MELD score: A reliable predictor of mortality and post operative complications in patients with chronic liver disease undergoing non-transplant surgeries.

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ABSTRACT… Objective: To compare the results of CTP and MELD scoring systems for predicting outcome in patients of chronic liver disease and to conclude which model is better for risk stratification, so as to enable us in better management of these patients. Study Design: Observational study. Setting: General Surgery Department of Nishtar Medical University and Hospital. Period: October 2019 to March 2020. Material & Methods: We collected data from 30 patients. All the surgeries were done by the same team of consultant surgeons. All the investigations were done by the same institution. Scores of both CTP and MELD models were calculated preoperatively and post-operative outcome was compared with them to find out which model was a better predictor of mortality. Kaplan Meyer Survival Analysis was conducted to compare post-op survival time among patients divided on the basis of MELD score and CTP Grade. Pooled log rank test was conducted to determine if there were differences in the survival distributions for the different categories in each group. Significant results were followed-up by pair-wise log rank test, at Bonferroni adjusted α level of p <0.0167. Results: In our study the mean survival time of 71.20, 54.93, 8.40 for MELD scores of 11-20, 21-30 and >30 has a P value of <0.001. The mean survival time of 56, 54.85, 42.40 for CTP grades of A, B, and C respectively has a P value of 0.582. It shows that according to our study the MELD score has performed better in predicting the post-operative outcome of patients with liver diseases than CTP score. Conclusions: Although CTP and MELD both are widely used to predict the post-operative mortality but in our study MELD score has predicted the outcome more effectively than CTP scoring system.

Key words: Childs-Turcotte-Pugh (CTP), End Stage Liver Disease, Model of End-Stage Liver Disease (MELD), Post-operative Mortality.

INTRODUCTION

The chronic liver disease has been a major health problem worldwide.[1] Cirrhosis has a variable course and depends upon a lot of other factors, including hepatic reserve. These patients have posed a burden on the surgical department because any surgery involving these patients usually has an adverse outcome.[2] In view of these problems and with the advancement in medical sciences, various scoring systems have been developed to predict the post-operative mortality in these patients. Model for end-stage liver disease and Child–Turcotte–Pugh (CTP) scoring systems are two such examples.[3] MELD score was developed for the assessment of patients who require liver transplant. Since then, it has also been employed as a predictor of mortality in patients undergoing extra hepatic surgeries.[4] CTP scoring, initially developed to predict prognosis after surgery for portal hypertension is also currently being employed is assessing the severity of decompensated liver cirrhosis.[5,6] Recent systemic reviews have shown CTP a very important predictor of mortality in patients with compensated cirrhosis even in the absence of ascites and hepatic encephalopathy.[7]

These scoring systems have not only been able to predict hepatic dysfunction, but also predict the post-operative mortality and morbidity in these patients.[8] In this research we ought to see how effective these two systems are in predicting mortality and morbidity in patients undergoing surgical procedures under general anesthesia.

MATERIAL & METHODS

This is an Observational study that was carried out at General Surgery Department of Nishtar Medical University and Hospital from October 2019 to March 2020. We collected data from 30 patients. All the surgeries were done by the same team of consultant surgeons. All the investigations were done by the same institution. Scores of both CTP and MELD models were calculated preoperatively and post-operative outcome was compared with them to find out which model was a better predictor of mortality. The mortality and morbidity of patients was calculated at early post-operative period, 30-day interval and 90-day interval.

SPSS version 20 was used for data analysis. All the continuous variables were reported as mean ± standard deviation. Kaplan Meyer Survival Analysis was conducted to compare post-op survival time among patients divided on the basis of MELD score and CTP Grade. Pooled log rank test was conducted to determine if there were differences in the survival distributions for the different categories in each group. Significant results were followed-up by pair-wise log rank test, at Bonferroni adjusted α level of $p < 0.0167$.

RESULTS

The mean age of patients in our research was 52.67 years, with 25 males and 5 females in the research. The mean MELD score is 24.30 while CTP is 7.87. The post-operative mortality and morbidity associated with MELD and CTP scores is demonstrated in these tables.

This table indicates that the survival time in cases of patients with a higher MELD score and the ones undergoing emergency surgery is significant (p value <0.05) whereas the survival time for CTP score wasn't significant.

There were no patients in the current study with MELD score of <10. Patients with MELD score >30 had a mean survival of 8.4 days (SE = 2.77 days). This was significantly shorter than patients with MELD score of 11-20 and 21-30, who had a mean score of 71.20 days (SE = 8.67) and 54.93 days (SE = 9.25) respectively. However, there was no significant difference between patients with MELD score 11-20 and 21-30.

There was no significant difference between the survival time of patients when divided according to CTP grade.

