Correlation Between the Radiologic and Histologic Size of Hepatocellular Carcinoma in Patients Eligible for Liver Transplantation


ABSTRACT

Hepatocellular carcinoma is the most prevalent primary hepatic tumor. Early diagnosis and staging is of paramount importance to obtain favorable survivals. So far, there is no general agreement on the most appropriate imaging technique to detect the tumor for correlation between pretransplant radiologic and pathologic size of the tumor, which remains inadequate. With greater clinical experience and increasing accuracy of imaging methods, magnetic resonance (MR) appears to be the most accurate method, yielding a correlation in 67% of cases.

HEPATOCELLULAR CARCINOMA (HCC) accounts for 70% to 90% of primary hepatic malignancies.1,2 It displays a rapidly fatal outcome growing in damaged liver tissue. When left untreated, the survival rate of patients is less than 12 months. Early detection of the tumor is of vital importance for its treatment by means of resection or liver transplantation.

According to estimates, the tumor takes 4 to 6 months to double in size in untreated cases, which suggests that a late diagnosis worsens the disease prognosis.1,3,4 Diagnostic evaluation of patients at risk should include ultrasonography (US) and α-fetoprotein (AFP). In the presence of a nodular mass larger than 1 cm or abnormal AFP values, further studies should be performed to improve the sensitivity and specificity of conventional US including arterial and portal phase images obtained through helicoidal computed tomography (CT) and dynamic gadolinium-enhanced magnetic resonance (MR).

Despite the high diagnostic positivity of these techniques, an adequate correlation between the radiologic and pathologic size of these tumors has not been obtained. Three factors pose diagnostic difficulties in this respect: the differentiation between dysplasic nodules and HCC; multifocal growth of the tumor which is present in 20% to 60% of the cases and the lack of match of the size of transverse sections with those reported by radiologic and pathologic examination, the equivalence of which depends on the sample resection protocol.1,5–8

MATERIALS AND METHODS

We analyzed the correlation between HCC size reported by various imaging techniques (pretransplant radiologic Diagnosis) performed within 3 months of resection and the final pathologic examination of the sample (pathologic diagnosis). Among liver transplantation cases performed from April 15, 1994 to September 13, 2004. We measured the lesions in transverse sections obtained through radiologic examinations and the surgical sample.

RESULTS

Among the 500 liver transplantsations performed during the study period, 48 (9.6%) were due to HCC. The marked progress in imaging techniques since 2000 has resulted in greater diagnostic accuracy. Thus, we divided the patients into two groups: group I patients (n = 31) were transplanted before 2000 versus group II (n = 17) transplanted after that date. Seven patients were excluded from group I because they did not have a presurgical suspicion of HCC and the tumor was incidentally diagnosed on pathologic examination.

In the second half of 2001, some guidelines were established that required that the diagnosis of HCC be confirmed by two imaging tests. We observed that, prior to this date the diagnosis was based on one, two, or rarely three radiologic tests. A CT/MR was performed on all the patients every 3 months while they were awaiting transplantation. A positive correlation between the radiologic and pathologic size of the tumors was established with this difference was <0.5 cm above (excess) or 0.5 cm below (defect).

From the Hepatobiliopancreatic Surgery and Liver Transplant Unit, University Hospital Virgen Del Rocío, Seville, Spain.

Address reprint request to Angel Bernardos, MD, Hospitales Universitarios Virgen del Rocío, Avenida Manuel Siurot s/n, 41013 Sevilla, España. E-mail: angel.bernardos.sspa@juntadeandalucia.es

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360 Park Avenue South, New York, NY 10010-1710

The results of US showed no correlation in 11 patients (61%) in group I and in 8 patients (53%) in group II. CT findings showed no correlation in 12 group I patients (71%) versus 9 group II (60%). Finally, MR showed no correlation in three patients (100%) in group I and five (33%) in group II. We also observed that the lack of correlation was mainly due to defect values in the case of US and CT and to excess values in the case of MR. An adequate correlation of 80% was obtained between the number of nodules diagnosed by MR and pathologic examination in the 15 patients who underwent MR after 2000.

