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Radiation exposure associated with dedicated renal mass computer tomography protocol: Impact of patient characteristics

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Introduction & Objective: Dual phase abdomen-pelvis computer tomography (CT) is currently the mainstay for diagnosis, characterization and surveillance of small renal masses. We correlated the radiation exposure from this imaging modality to patient characteristics.

Methods: We retrospectively reviewed the records of 247 patients treated for a small renal mass (cT1a) between 2005-2011 at our institution, recorded demographic (age, race, gender, height and weight) and clinical (tumor size, mode of presentation) characteristics as well as the effective dose for dual phase abdomen-pelvis CT. Body mass index (BMI) was stratified as normal weight, overweight, obese and morbidly obese (≤ 25 , 25.1-30, 30.1-35 and >35.1 , respectively). Effective dose was calculated through the dose length product multiplied by a factor coefficient (0.015). Effective doses in millisieverts (mSv) were correlated to patient characteristics using univariable and multivariable analyses.

Results: In this cohort, median patient age was 61, median BMI 28.7 kg/m²; 72% were Caucasian and 56% were male. Median effective dose was 26.1 mSv (IQR 20.6-35.3). On univariable analyses, male gender, age, height and weight were positively associated with increased doses. When stratified by BMI, the median effective doses were 18.9, 25.2, 27.7 and 36.2 mSv for normal weight, overweight, obese and morbidly obese patients, respectively ($p < 0.001$). On multivariable analyses, BMI, age and male gender were significantly associated with increased effective dose ($p < 0.001$, $p = 0.023$ and $p < 0.001$, respectively). Compared to normal weight patients overweight, obese and morbidly obese patients' effective doses increased by 6.0, 9.1 and 18.5 mSv (all $p < 0.001$).

Conclusions: In this series the median effective dose for dual phase abdomen-pelvis CT was 26.1mSv. Obesity was independently associated with markedly increased radiation exposure, with morbidly obese patients exposed to almost twice the amount of radiation compared to normal weight. These findings should be considered when assessing management strategies in patients with a renal mass as well as strategies to effectively reduce or limit medical ionizing radiation exposure.