Abstract

The purpose of this study was to validate Pugh's modification of the Child-Turcotte Classification (CTC) in the prediction of mortality in patients with liver cirrhosis.

A cohort of 45 cirrhotics collected in Mosul Teaching Hospitals, Iraq, was followed for five years and deaths were recorded at twelve month intervals from the individual dates of diagnosis. Cohort analysis and estimation of Relative Risk measured the strength of the association between Pugh's classes and five year mortality. Life table analysis was used to compute the probability of survival or death in each year during the 5 year period.

Results. During the five-year period of study twenty patients died. Eighteen of the total deaths (90%) occurred in class C (severe class) from which 78% of the patients died while only two (15% of the group) died in class B (Relative Risk = 5.2). None died in class A (mild class).

In the first year 20% of the cohort died (all from Class C) and the Life Table Analysis showed a high probability of death for the whole cohort. A further 24% died during the next four years.

Conclusion - Pugh's grading can confidently be used in clinical practice to categorize the chances of patient survival. Patients with cirrhosis in the severe grade have a poor chance of survival.

Key Words: Liver Cirrhosis, Life-Table, Pugh's modification.

Introduction

For years the Child-Turcotte Classification (CTC) has been used as a clinical tool to classify the severity of the disease in patients with cirrhosis. Its application in clinical practice is easy and requires only a minimum of base line information\(^{(1,2)}\).

The Pugh modification of CTC can be used in clinical practice in the form of an ordinary scale (Grades A, B and C) or as a multivariate model with indicators and continuous variables.

Recently this classification has been used as a prognostic indicator for patients with cirrhosis\(^{(3,4,5)}\).

Life Table Analysis requires a cohort longitudinal study on patients with cirrhosis with the aim of determining prognosis in terms of survival amongst the group studied\(^{(6)}\).

The aim of the study was to examine the prognostic validity of the CTC-Pugh modification against the Life Table Method in predicting survival amongst a cohort of cirrhotics followed for a period of five years.

The Objectives

1. To categorize cirrhotic patients according to CTC-Pugh's modification.
2. To estimate the relative risk of death during 5-year period of cirrhotics classified according to the CTC-Pugh modification.
3. To compute the probability of survival of cirrhotic patients by applying life table analysis.
4. To display the mortality of cirrhotics during 5-year period according to the CTC-Pugh modification and the year of death.

Subjects and Methods

During 1991 a cohort of 45 patients with cirrhosis was collected from Mosul Teaching Hospitals. In all patients the diagnosis of cirrhosis of the liver was confirmed by histology. The date of diagnosis of cirrhosis in each patient determined his or her entry time in the study which finished at the end of 1996.

Each patient in this cohort was followed for five years from the date of diagnosis. Patients were assessed clinically and biochemically every three months for the entire follow-up period. The anniversary of the date of diagnosis was used to observe and record the patient survival/death in the preceding year up to the fifth anniversary. All deaths amongst the cohort during the follow-up period were found to be liver-related deaths.

The patient variables used in Pugh's modification of CTC were recorded for each patient at the time of initial diagnosis (Table 1). Each variable was given a value of either 1, 2 or 3. Three indicated the most severe abnormality. The scores for the five variables in each patient were added, the least possible...
score being five and the highest fifteen. Patients with a score of 5-6 were included in class A (compensated cirrhosis), those with a score of 7-9 in class B, while a score of 10-15 placed the patient in class C (decompensated cirrhosis)\(^7\).

**Table 1: Clinical and biochemical variables adopted in Pugh’s classification.**

<table>
<thead>
<tr>
<th>Variable(Grading)</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascites</td>
<td>Absent</td>
<td>Slight-Moderate</td>
<td>Tense</td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>None</td>
<td>Grade I-II</td>
<td>Grade III-IV</td>
</tr>
<tr>
<td>Serum Albumin(gm/dl)</td>
<td>&gt; 3.5</td>
<td>3.0-3.5</td>
<td>&lt; 3.0</td>
</tr>
<tr>
<td>Serum Bilirubin(mg/dl)</td>
<td>&lt; 2.0</td>
<td>2.0-3.0</td>
<td>&gt; 3.0</td>
</tr>
<tr>
<td>Prothrombin Time</td>
<td>&lt; 4.0</td>
<td>4.0-6.0</td>
<td>&gt; 6.0</td>
</tr>
</tbody>
</table>

*Each variable was given a value of either 1, 2 or 3. Three indicated the most severe abnormality.*

An allowance was made in the grading for primary biliary cirrhosis in which the increase of serum bilirubin is usually out of proportion to other evidence of liver failure\(^5\). Otherwise the accepted levels of serum bilirubin were for class A (1-4 mg/100 ml), for class B (4-10 mg/100ml) and for class C (>10mg/100ml). The 45 patients had mean age of 49 years (18-65 years) and a sex ratio of 2:1 in favour of males.

