Letters to the Editor

Recent eLetters to the Editor are available at *radiology.rsna.org.* eLetters that are no longer posted under ''Recent eLetters'' can be found as a link in the related article or by browsing through past Tables of Contents.

Linear No-Threshold Model May Not Be Appropriate for Estimating Cancer Risk from CT

From
Mohan Doss, PhD, MCCPM
Department of Diagnostic Imaging, Fox Chase Cancer Center, R427, 333 Cottman Ave, Philadelphia, PA 19111-2497
e-mail: *Mohan.Doss@fccc.edu*

Editor:

I read with interest the recent article by Zondervan and colleagues in the May 2013 issue of *Radiology* (1) regarding the increased cancer risk from computed tomography (CT). They cited references 2–4, which claimed an increased risk of cancer from low-dose radiation based on comparison to atomic bomb survivor data (5) and/or the linear no-threshold (LNT) model for radiation-induced cancers, which is justified by the atomic bomb survivor data.

The latest comprehensive report from the atomic bomb survivor study was published in 2012 by Ozasa et al (6). With the additional statistics, a significant curvature has been reported in the dose-response relationship for cancers in the dose range of 0–2 Gy, as seen in table 7 of the article by Ozasa et al (6). Ozasa et al said on page 238 of their article that the curvature is apparently due to "relatively lower than expected risks in the dose range 0.3–0.7 Gy, a finding without a current explanation." Whereas there is no explanation for the shape of dose-response curve in this dose range with the LNT model, there is an explanation with the radiation hormesis model (7), implying there may be a reduced risk of cancer from low-dose radiation. Because the observed dose response in the atomic bomb survivor data played a key role in the establishment of the LNT cancer risk model in the Biologic Effects of Ionizing Radiation (BEIR) VII report (4), and because the shape of the dose-response curve in the latest update cannot be explained by using the LNT model, the cancer risk models in the BEIR VII report should no longer be used.

Hence, when discussing CT radiation concerns, radiologists should inform patients about the new findings from the atomic bomb survivor study and dismiss such concerns as being baseless and potentially harmful due to missed diagnoses if the indicated diagnostic studies are not performed because of the concerns. In addition, the present widespread efforts to monitor and reduce CT radiation dose should be discontinued, as they consume considerable resources while providing no health benefit to patients and may be harming patients' health because of the potential for misdiagnoses from the use of alternative suboptimal imaging modalities or reduced image quality.

Disclosures of Conflicts of Interest: No relevant conflicts of interest to disclose.

References

1. Zondervan RL, Hahn PF, Sadow CA, Liu B, Lee SI. Body CT scanning in young adults: examination indications, patient outcomes, and risk of radiation-induced cancer. Radiology 2013;267(2):460–469.
2. Berrington de Gonzalez A, Darby S. Risk of cancer from diagnostic x-rays: estimates for the UK and 14 other countries. Lancet 2004; 363(9406):345–351.
3. Brenner DJ, Hall EJ. Computed tomography: an increasing source of radiation exposure. N Engl J Med 2007;357(22):2277–2284.
4. Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, National Research Council. Health risks from exposure to low levels of ionizing radiation: BEIR VII phase 2. Washington, DC: National Academies Press, 2006.
5. Preston DL, Ron E, Tokuoka S, et al. Solid cancer incidence in atomic bomb survivors: 1958–1998. Radiat Res 2007;168(1):1–64.
6. Ozasa K, Shimizu Y, Suyama A, et al. Studies of the mortality of atomic bomb survivors,

report 14, 1950–2003: an overview of cancer and noncancer diseases. Radiat Res 2012; 177(3):229–243.

7. Doss M. Linear no-threshold model vs. radiation hormesis. Dose Response doi:10.2203/dose-response.13-005.Doss. Published online May 24, 2013. Accessed May 25, 2013.

Response

Robert L. Zondervan, BA,* Peter F. Hahn, MD, PhD,* Cheryl A. Sadow, MD,† Bob Liu, PhD,** and Susanna I. Lee, MD, PhD**
Department of Radiology* and Webster Center for Radiation Research and Education,‡ Massachusetts General Hospital, 55 Fruit St, Boston, MA 02114
e-mail: *robert.zondervan@gmail.com*
Department of Radiology, Brigham and Women's Hospital, Boston, Mass†

We thank Dr Doss for his interest in our article. In the face of continuing controversy about the risks and benefits of CT (1,2), radiologists should continue to be mindful that even small amounts of radiation, delivered to a large population, might have harmful effects. Nevertheless, our study shows that, even in the face of worst-case LNT estimates, in a specific patient the real dangers of the underlying illness dwarf the risk of diagnostic CT radiation. We are in complete agreement with Dr Doss that patients should not be discouraged from undergoing appropriate diagnostic testing over a small risk, if any, of radiation-induced cancer.

