ORIGINAL ARTICLE

Model for end-stage liver disease (MELD) score, as a prognostic factor for post-operative morbidity and mortality in cirrhotic patients, undergoing hepatectomy for hepatocellular carcinoma

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Abstract

Background/aims: To evaluate the ability of the model for end-stage liver disease (MELD) in predicting the post-hepatectomy outcome for hepatocellular carcinoma (HCC).

Methods: Between 2001 and 2004, 69 cirrhotic patients with HCC underwent hepatectomy and the results were retrospectively analysed. MELD score was associated with post-operative mortality and morbidity, hospital stay and 3-year survival.

Results: Seventeen major and 52 minor resections were performed. Thirty-day mortality rate was 7.2%. MELD $\leq$ 9 was associated with no peri-operative mortality vs. 19% when MELD > 9 ($P < 0.02$). Overall morbidity rate was 36.23%; 48% when MELD > 9 vs. 25% when MELD $\leq$ 9 ($P < 0.02$). Median hospital stay was 12 days [8.8 days, when MELD $\leq$ 9 and 15.6 days when MELD > 9 ($P = 0.037$)]. Three-year survival reached 49% (66% when MELD $\leq$ 9; 32% when MELD > 9 ($P < 0.01$). In multivariate analysis, MELD > 9 ($P < 0.01$), clinical tumour symptoms ($P < 0.05$) and American Society of Anesthesiologists (ASA) score ($P < 0.05$) were independent predictors of peri-operative mortality; MELD > 9 ($P < 0.01$), tumour size >5 cm ($P < 0.01$), high tumour grade ($P = 0.01$) and absence of tumour capsule ($P < 0.01$) were independent predictors of decreased long-term survival.

Conclusion: MELD score seems to predict outcome of cirrhotic patients with HCC, after hepatectomy.

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Introduction

Hepatocellular carcinoma (HCC) is one of the most common malignancies worldwide. Its incidence is 1:500 000 and it is strongly correlated with cirrhosis.[1] The mainstay of treatment, in patients with solitary HCC and good liver function, is hepatic resection.[2]

Evolution in surgical techniques and peri-operative care have improved post-operative outcome, in patients with severe underlying liver disease undergoing hepatectomy. The risk of hepatic failure in a cirrhotic patient undergoing hepatectomy still remains high, as a result of compromised function of the liver remnant.[3,4]

Therefore, a thorough evaluation of the hepatic function reserve is necessary prior to surgical intervention, in order to select the best candidates for hepatic resection among cirrhotic patients, with reasonable post-operative morbidity and mortality.

Child–Pugh–Turcotte (CPT) classification was the first systematic approach used to determine the severity of cirrhosis and select those patients who could tolerate hepatic resection.[5] CPT class C is considered an absolute contraindication for surgical treatment, whereas only few hepatectomies are performed in class B cirrhosis.[5–7] CPT class A patients are generally considered good candidates for hepatic resection and good post-operative outcome is expected. More refined evaluation of the liver function reserve is

often needed, as a result of limitations in the discriminatory ability of the CPT system, as it uses subjective parameters, such as ascites and encephalopathy.[8–11]

Many tests have been applied for the assessment of dynamic hepatic function, such as the indocyanine green clearance test,[9] lidocaine test,[10] galactose elimination capacity,[11] and it was shown that they could provide a more refined estimate of hepatic function than the CPT score.[9]

The model for end-stage liver disease (MELD) score was recently introduced to evaluate hepatic function reserve in cirrhotic patients.[12–15] It has the advantage of using three objective and easily measured parameters: creatinine levels, international normalized ratio (INR) and total bilirubin.

MELD score is used for survival prediction in cirrhotic patients receiving a transjugular intrahepatic portosystemic shunt.[12] It has also been used to determine priority on waiting lists for liver transplantation[13] and in predicting post-operative outcome of cirrhotic patients, undergoing surgical procedures.[14,15]

The aim of this study was to examine whether the pre-operative MELD score can predict post-operative mortality, morbidity, hospital stay and 3-year survival in cirrhotic class A patients undergoing hepatectomy for HCC. An effort to subcategorize the low-from the high-risk class A patients is provided.

Materials and methods

We retrospectively analysed the clinical records of all patients with HCC, who underwent hepatic resection in our institution between January 2001 and January 2004. Patients who were anticoagulated and those with chronic renal insufficiency requiring haemodialysis were excluded from the study. HCC was pathologically confirmed in all patients included in the study. We identified 69 patients fulfilling the above criteria. Clinical and pathological features of the patients are reported in Tables 1 and 2.

CPT class was calculated using prothrombin time, albumin, bilirubin and clinical findings of ascites and encephalopathy.[16] CPT score was stratified as class A (5–6), B (7–9) and C (10–15). Sixty two patients were classified as CPT class A (89.8%) and seven patients as CPT class B, score 7 (10.2%).

MELD score was calculated using pre-operative values of three laboratory tests: INR for prothrombin time, serum total bilirubin (TBil) and serum creatinine (Cr). MELD score was calculated using the following formula: $MELD = 9.57 \times \log_e(Cr\ mg/dl) + 3.78 \times \log_e(TBil\ mg/dl) + 11.20 \times \log_e(INR) + 6.43$.[12] We used the MELD score of the patient upon admission to our clinic, as it more accurately represents the severity of cirrhosis before surgery. Median MELD score prior to surgery was nine (range, 6–15). The distribution of MELD score in our population is shown in Fig. 1.

Patients with CPT class A cirrhosis showed a median MELD score of 8, ranging from 6 to 14, significantly lower than patients with CTP class B cirrhosis who had a median MELD score of 11 (range, 9–15, $P < 0.05$).

During hospitalization and prior to surgery, the majority of the patients received blood products such as fresh frozen plasma

Table 1 Univariate analysis of peri-operative mortality in patients with cirrhosis with hepatocellular carcinoma

Variable	No. of patients	Peri-operative mortality, n (%)	P-value
Age (years)			0.6
≤65	41	2	
>65	28	3	
Gender			0.7
Male	49	4	
Female	20	2	
Symptoms			<0.05
Present	28	5	
Absent	41	0	
CPT class			0.5
A	62	4	
B	7	1	
MELD score			0.01
≤9	43	0	
>9	26	5	
Tumour size			>0.05
≤5	43	3	
>5	26	2	
Grade			>0.05
1	5	0	
2	36	3	
3	28	2	
4	0		
Stage			0.1
1	22	2	
2	26	2	
3	19	1	
Extent of resection			0.09
Minor	52	2	
Major	17	3	
ASA class			<0.05
1	14	0	
2	34	1	
3	21	4	

CPT, Child–Pugh–Turcotee; MELD, model for end-stage liver disease; ASA, American Society of Anesthesiologists.

(FFP) in order to improve their laboratory values. Hepatitis activity and cirrhosis were evaluated using the Isaak fibrosis score.[17] Necrosis and inflammatory changes characteristic of hepatitis were scored as mild (0–5), moderate (6–12) or severe (13–18), and fibrosis was scored as cirrhosis vs. Non-cirrhosis. Operative data are shown in Tables 1 and 2. Major hepatic resection was defined as the removal of three or more segments.[18] Portal vein embolization (PVE) was performed 6 to 8 weeks before surgery whenever