EVALUATION OF CREATININE-MODIFIED CHILD PUGH SCORE FOR PREDICTING SHORT-TERM PROGNOSIS OF PATIENTS WITH DECOMPENSATED CIRRHOSIS OF LIVER AS COMPARE TO ORIGINAL CHILD PUGH SCORE

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Background: Original Child-Turcotte-Pugh (CTP) score has traditionally being used as a useful tool to assess prognosis in cirrhotic patients but the serum creatinine level has recently seen as an important predictor of survival in patients with liver cirrhosis. The aim of this study was to compare the accuracy of CP and modified CP score for predicting in hospital survival as well as cirrhosis related complications such as encephalopathy, haematemesis and ascites in patients with decompensated cirrhosis. It was Descriptive case series. The study was conducted at Department of Medicine, Liaquat University of Medical & Health Sciences Jamshoro from October 2005 to July 2007. **Methods:** This study included 222 patients with decompensated cirrhosis diagnosed either clinically or radio-logically were followed-up during hospital stay. Patient's demographic data was enrolled in well designed proforma which included enquiry regarding cirrhosis related complications. Patients were classified according to original CP classification into A, B and C and modified Child Pugh scores estimated by adding 0, 2 and 4 points with serum creatinine <1.3 mg/dL,1.3–1.8 and >1.8 mg/dl respectively to the original score using creatinine levels as a sixth categorical variable were evaluated. Simple *t*-test and Chi-square test were done for continuous and categorical data. Original CP and creatinine modified CP was compared by the ROC curve. $p<0.05$ was considered significant. **Results:** In this study 222 cirrhotic patients constituting 144 (65% male and 78 (35%) female. The mean age of the patients were 46.8 ± 12.8 and mean serum creatinine 1.41 ± 0.55 mg/dl. In Original Child-pugh classification 9, 82, 131 out of 222 were in grade A, B and C respectively whereas in creatinine-modified child-pugh classification 7, 28 and 187 patients were in grade A, B and C respectively. For cirrhosis related complications creatinine modified child Pugh has a better predictive value for encephalopathy ($p=0.03$) as compared to original child Pugh ($p=0.42$) whereas for haematemesis ($p=0.001$) and grades of ascites ($p=0.003$) creatinine modified CP was marginally better than original CP ($p=0.004$) and ($p=0.007$) respectively. Predicting the in hospital death and duration of hospitalization as outcome creatinine modified CP ($p=0.001$) as compared to original CP ($p=0.004$). ROC (receiver–operating characteristic) curve the creatinine-modified CTP score showed a marginal, better prognostic accuracy as compared with the CTP score (CTP vs creatinine-modified CTP, c-index and 95% CI=0.654 (0.578–0.731), vs 0.642 (0.562–0.722), $p=0.001$). **Conclusion:** Inclusion of serum creatinine can improve the prognostic value of Child-Pugh classification particularly class B in which the serum creatinine play a major role in properly predicted the survival as well as cirrhosis related complications.

Keywords: child-pugh, cirrhosis of liver, serum creatinine, encephalopathy.

INTRODUCTION

The poor survival of patients with decompensated cirrhosis has driven physicians to a constant search for good prognostic markers.[1,2] In 1964, Child and Turcotte[3] published a classification to assess the operative risk in cirrhotic patients who recovered from variceal bleeding, undergoing portosystemic shunt surgery. They considered five variables selected by clinical experience *viz* ascites, encephalopathy, nutritional status and serum levels of bilirubin and albumin; classifying patients in class A, B or C in relation to best (A), moderate (B), or worse (C) prognosis. In 1973, Pugh *et al*[4] used a modified version of this classification for patients undergoing surgical transaction for oesophageal varices.

They replaced nutritional status with prothrombin time (PT) and assigned a score ranging from 1 to 3 to each variable. Subsequently, this classification was used to predict the outcome of surgery in cirrhotic patients in general, and more recently, to stratify patients on the waiting list for liver transplantation (LT). It has been shown that renal function had a predictive value for hepatorenal syndrome occurrence[5] and for survival in patients undergoing orthotopic liver transplantation.[6]

Indeed, creatinine serum levels proved to be independent predictors of survival in cirrhotic patients during the natural course of the disease as well as during acute complications.[7] In this study we attempted to evaluate whether the traditional CTP can be improved

by adding serum creatinine values. The creatinine-modified CTP score was calculated by simply assigning a further, arbitrary score to the creatinine serum levels of the patients and by adding this score to the traditional CTP so as to keep this new parameter easy to use.

MATERIALS AND METHODS

In this descriptive case series study we studied 222 consecutive patients with decompensated cirrhosis, who were admitted to our department between from October 2005 to July 2007. Patients with hepatocellular carcinoma, severe primary cardiopulmonary failure or intrinsic kidney disease were excluded, while patients with more than one admission during the study period were evaluated in the analysis only at their first admission. The diagnosis of decompensated cirrhosis was based on clinical, laboratory, and radiological signs of cirrhosis with at least one sign of liver decompensation (ascites, variceal bleeding, hepatic encephalopathy, non-obstructive jaundice).

