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Original research

FibroScan predicts ascites after liver resection for hepatitis B virus-related hepatocellular carcinoma: A prospective cohort study

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HIGHLIGHTS

- Ascites was not uncommon following liver resection for HCC.
- Liver stiffness measured by Fibroscan is a predictor of postoperative ascites after liver resection.
- Liver stiffness measured by Fibroscan may be a useful predictor of postoperative liver failure.

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ABSTRACT

Objective: To assess the correlation of preoperative FibroScan value and postoperative ascites in patients undergoing liver resection for hepatitis B virus-related hepatocellular carcinoma (HBV-related HCC).
Methods: A prospective study group of consecutive HBV-related HCC patients considered eligible for liver resection was conducted from 2012 to 2014 (N = 77). Liver stiffness measured by FibroScan was administrated to all patients. Patient's pre- and intra-operative variables were prospectively collected.
Results: FibroScan was successfully performed in 75 patients. Postoperative ascites was observed in 13 patients. Univariate analyses suggested tumor size, high preoperative hepatitis B viral load, intra-operative blood loss, major hepatectomy and FibroScan value were potential risk factors for post-operative ascites. However, in multivariate analysis, only FibroScan value (OR = 1.506, 95%CI = 1.21 −1.87) showed prognostic power. The best cut-off value of FibroScan value to predict postoperative ascites was 15.6 kpa with a sensitivity of 76.9% and a specificity of 98.4%. The corresponding area under the receiver operating curve was 0.902.
Conclusions: FibroScan value was a reliable surrogate marker for predicting postoperative ascites should be routinely performed in patients with HBV-related HCC undergoing liver resection.

1. Introduction

Hepatocellular carcinoma (HCC) is the sixth most common malignancy and third most frequent cancer related death in the worldwide [1]. Liver resection is a curative treatment for patients with HCC. However, HCC often arises from a background of liver cirrhosis. Despite the major advances in patient selection, perioperative management and operative techniques have contributed to greatly improvements in the outcomes of liver resection for HCC, the postoperative morbidity of liver resection for HCC is still not satisfactory at 33.4%–55.5% [2–4]. Postoperative ascites is one of the most common morbidity of liver resection which can lead to hyponatremia, bacterial peritonitis, hypovolemia, hepatic hydrothorax, hepatorenal syndrome, which can lead to posthepatectomy liver failure [4]. Moreover, Chan et al.'s [5] study indicated patients with postoperative ascites had a high incidence of HCC recurrence and mortality risk after liver resection. Accordingly, identify risk factors associated with postoperative ascites is useful to guide our clinical practice.

Liver fibrosis or cirrhosis, which can result in liver stiffness, is often observed in HBV-related HCC. Transient elastography assessed by FibroScan is a rapid, noninvasive, and reproducible

Abbreviations: ALT, alanine aminotransferase; AST, aspartate aminotransferase; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; INR, international normalised ratio; ROC, receiver operating curve.

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method for diagnosis and quantification of liver fibrosis. Previous investigations suggested because liver stiffness measured using FibroScan can reflect the degree of liver fibrosis, liver stiffness measurement can predict the liver functional reserve [6,7]. Recently, Cescon et al.'s [8] investigation confirmed liver stiffness, which was measured by FibroScan, was a valid tool for prediction of postoperative liver failure in patients undergoing liver resection for HCC. Hence, we hypothesize FibroScan value maybe a useful marker in prediction postoperative ascites after liver resection for patients with HBV-related HCC. Hence, the aim of this study was to identify whether liver stiffness measured by FibroScan can predict postoperative ascites after liver resection for HBV-related HCC.

2. Patients and methods

2.1. Study group

Adult patients with HBV-related HCC who underwent liver resection at our center between 2012 and 2014 were recruited in the study. Patients with Child-pugh B or C liver function were excluded from this study. A total of 77 patients fit the inclusion criteria and agreed to participate in this study. Of these patients, preoperative and intraoperative variables were prospectively collected. Serum hepatitis B surface antigen was positive in all patients. Hepatitis B virus (HBV) DNA was detected in all patients within one week before operation. This study was approved by the ethical committee of West China Hospital. This study is also compliant with the STROBE criteria [9].