Disclosures of Conflicts of Interest: R.I.Z. No relevant conflicts of interest to disclose. **P.F.H.** No relevant conflicts of interest to disclose. **C.A.S.** No relevant conflicts of interest to disclose. **B.L.** No relevant conflicts of interest to disclose. **S.I.L.** No relevant conflicts of interest to disclose.

References

1. Tubiana M, Feinendegen LE, Yang C, Kaminski JM. The linear no-threshold relationship is inconsistent with radiation biologic and experimental data. Radiology 2009; 251(1):13–22.

2. Little MP, Wakeford R, Tawn EJ, Bouffler SD, Berrington de Gonzalez A. Risks associated with low doses and low dose rates of ionizing radiation: why linearity may be (almost) the best we can do. Radiology 2009;251(1):6–12.

Optimization of Thoracic US Guidance for Lung Nodule Biopsy

From
Guglielmo M. Trovato,* Marco Sperandeo,† and Daniela Catalano*
Department of Medical and Pediatric Sciences, University Hospital Policlinico, University of Catania, Catania, Italy*
e-mail: *Guglielmotrovato@unict.it*
Department of Internal Medicine, IRCCS Casa Sollievo della Sofferenza Hospital, San Giovanni Rotondo, Italy†

Editor:

In the March 2013 issue of *Radiology*, Dr Sconfienza and colleagues (1) demonstrated that ultrasonographic (US) guidance for fine-needle aspiration biopsy (FNAB) is comparable to computed tomographic (CT) guidance in terms of sample accuracy of pleural or peripheral lung lesions, allowing for a significant reduction in procedure time and postprocedural pneumothorax, which was observed in 25 of 170 CT-guided procedures (14.7%) and six of 103 US-guided procedures (5.8%) (P = .025); hemorrhage occurred in two of 170 CT-guided procedures (1.2%) and one of 103 US-guided procedures (1.0%) (P = .875). Nonetheless, the complication rate of transthoracic US–guided FNAB is still exceedingly high in comparison to that reported in other studies (2) and in our experience (3): The occurrence of pneumothorax is less than 1%. This can be due to the skills of the physician but also to the type of device used: Transducers with "parallel" needle guidance allow only oblique access, with the needle angulated versus the ultrasound beam, causing some uncertainty of localization. The use of probes that have a central hole through which the needle set is introduced optimizes the procedure (4). This is still the most suitable and reliable approach for these purposes, including thoracentesis. The central hole (convex or linear array probes) allows the passage of the intervention needle: The needle is visible in its road, with an image exactly on the line of the transducer. The intercostal path may be individualized, allowing one to skip vessels; the lung is visualized immediately below the tip of the needle, allowing the possibility of a timely and quick withdrawal while avoiding blood vessel puncture. The outcome is satisfactory. In our experience in 2012, there was one minimal pneumothorax and no intrapleural hemorrhage in 197 US-guided FNABs. Twenty FNABs were repeated, with success, because the length of the specimen was insufficient for immunohistochemical study. In the period from 2008 to 2011, 453 transthoracic US–guided FNABs of subpleural nodules were performed, with only three cases of partial pneumothorax and no cases of intrapleural hemorrhage. We use 20–21-gauge needles, as others have reported using 19–22-gauge needles (5). This provides specimens suitable for histologic diagnosis and minimizes the occurrence of complications, which appear to be more frequent with 18-gauge needles (1).

Disclosures of Conflicts of Interest: G.M.T. No relevant conflicts of interest to disclose. **M.S.** No relevant conflicts of interest to disclose. **D.C.** No relevant conflicts of interest to disclose.

References

1. Sconfienza LM, Mauri G, Grossi F, et al. Pleural and peripheral lung lesions: comparison of US- and CT-guided biopsy. Radiology 2013;266(3):930–935.

2. Diacon AH, Theron J, Schubert P, et al. Ultrasound-assisted transthoracic biopsy: fine-needle aspiration or cutting-needle biopsy? Eur Respir J 2007;29(2):357–362.

3. Sperandeo M, Sperandeo G, Varriale A, et al. Contrast-enhanced ultrasound (CEUS) for the study of peripheral lung lesions: a preliminary study. Ultrasound Med Biol 2006; 32(10):1467–1472.

4. Goldberg BB, Pollack HM. Ultrasonic aspiration biopsy techniques. J Clin Ultrasound 1976;4(2):141–151.

5. Wagnetz U, Menezes RJ, Boerner S, et al. CT screening for lung cancer: implication of lung biopsy recommendations. AJR Am J Roentgenol 2012;198(2):351–358.