TO EVALUATE PROGNOSTIC VALUE OF MELD AND CHILD-TURCOTTE PUGH SCORES IN PATIENTS WITH LIVER CIRRHOSIS AND VARICEAL BLEEDING

Pradeep Kumar Gupta1, Keerti Manocha2, Sumit Kant Jha3, Saurabh Singh4

1Associate Professor, Department of General Medicine, Subharti Medical College, Meerut, Uttar Pradesh.
2Resident, Department of General Medicine, Subharti Medical College, Meerut, Uttar Pradesh.
3Associate Professor, Department of General Medicine, Subharti Medical College, Meerut, Uttar Pradesh.
4Professor and HOD, Department of General Medicine, Subharti Medical College, Meerut, Uttar Pradesh.

ABSTRACT

BACKGROUND
Patients with liver cirrhosis have significant morbidity and mortality. Bleeding oesophageal varices is responsible for much of the high mortality rate in cirrhosis. An important objective of management of bleeding varices is to develop reliable tools for predicting survival, controlling bleeding and encephalopathy, and improve quality of life. Our study aimed to validate the utility of MELD score versus Child Turcotte Pugh (CTP) in patients with liver cirrhosis and oesophageal varical bleeding. We wanted to compare the predictive ability of Child-Turcotte-Pugh score and MELD score for the assessment of prognosis and mortality in patients with liver cirrhosis and oesophageal variceal bleeding.

METHODS
100 Patients of liver cirrhosis and oesophageal variceal bleeding above 18 yrs. of age were enlisted after informed consent at CSSH, Meerut. Diagnosis was established on the basis of history along with proper clinical examination to look for any stigmata of liver failure, laboratory parameters, radiological investigations including ultrasound of abdomen with Doppler and upper GI endoscopy as per guidelines. MELD score was calculated, and CTP criteria were established.

RESULTS
Majority of patients in the study group were in the age group of 41-60 yrs., 74% of patients were male and 26% were female. AUROC was significantly higher for MELD (.686) compared to CTP score (.551). This finding was consistent even after 3 months, where AUROC was significantly higher for MELD (.922) compared to CTP score (0.547).

CONCLUSIONS
In cirrhotic patients the MELD score is an excellent survival predictor and is as good as if not better than the Child-Pugh score. Increase in the MELD score is associated with decrease in residual liver function. In the group of patients with liver cirrhosis and oesophageal variceal bleeding, the MELD score identifies those with a higher intra hospital mortality risk.

KEYWORDS
Liver Cirrhosis, Oesophageal Variceal Bleeding, CTP, MELD, Prognosis, Mortality


BACKGROUND
Cirrhosis has become one of the leading causes of death worldwide with alcohol abuse being the most common cause in developed countries and viral hepatitis contributing to the vast majority of cases in developing countries. In our country, also, liver cirrhosis has become a major cause of mortality owing to the large number of cases of viral hepatitis and heavy alcohol consumption.

Laboratory tests can give only a rough guide to prognosis in patients with liver cirrhosis. Liver function tests can be broadly divided into static tests and dynamic tests i.e. quantitative liver function tests.1

In 1964, Child and Turcotte,2 described a prognostic model for assessment of surgical risk in cirrhotic patients. Pugh et al proposed a modification of this model in 1973.3 The short-term prognosis of acutely ill patients with cirrhosis is influenced by the degree of hepatic insufficiency and by the dysfunction of extrahepatic organ systems.4 Recently, the study group at the Mayo Clinic introduced a new scoring system, the Model for End Stage Liver Disease (MELD), to evaluate the prognosis of patients undergoing TIPS (Transjugular intrahepatic portosystemic shunt)5 6. They then generalized its application to patients with different stages of cirrhosis to evaluate their short term survival prognosis.7

The MELD score takes into consideration objective parameters (serum creatinine, prothrombin time INR, serum bilirubin) and is computed with a statistically derived coefficient on a continuous scale with no upper or lower limits, thus avoiding many drawbacks of the Child-Pugh
MELD SCORE

\[
\text{MELD} = \text{MELD} + 1.32 \times (137 + 6.43 \times \log \text{creatinine}) + (3.78 \times \log \text{bilirubin}) + (11.2 \times \log \text{INR})
\]

The MELD score was developed to predict survival in patients with liver cirrhosis and is a continuous function of bilirubin, international normalized ratio (INR), and creatinine.6,9

METHODS

Sample Size
100 new patients of liver cirrhosis and oesophageal variceal bleeding will be enlisted in study after informed consent and optimum allocation stratified sampling.

Inclusion Criteria
All Patients with liver cirrhosis above 18 yrs. of age, in patients (at CSSH, Meerut) will be enrolled in the study for a period of 3 months. Liver cirrhosis will be established as a diagnosis on the basis of history, clinical examination, laboratory parameters, radiological investigations including ultrasound of abdomen with Doppler and computed tomography abdomen (whenever necessary) along with upper gastrointestinal endoscopy as per the guidelines.

