Liver Transplantation for Hepatocellular Carcinoma

Expanding Special Priority to Include Stage III Disease

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Hypothesis: After liver transplantation, patients with stage III hepatocellular carcinoma (HCC) experience survivals similar to those of patients with less advanced disease and of matched control subjects.

Design: Retrospective review of prospectively collected database.

Setting: University hospital.

Patients: Fifty-one adults with HCC and 153 matched adults without HCC who underwent orthotopic liver transplantation.

Main Outcome Measures: One-, 3-, and 5-year survivals for all groups. After matching for year of transplantation, age, sex, and underlying liver disease, long-term survival was compared between groups. Rates of recurrence were also measured in the HCC groups.

Results: From August 1, 1985, to February 28, 2002, we performed 635 adult liver transplantations, including 51 (8%) in patients with HCC. One hundred fifty-one patients without HCC who underwent transplantation were selected as controls. Patient demographic features were similar between case-control groups. The overall 5-year survival trend was worse for patients with HCC vs their matched controls (48% vs 65%; \(P = .07\)); however, this survival disadvantage was eliminated when patients with stages I through III HCC were combined and compared with their matched controls (59% vs 63%; \(P = .96\)). Survival of patients with stage III disease was comparable to that of matched controls (65% vs 59%; \(P = .44\)).

Conclusions: For patients with stages I through III disease, long-term survival is comparable to that of matched controls, and only patients with stage IV disease experience poorer survival. Consideration should be given to granting exception points to patients with stage III disease.


IN THE PAST 2 DECADES, HEPATOCELLULAR CARCINOMA (HCC) has emerged as a growing health threat in the developed world. In the United States alone, the incidence has almost doubled.1 As patients with chronic viral hepatitis age, the incidence of HCC is expected to grow significantly. Historically, surgical resection was the only treatment available, and 5-year survival in selected patients undergoing resection approached 60%.2 However, more than 75% of patients present with associated cirrhosis that precludes standard resection.3 In addition, even when patients are able to undergo successful resection, there is a high rate of tumor recurrence in the remnant liver, with long-term disease-free survivals of only 20% to 30%.4

Early experience with liver transplantation for HCC was disappointing, with reported 1-year survival frequently less than 50%.5,6 More recently, liver transplantation has resurfaced as a practical alternative in patients with unresectable disease. In 1996, Mazzaferro et al8 published their largely unprecedented results with liver transplantation in a highly selected group of patients with HCC (hereafter referred to as HCC patients). Subsequently, the United Network for Organ Sharing (UNOS) adopted the Milan criteria as guidelines for determining eligibility for transplantation in HCC patients, thereby limiting transplantation to recipients with stage I or II disease. Using these criteria, long-term outcomes have met or exceeded those recognized after resection.7 Analysis of UNOS data on transplantation for HCC demonstrates a recent increase in the 5-year survival rate to 61.1%, which is presumptively attributed to improved patient selection.9 Furthermore, there are now reports of success after transplantation in individuals whose tumor burden exceeds the Milan criteria.10,11
To validate these more recent reports, we examined our institutional experience with liver transplantation for HCC during a 17-year period. The survival of HCC patients undergoing transplantation was compared with that of a matched, non-HCC cohort undergoing transplantation during the same period. Stage-specific outcome was also examined. This study confirms our hypothesis that HCC patients with stage III disease may fare as well after liver transplantation as those patients with less advanced disease if careful selection criteria are used.

### METHODS

We reviewed data from all liver transplant recipients at Washington University, St Louis, Mo, from August 1, 1985, to February 28, 2002. Using a prospectively maintained database, we identified 51 HCC patients who had received liver transplants during the period of interest. These patients were matched with a contemporary cohort of 153 patients without HCC (a 3:1 matching scheme) who underwent liver transplantation at the same institution. When possible, patients were matched by age, sex, year of transplantation, and underlying etiology of cirrhosis. Patients younger than 18 years and those requiring urgent or emergent liver transplantation were excluded from analysis. The study was approved by the Human Studies Committee at Washington University.

