

SHORT ABSTRACT

Image Guided Interventional Procedures: What Should We Tell Our Patients?

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Keywords: dose monitoring; interventional radiology; peak skin dose; patient information

Image guided interventions, as any other x-ray exam, are associated with both the classical stochastic risks of cancer induction and risks for deterministic effects. The latter occur when certain well-documented dose thresholds are exceeded. Usually the focus is on the skin of the patients. Never the less, absorbed doses in the eye lens may exceed deterministic thresholds, namely for induction of cataract. Image guided interventional procedures received special attention in the recent EURATOM Directive 2013 [1] which will soon be transcript in the Belgian national legislation.

Every exposure for image guided interventions has to be justified and patients have to be informed of the potential benefits and risks. In most procedures, the benefit is obvious, as the intervention is part of the treatment. Following the NCRP168 [2], every intervention in which 5% of the procedures exceed the threshold level of 3 Gy air kerma at the reference point should be classified as a potentially high-radiation dose procedure and patients should get a specific follow up. In the frame of the upcoming royal decree, we worked on a procedure in which patients at risk for deterministic effects received more specific information.

The peak skin dose can be defined as the highest absorbed dose over a surface of a few square centimeters at the skin of the patients. At a 2 Gy air kerma absorbed dose in the skin, deterministic effects can develop but are still very rare. The NCRP168 recommends that in case ‘substantial radiation dose levels’ (SRDL) are exceeded, a note shall be made in the patient records for justification purposes. The NCRP168 formulates a next recommendation, namely to inform patient and caregivers about the possible deterministic effects and the recommended follow-up. These SRDLs have been defined as 3 Gy peak skin dose or 500 Gy cm² for FOV of 100 cm². Trigger levels for dose area product (DAP) can be multiplied with the ratio of effective FOV to 100 cm². Earlier Belgian research has pointed to similar trigger levels for action [3].

In this presentation, we will address two practical aspects of good clinical practice in radiation protection

for patients in interventional radiology: (1) how to verify whether radiation levels are substantial and (2) how to inform the patients about these risks and the necessary follow-up.

While the interventionist may intuitively know whether patient doses have been high, different aspects make a more quantitative approach the preferred procedure. Both the SRDL in terms of DAP or in terms of peak skin dose can be used. While the DAP can be verified manually at the accomplishment of any procedure, the estimate of peak skin dose requires an automated approach, by either the imaging device or an offline dose monitoring system. We illustrate the distribution of DAP and peak skin doses in our angiography room. The number of cases above the SRDL is very limited (**Figure 1a** and **1b**). Yet our department prepared a leaflet with information for the patient that will be shared with the FANC in its initiative to support radiology with material to inform the patients.

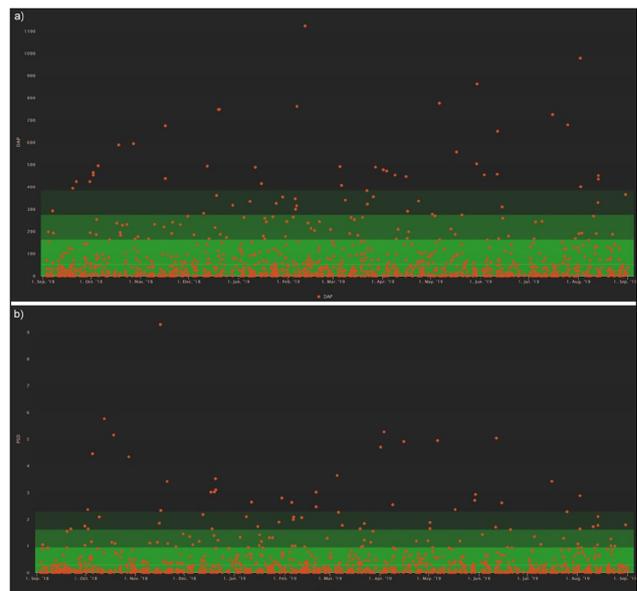


Figure 1: Overview of DAP distribution (**a**) and peak skin dose (**b**) in interventional radiology (abdomen/lower limbs) in the period Sept 1 2018–Sept 1, 2019 as obtained with dose monitoring software (Courtesy Qaelum NV).

Competing Interests

(No information provided)

References

1. Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising.
2. NCRP Report No. 168, Radiation Dose Management

for Fluoroscopically-Guided Interventional Medical Procedures.

3. **Struelens, L, Bacher, K, Bosmans, H,** et al. Establishment of trigger levels to steer the follow-up of radiation effects in patients undergoing fluoroscopically-guided interventional procedures in Belgium. *Phys Med.* 2014; 30(8): 934–40. DOI: <https://doi.org/10.1016/j.ejmp.2014.09.006>

How to cite this article: Bosmans, H and Maleux, G. Image Guided Interventional Procedures: What Should We Tell Our Patients?. *Journal of the Belgian Society of Radiology.* 2019; 103(1): 64, 1–2. DOI: <https://doi.org/10.5334/jbsr.1936>

Submitted: 03 September 2019

Accepted: 06 September 2019

Published: 16 November 2019

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