Exclusion Criteria
Patients of established kidney disease with deranged renal function parameters (except hepatorenal syndrome), patients with known bleeding disorders, patients with ascites of aetiology other than liver cirrhosis were excluded from the study.

Investigations Done

Tools
Clinical proforma, Meld score and Child’s Pugh score to assess the severity and prognosis in cirrhosis of liver. MELD score will be calculated on the basis of the formula: (9.57 × log creatinine) + (3.78 × log bilirubin) + (11.2 × log INR) + 6.43 (constant for liver disease aetiology).

MELD = MELD + 1.32 *(137-Na) - (0.033*MELD*(137-Na))

MELD SCORE: 6 to 40

United Network for Organ Sharing (UNOS) modifications of the original model. Any value less than 1 is automatically given a lower limit value of 1 to prevent generating a negative score. The lower limit of Serum Sodium (Na) is capped at 125, and the upper limit is at 137. The upper limit of serum creatinine is capped at 4; in addition, if the patient had dialysis at least twice in the past week, the value for serum creatinine will be automatically adjusted to 4.0. The maximum MELD score is 40.

All the patients will be categorized as per Child’s Criteria (Table 1) and MELD.

Statistical Analysis
Data were described in terms of range; mean ± standard deviation (±SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square (χ²) test was performed and exact test was used when the expected frequency is less than 5. Receiver operator characteristics (ROC) curve was done, and criterion value was estimated depending on the specificity and sensitivity. Area under curve (AUC) was measured. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

RESULTS
The majority of patients in the study group were in the age group of 41-60 yrs. (50%) followed by below 40 yrs. (27%), above 60 yrs. (23%).

In the present study it was observed that 74% of patients were male and 26% were female. Table 4 and 5 show the comparison of survival and expired patients with demographic and investigations parameters. In our study, on comparing statistically the ROC analysis of both the score, we observed that MELD score came more appropriate with higher sensitivity and specificity in predicting mortality at 90 days in comparison with CTP score (Figure 2).

AUROC was significantly higher for MELD (.686) compared to CTP score (.551). This finding was consistent even after 3 months, where AUROC was significantly higher for MELD (.922) compared to CTP score (0.547) H. Garg et al showed that amongst all severity scores studied, MELD, SOFA and APACHE-II scores had AUROCs of>0.8 which was significantly higher than that of Child-Turcotte-Pugh score.

In this study it was observed that majority of patients in the study group were in the age group of 41-60 yrs. (50%) followed by below 40 yrs. (27%), above 60 yrs. (23%).

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>26</td>
<td>26%</td>
</tr>
<tr>
<td>Male</td>
<td>74</td>
<td>74%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>3-Months Survival (95% CI) AUC</th>
<th>Std. Error</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MELD</td>
<td>0.78 (0.69-0.82)</td>
<td>0.07</td>
<td>0.001</td>
</tr>
<tr>
<td>CTP</td>
<td>0.69 (0.54-0.74)</td>
<td>0.09</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Table 1: Comparison Analysis of CTP, MELD Scores for their Prognostic Abilities in Predicting the In-Hospital Mortality (ROC, receiver operating characteristic curve; MELD, model for end stage liver disease.)

Figure 1

Figure 2

Figure 3
DISCUSSION
Numerous studies have compared the performance of Child-Pugh score with that of MELD score for the prognostic prediction in patients with liver diseases. As for the cirrhotic patients with acute variceal bleeding, their superiority remained controversial among studies. Chalasani et al. collected 239 cirrhotic patients with acute variceal bleeding from 4 large academic hospitals, and compared the performance of the two scoring systems in predicting the in-hospital and 1-year mortality rates. The MELD score was highly predictive of both in-hospital (AUROC=0.82) and 1-year (AUROC=0.75) mortality rates.

Amitrano et al. retrospectively analysed the 6-week and 3-month mortality of 172 cirrhotic patients with the first episode of oesophageal variceal bleeding after drug and endoscopic therapy. AUROC for the MELD and Child-Pugh scores for predicting the 6-week mortality was 0.80 and 0.76, respectively. AUROC for the MELD and Child-Pugh scores for predicting the 3-month mortality was 0.79 and 0.76, respectively.

Cerqueira et al. included 102 cirrhotic patients consecutively admitted with oesophageal variceal bleeding. AUROC for the MELD and Child-Pugh score for predicting the in-hospital mortality was 0.76 (95% CI: 0.64-0.876) and 0.719 (95% CI: 0.585-0.853), respectively.

More recently, Reverter et al. analysed 178 patients with cirrhosis and acute oesophageal variceal bleeding. AUROC for the MELD and Child-Pugh scores for predicting the 6-week mortality was 0.70 and 0.74, respectively (P=0.2179). These studies by Amitrano, Cerqueira, and Reverter suggested the superiority of MELD score over Child-Pugh score. However, it should be noted that the difference was not statistically significant. Or off et al. enrolled 211 consecutive patients with liver cirrhosis and oesophageal variceal bleeding after endoscopic sclerotherapy or emergency portacaval shunt. The investigators found that Child-Pugh score was similar to MELD score in predicting the survival, recurrent encephalopathy, and rebleeding. Additionally, Child-Pugh score was superior to MELD score in predicting the hospital readmissions and readmission days.

