

# Prediction of Liver Function after Radioembolization Using the <sup>13</sup>C-Methacetin Breath Test (MBT)

Malte Kircher, Rudolf Werner, Andreas Buck, Constantin Lapa, Su Hae Lee, Andreas Geier, Ralph Kickuth and Oliver Götze  
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## Abstract

### P812

**Introduction:** Radioembolization (RE) is a local treatment option for primary and secondary liver malignancies. Protecting healthy liver parenchyma while achieving high radiation doses in the tumor is a key priority. However, accurate estimation of liver function is not trivial, and currently used algorithms like Model For End-Stage Liver Disease (MELD) are prone to error, particularly in patients with lower scores. The <sup>13</sup>C-methacetin breath test (MBT) is a sensitive and non-invasive method for estimation of the hepatic functional reserve.

We therefore wanted to assess the effect of RE with yttrium-90-loaded resin microspheres on hepatic functional reserve in a prospective pilot study using the MBT in patients with primary and secondary liver malignancies.

**Methods:** 28 patients (19 male, 9 female, age  $65 \pm 10$  years, BMI  $26.2 \pm 4.4$  kg/m<sup>2</sup>, MELD  $8.6 \pm 2.5$ , all mean  $\pm$  SD) with primary and secondary liver malignancies of different etiologies completed the MBT before, during and after RE. The <sup>13</sup>C/<sup>12</sup>C ratio in breath was determined over 60 minutes in 10-minute intervals by nondispersive isotope selective infrared spectroscopy, and delta values [‰] and maximal percentage dose rates ( $PDR_{max}$  [%/h]) were calculated. In addition, liver volumetry was carried out semi-quantitatively prior to radioembolization and at follow-up.

**Results:** One day after RE a decrease in oxidative capacity occurred ( $P = 0.015$ ) with a significant increase of liver capacity after seven days ( $P < 0.001$ ). The increase was temporary and levelled out over the following four to eight weeks. Six weeks after RE of the right lobe, a significant volume increase of 23% ( $P = 0.002$ ) was observed in the left lobe, but not vice-versa. Liver function as estimated by MELD did not correlate with liver function as measured by MBT ( $P = n.s.$ ).

**Conclusions:** RE does not impair hepatic functional reserve as measured by MBT. A significant increase in liver volume of the untreated (left) lobe as well as an (mostly temporary) increase in liver function was observed after RE, opening the possibility of secondary resectability in some patients. No correlation was found between MELD and MBT, suggesting that current risk-stratification approaches may be prone to error in some cases. As a sensitive, non-invasive tool to estimate the hepatic functional reserve MBT can help to predict postprocedural liver function and might therefore assist in preventing complications after RE.