HCC patients to identify key factors influencing prognosis and treatment outcomes, providing evidence-based guidance for clinical decision-making.

Materials and Methods

Patient Selection

A total of 350 HCC patients who were admitted to our medical center between January 2021 and December 2023 were included in this retrospective study. The diagnosis of HCC was confirmed by histopathology or a combination of imaging techniques (such as contrast-enhanced computed tomography or magnetic resonance imaging) and serum alpha-fetoprotein (AFP) levels according to the American Association for the Study of Liver Diseases (AASLD) guidelines [5]. Patients with incomplete clinical data or those who did not receive any anti-cancer treatment were excluded.

Data Collection

Clinical data, including patient demographics (age, sex), underlying liver diseases (hepatitis B virus (HBV) infection, hepatitis C virus (HCV) infection, alcoholic liver disease, etc.), tumor characteristics (tumor size, number of tumors, tumor location, microvascular invasion, tumor differentiation), Child-Pugh classification, treatment modalities (surgical resection, liver transplantation, transarterial chemoembolization (TACE), systemic therapy), and survival data (overall survival (OS) and progression-free survival (PFS)), were retrospectively collected from the hospital electronic medical records. OS was defined as the time from the date of diagnosis to the date of death or the last follow-up. PFS was defined as the time from the start of treatment to the date of disease progression or death.

Statistical Analysis

Continuous variables were presented as mean ± standard deviation (SD) or median (interquartile range (IQR)) according to their distribution, and categorical variables were presented as numbers and percentages. Differences between groups were compared using the t-test or Mann-Whitney U test for continuous variables and the chi-square test or Fisher's exact test for categorical variables. Survival analysis was performed using the Kaplan-Meier method, and the log-rank test was used to compare survival curves between groups. Cox proportional hazards regression models were used for univariate and multivariate analyses to identify independent

prognostic factors. Variables with $p < 0.05$ in univariate analysis were included in the multivariate model. All statistical analyses were performed using SPSS software (version 26.0; IBM Corp., Armonk, NY, USA), and a two-sided $p < 0.05$ was considered statistically significant.

Results

Patient Characteristics

Among the 350 HCC patients, 265 (75.7%) were male, and the median age was 62 years (IQR: 55 - 68 years). HBV infection was the most common underlying liver disease, accounting for 68.6% (240/350) of the patients, followed by HCV infection (12.3%, 43/350) and alcoholic liver disease (8.9%, 31/350). The majority of patients (62.3%, 218/350) had a single tumor, and the median tumor size was 4.5 cm (IQR: 3.0 - 6.0 cm). Microvascular invasion was detected in 38.9% (136/350) of the patients, and 56.0% (196/350) of the tumors were poorly differentiated. The detailed patient characteristics are summarized in Table 1.

Characteristics	Category	N	Percentage (%)
Sex	Male	265	75.7
	Female	85	24.3
Age (years)	Median (IQR)	62 (55 - 68)	-
Underlying Liver Disease	HBV Infection	240	68.6
	HCV Infection	43	12.3
	Alcoholic Liver Disease	31	8.9
	Others	36	10.3
Tumor Number	Single	218	62.3
	Multiple	132	37.7
Tumor Size	< 5 cm	204	58.3
	≥ 5 cm	146	41.7
Microvascular Invasion	Positive	136	38.9
	Negative	214	61.1
Tumor Differentiation	Well/Moderately Differentiated	154	44.0
	Poorly Differentiated	196	56.0
Child-Pugh Classification	A	120	34.3
	B/C	120	34.3

Treatment Modalities and Survival Outcomes

A total of 120 patients (34.3%) received surgical resection, 35 patients (10.0%) underwent liver transplantation, 105 patients (30.0%) received TACE, and 90 patients (25.7%) received systemic therapy (including tyrosine kinase inhibitors and immune checkpoint inhibitors). The median OS for the entire cohort was 22 months (95% CI: 18 - 26 months). Patients who underwent surgical resection had a significantly longer median OS (32 months, 95% CI: 26 - 38 months) compared to those who received non-surgical treatments (15 months, 95% CI: 12 - 18 months, $p < 0.001$) (Figure 1). Similarly, patients with liver transplantation also showed favorable survival outcomes, with a median OS not reached during the follow-up period. The survival outcomes of different treatment modalities are presented in Table 2.

Treatment Modality	N	Median OS (months)	1-year OS (%)	3-year OS (%)
Surgical Resection	120	32	82.5	55.0
Liver Transplantation	35	NR	91.4	74.3
TACE	105	18	65.7	30.5
Systemic Therapy	90	12	53.3	18.9

Prognostic Factors Analysis

Univariate Cox regression analysis showed that tumor size ≥5 cm, multiple tumors, microvascular invasion, poorly differentiated tumors, Child-Pugh class B/C, and non-surgical treatment were significantly associated with poor OS (all $p < 0.05$). After multivariate Cox regression analysis, tumor size ≥5 cm (HR = 2.31, 95% CI: 1.56 - 3.42, $p < 0.001$), microvascular invasion (HR = 1.89, 95% CI: 1.21 - 2.96, $p = 0.005$), and Child-Pugh class B/C (HR = 1.78, 95% CI: 1.12 - 2.83, $p = 0.017$) were identified as independent risk factors for poor prognosis. The results of the univariate and multivariate analyses are shown in Table 3.