According to our routine clinical practice, detailed medical history, complete physical examination, and a battery of laboratory tests were performed in all patients with decompensated cirrhosis on the day of admission. Moreover, diagnostic paracentesis and ascitic fluid culture were performed in all admitted cirrhotic patients with ascites. The age, sex, cause of admission, first and previous complications of decompensated cirrhosis such as ascites, haematemesis and hepatic encephalopathy as well as complete blood count including platelet count, prothrombin time and INR, serum urea and creatinine, total, and direct bilirubin, alanine aminotransferase (ALT) and aspartate aminotransferase (AST), alkaline phosphatase, gamma-glutamate transpeptidase (GGT), serum albumin and globulins and ascitic fluid characteristics were done in all patients. Based on the admission data, the CP score (range: 5-15) and Child class were estimated for each patient according to the suggestion by Pugh *et al.*[6] In addition, modified CP score with serum creatinine as a sixth variable was also calculated by adding serum creatinine (range: 5–19) derived from the original CP score by adding 0 points for creatinine <1.3 mg/dl, 2 points for creatinine 1.3-1.8 mg/dL and 4 points for creatinine >1.8 mg/dL according to what was reported by Angermayr *et al.*[7]

Descriptive statistics are presented as Mean±SD. The *t*-test was used to compare quantitative data, and the chi-square test was used for categorical data. *p*<0.05 were considered significant. All analyses were carried out using SPSS (SPSS, Inc, Chicago, IL).

The accuracy of the different score systems for predicting outcome which include in hospital death as well as duration of hospitalisation was evaluated through the urea under the receiver operating characteristic (ROC) curve. The accuracy of the

different models as predictors of survival was evaluated by the concordance c-statistics (equivalent to the area under the ROC curve). Each model was considered to have significant diagnostic accuracy if the value of c-statistics is >0.50.

RESULTS

In this case series study which included 222 patients of which 144 (65%) were male and 78 (35%) were female. Mean age of the patients was 46.8±12.89 years. Mean serum creatinine (mg/dl) level was 1.41±0.55 (*p*=0.004). Table shows demographic features of all cirrhotic patients. Ascites was found to be the most common presentation of the patients with 8 (3.6%), 56 (25.2%), 128 (57.7), and 30 (13.5%) were in mild, moderate, severe and refractory ascites respectively. About 42 (19%) of patients presented with history of encephalopathy whereas 108 (48.6%) presented with history of haematemesis. According to severity of cirrhosis of liver 7, 82 and 131 patients were in grade A, B, and C respectively in original child Pugh class. However, addition of serum creatinine has shifted 54 patients who were in grade B in original CP to grade C of creatinine modified CP making 7, 28 and 187 in grade A, B, and C respectively. In original CP grade A only 2 patients has grade 1 (mild) and 7 patients had grade 2 (moderate) ascites whereas in grade B original CP 5, 35, 31 and 11 had grade1, 2, 3, and refractory ascites and in grade-C 1, 14, 97 and 11 had grade 1, 2, 3, and refractory ascites (*p*=0.007). In creatinine modified CP grade A 1, 5 and 1 had grade 1, 2 and 3 ascites whereas in grade B creatinine modified CP 3, 12, and 13 had grade 1, 2 and 3 ascites and in grade-C 4, 39, 128, and 30 patients had grade 1, 2, 3, and refractory ascites respectively (*p*=0.003). Out of 42 patients with encephalopathy 1, 19 and 22 were in grade A, B and C of original CP (*p*=0.42) and 8, 63 and 109 whereas 1 and 41 patients who had history of encephalopathy were in creatinine modified CP grade B and grade C respectively (*p*=0.03) (Figure-1). History of haematemesis was present in 1, 62 and 45 patients in grade A, B and C of original CP (*p*=0.004) whereas 1, 6 and 101 patients were in Grade A, B and C of creatinine modified CP (*p*=0.001). As far outcome of the patients is concerned 41 (18.5%) died because of cirrhosis related complications out of which 19 were in grade B and 22 were in grade C of original CP whereas 141 (64.4%) remained hospitalisation for >14 days (*p*=0.004). With patients in creatinine modified CP all 41 deaths were in grade C whereas 2, 16 and 136 in grade A, B and C remained hospitalized for >14 days (*p*=0.001).The receiver operating characteristic (ROC) curve comparing the two scores for the outcome of the patients show c-statistics 0.654 and 95% CI (0.578–0.731) for CTP vs c-statistics 0.642 and 95% CI (0.562–0.722) for creatinine-modified (*p*=0.001) (Figure-2).

