Evaluation of organ doses and specific *k* effective dose of 64-slice CT thorax examination using an adult anthropomorphic phantom

ABSTRACT

The magnitude of radiation dose in computed tomography (CT) depends on the scan acquisition parameters, investigated herein using an anthropomorphic phantom (RANDO®) and thermoluminescence dosimeters (TLD). Specific interest was in the organ doses resulting from CT thorax examination, the specific *k* coefficient for effective dose estimation for particular protocols also being determined. For measurement of doses representing five main organs (thyroid, lung, liver, esophagus and skin), TLD-100 (LiF:Mg, Ti) were inserted into selected holes in a phantom slab. Five CT thorax protocols were investigated, one routine (R1) and four that were modified protocols (R2 to R5). Organ doses were ranked from greatest to least, found to lie in the order: thyroid>skin>lung>liver>breast. The greatest dose, for thyroid at 25 mGy, was that in use of R1 while the lowest, at 8.8 mGy, was in breast tissue using R3. Effective dose (*E)* was estimated using three standard methods: the International Commission on Radiological Protection (ICRP)-103 recommendation (E103), the computational phantom CT-EXPO (E(CTEXPO)) method, and the dose-length product (DLP) based approach. E103 *k* factors were constant for all protocols, ~8% less than that of the universal *k* factor. Due to inconsistency in tube potential and pitch factor the *k* factors from CTEXPO were found to vary between 0.015 and 0.010 for protocols R3 and R5. With considerable variation between scan acquisition parameters and organ doses, optimization of practice is necessary in order to reduce patient organ dose.

Keyword: Organ absorbed dose; Organ equivalent dose; CT thorax; Specific *k* coefficient; Optimization strategies