Tumor staging was determined from pathological data obtained from the explanted specimens using the American Liver Tumor Study Group modified TNM staging classification (Table 1). This staging system is currently used by UNOS in determining eligibility for exception points. In selected patients, chemoembolization and tumor ablation were performed while awaiting transplantation; however, the effect of neoadjuvant therapy was not assessed as part of the present study. The primary end points were overall survival and recurrence rate. Overall survival was defined as the time from initial transplantation to patient death. Recurrence was determined by using laboratory or imaging study results suggestive of HCC after transplantation. Patients who underwent retransplantation were censored from further analysis at that time.

We calculated means and standard deviations for continuous variables, and performed statistical analysis using 2-tailed t tests and Fisher exact tests as appropriate. We constructed survival curves using Kaplan-Meier estimates and analyzed them using the log-rank test. We used Microsoft Excel 2002 (Microsoft Corp, Redmond, Wash) and GraphPad Prism software, version 4.02 (GraphPad Software Inc, San Diego, Calif) for analysis. P < .05 was considered significant.

### RESULTS

During the study period, 635 adult liver transplantsations were performed at our institution. Fifty-one HCC patients underwent transplantation, constituting 8% of the total. The mean age at transplantation was 51.9 years, with a predominance of men and a racial distribution representative of our referral pattern (Table 2). More than half (28 patients [55%]) of the HCC patients had known viral hepatitis (hepatitis B or C), with HCC developing in the remainder in the setting of alcoholic (10 patients [20%]) or other cirrhotic (13 patients [25%]) etiologies. The HCC patients were matched to 153 patients undergoing transplantation for liver disease without evidence of malignancy (non-HCC cohort). Age, sex, race, and hepatitis B or C as the cause of liver failure were not significantly different between groups (Table 2). Median lengths of follow-up for HCC and non-HCC patients were 37 and 53 months, respectively (P = .02). This difference in follow-up can be attributed to the poor survival of HCC patients with stage IV disease, as median follow-up for patients with stages I to III disease was not significantly different from that of their matched controls (48 vs 44 months; P = .82). Stage distribution of HCC patients is shown in Table 3.

As depicted in Figure 1, median 5-year survival for all HCC patients undergoing transplantation was 48%, compared with 65% for the non-HCC cohort (P = .07). The 1-, 3-, and 5-year survivals based on HCC stage are shown in Table 4 and Figure 2. Overall survival for patients with stage III disease was not statistically different from that of patients with stage I (P = .70) or stage II (P = .44) disease. Conversely, patients undergoing transplantation for stage IV disease fared significantly worse than those with less advanced disease, with a median 5-year survival of 26%. When compared with the non-HCC matched cohort (Table 5), only patients with stage IV disease experienced significantly worse

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**Table 1. American Liver Tumor Study Group Modified TNM Staging Classification**

<table>
<thead>
<tr>
<th>Cancer Stage</th>
<th>Tumor Classification</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>T1</td>
<td>1 Nodule ≤ 1.9 cm</td>
</tr>
<tr>
<td>II</td>
<td>T2</td>
<td>1 Nodule 2.0–5.0 cm; 2 or 3 nodules all &lt; 3.0 cm</td>
</tr>
<tr>
<td>III</td>
<td>T3</td>
<td>1 Nodule &gt; 5.0 cm; 2 or 3 nodules with at least 1 &gt; 3.0 cm</td>
</tr>
<tr>
<td>IVA</td>
<td>T4a</td>
<td>≥ 4 nodules, any size</td>
</tr>
<tr>
<td>IVC</td>
<td>T4b</td>
<td>T2, T3, or T4a with gross intrahepatic portal or hepatic vein involvement as indicated by CT, MRI, or ultrasonography</td>
</tr>
<tr>
<td>IVB</td>
<td>Any N1; any M1</td>
<td>Regional (portal hepatic) nodes (N1); metastatic disease, including intrahepatic portal or hepatic vein involvement (M1)</td>
</tr>
</tbody>
</table>

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging.

