

Estimation of radiation cancer risk in CT-KUB

ABSTRACT

The increased demand for computed tomography (CT) in radiological scanning examinations raises the question of a potential health impact from the associated radiation exposures. Focusing on CT kidney-ureter-bladder (CT-KUB) procedures, this work was aimed at determining organ equivalent dose using a commercial CT dose calculator and providing an estimate of cancer risks. The study, which included 64 patients (32 males and 32 females, mean age 55.5 years and age range 30–80 years), involved use of a calibrated CT scanner (Siemens-Somatom Emotion 16-slice). The CT exposures parameter including tube potential, pitch factor, tube current, volume CT dose index ($CTDI_{vol}$) and dose-length product (DLP) were recorded and analyzed using CT-EXPO (Version 2.3.1, Germany). Patient organ doses, including for stomach, liver, colon, bladder, red bone marrow, prostate and ovaries were calculated and converted into cancer risks using age- and sex-specific data published in the Biological Effects of Ionizing Radiation (BEIR) VII report. With a median value scan range of 36.1 cm, the $CTDI_{vol}$, DLP, and effective dose were found to be 10.7 mGy, 390.3 mGy cm and 6.2 mSv, respectively. The mean cancer risks for males and females were estimated to be respectively 25 and 46 out of 100,000 procedures with effective doses between 4.2 mSv and 10.1 mSv. Given the increased cancer risks from current CT-KUB procedures compared to conventional examinations, we propose that the low dose protocols for unenhanced CT procedures be taken into consideration before establishing imaging protocols for CT-KUB.

Keyword: CT-KUB; Patient effective dose; Organ equivalent dose and cancer risks