Variable	Number of Patients(30)	
Age	52.67	(5.94%)
Gender		
Male	25	(83.30%)
Female	05	(16.70%)
Procedure Performed		
Emergency	23	(76.70%)
Elective	07	(23.30%)
MELD Score*	24.30	(5.43)
CTP Score*	7.87	(1.38)
CTP Grade		
A	05	(16.70%)
B	20	(66.70%)
C	05	(16.70%)
Post-op Complications		
Wound Infection	09	(30.00%)
Chest Infection	05	(16.70%)

Table-I. Demographic profile and meld score
***Reported as Mean ± Standard Deviation**

Predictor	No. of Patients	Mortality, No. of Patients at Risk			
		30 Days		90 Days	
MELD					
<10	0	0		0	
11-20	10	1	(10%)	4	(40%)
21-30	15	5	(33.33%)	8	(53.33%)
>30	05	0	(0%)	5	(100%)
CTP Grade					
A	05	2	(40%)	2	(40%)
B	20	7	(35%)	11	(55%)
C	05	2	(40%)	4	(80%)
Procedure Performed					
Emergency	23	11	(47.83%)	16	(69.57%)
Elective	07	0	(0%)	1	(14.29%)

Means and Medians Survival Time (days)						Log Rank Pooled Comparison (dF=2)		
Category	Est.	**Mean**		Est.	**Median**			
		95% Conf. Interval			95% Conf. Interval		χ^2	dF	p value.
		Lower Bound	Upper Bound		Lower Bound	Upper Bound			
MELD Score Categories									
11-20 [a]	71.20	54.20	88.20	.	.	.	16.07	2	<0.001
21-30 [ab]	54.93	36.80	73.07	60.00	.	.			
>30 [c]	8.40	2.98	13.83	8.00	0.00	16.59			
Overall	52.72	39.60	65.85	60.00	40.9	79.09			
CTP Grade									
A	56.00	19.43	92.57	.	.	.	1.08	2	0.582
B	54.85	39.04	70.66	90.00	22.03	97.98			
C	42.40	14.42	70.38	90.00	.000	120.000			
Overall	52.72	39.60	65.85	90.00	40.9	79.09			

Table-II. Means and medians survival time (days)

Emergency	43.000	28.253	57.747	36.000	.000	84.520			
Elective	85.000	76.054	93.946	.	.	.	5.47	1	0.019
Overall	52.721	39.597	65.845	60.000	40.911	79.089			

Table-III. Procedure performed
Sig. differences among groups for MELD score categories (p < 0.0167 after Bonferroni correction) are indicated by different letters a, b, c (e.g., a is different from b but not from ab).
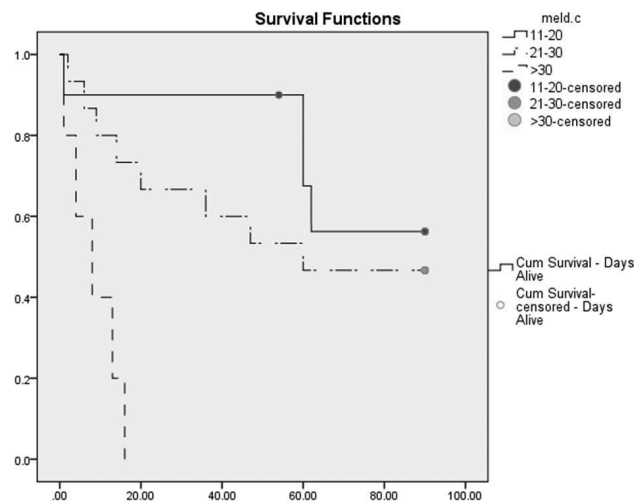

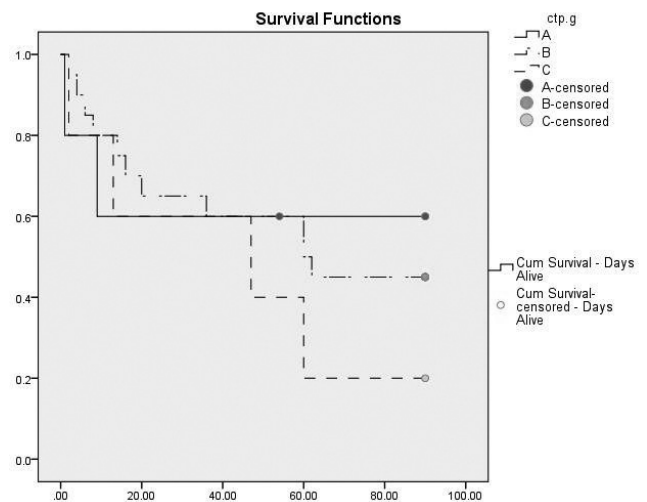**Figure-1. Kaplan meyer survival curve for MELD score categories**