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**Table 2. Demographics Comparing Patients With HCC Undergoing Transplantation and Non-HCC Matched Controls**

<table>
<thead>
<tr>
<th>Demographic Features</th>
<th>HCC (n = 51)</th>
<th>Non-HCC (n = 153)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), y</td>
<td>51.9 (10.7)</td>
<td>50.0 (10.9)</td>
<td>.29</td>
</tr>
<tr>
<td>Men, No. (%)</td>
<td>43 (84)</td>
<td>127 (83)</td>
<td>.99</td>
</tr>
<tr>
<td>White, No. (%)</td>
<td>40 (78)</td>
<td>133 (87)</td>
<td>.18</td>
</tr>
<tr>
<td>Viral hepatitis, No. (%)</td>
<td>28 (55)</td>
<td>63 (41)</td>
<td>.10</td>
</tr>
<tr>
<td>Median follow-up, mo</td>
<td>37</td>
<td>53</td>
<td>.02</td>
</tr>
<tr>
<td>Median follow-up, stages I–III only, mo</td>
<td>48</td>
<td>44</td>
<td>.82</td>
</tr>
</tbody>
</table>

Abbreviation: HCC, hepatocellular carcinoma.
survival than their matched controls (P = .002), with patients with stage I, II, and III disease demonstrating 5-year survivals equivalent to those of patients without malignancy. Specifically, patients with stage III disease did no worse than their matched controls at the 1-, 3-, and 5-year times (Table 6). Considering patients with stages I, II, and III disease as a group, survival was not significantly different from that of matched controls (Figure 3) (P = .96).

Recurrent or metastatic disease developed in 13 HCC patients (25%). Eleven of these patients (85%) had stage IV disease. No recurrence developed in any patient with stage I disease undergoing transplantation, whereas recurrent HCC developed in 1 patient each with stage II (7%) and stage III (11%) disease. The overall mean time to recurrence was 10 months.

Hepatocellular carcinoma is a rising health problem in the United States, with the incidence nearly doubling from the 1970s to the 1990s.1 In addition, the explosion in the number of hepatitis C cases, which peaked in the late 1980s, will be expected to produce a similar peak in HCC approximately 20 to 30 years later.13,14 Although surgical resection has traditionally been considered the gold standard of treatment, long-term survival is generally disappointing, with most series reporting 5-year survivals ranging from 32% to 44% in cirrhotic patients undergoing partial hepatectomy for HCC.12-18 In addition, longer follow-up demonstrates a high rate of recurrence in the

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Table 3. Distribution of Patients Undergoing Transplantation for HCC by Modified TNM Stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>No. (%)</th>
<th>Tumor Diameter, Mean (SD), cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>11 (22)</td>
<td>1.2 (0.55)</td>
</tr>
<tr>
<td>II</td>
<td>14 (27)</td>
<td>2.1 (0.79)</td>
</tr>
<tr>
<td>III</td>
<td>9 (18)</td>
<td>4.9 (2.8)</td>
</tr>
<tr>
<td>IV</td>
<td>17 (33)</td>
<td>6.1 (4.3)</td>
</tr>
</tbody>
</table>

Abbreviation: HCC, hepatocellular carcinoma.

Table 4. Survival of Patients Undergoing Transplantation for HCC by Modified TNM Stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>1 y</th>
<th>3 y</th>
<th>5 y</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>82</td>
<td>73</td>
<td>73</td>
</tr>
<tr>
<td>II</td>
<td>79</td>
<td>61</td>
<td>41</td>
</tr>
<tr>
<td>III</td>
<td>78</td>
<td>78</td>
<td>65</td>
</tr>
<tr>
<td>IV</td>
<td>59</td>
<td>29</td>
<td>26</td>
</tr>
<tr>
<td>All stages</td>
<td>73</td>
<td>57</td>
<td>48</td>
</tr>
</tbody>
</table>

Abbreviation: HCC, hepatocellular carcinoma.

Table 5. Survival of HCC Patients vs Non-HCC Matched Controls

<table>
<thead>
<tr>
<th>Stage</th>
<th>5-y Survival, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCC</td>
<td>73 41 65 26</td>
</tr>
<tr>
<td>Non-HCC</td>
<td>61 66 59 69</td>
</tr>
<tr>
<td>P value</td>
<td>.90 .41 .44 .001</td>
</tr>
</tbody>
</table>

