

Application of the Model for End-Stage Liver Disease (MELD) score to predict survival in patients undergoing elective Transjugular Intrahepatic Portosystemic Shunts (TIPS).

Hector Ferral, M.D.

Associate Professor of Radiology

The University of Texas Health Science Center at San Antonio.

Pablo Gamboa, M.D.

Assistant Professor of Radiology

The Ohio State University

Introduction

The factors affecting patient survival after the Transjugular Intrahepatic Portosystemic Shunt (TIPS) procedure have been extensively studied [1-6]. Elevated serum bilirubin and creatinine levels before TIPS creation have been proposed as important predictors of poor patient prognosis [3, 5, 7]. The Model for End-Stage Liver Disease (MELD) score has been recently described and has gained widespread acceptance as an accurate disease severity index [8]. The MELD score is calculated by using three objective indicators: serum bilirubin, serum creatinine and INR. These indicators are plotted in a mathematical formula : $MELD\ score = 9.6 \times \log_e(creatinine\ mg/dL) + 3.8 \times \log_e(bilirubin\ mg/dL) + 11.2 \times \log_e(INR) + 6.4$. The MELD score can be easily calculated using a web site. The web site that we have used for our calculations is:

<http://depts.washington.edu/uwhep/calculations/meldscore.htm>.

We applied the MELD score to all patients who underwent an elective TIPS procedure in our institutions in a 3 year period. No significant differences in patient survival were found between our Institutions (P=0.293). The survival for all patients was 88.4% at 30 days, 78.1% at 3 months and 71.8% at 6 months.

Survival by MELD Score

A total of 167 elective TIPS procedures were attempted and 166 were completed successfully for a technical success rate of 99.4%. The patients were separated into four categories by MELD scores as follows: MELD score ≤ 10 (n=28); 11-17 (n=83); 18- 24 (n=40) and MELD score ≥ 25 (n=15). Survival was significantly worse in patients with MELD scores ≥ 18 compared to patients with MELD scores ≤ 17 (P=0.0001). Survival was significantly better for patients with MELD scores ≤ 10 than for other groups (P<0.012) and significantly worse for patients with MELD ≥ 25 , compared to other groups (P<0.035).

Mortality was significantly increased at 3 months (P=0.001) in patients with MELD scores ≥ 18 compared to patients with MELD scores ≤ 17 . Within the ≤ 17 MELD score bracket, those patients with a MELD score ≤ 10 had a

significantly lower 3-month mortality than those patients with MELD scores 11-17 ($P=0.035$). Within the ≥ 18 MELD score bracket, those patients with a MELD score ≥ 25 had a significantly higher 3-month mortality than those patients with MELD scores 18-24 ($P=0.047$). Of note is that the six month mortality for patients with a MELD score ≤ 10 was 0% and for patients with MELD scores ≥ 25 the six month mortality was almost 75%.

Early mortality

Nineteen patients died within 30 days post-TIPS; the early death rate was 11.65%. The causes of early death included: liver failure ($n=10$), sepsis ($n=4$), renal failure ($n=1$), multiorgan failure ($n=2$), and undetermined ($n=2$). There was a significant difference in the 30-day mortality between patients with MELD scores ≤ 17 and MELD scores ≥ 18 ($P=0.001$). The early mortality for patients with MELD scores ≤ 10 ($n=28$) was 0% and those with a MELD score ≥ 25 ($n=15$) had an early mortality of 42.6%.

Discussion.

