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## Imaging for selection of LT candidates: naïve vs. down-staging

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Hepatocellular carcinoma (HCC) is the most common primary hepatic malignancy and the third leading cause of cancer-related mortality worldwide. Liver transplantation (LT) is the ideal treatment for suitable patients with HCC, as LT not only eliminates the tumor, but also cures the underlying liver disease. Because the results of LT for HCC much depend on the severity of liver disease, and the presence and extent of HCC, the optimal selection of candidates for LT is essential for successful outcome. The Milan criteria are the most widely used selection criteria for LT candidates. Many studies validated the Milan criteria, demonstrating 5-year survival > 70% in patients who met the Milan criteria, in the absence of macroscopic vascular invasion and extrahepatic metastases. In recent years, down-staging of HCC prior to LT has been in the spotlight. Down-staging is defined as reduction in the tumor burden using locoregional therapy to meet the eligibility criteria for LT. In both patients with untreated HCC and those after down staging, cross-sectional preoperative imaging has a critical role for noninvasive diagnosis of HCC and evaluation of its extent. In this lecture, we will discuss the eligibility criteria for LT, the role of imaging for selecting optimal LT candidates, and general concepts of downstaging of HCC before LT.

### 1. The eligibility criteria for LT

In 1996, the Milan criteria (one HCC  $\leq$  5 cm, two or three HCCs  $\leq$  3 cm) defined a subgroup of patient with early-stage HCC who could have excellent survival after LT with a low rate of post-LT tumor recurrence. Although current selection strategy exclusively based on the Milan criteria, there have been several concerning issues regarding the use of Milan criteria. For example, there are many patients with HCC exceeding Milan criteria who have a chance for cure with LT. Therefore, several studies have suggested the expanding criteria.

### 2. Downstaging of HCC before LT

Down-staging is defined as reduction in the tumor burden using locoregional therapy to meet the eligibility criteria for LT. The rationale of downstaging of HCCs initially exceeding conventional criteria for LT is to select tumors with favorable biology and prognosis for LT by assessing their response to locoregional therapy. There are essential components that are required for the application of tumor down-staging: eligibility criteria, down-staging endpoints, selection of the type of locoregional therapy, minimal observation period from successful tumor downstaging to LT, and criteria for treatment failure and exclusion from LT. Radiographic evaluation of treatment response should follow the Liver Imaging Reporting and Data System (LI-RADS) principles and should be based on measurements of the maximum diameter of viable tumors by multiphase CT or MRI.

### 3. Imaging for patients with treatment-naïve HCC and those after downstaging

A number of studies have been published studies regarding imaging study for LT eligibility. They include validation studies of guidelines for HCC diagnosis such as the Organ Procurement and Transplantation Network (OPTN) policy or LI-RDAS principles, comparison of imaging modalities or MR sequences for transplantation allocation, and imaging methods for measuring eligibility for LT after downstaging.

### References

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