Table: Demographic data of patients with cirrhosis of liver (n=222)

Qualitative Variables	Frequency	Percentage
Sex		
Male	144	65
Female	78	35
Ascites		
1.Grade I (mild)	8	3.6
2.Grade II (moderate)	56	25.2
3.Grade III (Severe)	128	57.7
4. Refractory Ascites	30	13.5
H/O Haematemesis		
Positive	108	48.6
Negative	114	51.4
H/O Encephalopathy		
Positive	42	18.9
Negative	180	81.1
Origanal C.P		
1. Grade A	9	4.1
2. Grade B	82	36.9
3. Grade C	131	59
Modified C. P		
1. Grade A	7	3.2
2. Grade B	28	12.6
3. Grade C	131	59
Outcome		
Death	41	18.5
Hospital stay up to 14 days	36	16.2
Hospital stay >14 days	143	64.4
Quantitative Variables	**Mean±SD**	***p*-Value**
Age(years)	46.877±12.89	0.005
S. creatinine(mg/dl)	1.411±0.55	0.004

Figure-1: Relation of creatinine modified CP with H/O encephalopathy (*p*-0.001)

DISCUSSION

In this study, our aim was to compare the prognostic accuracy of the CTP, creatinine-modified CTP as well as to evaluate the in hospital outcome of series of cirrhotic patients. The creatinine-modified CTP was introduced for several reasons. Firstly, serum creatinine levels are an important and independent predictor of mortality in patients with liver cirrhosis with or without complications of liver disease.[8,9]

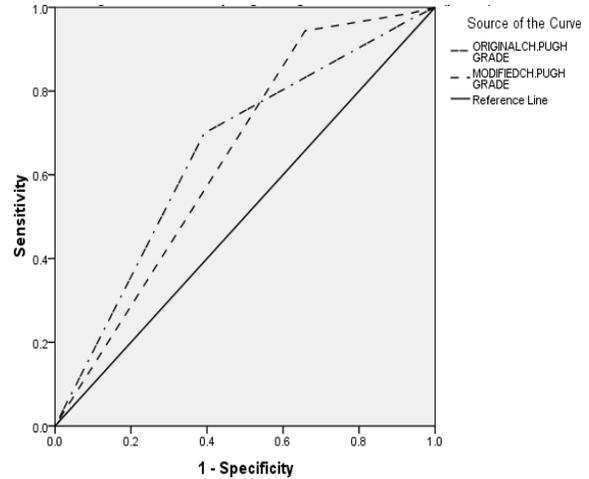Diagonal segments are produced by ties.

Figure-2: ROC Curve comparing the original CP with creatinine modified CP (*p*=0.001)

In our study 86.5% patients presented with uncomplicated ascites (grade 1 to 3) whereas 13.5% patients presented with complicated (refractory) ascites in accordance with Salerno F *et al*[10] who has seen refractory ascites in 5–10% of cases depending on the duration of cirrhosis of liver. History of haematemesis was found in 48.6% of patients in our study. This figure is near to Schepis F *et al.* who found oesophageal varices in 40% of cases at the time of presentation and in 60% of cases with ascites.[11]

The modified CP with the addition of serum creatinine levels as categorical variable (0 points for creatinine <1.3 mg/dl, 2 points for creatinine= 1.3–1.8 mg/dl and 4 points for creatinine >1.8 mg/dl) showed almost the same prognostic accuracy as compared with the CTP score (CTP vs creatinine-modified CTP, c-index and 95%CI 0.654 (0.578–0.731), vs 0.642 (0.562–0.722), *p*=0.001. If two or more scoring systems offer similar accuracy in predicting outcome, then other characteristics should be taken into account for adopting one of them into clinical practice.

CONCLUSION

We observed that creatinine modified C.P can better predict encephalopathy than original child pugh but has mariginal advantage over the original CP in predicting other cirrhosis related complications such as ascites and haematemesis. The predicting ability of both creatinine modified CP and original CP for short term prognosis of the patients is same. Further studies are needed in this regard to assess the importance of serum creatinine in patients with cirrhosis of liver.
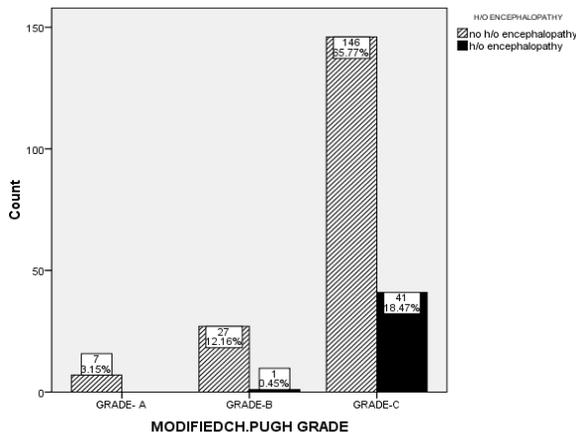
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