**Background:** In patients with hepatocellular carcinoma (HCC) who meet the Milan criteria (MC), liver transplantation (LT) is the most effective treatment. However, MC is very strict to apply for living donor liver transplantation (LDLT). With only pre-existing morphologic criteria, like MC, we could not expand the selection criteria for LDLT reasonably because of the prediction of HCC recurrence would be inaccurate. There have been several suggestions that serum alpha-fetoprotein (AFP) and protein induced by vitamin K antagonist-II (PIVKA-II) are strongly associated with microvascular invasion which has been consistently shown to predict a poor prognosis after LDLT. So, we hypothesized that combining model of serum tumor markers and morphologic criteria could predict HCC after LDLT.

**Methods:** We examined preoperatively AFP and PIVKA-II within one month before LDLT as predictors of HCC recurrence in 834 patients who underwent LDLT for HCC from May 2007 to May 2015 in Asan medical center. We divided the patients into 2 groups using tumor markers, 1 within cut-off (AFP ≤ 150 ng/mL and PIVKA-II ≤ 100 mAU/mL) 2. beyond Cut-off (the others)

**Results:** 139 patients (16.7%) who experienced recurrence were retrospectively reviewed. The median time to recurrence was 10 months. The median survival time after recurrence was 26 months. 282 patients (33.8%) were in beyond MC group. Receiver operating characteristics (ROC) analysis revealed that the cut-off value was AFP>150 ng/mL and PIVKA-II>100 mAU/mL for HCC recurrence in the patients who did not receive downstaging treatment (n=574/834 (68.8%) before LDLT. Multivariate analysis revealed tumor size >5 cm, AFP>150 ng/mL and PIVKA-II>100 mAU/mL as significant independent risk factors for recurrence. The 1-, 3- and 5-year recurrence free survival (RFS) in beyond MC group were 79.4%, 69.6%, 65.5%, respectively. By using cut-off level of AFP150ng/mL and PIVKA-II 100mAU/mL, the RFS in beyond MC group were 92.3%, 80.1%, 77.3%, respectively. Even within the same criteria, there is a significant difference in the recurrence rate after LDLT according to tumor marker groups. Moreover, downstaging treatment of patients with high tumor markers, even within Milan criteria, result in more good results for recurrence rates if the tumor markers are lowered below the cut-off values of tumor markers after downstaging treatment.

**Conclusion:** Preoperatively, AFP and PIVKA-II levels can offers important information for the recurrence after LDLT for HCC. Highly selected patients with advanced HCC (beyond MC) satisfying both PIVKA-II <100 AU/mL and AFP<150 ng/mL can be indicated for LDLT. Thus, combination of tumor markers might be used for expansion of pre-existing strict selection criteria of LDLT for HCC.