

Prognostic Value of Thallium-201 Per Rectum Scintigraphy in Alcoholic Cirrhosis

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Methods: In a 4-yr survival study, the prognostic value of the inferior mesenteric shunt, as evaluated by ^{201}Tl per rectum scintigraphy, was assessed in 170 alcoholic cirrhotic patients. The global severity of the hepatic disease was assessed by the Child score, and specific hepatocellular function was evaluated by the aminopyrine breath test. Using ^{201}Tl scintigraphy, three groups were considered: group I, heart-liver activities ratio (H/L ratio) ≤ 0.5 , $n = 55$; group II, H/L between 0.5 and 0.85, $n = 50$; and group III, H/L > 0.85 , $n = 65$. **Results:** The 4-yr survival rates in the three groups were 76%, 36% and 18%, respectively. The log-rank test showed that the differences between the groups were statistically significant. Regression analysis using Cox's proportional-hazards model showed that the three parameters, Child score, aminopyrine breath test results and H/L ratio were significantly related to survival. **Conclusion:** The inferior mesenteric shunt per se has a prognostic value in alcoholic cirrhosis. Moreover, the H/L ratio provides additional information on survival after the Child score and the aminopyrine breath test results have been taken into account.

Key Words: thallium-201 per rectum scintigraphy; liver cirrhosis; prognostic value

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Liver cirrhosis induces both hepatocellular impairment and portal circulation disturbances. The Child-Turcotte score modified by Pugh (CTP score) (1) represents a combination of both aspects and has been shown to be a good indicator of the global severity of the disease. Hepatocellular function can be estimated reliably independent of portal circulation changes by the aminopyrine breath test (ABT) (2,3). This test has a well-known prognostic value in cirrhosis (3-5). The prognostic significance of portal hypertension per se is still being discussed. Some authors emphasize the prognostic value of portal pressure (6,7), others do not confirm this (8,9).

The specific prognostic significance of portal systemic shunt (PSS) is not well known. Different types of PSS can develop, including the azygos shunt, the splenic shunt and

the superior mesenteric shunt. Portal systemic shunt can also develop in the inferior mesenteric territory (10,11). In cirrhotic patients, these shunts usually occur with variable degrees of severity (12).

Recently, the authors demonstrated that the ^{201}Tl per rectum scintigraphy is a specific method for measuring the inferior mesenteric PSS (13). The aim of the present study was to assess the prognostic value of the inferior mesenteric shunting as evaluated by the ^{201}Tl per rectum scintigraphy, taking into account the information already obtained from the CTP score and ABT.

MATERIALS AND METHODS

From January 1984 to December 1987, all patients admitted to Saint-Pierre University Hospital in Brussels who fulfilled the inclusion criteria were included in the study. The inclusion criteria were biopsy-proved liver cirrhosis, chronic heavy alcoholism (daily consumption of more than 130 g alcohol per day for more than 5 yr), age younger than 70 yr, absence of other known disease influencing short-term prognosis and ability to cooperate in the study. Using these criteria, 170 patients were selected for the study. The mean age of the 170 patients was 49.6 yr (range 25 to 70 yr). There were 129 men and 41 women. Hepatic biopsies were obtained by transthoracic liver puncture, laparoscopy or transvenous route.

CTP Score

The CTP score was evaluated for each patient. The variables were ascites, encephalopathy, serum albumin and bilirubin levels and prothrombin time. Depending on the CTP score, three classes of patients were considered: class A (score 5-6), class B (score 7-9) and class C (score 10-15). The patients were distributed as follows: class A, 48 patients; class B, 85 patients; and class C, 37 patients.

Thallium-201 Per Rectum Scintigraphy

The method has been extensively described in previous articles (14,15). Briefly, 0.5 mCi of ^{201}Tl is administered intrarectally. Twenty-five 1-min images of the cardiac and hepatic areas are acquired. The 25th min heart-liver activities ratio (H/L ratio) is used to measure the magnitude of PSS. The established values in this center of the H/L ratio in patients without hepatic cirrhosis are less than 0.40 (14). Based on the H/L values, survival was evaluated in three groups: H/L ratio ≤ 0.5 , 55 patients; H/L ratio between 0.5 and 0.85, 50 patients; and H/L ratio > 0.85 , 65 patients.