Abbreviation: HCC, hepatocellular carcinoma.
The report of Mazzaferro et al, transplantation for HCC gained transplantation for HCC, and waiting time and waiting-list mor-
number and the proportion of patients undergoing trans-
anatomized model for end-stage liver disease priority score higher
patients with stages I and II disease are incidental with the change in liver allocation procedures us-
with smaller tumors who underwent transplantation enjoyed favorable long-term survival.24-26 Beginning in 2002 and coincident with the change in liver allocation procedures using the model for end-stage liver disease score, patients with early-stage HCC have been given special priority.27 Based on the Milan criteria, patients with stages I and II disease are allotted a model for end-stage liver disease priority score higher than what might be calculated on the basis of liver function alone. This has resulted in an increase in both the absolute
...No-one, 3-, and 5-year survival rates did not differ significantly between 
remnant liver due to intrahepatic spread and the development of second primary tumors associated with the underlying hepatic disease. Furthermore, patients with moderate to severe cirrhosis typically are not candidates for resection. Less invasive therapies such as chemoembolization and ethanol or radiofrequency ablation have produced only modest success.19,20
Historically, transplantation for HCC was met with significant resistance because of less-than-favorable outcomes. Long-term survival was unusual, and recurrence of disease was frequent.21,22 Paralleling an improvement in outcomes after liver transplantation for all causes has been an improved survival after transplantation for HCC. Both modern immunosuppressive regimens and stricter patient selection are believed to have contributed to this shift in outcomes.23 After the report of Mazzaferro et al, transplantation for HCC gained renewed interest. Subsequent studies confirmed that patients with smaller tumors who underwent transplantation enjoyed favorable long-term survival.24-26 Beginning in 2002 and coincident with the change in liver allocation procedures using the model for end-stage liver disease score, patients with early-stage HCC have been given special priority.27 Based on the Milan criteria, patients with stages I and II disease are allotted a model for end-stage liver disease priority score higher than what might be calculated on the basis of liver function alone. This has resulted in an increase in both the absolute number and the proportion of patients undergoing transplantation for HCC, and waiting time and waiting-list mortality rates have decreased significantly.28 Nevertheless, the dropout rate for patients with HCC remains high, with 50% of patients with large or multiple tumors becoming ineligible for transplantation within 1 year.29 In light of limited organ availability and rapid disease progression in some patients, transplantation for HCC should be offered only to patients whose survival is predicted to be similar to that of patients receiving transplants for benign disease.30
Recently, there have been reports of extended survival after transplantation in patients with more advanced HCC. On the basis of their experience with transplantation for large HCC, Yao et al30 proposed expanding transplantation eligibility criteria to include patients with solitary tumors having diameters of less than 6.5 cm, or patients with fewer than 4 nodules, with the largest lesion smaller than 4.5 cm and total tumor diameter not exceeding 8 cm. Under these criteria, the authors reported a 5-year survival of 75.2%. Of these patients, 12% had tumors greater than 5 cm in diameter. Others have demonstrated that recurrence-free survival is not significantly different between patients who did or did not meet UNOS criteria.21 Using a combination of preoperative adjuvant chemotherapy and subsequent liver transplantation, Roayaie et al31 achieved durable long-term survival in patients with tumors greater than 5 cm. Similarly, Gondolesi et al32 reported their experience with living donor liver transplantation for early- and late-stage HCC. These patients, 53% of whom had tumors exceeding UNOS priority criteria, experienced a 2-year survival of 60% with acceptable recurrence rates (26%).
The present study confirms the success of transplantation for HCC in early-stage disease and adds to the growing body of evidence that stage III disease also may be successfully managed with transplantation. This study is unique, however, in comparing the results of transplantation in HCC patients with those of patients without cancer. Our matching strategy, which specifically includes year of transplantation, decreases the possibility of confounding based on era of transplantation. Most patients with stage IV disease underwent transplantation early in our series (12 of 17 patients before 1996). As with early experience, the results were uniformly poor when considered alone and when compared with those of contemporary controls without HCC. Patients with stages I through III HCC were more evenly distributed throughout the period of study. Although the improved outcomes in these patients could, in part, be attributed to the overall increase in survival seen in the past 2 decades for liver transplantation, comparison with matched controls confirms that HCC patients undergoing transplantation enjoy survival comparable to that of non-HCC patients undergoing transplantation. Overall and disease-free survival must be considered when evaluating the results of transplantation for HCC. Specifically with regard to patients with stage III disease, we believe that the case-matched data in this report support the call to expand liver transplantation as a treatment option to those with more advanced HCC. We found an overall 5-year survival rate of 65% in patients with stage III HCC, with only 1 recurrence in 9 cases. This

<table>
<thead>
<tr>
<th>Table 6. Comparison of Stage III HCC vs Non-HCC Matched Controls</th>
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<tbody>
<tr>
<td>Survival, %</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Stage III HCC</td>
</tr>
<tr>
<td>Non-HCC</td>
</tr>
</tbody>
</table>

Abbreviation: HCC, hepatocellular carcinoma.

