CORRESPONDENCE

Radiation Protection in Diagnostic Radiology

by Dr. Ferid Shannoun, Prof. Dr. rer. nat. Maria Blettner, Prof. Dr. med. Heinz Schmidberger, Prof. Dr. med. Hajo Zeeb in volume 3/2008

More Intense Communication is Required

The article on radiation protection in diagnostic radiology constitutes an important scientific contribution. Details of individual dosimetric terms are explained in an exemplary fashion.

All reported risk estimates are based primarily – as mentioned in the article – on the experiences of the nuclear bombs dropped on Japan in World War II. These calculations are bound to be rough estimates as the radiation doses and types at the time were different to those used in diagnostic radiology today.

The reported tables are for orientation purposes, and it should be mentioned that a substantial variation in range exists which is mainly user dependent. The factor 400 for a thoracic computed tomography scan seems high, whereas in abdominal CT, more than 10 mSv can occur, depending on the number of the examined phases (1). Data are missing on catheter investigations (cardiac catheter, percutaneous transluminal coronary angioplasty), image guided treatments (vertebroplasty and kyphoplasty, intraoperative radiology), and modern methods (CT colography, cardiac CT, high resolution CT of the lung). The doses of all these investigations are often not known to referring doctors (2).

Many unpredictable factors exist with regard to the "attributable mortality risk" (3). The absolute numbers may be correct under the given circumstances, but they are suitable merely for comparing exposure practices in the different countries. With regard to potential deaths or malignancies due to radiography, it needs to be kept in mind that investigations using ionizing radiation are usually done on severely ill patients who are often of advanced age.

The authors emphasized the need for intensive communication between referrers and specialists – this is of crucial relevance. Radiation protection should start earlier than in the radiography department! The correct indication with set requirements and radiation-sparing investigation techniques will result in a dose reduction in the individual as well as in the population. "In radiation protection, 1 g of cerebral matter weighs more than 1 tonne of lead" (Felix Wachsmann, 1965). DOI: 10.3238/arztebl.2008.0498

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Only Trained Staff Defines Indication

In our capacity as the presidents of the German Society of Nuclear Medicine and the German Radiological Society, we wish to comment on the article by Shannoun and colleagues.

Examinations in radiology and nuclear medicine are not only an "accepted part of clinical practice," but are often the vital prerequisite to reach the final diagnosis. The different units of energy dose D (Gy) and equivalent dose H (Sv) were not chosen so as to "avoid confusion." The actually relate to differently defined parameters.

We disagree with the authors' statement, that "the radiation exposure of patients during comparable investigations can vary by several orders of magnitude." For example, radiation exposure of posterior-anterior chest radiography, is about 0.02 mSv. If it were one order of magnitude higher, the effective dose would be 0.2 mSv whereas several orders of magnitude would mean a factor 100, i.e. an effective dose of 2 mSv – an unthinkable radiation exposure with state-of-the-art equipment.

Reference values in nuclear medicine are by no means "standard values which must be complied with." With an appropriate indication they may even be exceeded, granted that the dose is documented.

The legal responsibility for the choice of imaging method with ionizing radiation can only be taken over by the referring physician if he or she has permission according to radiation protection regulations (Röntgenverordnung). In any other scenario, the radiologist (expert in nuclear medicine) is responsible for what is called justifying indication. This may result in a change to the requested examination if another imaging method is more suitable for diagnosis and/or results in less radiation exposure.

The term "radiation exposure" (Strahlenexposition) should be preferred to "radiation burden" (Strahlenbelastung). Sentences such as "Direct dose-dependent radiation damage is extremely rare in X-ray diagnosis. At most, stochastic effects are observed" and "It is now assumed that there is no threshold under which damage is absolutely excluded" require further comment.

Deterministic effects do not occur if diagnostic procedures are applied along well established guidelines. Stochastic effects, by definition, cannot be excluded, but cannot be proven in practice, since it is impossible to recognize radiation reactions below a dose of 100 mSv.

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In Reply:

The overview of typical effective radiation doses in different investigations is not complete and can thus serve for orientation purposes only. Especially for interventional approaches, it will be difficult to name "typical" doses. With regard to attributable risks, it needs to be added that Berrington de González and Darby (1) accumulate risks only to age 75 and risk data from older patients are not included in their estimates. A systematic benefits assessment of using diagnostic ionizing radiation in relation to patients' age is also lacking. Knowledge of dose and risk dimensions in connection with radiography and nuclear medical diagnostics is, however, undoubtedly important for the mentioned intensive communication between referrers and specialists.

Drs Bockisch and Laniado criticized several unclear passages in our manuscript. We thank them for pointing

these out. We wish to emphasize especially the importance of the justifying indication, which should be made by a medical practitioner holding a certificate in radiation protection. A considerable variation in radiation exposure for comparable investigations – even if not by several orders of magnitude, as formulated by ourselves – can probably not be excluded, even now (2).

As the correspondents point out, deterministic effects can occur only in a scenario of non-guideline-conform diagnostics, if threshold values are exceeded. For stochastic harms, such as malignancies, no threshold value has been described; the effects associated with lower doses have thus far not been directly proved in scientific studies.

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Conflict of interest statement

The authors of both letters and the reply declare that no conflict of interest exists according to the guidelines of the International Committee of Medical Journal Editors.

CORRESPONDENCE

Novel Therapies in Advanced Renal Cell Carcinoma – Management of Adverse Events from Sorafenib and Sunitinib

by Dr. med. Philipp Ivanyi, Dr. med. Thomas Winkler, Prof. Dr. med. Arnold Ganser, Priv.-Doz. Dr. med. Christoph Reuter, Dr. med. Viktor Grünwald in volume 13/2008

Addition

The number of specific tyrosine kinase inhibitors that are already licensed or in development is about 25 or 30, and these substances are always presented as low in side effects. Thanks to the authors for having dispensed with this myth – at least for sunitinib and sorafenib.

However, an addition seems required. Four months after the review article was submitted, an article was published (1) that pointed out the cardiotoxic risk of sunitinib. Of 75 patients in a phase I/II study, eight had a cardiovascular event: one cardiac death, one myocardial infarction, and six patients with heart failure. 35 patients (47%) developed hypertension (>150/100 mm Hg).

The authors' recommendation to use antidepressants in therapy associated exhaustion also has to be questioned. If it is to be interpreted as „ut aliquid fiat“ („for something to happen“) it seems advisable to do without or prescribe St John's wort. If a patient does indeed have concomitant depression, the indication