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Image Gently Europe

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IMAGING CHILDREN, GENTLY

The number of radiological examinations performed yearly all over the world has significantly increased in the last two decades (Brenner 2010; Furlow 2010). As a consequence, the radiation exposure to the population from medical sources alone accounts for more than 50% of all radiation exposure the population receives (Amis et al. 2007; Brenner and Hall 2007; Mettler et al. 2009). There is general agreement in the scientific community that this increment of radiation exposure may result in a small but significant increase of developing cancer later in life, and this is particularly true in young children. Children are considered to be more at risk for radiation-induced cancer than adults due to their higher biological sensitivity to ionising radiation and to the longer period of time it takes them to generate a cancer related to radiation exposure (Brenner 2002). To date, most of the risk estimations have been calculated from studies of survivors of the Hiroshima and Nagasaki atomic bombs (Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation 2006), but many researchers argue that this extrapolation could be affected by substantial bias, because during a nuclear blast not only radiation, but also a large amount of toxins are produced. In addition, radiological modalities tend to irradiate only specific body regions, in contrast to atomic explosions, which result in total body exposure. However, recent and strong epidemiological studies performed in populations exposed to ionising radiation with CT examinations during their childhood have demonstrated that the risk is real, and must be carefully considered if we think that many millions of CT scans are daily performed on children all over the world (Mathews et al. 2013; Pearce et al. 2012).

To date, radiological examinations of children (and in particular CT scans) have been performed by adapting adult protocols and not using specific and native paediatric protocols. This malpractice finds explanation in the dramatic lack of awareness about radiation risks among medical professionals. Many papers have clearly demonstrated that most healthcare professionals did not know the radiation dose delivered to patients for common radiological exams, and, if they do not believe i t is a problem, they do not care (Brown and Jones 2013; Divrik Gökçe et al. 2012; Lee et al. 2004). This lack of awareness does not respect the two fundamental principles of radiation protection: justification and optimisation. Justification means to balance the risks and benefits of each procedure, choosing the right diagnostic tool and the right timing in order to maximise benefits and minimise risks. Although it may be obvious, the best way to reduce radiation is to not image the patient at all, or, as an alternative, to image patients with MRI or US, which are ionising radiation-free. When it is necessary to use ionising radiation modalities, as in trauma or unstable patients, the optimisation principle acquires the greatest role; its goal is to perform images with sufficient diagnostic image quality and the lowest possible radiation dose, according to the ALARA concept (as low as reasonably achievable). Optimisation requires clear understanding of all technical aspects of radiological equipment, which is increasingly complex in high dose procedures such as CT scans.

Image Gently® Campaign

In 2001 an article in USA Today (Sternberg 2001), based on papers published in the American Journal of Roentgenology, brought the public's attention to the potential risks related to CT examinations performed in children. The Society for Pediatric Radiology organised an international conference to promptly respond to public concerns. This led to the creation in 2008 of the Image Gently® (IG) Campaign, founded in collaboration with the American Society of Radiologic Technologists, the American College of Radiology and the American Association of Physicists in Medicine. The purpose of this fundamental alliance, the Alliance for Radiation Safety in Pediatric Imaging, is to increase awareness by means of educational actions addressed to both parents and professionals. The website of the campaign (http://imagegently.org) gives the opportunity to get any kind of information, from easy brochures by which parents can learn about radiological examinations their children have to undergo, to detailed educational materials for referring physicians, physicists, radiologists and radiographers. To date, the alliance has

sponsored campaigns in different radiological areas, such as diagnostic fluoroscopy, interventional radiology and nuclear medicine. The last campaign, called “Back to Basics” focused on digital radiography. The action of the alliance is completely changing professional behaviour, increasing awareness and sensibility towards paediatric patients. In the last five years the Alliance for Radiation Safety in Pediatric Imaging has quickly grown and now includes more than 60 national and international professional societies who are contributing to dissemination of the message.