Analysis of patient survival confirmed that patients with MELD scores ≥ 18 have a significant lower survival than patients with MELD scores ≤ 17 . When these patients are further divided, the differences in survival are even more striking i.e. patients with MELD scores ≤ 10 had a 100% six-month survival whereas those patients with MELD scores ≥ 25 had a six-month survival of only 25%. These results confirm that the MELD score is a reliable disease severity index [8-11] and that higher MELD scores are associated with a worse prognosis. These results have had a major impact on our daily clinical practice and presently, we do not recommend performing elective TIPS in patients with MELD scores ≥ 25 ; alternative management strategies (i.e. expedited liver transplant, banding/ sclerotherapy or repeat paracentesis) are offered to these patients. Our early death rate is comparable to the early death reported in previous series [1, 2, 7, 10, 12]. We found a significantly higher early mortality

in patients with MELD scores ≥ 18 compared to patients with MELD ≤ 17 . Patients with MELD score ≥ 25 had a 42% early mortality rate, which was much higher when compared to other subgroups.

We think that the MELD score is useful as a disease severity index to predict poor survival in patients undergoing elective TIPS procedures. Our results strongly suggest that patients with MELD scores ≥ 25 should not undergo an elective TIPS procedure and alternative management strategies such as banding, repeat paracentesis or expedited liver transplantation should be considered. Patients with refractory ascites and high MELD scores probably should not undergo TIPS and be treated with repeat paracentesis as the management of choice; discussion with the referring physicians, patient and family members will become extremely important in deciding management strategies for patients with refractory ascites. The most important application of these results is in deciding the usage of available resources.

References

1. Rossle M, Siegerstetter V, Huber M, Ochs A. The first decade of the transjugular intrahepatic portosystemic shunt (TIPS): state of the art. *Liver* **1998**;18:73-89
2. Encarnacion CE, Palmaz JC, Rivera FJ, et al. Transjugular Intrahepatic Portosystemic Shunt Placement for Variceal Bleeding: Predictors of Mortality. *J Vasc Intervent Radiol* **1995**;6:687-694
3. Rajan DK, Haskal ZJ, Clark TWI. Serum bilirubin and Early Mortality after Transjugular Intrahepatic Portosystemic Shunts: Results of a Multivariate Analysis. *J Vasc Interv Radiol* **2002**;13:155-161
4. Rubin RA, Haskal ZJ, O'Brien C, Cope C, Brass C. Transjugular intrahepatic portosystemic shunting: decreased survival for patients with high APACHE II scores. *Am J Gastroenterol* **1995**;90:556-563
5. Chalasani N, Clark WS, Martin LG, et al. Determinants of mortality in patients with advanced cirrhosis after transjugular intrahepatic portosystemic shunting. *Gastroenterology* **2000**;118:138-144
6. Patch D, Nikolopoulou V, McCormick A, et al. Factors related to early mortality after transjugular intrahepatic portosystemic shunt for failed endoscopic therapy in acute variceal bleeding. *J Hepatol* **1998**;28:454-460
7. Coldwell DM, Ring EJ, Rees CR, et al. Multicenter Investigation of the Role of Transjugular Intrahepatic Portosystemic Shunt in Management of Portal Hypertension. *Radiology* **1995**;196:335-340

8. Kamath PS, Wiesner RH, Malinchoc M, et al. A model to predict survival in patients with end-stage liver disease. [see comments]. *Hepatology* **2001**;33:464-470
9. Malinchoc M, Kamath PS, Gordon FD, Peine CJ, Rank J, Ter Borg PCJ. A Model to Predict Poor Survival in Patients Undergoing Transjugular Intrahepatic Portosystemic Shunts. *Hepatology* **2000**;31:864-871
10. Ferral H, Vasan R, Speeg KV, et al. Evaluation of a model to predict poor survival in patients undergoing elective TIPS procedures. *J Vasc Interv Radiol* **2002**;13:1103-1108
11. Salerno F, Merli M, Cazzaniga M, et al. MELD score is better than Child-Pugh score in predicting 3-month survival of patients undergoing transjugular intrahepatic portosystemic shunt. *J Hepatol* **2002**;36:494-500
12. Walser EM, DeLa Pena R, Villanueva-Meyer J, Ozkan O, Soloway R. Hepatic perfusion before and after the transjugular intrahepatic portosystemic shunt procedure: impact on survival. *J Vasc Interv Radiol* **2000**;11:913-918

