

Adult and pediatric doses in CT.

Abstract

Doses in CT are generally expressed in terms of the Computed Tomography Dose Index (CTDI), which corresponds to the total energy deposited in the CTDI acrylic phantom divided by the mass of the directly irradiated section. The CTDI can be generalized for to any sized patient as the Mean Section Dose (MSD). However, the CTDI/MSD do not take into account CT section thickness or number of sections acquired and therefore are poor indicators of the patient risk from CT examinations. However, CTDI/MSD data can be used to determine the energy imparted to patients undergoing CT examinations, and thus the corresponding effective doses, which are much better indicators of the patient radiation risk. Effective dose computations also need to take into account the patient size, which ranges from less than 10 kg for young infants to oversized adults who can exceed 120 kg.

For abdominal CT examinations performed at 120 kVp and 340 mAs, newborns have mean section doses that are ~40 mGy. The corresponding dose for a normal sized adult is ~20 mGy and for an overweight adult is ~10 mGy. Adults undergoing an abdominal CT examination receive effective doses of ~4 mSv, but dose to infants are ~50% higher. Failure to account for patient size when selecting the x-ray tube potential and mAs used to perform CT examinations may result in patients being unnecessarily exposed, or could generate sub-optimal image quality if the amount of radiation used is too low.

Educational objectives:

1. Understand the dosimetry of Computed Tomography Dose Index and Mean Section Dose.
2. Understand how to compute energy imparted in CT examinations.
3. Understand how to convert values of energy imparted into effective doses.
4. Understand how to take into account patient size in computing effective doses.
5. Understand typical values of effective dose in CT for adults and pediatric patients.
6. Understand how image quality (contrast to noise ratio) is related to patient dose.