2.2. Liver stiffness measurement

All patients received liver stiffness measurement using FibroScan within one week before surgery. Ten validated measurements were performed on each patient. The success rate was calculated as the number of validated measurements divided by the total number of measurements. The results were expressed in kilopascals (kPa). The median value was considered as representative of the elastic modulus of the liver. Only procedures with ten validated measurements and a success rate of at least 60% were considered reliable [6,10,11].

2.3. Surgical procedure

The liver function of patients who received liver resection in our center must be in Child-Pugh A. Before surgery, computed tomography or magnetic resonance imaging with contrast was performed to evaluate the liver volume, tumor size, number and so forth. After general anaesthesia, the liver was exposed via a right subcostal incision with an extension to the upper midline. Hemihepatic vascular occlusion was the primary technique utilised to reduce intraoperative bleeding. The Pringle manoeuvre was considered as a back-up strategy. A CUSA Excel™ device was used for liver transection. Drainage was routinely placed in the subphrenic cavity before closure [12]. The decision to conduct blood transfusion during both donor and recipient operations was based on the findings of laboratory tests. Packed RBCs were transfused to maintain the haemoglobin level above 7.0 g/dL [13].

2.4. Definitions

Postoperative ascites was defined as abdominal output greater than 500 ml/d, or ascites that require medical treatment to be controlled [14]. Postoperative liver failure was defined as both a prothrombin time less than 50% (international normalised ratio (INR) > 1.7) and a serum bilirubin concentration greater than 50 μmol/L on postoperative day 5 [15,16]. Major hepatectomy was defined as resection of 4 or more liver segments, whereas resection of 3 or less liver segments was considered as minor hepatectomy [17]. High HBV-DNA load was defined as serum HBV-DNA load higher than 10^4 copies/ml [18].

2.5. Statistical analysis

All continuous variables were expressed as the mean ± SD and compared using one-way analysis of variance. Categorical variables were analysed using chi-squared test or Fisher's exact test. Factors significant at a $P < 0.10$ in the univariate analyses were involved in the multivariate analyses. The diagnostic accuracy of the identified risk factors was evaluated using receiver operating curve (ROC). A P value of less than 0.05 was considered statistically significant. SPSS 21.0 for Windows was used for all statistical analyses [13].

3. Results

A total of 77 patients were recruited in this study. FibroScan was successfully performed in 75 patients. Two patients were excluded from this study because of liver stiffness measurement was not successfully performed. The causes were obesity (N = 1) and diffuse HCC (N = 1). As listed in Table 1, the mean age of the qualified 75 patients was 51.35 ± 11.50 years. This study included 16 female patients and 59 male patients. Hepatitis B virus antigen was observed in all patients. Eleven patients had a high preoperative hepatitis B viral load. The mean FibroScan value was 11.06 ± 5.94 kpa. The mean tumor size was 5.81 ± 4.01 cm. Fourteen patients suffered from multiple HCCs. The mean total bilirubin (TB) was 14.31 ± 5.46 mmol/L. The mean platelet count was 119.67 ± 68.49 × 10^9/L. The mean intraoperative blood loss was 379.33 ± 300.35 ml. Nine patients received intraoperative blood transfusion. Thirteen patients received major liver resection, whereas 62 patients underwent minor liver resection. Ishak score ≥5 was observed in 24 patients.

Postoperative ascites was observed in 13 patients. Postoperative liver failure was observed in 4 patients. Among the 4 patients with postoperative liver failure, the liver function recovered in 3 patients. One patients with postoperative liver failure died.

3.1. Identification of risk factors in predicting postoperative ascites

As shown in Table 2, tumor size, high preoperative hepatitis B

Table 1
Demographic data of current study.

Variables	N/mean ± SD
Age (years)	51.35 ± 11.50
Female/male	16/59
High hepatitis B viral load	11
Total bilirubin (mmol/L)	14.31 ± 5.46
Platelet (10^9/L)	119.67 ± 68.49
Creatinine (mmol/L)	74.24 ± 40.77
ALT (U/L)	50.57 ± 51.33
AST (U/L)	51.46 ± 49.19
INR	1.07 ± 0.08
Tumor size (cm)	5.81 ± 4.01
Multiple tumors	14
Pringle's maneuver	45
Time of occlusion (min)	30.19 ± 16.46
Intraoperative blood loss (ml)	379.33 ± 300.35
Transfusion	9
Major/minor hepatectomy	13/62
Ishak score ≥5	24
FibroScan value (kpa)	11.06 ± 5.94