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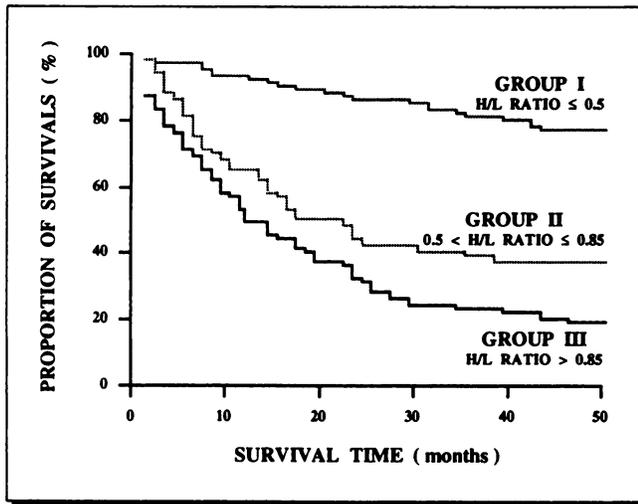


FIGURE 1. Survival curves for the three groups of patients. The log-rank test showed that survival differed significantly between Groups I and II ($p < 0.01$), I and III ($p < 0.0001$) and II and III ($p < 0.001$).

Aminopyrine Breath Test

The test was performed within 1 wk of admission using the classic oral method (16). Fasting patients were given an oral tracer dose of ^{14}C -aminopyrine. Two hours later, a breath sample was collected in a counting vial containing 2 ml of 1 M hyamine hydroxide in methanol and 2 ml of ethanol. Thymolphthalein is used as the indicator. A liquid scintillation counter was used to determine the ^{14}C radioactivity. Results were expressed as the percent of ingested dose excreted in 2 hr. In this center, using this procedure, values in normal subjects are $\geq 4.0\%$.

Survival Study

The status of the patient, living or deceased, 4 yr after inclusion in the study was used as the end point. This information was obtained either from medical records at the center or from family physicians or social survey. When the patient died, the exact date of the death was recorded. Because only about 70% of the patients

were regularly followed in this institution, detailed clinical data, occurrence of other diseases and cause of death were not considered in this study. Only survival was taken into account.

To evaluate the prognostic value of the inferior mesenteric shunt per se, a Kaplan-Meier life table was constructed for each group of shunt values. The differences between groups were tested using the log-rank test (17). To determine whether the inferior mesenteric shunt added new information concerning survival after CTP score and ABT results were available, a regression analysis using Cox's proportional-hazards model was performed. The CTP score, the ABT results and the value of the H/L ratio were included as variables.

RESULTS

H/L results ranged from 0.30 to 1.6 (mean 0.91 ± 0.31). Survival rates at 4 yr were 76% for Group I, 36% for Group II and 18% for Group III. Survival curves for the three groups are presented in Figure 1. The survival differed significantly between groups I and II ($p < 0.01$), I and III ($p < 0.0001$) and II and III ($p < 0.001$).

Figure 2 shows the scatterplots of H/L ratio against, respectively, CTP scores and ABT results. The imperfect relationship between these variables indicated the possibility that these three variables contained different prognostic information. This possibility was evaluated by performing a regression analysis using Cox's proportional-hazards model. For high and low values of CTP score, ABT results and H/L ratio, plots of log minus log survivor functions against time showed constant separations, suggesting that the proportionality assumption in the Cox's model was fulfilled. The results of regression analysis are presented in Table 1. The three parameters, CTP score, ABT results and H/L ratio were found to be significantly related to the survival. This suggests that the magnitude of the inferior mesenteric shunt provides additional prognostic information after the CTP score and the ABT results have been considered.

