CLINICAL STUDY

Albumin-Bilirubin and Platelet-Albumin-Bilirubin Grades Accurately Predict Overall Survival in High-Risk Patients Undergoing Conventional Transarterial Chemoembolization for Hepatocellular Carcinoma

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ABSTRACT

Purpose: To evaluate albumin-bilirubin (ALBI) and platelet-albumin-bilirubin (PALBI) grades in predicting overall survival in high-risk patients undergoing conventional transarterial chemoembolization for hepatocellular carcinoma (HCC).

Materials and Methods: This single-center retrospective study included 180 high-risk patients (142 men, 59 y ± 9) between April 2007 and January 2015. Patients were considered high-risk based on laboratory abnormalities before the procedure (bilirubin > 2.0 mg/dL, albumin < 3.5 mg/dL, platelet count < 60,000/mL, creatinine > 1.2 mg/dL); presence of ascites, encephalopathy, portal vein thrombus, or transjugular intrahepatic portosystemic shunt; or Model for End-Stage Liver Disease score > 15. Serum albumin, bilirubin, and platelet values were used to determine ALBI and PALBI grades. Overall survival was stratified by ALBI and PALBI grades with substratification by Child-Pugh class (CPC) and Barcelona Liver Clinic Cancer (BCLC) stage using Kaplan-Meier analysis. C-index was used to determine discriminatory ability and survival prediction accuracy.

Results: Median survival for 79 ALBI grade 2 patients and 101 ALBI grade 3 patients was 20.3 and 10.7 months, respectively ($P < .0001$). Median survival for 30 PALBI grade 2 and 144 PALBI grade 3 patients was 20.3 and 12.9 months, respectively ($P = .0667$). Substratification yielded distinct ALBI grade survival curves for CPC B ($P = .0022$, C-index 0.892), BCLC A ($P = .0308$, C-index 0.887), and BCLC C ($P = .0287$, C-index 0.839). PALBI grade demonstrated distinct survival curves for BCLC A ($P = 0.0229$, C-index 0.869). CPC yielded distinct survival curves for the entire cohort ($P = .0019$) but not when substratified by BCLC stage (all $P > .05$).

Conclusions: ALBI and PALBI grades are accurate survival metrics in high-risk patients undergoing conventional transarterial chemoembolization for HCC. Use of these scores allows for more refined survival stratification within CPC and BCLC stage.

ABBREVIATIONS

ALBI = albumin-bilirubin, BCLC = Barcelona Liver Clinic Cancer, CI = confidence interval, CPC = Child-Pugh class, HCC = hepatocellular carcinoma, N/A = not applicable, PALBI = platelet-bilirubin-albumin, ^{90}Y = yttrium-90

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Risk stratification of patients with hepatocellular carcinoma (HCC) before locoregional therapy is paramount owing to the varying severity of underlying liver disease. A commonly used metric is the Child-Pugh scoring system. The use of interrelated and subjective variables, such as ascites and encephalopathy, limits the prognostic ability of the Child-Pugh score, particularly in patients with advanced cirrhosis and HCC. In 2015, Johnson et al (1) introduced a new tool to assess liver function, the albumin-bilirubin (ALBI) grade. This evidence-based model is solely based on laboratory parameters and has been validated in an

international cohort of Child-Pugh class (CPC) A patients with HCC from Asia, Europe, and the United States. Several other groups have since provided external validation of the ALBI grade (2,3). Further modification of the ALBI grade resulted in the platelet-bilirubin-albumin (PALBI) grade, which incorporates the blood platelet count as a surrogate marker for portal hypertension (4). ALBI and PALBI grades assess the degree of underlying liver dysfunction in patients with HCC and may be helpful in predicting mortality related to liver failure rather than tumor progression. Despite numerous external validations of the ALBI and PALBI grades, there is a paucity of data regarding their use in high-risk patients undergoing transarterial chemoembolization, and their utility in this population has not been well characterized. The purpose of this study was to assess the performance of ALBI and PALBI grades in predicting overall survival outcomes in high-risk patients undergoing conventional transarterial chemoembolization for treatment of HCC.