Figure-2. Kaplan meyer survival curve for CTP Categories

DISCUSSION

Chronic liver disease leading to cirrhosis and eventually end stage liver disease is a leading cause of death in Pakistan like other developing countries. Surgical pathologies are complicated by associated end stage liver disease which causes increased per operative and post-operative mortality. Viral hepatitis, alcohol consumption and NAFLD are more common risk factors worldwide.
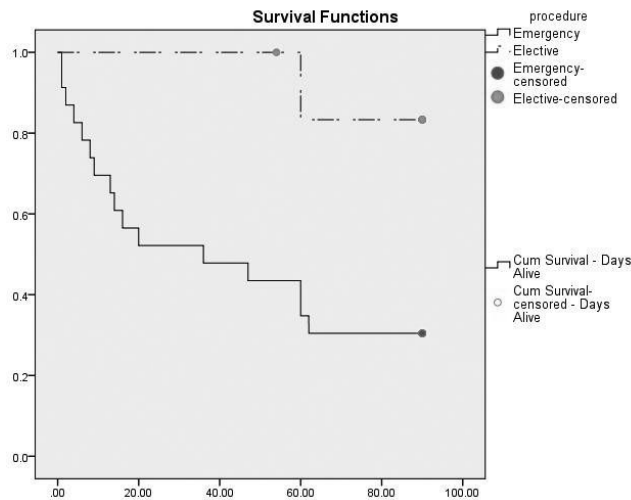
Figure-3. Kaplan meyer survival curve for the type of surgery performed

According to WHO more than 75% cases of end stage liver disease in EMRO region is because of viral hepatitis and in developed countries alcohol consumption is the leading cause.[9]

Age, obesity and life style contributes to the progression of disease. Mean age of the patients with liver cirrhosis varies worldwide. In a study conducted in Italy mean age was 60.3 years and male to female ratio was 1.7 while it was 48.94 years and a male to female ration of 5:1 in India which is closer to our figures.[10,11] In our study the mean age of the patients was 52.67 and male to female ratio was 5:1.

Risk stratification before any surgical procedure in patients of end stage liver disease is necessary to predict post-operative mortality. Association of acute liver or renal failure, coagulopathy and cardiomyopathy with liver cirrhosis is considered a contraindication of elective surgery. Reduced hepatic perfusion caused by anesthetic agents and porto-pulmonary hypertension cause worsening of hepatic functions and increased post-operative mortality.[12] In our study 30 patients with chronic liver disease were operated. 23 patients were operated in emergency and 7 patients were put on elective list. The 30-day mortality of patients operated in emergency was 47.8% and 90-day mortality was 69.57%.

On the contrary only one patient out of seven electively operated died at the 90-day mark. Childs-Turcotte-Pugh (CTP) and Model of End-Stage Liver Disease (MELD) scoring systems are globally accepted models for predicting post-operative mortality in end stage liver disease patients. Childs-Turcotte-Pugh score has been in use as a reliable predictor of post-operative mortality for over 30 years with few modifications. It is divided into three severity stages (A, B, C), uses five variables (bilirubin, albumin, ascites, encephalopathy and prothrombin time) and is considered the most consistent disease severity predictor model(7). MELD score uses patient's bilirubin, INR and creatinine levels and each point of MELD scoring is associated with increase in risk of severity of disease which makes it a more precise model of predicting post-operative mortality.[13]

In our study 5, 20 and 5 patients were included in CTP grades A, B, C respectively. There was no difference in30-day and 90-day mortality of CTP grade A patients. For classes B and C, 30-day mortality was 35% and 80% respectively. The 90-day mortality, on the other hand, was 55% and 80% respectively. There were 10, 15 and 5 patients under MELD score categories of 11-20, 21-30 and >30 respectively. 30- day mortality in these categories was 10%, 33.33% and 0% respectively. With most of the patients in the third category expiring before the thirty days mark. The 90- day mortality was 40%, 53.33% and 100% respectively. There was significant difference of 30 days and 90 days mortality in all three categories. The mortality recorded has been much higher for the procedures that required an emergency surgery as compared to the elective procedures.

Another study showed that the 90-day mortality in CTP A, B, and C classes to be 2.1, 22.1 and 54.5% respectively. The 90-day mortality with MELD score was 3.5% for the category 6-9, 8.9% for the category 10-14, 14.3% for category 15-19. The mortality rate shot up to 22.5% for the category 20–24 and reached an alarming 63.6% for scores ≥25.[14] Our study shows a very high mortality risk as compared to this one both with

CTP and MELD scores. We compared our study with a meta-analysis of 26 researches involving 4,732 patients in which MELD score had a greater AUC (0.82) for 30-day mortality when compared with other prediction models.[15]

In our study the mean survival time of 71.20, 54.93, 8.40 for MELD scores of 11-20, 21-30 and >30 has a P value of <0.001. The mean survival time of 56, 54.85, 42.40 for CTP grades of A, B, and C respectively has a P value of 0.582. it shows that according to our study the MELD score has performed better in predicting the post-operative outcome of patients with liver diseases than CTP score.

CONCLUSION

The predictive value of MELD score and CTP cannot be underestimated even in the setting of non-transplant surgery. The results showed that higher the score, higher was the mortality in patients who underwent surgery. In our research MELD edges past CTP in predicting the morbidity and mortality. It is therefore recommended that the patients with chronic liver disease should have their MELD score calculated mandatorily in their pre-operative assessment. The patients with a higher score should be managed in an intensive care unit post operatively with adequate input from internal medicine and hepatology department. These patients once successfully discharged should be further referred to a transplant facility.
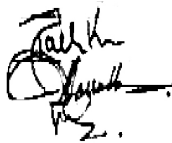
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