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Long-Term Oncologic Outcomes After Liver Transplantation for Neuroendocrine Liver Metastases: A Multisite Mayo Clinic Study

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BACKGROUND

The liver is the most common site of metastasis in patients with neuroendocrine tumors (NETs). Liver transplantation (LT) is a potentially curative option for highly selected patients with neuroendocrine liver metastases (NELM). In this study we aimed to evaluate oncological outcomes of patients with NELM who underwent LT.

METHODS

We performed a multi-site retrospective analysis of patients with unresectable NELM treated with LT at Mayo Clinic (Arizona, Florida, and Rochester) from 1990 to 2026. Baseline characteristics, including tumor biology (Ki-67, grade), timing of diagnosis and transplant, and patterns of recurrence were evaluated. Overall survival (OS) and disease-free survival (DFS) were determined using Kaplan-Meier methods and independent multivariable predictors of mortality and disease recurrence were identified via Cox proportional hazards regression models.

RESULTS

Forty-seven patients (median age 48 years; 68.1% male) were identified. Primary tumor origins were predominantly pancreatic (48.9%) and small bowel (46.9%). Most patients had grade I (32%) or II (60%) tumors. Median OS was 108.3 months (95% CI 73.3-216) and median DFS was 47.9 months (95% CI 28.2-77.7). Ten-year OS and DFS were 44.3% (95% CI 30.9-63.5%) and 20.1% (95% CI 10.6-38.0%), respectively. Post-transplant recurrence occurred in 31 patients (66%) at a median of 28.2 months. Common sites included lymph nodes (n=18), bone (n=16), and the liver allograft (n=15). Ten patients developed recurrences at least 5 years after LT, including one more than 10 years after LT. Exploratory analysis of patients requiring pre-transplant PRRT (n=7) revealed an inferior median DFS (7.8 months), reflecting aggressive baseline biology. Salvage therapies included

somatostatin analogs (n=19), radiation (n=12) and PRRT (n=11). Post-transplant PRRT yielded a median post-reoccurrence survival of 54.5 months vs 30 months without PRRT, though this survival benefit is likely confounded by selection and immortal time biases.

CONCLUSIONS

LT for NELM provides durable survival in strictly selected patients achieving a 10 year OS 44.3%. Careful patient selection is essential to optimizing long-term outcomes after LT. The persistent risk of late recurrence (5+ years) and subsequent systemic treatment highlights of the need for long-term oncologic surveillance. Upon recurrence, multimodality salvage therapies, including PRRT, may contribute to prolonged disease control in selected patients.

ABSTRACT ID #36606