As for the cirrhotic patients with unstable UGIB (heart rate &gt; 100 beats/minute or systolic blood pressure &lt; 100 mmHg), Hsu et al. retrospectively analysed the performance of Glasgow-Blatchford, Rockall, and MELD scores. MELD scores had a significant discriminative ability for predicting the mortality (AUROC=0.736, 95% CI: 0.629-0.842, P=0.001). By comparison, Glasgow-Blatchford and Rockall scores did not have any significant discriminative ability for predicting the mortality (AUROC=0.527, 95% CI: 0.393-0.661, P=0.709; AUROC=0.591, 95% CI: 0.465-0.717, P=0.208).

The median age of the patients was 36(range 15 to 80) years in a large prospective study done by H. Garg et al in Delhi. In a study done by Khatun UF et al. Majority of the patients were between 45-54 years. Dhiman RK et al reported in their study that the mean age with standard deviation was 46 ± 13 years in ACLF patients. The median age was 53 years in a study reported by Deepakamarapurkar et al.

Male Patients consisted of 74%, 86%, 86%, 81.8% in studies by H Garg et alKhatun UF et al, Dhiman RK et al, Deepakamarapurkar et al.

<table>
<thead>
<tr>
<th>Study</th>
<th>No. of Patients</th>
<th>Meld</th>
<th>Child-Pugh Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalasani et al.</td>
<td>239 of acute variceal bleeding</td>
<td>score in hospital (AUROC=0.82) AUROC=0.75) mortality rates</td>
<td></td>
</tr>
<tr>
<td>Amitrano et al.</td>
<td>172 cirrhotic patients first episode of oesophageal variceal bleeding after drug and endoscopic therapy</td>
<td>AUROC 6-week mortality was 0.80. AUROC for the for predicting the 3-month mortality was 0.79</td>
<td>AUROC 6-week mortality was 0.76, AUROC for scores for predicting the 3-month mortality was 0.76</td>
</tr>
<tr>
<td>Cerqueira et al.</td>
<td>102 cirrhotic with oesophageal variceal bleeding</td>
<td>AUROC for predicting the in-hospital mortality was 0.760 (95% CI: 0.644-0.876)</td>
<td>AUROC for predicting the in-hospital mortality was 0.719 (95% CI: 0.585-0.853)</td>
</tr>
<tr>
<td>Reverter et al.</td>
<td>178 patients with cirrhosis and acute oesophageal variceal bleeding</td>
<td>AUROC for predicting the 6-week mortality was 0.79</td>
<td>AUROC for predicting the 6-week mortality was 0.74 P=0.2179</td>
</tr>
<tr>
<td>Giannini et al.</td>
<td>145 European cirrhotic patient</td>
<td>c statistics for predictive values for 3-month mortality 0.827</td>
<td>c statistics for predictive values for 3-month mortality 0.047P ≤0.0001</td>
</tr>
</tbody>
</table>

Table 8

Our target population has the following features. 1) All patients had a diagnosis of liver cirrhosis. 2) All patients presented with acute UGIB. Indeed, at the emergency admission for UGIB, especially massive hematemesis, not all patients had the opportunity to undergo the endoscopic examinations to identify the sources of bleeding. 3) Child-Pugh and MELD scores, two most important scoring systems for the prognosis of liver cirrhosis, were compared in our cohort. 4) The in-hospital mortality of acute UGIB was the only endpoint of our study. We found that both scoring systems had good discriminative abilities for the in-hospital mortality of acute UGIB in liver cirrhosis, and that the AUROC for MELD score might be slightly superior to that for Child-Pugh score, but the difference was not statistically significant between them.

The potential limitations of our study should be clarified. First, the comparisons of long-term follow-up outcome between the two scoring systems were lacking. Second, 20% of included patients did not undergo the endoscopic examination. Thus, we did not strictly limit the source of UGIB (variceal or non-variceal). Third, none of patients underwent TIPS for acute UGIB. Indeed, a recent randomized controlled trial suggested that early TIPS should be more effective for improving the survival of acute variceal bleeding in high-risk cirrhotic patients. This consideration is also supported by a meta-analysis. Thus, the mortality would be lower in our patients, if TIPS was employed.
CONCLUSIONS
The discriminative ability for predicting the in-hospital mortality of acute UGIB in liver cirrhosis was similar between Child-Pugh and MELD scores. In the group of patients with liver cirrhosis and oesophageal variceal bleeding, the MELD score identifies those with a higher intra hospital mortality risk.

ACKNOWLEDGEMENTS
The authors acknowledge the support of Dr. P. K. Gupta, Dr. S. K. Jha and Dr. Saurabh Singhal during the study.

REFERENCES