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LETTER TO THE EDITOR

Addition of diagnostic CT scan does not increase the cancer risk in patients undergoing SPECT studies

Comment on Brix et al.: Radiation risk and protection of patients in clinical SPECT/CT

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Dear Sir,

I read with great interest the article by Brix et al. [1] in which the authors have expressed concerns regarding the radiation dose to patients from the diagnostic CT scans that are increasingly being performed as part of SPECT/CT studies, and the presumed increased risk of cancer to the patients. The purpose of this letter is to examine the reasons for their concerns, show that such concerns may not be justified, and suggest that co-registered diagnostic CT scans should be performed, if feasible, to improve the diagnostic confidence in the SPECT studies.

The authors refer to the recent BEIR VII report [2] that has recommended the use of the linear no-threshold (LNT) model to extrapolate the cancer risk from higher radiation doses to lower doses linearly, with no threshold. The LNT model is, however, not universally accepted for estimating radiation cancer risks. A report contemporary to the BEIR VII report by the French Academy of Sciences concluded that the use of the LNT model is not justified, as it is not consistent with radiobiological data, and that there may even be possible beneficial health effects from low-dose radiation [3]. The BEIR VII report has, on the other hand, declared the atomic bomb survivor data to be the most important data for estimating radiation health effects, and referring to these data, it said "The arguments for thresholds or beneficial health effects are not supported by these data". Another reason given by the BEIR VII report to support low-dose radiation carcinogenic concerns is the 15-country study of radiation workers that showed a slightly increased risk of cancer among the radiation workers [4].

Data and evidence published since the time of the BEIR VII report have, however, overwhelmingly contradicted the LNT model [5]. This includes the latest update to the atomic bomb survivor data, corrections to the data from the 15-country study of atomic workers, studies showing different cellular responses to high and low doses of radiation, the study of second cancers in radiation therapy patients, analysis of cancer incidence in Taiwan apartment residents exposed to low-dose radiation from contaminated building materials, and a study of dogs subjected to chronic radiation over their lifetime, as described in [5]. There are also recent animal studies that have shown reduced DNA damage (micronuclei) following repeated CT scans [6]. Another argument against the LNT model is that the model completely ignores the opposite effects of low-dose and high-dose radiation exposures on the immune system. Since the immune system plays a crucial role in preventing occult cancers from becoming clinical cancers [7], again the linear extrapolation of radiation cancer risks from high dose to low doses would not be justified.

In view of the above information, notwithstanding the widespread support of many professional and advisory bodies for the use of the LNT model as mentioned by Brix et al. [1], the use of the LNT model for estimating the low-dose radiation cancer risk appears to be inappropriate, as there is neither mechanistic nor epidemiological support for the model. Thus, the blanket declaration in the opening line of the article by Brix et al. [1] which states "Medical imaging using ionizing radiation always poses some risk of adverse health effects to the persons examined—especially radiation-related cancer" is unjustified. Also, there is no justification for the claims of increased cancer risks from the addition of the diagnostic CT scans to SPECT studies.

Though SPECT without a co-registered CT scan has been the standard practice for decades, the addition of the CT scan in the modern SPECT/CT scanners does provide additional valuable localization and diagnostic information [8], especially in the regions of anatomy with closely spaced structures. Since the additional radiation dose from the CT scan should not be of concern based on the discussions above, acquisition of SPECT/

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CT studies whenever feasible could enable evaluation of the patients more accurately. Inclusion of the anatomic information from the co-registered CT scans can be very useful to physicians in other specialties by increasing their diagnostic confidence in the SPECT studies, especially as the modern PACS systems make the diagnostic images readily available to referring physicians. Finally, raising carcinogenic concerns when none exist could harm patient health because of evasive actions taken by physicians of not ordering the appropriate scans or patients refusing the recommended scans based on such concerns.

In summary, the carcinogenic concerns expressed by Brix et al. regarding the diagnostic CT scans are not justified. Hence, co-registered diagnostic CT scans should be performed, if feasible, to improve the diagnostic confidence in the SPECT studies.

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