PURPOSE: During [(90)Y]DOTATOC therapy, for determination of kidney doses a conventional approach using co-injected [(111)In]DOTATOC was evaluated for validity, reliability and reproducibility as well as for the influence of methodological variations and bremsstrahlung. Biologically effective doses were estimated by calculating the relative effectiveness (RE) of kidney doses. METHODS: Fractionated [(90)Y]DOTATOC therapy (n=20 patients, 3.1 +/- 0.7 GBq/therapy cycle, 45 therapy cycles) included co-injection of 157 +/- 37 MBq [(111)In]DOTATOC and a nephroprotective infusion regimen. From serial gamma camera/probe measurements, individual region of interest (ROI) sets were established and kidney doses were determined according to MIRDOS3 (corrected for individual kidney mass) by use of three methodological variants: (1) correction for interfering organs (liver/spleen) and background activity, (2) correction for interfering organs alone and (3) no corrections. A phantom study was performed with (111)In alone and with (111)In + [(90)Y] to estimate the influence of [(90)Y] bremsstrahlung. RESULTS: Mean kidney dose (method 1, n=20 patients, 20 therapy cycles) was 1.51 +/- 0.60 Gy/GBq [(90)Y]DOTATOC (1.41 +/- 0.48 Gy/GBq for n=20 patients, 45 therapy cycles). With partial correction (method 2) or no
correction (method 3) for interfering activity, kidney doses increased significantly, to 2.71+/-1.26 Gy/GBq and 3.15+/-1.22 Gy/GBq, respectively. The span of REs ranged from 1.02 to 1.24. Inter-observer variability was as high as +/-32% (+/-2SD). (90)Y bremsstrahlung accounted for a 4-11% underestimation of obtained target activity. CONCLUSION: The obtained kidney doses are highly influenced by methodological variations. Full correction for interfering activity clearly underestimates kidney doses. By comparison, (90)Y bremsstrahlung and variability in the relative effectiveness of kidney doses cause minor bias. Inter-observer variability must be considered when interpreting kidney doses.

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