We also analyzed whether the greater amount of tests performed increased the chances of obtaining an adequate correlation. We found no correlation in 9 of the 12 patients (75%) in group II who simultaneously underwent US, CT, and MR.

To compare the two measurement techniques, we used the Bland and Altman statistical method observing that MR was the most accurate imaging technique with a standard deviation of 0.7 (Table 1).

We simultaneously analyzed the occurrence of vascular invasion in relation to tumor size and the progression from the last diagnostic test to surgery. The vascular invasion in both groups was confirmed by pathologic examination in 13 patients (31.7%), 10 of whom (76.9%) had tumor sizes of 4 cm or greater. We observed tumor progression in 12 group I patients (50%), 3 of whom received chemoembolization; the tumor size had increased from 0.5 to 2.5 cm. As regards group II, 2 patients (12%) showed tumor progression in a range from 1.8 to 2.0 cm, one of these patients had also been treated with chemoembolization. In group I tumor growth was evident in less than 3 months in 7 patients (58.3%), between 3 and 7 months in 4 patients (33.3%) and over 7 months in just 1 patient (8.3%). In the two Group II patients tumor growth was assessed at months 3 and 9, respectively. Of the 12 group I patients who showed tumor progression, 6 presented with well-differentiated tumors (2 with vascular invasion); 4 developed moderately differentiated tumors (2 with vascular invasion); another patient with a low differentiated tumor with vascular invasion; and the last patient, a multicentric tumor also with vascular invasion. Of the two patients in group II showing tumor progression, one showed a moderately differentiated tumor and the other, a multicentric tumor, both showing signs of vascular invasion. So far, 6 patients have died because of tumor recurrence, 4 (20%) in group I at months 7, 17, 21, and 30 after surgery and two patients (11.8%) in group II at months 7 and 14.

DISCUSSION

Advances in imaging methods have improved diagnostic accuracy of hepatic tumors. However, there are still some difficulties resulting from the individual interpretations. The present study confirmed the lack of an adequate correlation between the size reported by radiologic and histologic examinations of HCC. Moreover, MR appeared to be the imaging technique yielding the most accurate results in up to 67% of the cases. MR was also precise in determining the number of hepatic tumors, but its combination with CT and US did not improve the above mentioned correlation.

Tumor size of 4 cm or greater is frequently associated with vascular invasion. The size of the tumor may duplicate in a period ranging from 4 to 6 months, thereby affecting the final prognosis and even determining the exclusion of several patients from resection or transplantation. HCC continued to progress in 14 patients (29%) on the waiting list for liver transplantation, even in the case of some patients treated with chemoembolization. Most patients presented with moderately differentiated, low differentiated, or multicentric histologic types with poor prognosis groups, showing vascular invasion present in 57% of cases.

To sum up, we conclude that there is no adequate correlation between the radiologic and histologic size of HCC, this correlation does not improve with a higher number of radiologic tests, and MR is the most adequate radiologic technique for the diagnosis and follow-up of patients awaiting liver transplantation. In our opinion, the correlation would improve if the protocol followed resection measurements based on transverse sections reported by imaging studies.

Table 1. Comparison of HCC Size Reported by Radiologic and Pathologic Examinations

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<th>MR - P</th>
<th>US - P</th>
<th>CT - P</th>
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<td>10</td>
</tr>
<tr>
<td>Mean</td>
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<td>−0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Minimum</td>
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<td>−2.0</td>
<td>−1.5</td>
</tr>
<tr>
<td>Maximum</td>
<td>—</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Standard deviation</td>
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<td>1.0</td>
<td>0.9</td>
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<table>
<thead>
<tr>
<th>Gl: &gt;2,000</th>
<th>MR - P</th>
<th>US - P</th>
<th>CT - P</th>
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<tbody>
<tr>
<td>Patients (n)</td>
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<td>15</td>
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<tr>
<td>Mean</td>
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</tr>
<tr>
<td>Minimum</td>
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</tr>
<tr>
<td>Maximum</td>
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<td>1.0</td>
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</tr>
<tr>
<td>Standard deviation</td>
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Abbreviation: P, Pathology.

REFERENCES


CORRELATION OF SIZE OF HCC