Pediatr Radiol (2013) 43:1265–1266
DOI 10.1007/s00247-013-2764-4

COMMENTARY

Gonadal shielding for neonates

Thomas L. Slovis · Keith J. Strauss

Received: 7 July 2013 / Accepted: 9 July 2013 / Published online: 6 August 2013

We read with great interest the article by Winfeld et al. [1] on gonadal shielding in neonates, in this issue of *Pediatric Radiology*.

The topic is quite pertinent and involves several questions:

1. Is gonadal shielding in neonates effective in significantly lowering the radiation dose?
2. Is achieving optimal position of the shields (1/3 were misplaced) worth the effort considering the small dose reduction and the small risk of missing something?
3. Is there a better way to reduce radiation exposure to neonates?
4. Has legislation addressed the problem but offered the wrong solution, or have we misinterpreted the law?

The reported actual entrance skin dose from a neonatal abdominal radiograph is small (20–80 μGy, 2–8 mrads). With proper collimation, added filtration, and technique selection the gonadal dose without lead shielding from the examination should be 25–50 μGy for boys and 13–25 μGy for girls. The reduced dose for girls results from 3 to 4 cm of soft tissue that naturally shields the female gonads. A significant fraction of the gonadal dose in both genders is from internal scatter, which is not attenuated by a properly placed gonadal shield. Therefore, the estimated radiation dose of the shielded gonads is not 0.6% of the entrance skin dose, but approximately 50% [2] (assuming proper positioning of the shields).

The significance of a radiation dose to the gonads has been stated as follows: "The absolute risk of passing mutated genetic material to subsequent generations remains at 0.2% per Gy exposed" [3]. However, taking the maximum radiographs some neonates in this series received (60), at a gonadal dose of 13–50 μGy, the maximum gonadal dose would be 3 mGy. Assuming the quoted risk of passing mutated genetic material to subsequent generations is correct, the estimated risk from 60 unshielded images is 1 out of 167,000, a quite small risk!

It seems to us that our efforts to lower the radiation dose should be spent reducing the number of radiographs as compared to teaching (successfully or unsuccessfully, not mentioned in the article) proper positioning of a gonadal shield. We must also teach proper collimation of images. We believe that these steps, when taught successfully, along with the elimination of repeat exposures as a result of an improperly placed gonadal shield, will have a greater effect in reducing radiation dose than placing gonadal shields.

We applaud the authors' efforts in considering radiation dose reduction to the vulnerable neonate and in trying to comply with the legislative demands. However, the legislative mandate seems inappropriate or over-interpreted because the law states "except for cases in which this would interfere with the diagnostic procedure" [3]. In the case of a neonate the use of a gonadal shield serves little purpose and the potential for missing something is probably as great or greater a concern than the effects of gonadal irradiation. We (pediatric radiologists) as experts need to work with legislators to make sure an appropriate, effective, evidence-based mandate evolves.

We thank the authors for providing us material that raises these interesting questions regarding the potential ramifications of the use of gonadal shields.

T. L. Slovis (✉)
Department of Pediatric Imaging, Children's Hospital of Michigan, Wayne State University School of Medicine, 3901 Beaubien Blvd., Detroit, MI 48201, USA
e-mail: tslovis@med.wayne.edu

K. J. Strauss
Department of Radiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

Conflict of interest None.

References

1. Winfeld M, Strubel N, Pinkney L et al (2013) Relative distribution of pertinent findings on portable neonatal abdominal radiographs: can we shield the gonads? Pediatr Radiol. doi:10.1007/s00247-013-2700-7 [Epub 02 May]
2. Reiss KH, Steinle B (1973) Tabellen zur Röntgendiagnostik, Teil II. Bereich Medizinische Technik, Entwicklungsabteilung. Siemens, Erlangen
3. Aichinger H, Dierker J, Joite-Barfuss S et al (2012) Radiation exposure and image quality in X-ray diagnostic radiology: physical principles and clinical applications. Springer, Berlin, p 307