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Effect of selective internal radiation therapy (SIRT) in patients with unresectable primary or metastatic liver tumors on microsomal liver function by means of ^{13}C -methacetin breath test (MBT)

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Background:

Selective internal radiation therapy (SIRT) is a therapeutic option for patients with unresectable liver tumors. MBT is a feasible function test for the assessment of hepatic functional reserve, overall prognosis and treatment complications in patients with liver diseases.

Aims:

To assess prospectively in a pilot study the effect of SIRT with ^{90}Y -loaded resin microspheres on hepatic function in patients with primary and secondary liver malignancies.

Methods:

18 patients (13 m, 5f, age 64 ± 2 y., BMI 25.9 ± 1.0 kg/m², MELD 8.8 ± 0.7 , mean \pm SEM) with malignancies of different etiologies (HCC 7: 5 w/o, 2 w/cirrhosis; NET 5; colon CA 2; ovarian CA 1; mamma CA 1; choroidal/ciliary melanoma 2) were studied. Each patient received 75 mg of ^{13}C -methacetin dissolved in 100 ml of water before (d0), 1 (d1) and 7days (d7) after coil embolization for aberrant visceral arteries as well as before (d0), 1 (d1), 7 (d7), 28 (d28) and 56 days (d56) after SIRT ($1.2 \pm 0.17\text{GBq}$). $^{13}\text{C}/^{12}\text{C}$ ratio in breath was determined over 1h in 10 minute intervals by nondispersive infrared spectroscopy (IRIS, Mayoly, France) as delta values. Maximal percentage dose rate (PDR_{max} [%/h]) was calculated. Linear mixed effects model fits were applied (R 3.2.3).

Results:

Coil embolization induced a strong short-term decrease in microsomal liver function 24h following therapy [PDR_{max} (%/h): d0: 27.3 ± 2.4 ; d1: 19.9 ± 2.0 ; d7: 25.9 ± 2.0 ; $p = 0.0009$ d0 vs. d1; $p = 0.46$ d0 vs. d7]. SIRT had only a marginal effect on microsomal liver function at d1 with even an increase in oxidative function at d7 [PDR_{max} (%/h): d0: 25.2 ± 2.1 ; d1: 20.7 ± 2.6 ; d7: 39.5 ± 3.1 ; d28: 27.3 ± 3.1 ; d56: 25.3 ± 3.7 ; $p = 0.09$ d0 vs. d1; $p < 0.0001$ d0 vs. d7].

Conclusions:

In this pilot study in a patient group with well-preserved liver function a significant short term reduction in functional hepatic reserve reflected by a decrease in ^{13}C -methacetin metabolism was unexpectedly observed after coil embolization but not SIRT. However, the observed sensitivity for assessment of changes in liver function might therefore be helpful in the quantification of postprocedural liver function and prediction of decompensation. Our results indicate that the SIRT procedure per se does not induce a significant decrease in liver function in non-cirrhotic subjects.