*One-, 3-, and 5-year survival rates did not differ significantly between groups (P = .44).
compared favorably with lower-stage disease, and survival after transplantation was comparable to that of the non-HCC matched cohort. Indeed, survival after liver transplantation for HCC is more likely a function of intrinsic biological characteristics of the tumor, such as microvascular invasion, rather than simply of tumor size.33,34

While the data reported herein are compelling, our study has several limitations. Although our liver transplant database is maintained prospectively, this report represents a retrospective review over 17 years. Inherent in a case-control study design is the possibility that patients are not equivalent matches. In addition, although pretransplant adjuvant therapy has been evaluated favorably in a prospective study,35 we did not assess its impact in our population of patients who variously received such therapy. Several authors have addressed the issue of possible disease progression while awaiting a suitable donor liver.20,35 Because the intent of this study was to examine outcome after transplantation for HCC, the impact of a potential delay in treatment was not included in our evaluation. Since the UNOS criteria went into effect, we have stopped performing transplantation in patients with advanced disease on a routine basis, and thus it will be difficult to accumulate additional experience with transplantation for stage III disease outside the confines of a clinical trial. However, as many as 30% of HCC patients with stage I or II disease as determined by preoperative imaging are found to have more advanced disease on the basis of explant pathological findings, and this may introduce additional bias in this report.20,37 Improvements in diagnostic imaging may reduce the impact of this problem in the future.

This retrospective review of our experience with liver transplantation for HCC supports the use of this treatment modality for patients with early-stage disease. Furthermore, patients with stage III disease had outcomes similar to those with less advanced malignancy as well as to non-HCC matched controls. On the basis of these findings, we support the expansion of special priority for liver transplantation to those with stage III HCC.

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Correspondence: William C. Chapman, MD, Department of Surgery, Washington University School of Medicine, 660 S Euclid Ave, Campus Box 8109, St Louis, MO 63110 (chapmanw@wustl.edu).

Previous Presentation: This paper was presented at the Annual Meeting of the Western Surgical Society; November 8, 2004; Las Vegas, Nev; and is published after peer review and revision. The discussions that follow this article are based on the originally submitted manuscript and not the revised manuscript.

REFERENCES

Jean-Nicholas Vauthey, MD, Houston, Tex: I wish to congratulate the authors for using the American Liver Tumor Study Group TNM stage to analyze the explanted specimens of 51 patients with HCC after liver transplantation. Based on the posttransplant survival of 9 patients with stage III who had a survival similar to stage I and II, the authors suggest that liver transplantation could be expanded to stage III patients.

Notwithstanding the small numbers, the concern is whether you can safely say these patients were stage III before transplantation. That is, the intent-to-treat survival may differ from the survival derived from the specimen analysis. In addition, the American Joint Committee on Cancer (AJCC) recommends differentiating between the cTNM (clinical TNM) and pTNM (pathologic TNM). The cTNM and pTNM may variably overlap.

The main factor limiting the expansion of the criteria of transplantation is the inadequate stratification of HCC using morphologic criteria alone. The American Liver Tumor Study Group, the University of California–San Francisco group, and the Barcelona group use different combinations of morphologic criteria (number and size) to expand transplantation without consensus. As indicated in the previous paper, large size does not mean bad prognosis. The factor that best stratifies HCC, after resection or transplantation, irrespective of size, is vascular invasion. Some centers now perform fine-needle aspiration to obtain grade and use high grade as a surrogate marker of vascular invasion. This biological marker is then integrated into the selection criteria for transplantation. I have 3 questions for the authors.

Do the authors have data on the pretransplant cTNM stage of their patients? How many patients classified clinically as stage III before transplantation actually had stage III based on the pathology?

