

Answer

Bone Metastases From HCC

The fludeoxyglucose F18–positron emission tomographic/CT scan (Figure 1) shows increased uptake involving most of the upper half of the sternal body. Her α_1 -fetoprotein level was 943 ng/mL, and she underwent a fine-needle aspiration and a core biopsy of the sternal mass (Figure 2A). The fine-needle aspiration revealed a malignant neoplasm composed of loose clusters of large polygonal cells with a moderate amount of cytoplasm (Figure 2B and C). A core biopsy showed the tumor to be arranged in clusters with surrounding endothelial cells. Immunohistochemistry performed on the core biopsy demonstrated tumor cell immunoreactivity for α_1 -fetoprotein and hepatocyte paraffin 1, which is diagnostic for metastatic HCC.

Recurrence of HCC after LT is rare in the appropriately selected patient. The largest series reported an overall recurrence rate of 11% to 18%.^{1,2} Patients whose explant tumor characteristics are within the Milan criteria have a recurrence rate after LT of 8%. Those with characteristics outside the criteria have a 50% to 60% incidence of recurrence 4 years after LT.³ A series of 57 patients with HCC recurrence after LT showed that 52% of these patients had extrahepatic recurrence, 16% had recurrence limited to the liver, and 31% presented both hepatic and extrahepatic recurrences.¹

The prognostic factors that increase the risk of post-transplant recurrence were vascular invasion, poorly differentiated HCC, a tumor size of greater than 5 cm, and HCC exceeding the Milan criteria.⁴ The recurrence of HCC after LT results in significantly diminished survival.¹ If a posttransplant recurrence is detected, surgical intervention is reserved for patients with localized and resectable HCCs, no matter where the tumor is localized. This decision is based on the fact that those patients whose lesions can be removed fare better than those with unresectable recurrence.⁵ Yet, the cumulative experience is too small to draw firm conclusions regarding clinical decisions in management and prognostic factors affecting surgical resection of recurrences.⁶

Our patient had a tumor that met the Milan criteria. Her explant showed a moderately differentiated lesion, 2.5 cm in maximal diameter and limited to 1 lobe without vascular invasion. She also had no preoperative evi-

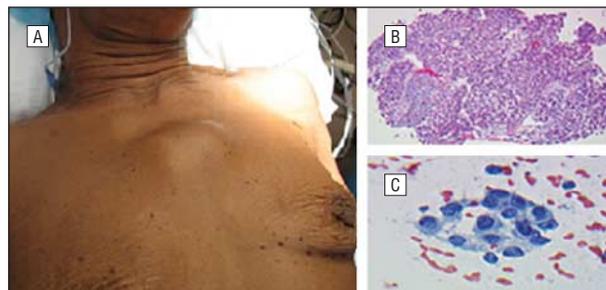


Figure 2. Fine-needle aspiration and core biopsy of sternal mass (A) using Papanicolaou stain (B [original magnification $\times 400$]) and hematoxylin-eosin (C [original magnification $\times 100$]).

dence of bone metastases. Nevertheless, a recurrence on the sternum was detected 11 months after LT. She underwent resection of the osteolytic sternal lesion with coverage by pectoral muscle flaps. Postoperatively, she received sirolimus and sorafenib. Sirolimus has been shown to exert beneficial effects on recurrence-free survival.^{7,8} Some cases have been reported in which a combination of sorafenib and sirolimus showed a significant improvement in patients with HCC recurrence.^{9,10} However, to our knowledge, the role of sirolimus and sorafenib as adjunct therapy to resection for HCC recurrence has not been conclusively studied yet.

Accepted for Publication: December 23, 2011.

Correspondence: Jorge Ortiz, MD, Department of Transplant Surgery, Albert Einstein Healthcare Network, Klein Professional Bldg, 5401 Old York Rd, Ste 505, Philadelphia, PA 19141 (ortizjor@einstein.edu).

Author Contributions: Study concept and design: Chavez, Danniell, and Ortiz. Acquisition of data: Chavez, Danniell, Jarrar, Khanmoradi, and Ortiz. Analysis and interpretation of data: Danniell, Miick, Khanmoradi, and Ortiz. Drafting of the manuscript: Chavez, Danniell, Miick, Jarrar, and Ortiz. Critical revision of the manuscript for important intellectual content: Miick, Khanmoradi, and Ortiz. Statistical analysis: Danniell. Obtained funding: Chavez. Administrative, technical, and material support: Chavez, Danniell, Miick, and Jarrar. Study supervision: Khanmoradi and Ortiz.

Conflict of Interest Disclosures: None reported.

REFERENCES

- Roayaie S, Schwartz JD, Sung MW, et al. Recurrence of hepatocellular carcinoma after liver transplant. *Liver Transpl*. 2004;10(4):534-540.
- Regalia E, Fassati LR, Valente U, et al. Pattern and management of recurrent hepatocellular carcinoma after liver transplantation. *J Hepatobiliary Pancreat Surg*. 1998;5(1):29-34.
- Roberts JP. Tumor surveillance—what can and should be done? *Liver Transpl*. 2005;11(11)(suppl 2):S45-S46.
- Sotiropoulos GC, Molmenti EP, Löscher C, Beckebaum S, Broelsch CE, Lang H. Meta-analysis of tumor recurrence after liver transplantation for hepatocellular carcinoma based on 1,198 cases. *Eur J Med Res*. 2007;12(10):527-534.
- Taketomi A, Fukuhara T, Morita K, et al. Improved results of a surgical resection for the recurrence of hepatocellular carcinoma after living donor liver transplantation. *Ann Surg Oncol*. 2010;17(9):2283-2289.
- Zimmerman MA, Ghobrial RM, Tong MJ, et al. Recurrence of hepatocellular carcinoma following liver transplantation. *Arch Surg*. 2008;143(2):182-188, discussion 188.
- Chinnakotla S, Davis GL, Vasani S, et al. Impact of sirolimus on the recurrence of hepatocellular carcinoma after liver transplantation. *Liver Transpl*. 2009;15(12):1834-1842.
- Kornberg A, Küpper B, Tannapfel A, et al. Long-term survival after recurrent hepatocellular carcinoma in liver transplant patients. *Eur J Surg Oncol*. 2010;36(3):275-280.
- Llovet JM, Ricci S, Mazzaferro V, et al; SHARP Investigators Study Group. Sorafenib in advanced hepatocellular carcinoma. *N Engl J Med*. 2008;359(4):378-390.
- Wang Y, Speeg KV, Washburn WK, Half G. Sirolimus plus sorafenib in treating HCC recurrence after liver transplantation. *World J Gastroenterol*. 2010;16(43):5518-5522.