Cohort analysis and estimation of relative risk was applied to gauge the strength of association between Pugh’s modification of CTC and the 5-year mortality of patients with cirrhosis. Life Table Analysis was used to calculate the probability of survival.

**Results**

On the Pugh scale 20% had a score of 5 or 6 (class A); 29% a score of 7 to 9 (class B) and 51% a score of 10 to 15 (class C) (Table 2).

The 5-year mortality in class C was five times greater than that in class B (Relative Risk =5.2) (Table 3). As there were no deaths in class A no comparison was done with that class. The average duration of subsequent life for the whole cohort was 3.36 years.

Using the date of diagnosis anniversary data the Life Table probability of surviving and dying for the cohort of 45 patients is shown in table 4. The first year had the greatest probability of dying as 20% of the cohort died during that year. The four following years altogether had a probability of dying of only 24%. The probability of surviving for the whole 5 years was 56% of the cohort. i.e 56% of the patients would be alive and 44% of the patients would be dead at the end of the five years.
Table 4: Probability of surviving and dying of the cohort of 45 patients with cirrhosis: Date of Diagnosis anniversary data

<table>
<thead>
<tr>
<th>Year after diagnosis</th>
<th>Probability of surviving in each year</th>
<th>Probability of dying in each year</th>
<th>No. alive on each anniversary out of 1000 patients</th>
<th>No. dying during each year</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>p(x)</td>
<td>x</td>
<td>l(x)</td>
<td>d(x)</td>
</tr>
<tr>
<td>0</td>
<td>0.80</td>
<td>0.20</td>
<td>1000</td>
<td>200</td>
</tr>
<tr>
<td>1</td>
<td>0.89</td>
<td>0.11</td>
<td>800</td>
<td>88</td>
</tr>
<tr>
<td>2</td>
<td>0.97</td>
<td>0.03</td>
<td>712</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>0.87</td>
<td>0.13</td>
<td>691</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>0.93</td>
<td>0.07</td>
<td>643</td>
<td>48</td>
</tr>
<tr>
<td>5</td>
<td>—</td>
<td>—</td>
<td>595</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 5: Deaths among cirrhotics during 5 year period according to CTC-Pugh's modification and year of death

<table>
<thead>
<tr>
<th>Years after diagnosis</th>
<th>Pugh's Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>&lt; 1</td>
<td>—</td>
</tr>
<tr>
<td>1-4</td>
<td>—</td>
</tr>
</tbody>
</table>

Discussion

The fact that 80% (36/45) of the patients were in classes B and C indicates that the majority of the patients in the study had a severe form of liver disease. Pugh et al. reported a similar frequency of 82% for class B and C. Rivard et al., applying the same classification, showed that 68% of 177 cirrhotic patients collected in Montreal, Canada over a 4-year period belonged to classes B and C.

The 5-year mortality rate of 44% for the cohort was consistent with a severe form of cirrhosis as was also the deaths during the first year being four times greater than the four following years.

Patients in class C were mainly responsible for the severe variety of cirrhosis exhibited by the whole cohort. Ninety percent (18/20) of the total deaths occurred in this class.

Several other studies reached the same conclusion that class C carries a higher risk of morbidity and mortality. In the present study the strength of association between five year mortality and the severity of the cirrhotic process expressed by relative risk showed that mortality in class C was five times that of class B. However, life table analysis suggested that the probability of death for the whole cohort during the first year alone was almost half the probability of the five year mortality. The probability of death during the first year was 20% of the cohort while the probability of death during the whole 5 years was 44%.

Life Table Analysis seemed to substantiate the findings of the cohort analysis and the calculation of relative risk to measure the strength of association of 5-year mortality with Pugh’s modification of CTC. Among other things, this was clearly illustrated by the first year deaths in class C equalling to the total number of deaths in this class during the four following years.

The results suggest that classes A, B and C of Pugh’s modification of CTC can be used satisfactorily in clinical practice to assess the prognosis of liver disease.

Pugh’s classes form the best available categorization of the severity of cirrhosis and of the chances of patient survival. Its constituents are simple, widely available and could be used rationally in clinical decision making.

References