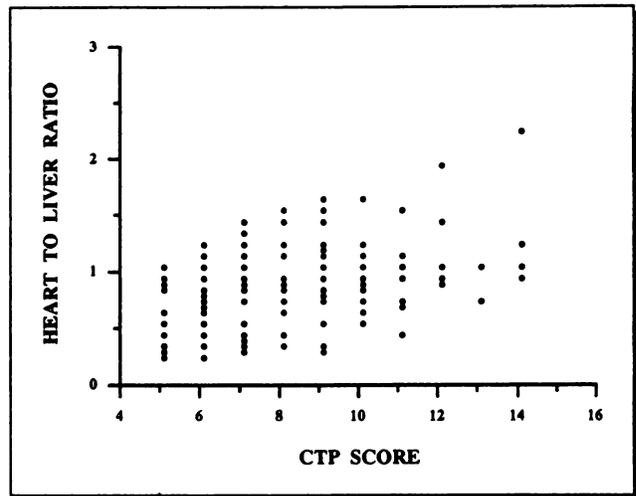
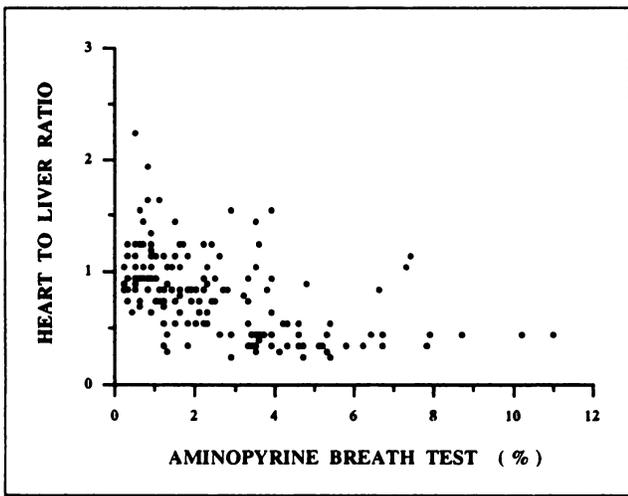


FIGURE 2. Scatterplots of heart-to-liver (H/L) ratio against CTP score and ABT results, respectively. The imperfect relationship between these variables indicated the possibility that these three variables contained different prognostic information, respectively.

TABLE 1
Regression Results Using Cox's Proportional-Hazards Model*

Parameter	Beta	Standard error	t-Value	Exponent beta
CTP score	0.226290	0.0598580	3.78044	1.253939
ABT result	-0.303637	0.0970599	-3.12835	0.738129
H/L ratio	0.688865	0.3026875	2.27583	1.991453

*n = 170, chi-square = 84.76, degrees of freedom = 3, p = 0.000.

DISCUSSION

Numerous factors influence survival in hepatic cirrhosis. Among biochemical variables, serum albumin and bilirubin levels and prothrombin time are considered to be of relative prognostic significance. The CTP score is widely used to assess the prognosis in medically treated cirrhosis. The ABT, which evaluates hepatocellular function more specifically, is also a good prognostic indicator in cirrhosis (3). The prognostic value of portal pressure in cirrhosis is still being discussed (7,9). The relationship between PSS and survival has been rarely studied, probably because of the invasive nature of the methods available to assess PSS.

Scintigraphy with ²⁰¹Tl per rectum is easy to perform and noninvasive. The test has recently been shown to be a specific measure of the inferior mesenteric shunt (13). As measured by ²⁰¹Tl per rectum scintigraphy, survival is clearly influenced by the magnitude of the spontaneous inferior mesenteric shunt. Patients with a high H/L ratio have reduced survival rates. This confirms the results of the authors' previous preliminary study (14). Moreover, these findings clearly show that the magnitude of H/L ratio provides additional prognostic information after CTP score and ABT have been taken into account.

It is unclear why inferior mesenteric shunt has a prognostic value because it provides specific but limited information (13). However, it is possible that inferior mesenteric shunt reflects indirectly the global PSS. The severe complications associated with PSS, such as portal systemic encephalopathy, septicemia or gastrointestinal bleeding, could therefore explain the prognostic value of the procedure (18,19).

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