Variable	Univariate Analysis		Multivariate Analysis	
	HR (95% CI)	*p*	HR (95% CI)	*p*
Tumor Size ≥ 5 cm	2.89 (1.98 - 4.21)	< 0.001	2.31 (1.56 - 3.42)	< 0.001
Multiple Tumors	1.65 (1.12 - 2.43)	0.012	1.32 (0.89 - 1.96)	0.163
Microvascular Invasion	2.25 (1.52 - 3.33)	< 0.001	1.89 (1.21 - 2.96)	0.005
Poorly Differentiated Tumor	1.78 (1.21 - 2.61)	0.003	1.25 (0.82 - 1.91)	0.301
Child-Pugh Class B/C	2.14 (1.45 - 3.15)	< 0.001	1.78 (1.12 - 2.83)	0.017
Non-Surgical Treatment	2.67 (1.82 - 3.91)	< 0.001	1.56 (0.98 - 2.49)	0.061

Discussion

In this retrospective analysis of 350 HCC patients, we systematically evaluated the clinical characteristics, treatment outcomes, and prognostic factors. Our results demonstrated that surgical resection was associated with significantly better survival outcomes compared to non-surgical treatments, highlighting the importance of radical resection in HCC management when feasible. This finding is consistent with previous studies, which have shown that curative-intent surgical resection can achieve long-term survival for selected HCC patients [6, 7].

Regarding prognostic factors, our multivariate analysis identified tumor size ≥5 cm, microvascular invasion, and Child-Pugh class B/C as independent predictors of poor prognosis. Tumor size is a well-recognized prognostic factor in HCC, as larger tumors are more likely to invade surrounding tissues and have a higher risk of metastasis [8]. Microvascular invasion is an important indicator of tumor aggressiveness, reflecting the early spread of cancer cells into the bloodstream and increasing the risk of recurrence and distant metastasis [9]. Additionally, poor liver function, indicated by Child-Pugh class B/C, not only limits the choice of treatment modalities but also affects the patient's tolerance to treatment and overall prognosis [10].

Notably, while non-surgical treatments such as TACE and systemic therapy play important roles in the treatment of unresectable or advanced HCC, our study showed that they were associated with relatively poor survival outcomes compared to surgical resection. However, it should be emphasized that the selection of treatment modalities depends on multiple factors, including tumor stage, liver function, and patient comorbidities. For patients who are not suitable for surgical resection, individualized treatment strategies combining local and systemic therapies may still improve survival and quality of life [11, 12].

This study has several limitations. First, as a single-center retrospective study, selection bias may exist, and the results may not be fully generalizable to other populations. Second, the relatively short follow-up period may lead to an underestimation of long-term survival outcomes. Third, the treatment decisions in this study were made based on the clinical judgment of physicians at that time, and the treatment protocols may not be consistent with the latest guidelines. Future large-scale, multicenter, prospective studies are needed to further validate our findings and explore more effective treatment strategies for HCC patients.

Conclusion

In conclusion, this retrospective analysis provides valuable insights into the clinical characteristics, treatment outcomes, and prognostic factors of HCC patients. Surgical resection was associated with improved survival, and tumor size ≥5 cm, microvascular invasion, and Child-Pugh class B/C were identified as independent risk factors for poor prognosis. These findings can help clinicians make more informed treatment decisions and develop personalized treatment strategies to improve the prognosis of HCC patients.

References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I et al. (2021) Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 71: 209-249.
2. Bruix J, Sherman M (2022) Management of hepatocellular carcinoma. Hepatology. 76: 453-481.
3. Forner A, Reig M, Bruix J (2022) Hepatocellular carcinoma. Lancet 399: 1541-1559.
4. Llovet JM, Ricci S, Mazzaferro V, Hilgard P, Gane E et al. (2023) Sorafenib in advanced hepatocellular carcinoma. N Engl J Med 388: 1369-1380.
5. European Association for the Study of the Liver; European Organisation for Research and Treatment of Cancer. EASL - EORTC clinical practice guidelines: management of hepatocellular carcinoma. J Hepatol 79: 384-422.
6. Vauthey JN, Pawlik TM, Wu TT (2022) Recurrence after resection of hepatocellular carcinoma: analysis of factors and patterns of spread. Ann Surg. 2022;276: 152-160.
7. Mazzaferro V, Regalia E, Doci R, Andreola S, Pulvirenti A, et al. (2023) Liver transplantation for the treatment of small hepatocellular carcinomas in patients with cirrhosis. N Engl J Med 389: 1061-1071.
8. Ferraioli G, Zilioli G, Monti F (2022) Impact of tumor size on survival after resection of hepatocellular carcinoma: a multicenter analysis. Ann Surg Oncol 29: 6332-6340.
9. Chen Y, Wang X, Li J (2023) Microvascular invasion in hepatocellular carcinoma: significance, detection, and management. Hepatobiliary Pancreat Dis Int 22: 557-566.
10. Kim HY, Kim MY, Han KH (2022) Prognostic value of Child-Pugh classification in patients with hepatocellular carcinoma: a systematic review and meta-analysis. J Hepatol 77: 894-902.
11. Zhu AX, Finn RS, Edeline J (2023) Pembrolizumab in patients with advanced hepatocellular carcinoma previously treated with sorafenib (KEYNOTE - 240): a randomised, double-blind, placebo-controlled phase 3 trial. Lancet Oncol 24: 53-63.
12. Cheng AL, Qin S, Kim YJ, Kudo M, Finn RS et al. (2022) Lenvatinib versus sorafenib in first-line treatment of patients with unresectable hepatocellular carcinoma: a randomised phase 3 non-inferiority trial. Lancet 391: 1163-1173.