Have the authors used the AJCC sixth edition staging, which stratifies based on vascular invasion posttransplantation pathologic system? Solitary tumors, regardless of size, and multiple tumors up to 5 cm are classified as T1 and T2 in that staging. Have the authors analyzed their patients based on grade and vascular invasion?

Dr Chapman: I would like to thank Dr Vauthey for his insightful comments and review of our paper. The issues regarding staging for HCC have been very complex, and I think as Dr Vauthey reviewed earlier even in his paper, we are now in the sixth edition of AJCC staging. One of the difficulties that is unique for HCC is, in addition to tumor characteristics, the issue of underlying advanced liver disease or the presence of cirrhosis. This has been one of the issues that has been incorporated into the current AJCC pathologic staging system. However, there are numerous staging systems that are used depending upon the groups that have interest in their respective area: Okuda, CLIP (Cancer of the Liver Italian Program), the modified AJCC system, and here what we have presented, the UNOS modification of the AJCC. In this project we assigned staging based on UNOS criteria because that is currently what is utilized for selection of patients for transplantation. This system relies on tumor size and does not incorporate the variables of vascular invasion, since these variables at present are not able to be reliably predicted based on preoperative imaging studies.

Even when patients have tumor biopsy, the biopsy results are unreliable in fully assessing vascular invasion. So, on this particular project, we utilized the UNOS staging system because of our interest in its potential application in selecting patients for transplantation. As far as the specific question regarding the intention-to-treat analysis, and I think that is an important point, we did not perform this study on an intention-to-treat basis. If such an expansion of consideration for transplantation is undertaken, this would be an important variable to consider on a prospective basis. The issue is, what is the dropout rate of patients selected for consideration of transplantation as they wait for transplant or, in fact, have more advanced disease than what is predicted? This paper, and it is a recognized limitation, is a retrospective look at the results over an extended time period with long follow-up, and so what we assessed was based on the defined pathology and the outcome results using transplantation in patients with more advanced disease. In our opinion, the results are more favorable than other options that are available, and in this series were equivalent for patients with stage III disease compared with stages I and II. In answer to the second question, we did not utilize the AJCC criteria for the pathology review, so I do not have that actual staging information, again, based on the fact that our interests were more based on the transplant approach as opposed to TNM staging. Similarly, we did not perform a separate analysis based on pathologic vascular invasion or tumor grade.

John Brens, MD, Chicago, Ill: One of the problems you alluded to is the wait for liver transplantation after these patients get put on the list. I was wondering what you do to these patients as they are waiting for liver transplantation. Do you treat them with chemoembolization or any type of negative modality as they await liver transplantation?

Dr Chapman: That is a very important question and one that I think the transplant group as a whole does not know the answer to. We currently utilize primarily chemoembolization for patients who have identified HCC while they are on the transplant waiting list. In this series, 15 patients out of the 51 had preoperative therapy, which included primarily chemoembolization but in a selected few included tumor ablation. There are considerations for conducting a multicenter study looking at the role of preoperative therapy while patients wait, and I think this is going to be an important factor also in this group of patients to look at the effect of tumor downstaging. If we can downstage a patient who has a T3 tumor to a T2 currently meeting criteria, what impact does that have on long-term survival? This is an unanswered question.

Scott Helton, MD, Chicago: Your study preceded the use of priority points for patients with UNOS stage II, and I was curious if your conclusions would change today given the use of priority points. My second point is, as you know, many patients who received transplants last year and were given priority points did not even have pathologically confirmed cancer in their liver. Did you confirm that all of your patients had cancer in the liver pathologically?

Dr Chapman: Dr Helton, those are 2 very important questions that I do not have the full answers to. In terms of priority listing, your second question, the current scheme that is utilized, assigning priority points for transplantation, was implemented in February 2002. Before that time patients did not receive extra priority for transplant listing, so we cannot reliably look back and factor that in. Basically, the prior scheme was based on waiting time, so patients only moved up the list as they accrued waiting time. The emphasis now is to try to perform transplants in those tumor patients at an earlier time interval. That is where the priority points come into play and, at present, priority points are not allowable for stage II disease on a routine basis. All patients in the current series have documented HCC, since their staging was based on explant pathology.

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