MATERIALS AND METHODS

Institutional review board approval was obtained for this study, which was compliant with the Health Insurance Portability and Accountability Act. This retrospective study identified patients who underwent conventional transarterial chemoembolization for HCC between April 2007 and January 2015 at a tertiary care referral center using the department of radiology picture archiving and communication system and the interventional radiology case log book. Demographic, laboratory, and imaging data were reviewed to collect baseline demographic and disease information. Diagnosis of HCC was made by established imaging criteria using National Comprehensive Cancer Network (5) and American Association for the Study of Liver Disease criteria (6) (n = 137) or biopsy (n = 43). Biopsy was performed for atypical imaging presentations to confirm the diagnosis before treatment. Patients who underwent conventional transarterial chemoembolization for HCC were included if they met at least 1 of the following risk factors previously described in the literature (7,8) before transarterial chemoembolization: serum bilirubin level > 2 mg/dL; albumin level < 3.5 mg/dL; serum platelet count < 60,000 mL; serum creatinine > 1.2 mg/dL; portal vein thrombus diagnosed on computed tomography or magnetic resonance imaging performed before the procedure; presence of ascites established on abdominal ultrasound, computed tomography, or magnetic resonance imaging; presence of hepatic encephalopathy, defined as brain dysfunction caused by liver insufficiency and/or portosystemic shunting (9); presence of transjugular intrahepatic portosystemic shunt; or Model for End-Stage Liver Disease score > 15. **Figure 1** outlines eligibility criteria for study inclusion and patient allocation, and the features of the study cohort are presented in **Table 1**. A serum albumin level < 3.5 mg/dL was used based on previously published data on high-risk patients undergoing transarterial chemoembolization (8). Using an albumin level < 3.5 mg/dL preserves the full range of abnormal albumin levels (as the 3.5 mg/dL threshold delineates the lower limit of normal albumin level), which is useful given that albumin level is an integral component in calculating both the ALBI and the PALBI scores.

Transarterial Chemoembolization

The decision to treat with conventional transarterial chemoembolization was made by an interdisciplinary tumor board consisting of hepatologists, transplant surgeons,

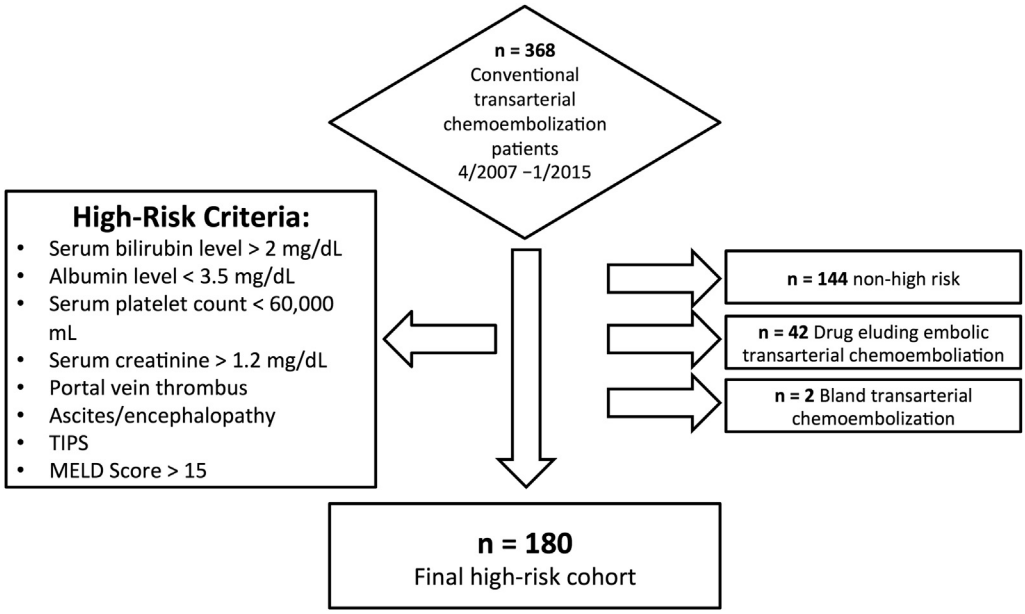

Figure 1. Flow diagram highlighting the process of patient selection and inclusion criteria for retrospective analysis. DEE = drug-eluting embolic; MELD = Model for End-Stage Liver Disease; TIPS = transjugular intrahepatic portosystemic shunt.