

**Supplemental Table 1. Comparison of Biomarker Thresholds at Predicting HCC Recurrence**

	No Recurrence Overall (n=267)	HCC Recurrence Overall (n=18)	No Recurrence at 3 years post LT (n=145)	HCC Recurrence at 3 years post LT (n=17)	Sensitivity at 3 years (%)	Specificity at 3 years (%)
<b>AFP ≥ 100 ng/mL</b>	10 (3.8)	2 (11.1)	7 (4.8)	2 (11.8)	11.8	95.2
<b>AFP-L3 ≥ 15%</b>	44 (16.5)	13 (72.2)	28 (19.3)	12 (70.6)	70.6	80.7
<b>AFP-L3 ≥ 25%</b>	25 (9.4)	12 (66.7)	14 (9.7)	12 (70.6)	70.6	90.3
<b>DCP ≥ 7.5 ng/mL</b>	27 (10.1)	14 (77.8)	15 (10.3)	13 (76.5)	76.5	89.7
<b>DCP ≥ 15 ng/mL</b>	15 (5.6)	11 (61.1)	9 (6.2)	10 (58.8)	58.8	93.8
<b>AFP-L3 ≥ 15% &amp; DCP ≥ 7.5 ng/mL</b>	9 (3.4)	11 (61.1)	6 (4.1)	10 (58.8)	58.8	95.9
<b>AFP-L3 ≥ 25% &amp; DCP ≥ 15 ng/mL</b>	1 (0.4)	8 (44.4)	1 (0.7)	8 (47.1)	47.1	99.3

**Supplemental Table 2. Univariate Cox-Proportional Hazards Analysis of Tumor Characteristics and Biomarkers Associated with HCC Recurrence**

	<b>No HCC Recurrence (n=267)</b>	<b>HCC Recurrence (n=18)</b>	<b>Univariate HR (95% CI)</b>	<b>P-Value</b>
<b>Largest Viable Tumor on Explant (cm, IQR)</b>	0.9 (0-1.7)	1.8 (1.0-2.4)	1.5 (1.1-2.1)	0.004
<b>Total Viable Tumor Diameter on Explant (cm, IQR)</b>	1.0 (0-2.8)	4.5 (1.8-7.8)	1.3 (1.2-1.5)	<0.001
<b>Number of Viable HCC Lesions on Explant (n, IQR)</b>	1 (0-2)	3 (1-5)	1.4 (1.2-1.6)	<0.001
<b>Vascular Invasion (n, %)</b>	7 (2.6)	6 (33.3)	11.8 (4.4-31.5)	<0.001
<b>High Risk Pathology on Explant (n,%)</b>	36 (13.5)	11 (61.1)	8.3 (3.2-21.3)	<0.001
<b>Explant Outside Milan (n, %)</b>	31 (11.6)	9 (50.0)	6.5 (2.6-16.5)	<0.001
<b>RETREAT Score (n, IQR)</b>	1 (0-2)	3 (2-4)	1.6 (1.6-2.6)	<0.001
<b>AFP ≥100 ng/mL at LT (n, %)</b>	10 (3.8)	2 (11.1)	2.8 (0.6-12.1)	0.173
<b>AFP-L3 ≥15% at LT (n, %)</b>	44 (16.5)	13 (72.2)	11.0 (3.9-30.8)	<0.001
<b>DCP ≥7.5 ng/mL at LT (n, %)</b>	27 (10.1)	14 (77.8)	24.2 (8.0-73.7)	<0.001
<b>AFP-L3 ≥ 15% and DCP ≥ 7.5ng/mL at LT (n, %)</b>	9 (3.4)	11 (61.1)	26.6 (10.3-68.9)	<0.001
<b>AFP-L3 ≥ 25% and DCP ≥15 at LT (n, %)</b>	1 (0.4)	8 (44.4)	40.0 (15.5-103.1)	<0.001

**Supplemental Table 3: Explant Characteristics on Pathology Stratified by Dual Positivity for AFP-L3  $\geq$  25% and DCP  $\geq$ 15 ng/mL**

	<b>Overall (n=285)</b>	<b>Negative for Dual Biomarker Elevation (n=276)</b>	<b>AFP-L3 <math>\geq</math> 25% and DCP <math>\geq</math>15 ng/mL (n=9)</b>	<b>P-Value</b>
<b>Median Largest Viable Tumor on Explant (cm, IQR)</b>	1 (0-1.8)	0.9 (0-1.8)	1.6 (1.2-2.1)	0.048 <sup>¶</sup>
<b>Median Total Viable Tumor Diameter on Explant (cm, IQR)</b>	1.2 (0-3.0)	1.1 (0-2.9)	4.1 (1.8-4.9)	0.004 <sup>¶</sup>
<b>Number of Viable HCC Lesions on Explant (n, IQR)</b>	1 (0-2)	1 (0-2)	3 (1-5)	0.003 <sup>¶</sup>
<b>Vascular Invasion (n, %)</b>	13 (4.6)	9 (3.3)	4 (44.4)	<0.001*
<b>High Risk Pathology on Explant (n,%)</b>	47 (16.5)	39 (14.3)	8(88.9)	<0.001*
<b>Explant Outside Milan (n, %)</b>	40 (14.0)	36 (13.0)	4 (44.4)	0.008*
<b>RETREAT Score (score, IQR)</b>	1 (0-2)	1 (0-2)	4 (2-4)	<0.001 <sup>¶</sup>
<b>Recurrence Free Survival (HR, 95% CI)</b>	-	Reference	40.0 (15.5-103.1)	<0.001 <sup>Δ</sup>
<b>Overall Survival (HR, 95% CI)</b>	-	Reference	16.8 (6.8-41.5)	<0.001 <sup>Δ</sup>

\* Chi squared test

<sup>¶</sup>Two-Sample Exact Wilcoxon rank-sum (Mann-Whitney) test

<sup>Δ</sup>Cox Proportional Hazards Test

**Supplemental Table 4: Stratification by Initial Milan Diagnosis Category and Tumor Markers**

	<b>Within Milan</b>	<b>Beyond Milan</b>	<b>All Comers</b>
<b>Total patients (recurrence)</b>	239 (14)	32 (1)	14 (3)
<b>AFP &gt;100 ng/mL (recurrence)</b>	11 (2)	0 (0)	1(0)
<b>AFP-L3 &gt;15% (recurrence)</b>	46 (12)	10 (1)	1(0)
<b>DCP &gt; 7.5 ng/mL (recurrence)</b>	31 (12)	5 (0)	5 (2)
<b>AFP-L3 &gt;15% &amp; DCP &gt;7.5 ng/mL (recurrence)</b>	18 (11)	2 (0)	0 (0)

**Supplemental Table 5: Multivariate Cox Proportional Hazards with Dual Biomarkers Adjusted for Initial Milan Category at Diagnosis**

	<b>Multivariate HR (95% CI)</b>	<b>P-value</b>
<b>Dual Positive Biomarkers</b>	44.3 (14.0-139.5)	<0.001
<b>Within Milan*</b>	Reference	Reference
<b>UNOS-Downstaging</b>	0.55 (0.07-4.2)	0.567
<b>“All-Comers”</b>	14.4 (3.2-64.4)	0.001

\*Reference category for initial Milan at diagnosis