What We Are Doing in Italy

Italian radiological professionals want to make their contribution too. In 2012 the Italian Radiographer Federation joined the alliance, recently followed by the Italian Physicist Association and the Italian Radiological Association (Società Italiana di Radiologia Medica - SIRM) Study Section of Paediatric Radiology. The first action to demonstrate our great interest has been the organisation of a congress specifically dedicated to the Image Gently® Campaign, which was held in October 2013 in Pisa, Tuscany, entitled “Image Gently: children sized radiology” (see image 1). Epidemiological, biological and technical topics related to paediatric imaging were tackled from both a theoretical and a practical standpoint with the involvement of both radiologists and radiographers. Specific attention was paid to the need for equipment, tools and protocols dedicated to paediatric patients in order to minimise the radiation dose.

The Italian Radiographer Federation is now working on translating into Italian the IG website contents in order to maximise the spread of the campaign. The goal is not to simply translate the texts, but to provide clear and easily understandable content, which does not require a high education level, by using tools able to measure the level of readability. In fact, parents who have received satisfactory information tend to acquire a greater autonomy, and they collaborate better with radiological staff during the diagnostic follow-up of their children (Paasche-Orlow et al. 2003). Some publications demonstrate that a brief informational handout can improve parental understanding of the potential increased risk of cancer related to paediatric CT, without causing parents to refuse studies recommended by the referring physician (Donnelly 2005; Larson et al. 2007). The availability of the IG contents in Italian can also allow all professional staff (physicians, nurses, technicians, etc.) to improve their knowledge about all issues related to the paediatric field, in order to take specific care of their little patients.

The spread of this campaign is particularly important in radiological facilities lacking specific expertise in paediatrics, which can lead to the execution of radiological examinations with more radiation than necessary and the inobservance of guidelines. Paediatric facilities have been shown to be more aware of radiation reduction methods, and are more likely to have paediatric protocols in place to reduce radiation. The lack of radiological staff training concerning paediatric protocols, along with the lack of new technological instrumentations, explains the difference in radiation dosage observed in some studies (Nosek 2013; Paolicchi et al. 2014). In order to support this need, it should be fundamental to set up an alliance between the most important paediatric hospitals. The aim is to create a link between paediatric and non-paediatric facilities, allowing the spread of good radiological practice in different sites; and, to overcome the several difficulties encountered by experts who are not used to handling young patients, providing them with ‘tools’ to work in autonomy, using acquisition parameters which are adequate according to worldwide standards.

What Needs Doing

Notwithstanding the increasing awareness of researchers worldwide and mass media towards patient radiation risk, with special attention to paediatric patients, the current situation demands further improvement. Many recent papers outline that knowledge of diagnostic radiation and its associated cancer-causing risks is still inadequate across the medical profession, particularly among more experienced professionals (Brown and Jones 2013; Divrik Gökçe et al. 2012; Lee et al. 2004). Improved training about radiation doses and potential risks from ionising radiation imaging is mandatory across the medical profession to ensure optimal use of these important diagnostic tools and the preservation of best medical practices. It is important to assure an adequate education level starting from university courses in the medical area, providing students with accurate knowledge about ionising radiation risks and later performing regular refresher courses for referring physicians and radiological operators.

A good way to increase knowledge and awareness is to develop interest in the ability to monitor and track the radiation dose used in medical imaging. Although radiological equipment is now able to produce a radiation report and to communicate it to the picture and archiving communication system (PACS), radiological staff have not yet completely understood the potential of carefully tracking radiation dose. Dose tracking can strengthen the process of justification and optimisation with the intent to better achieve patient protection. Several benefits can be obtained both by patients and operators. Patients could receive minimal radiation exposure, and thus acknowledge that there is a specific responsibility in the delivery of medical radiation and improve their confidence in healthcare providers’ care. On the other hand, operators could easily improve in terms of justification and optimisation, acquiring extensive radiation safety data sets, which might contribute to ongoing epidemiological research on malignancy risk from low-dose radiation, identification of best practices and incorporating radiation data into appropriateness criteria. Recently, many vendors have presented promising new software, which can extract the radiation dose report automatically from the radiological equipment and send it to the PACS, allowing the collection of statistics on cumulative and individual patient dose. This great interest in dose tracking has been confirmed by the International Atomic Energy Agency (IAEA), which has initiated the Smart Card Project, something like an ATM card that allows knowledge of patient radiation history (International Atomic Energy Authority; Rehani 2013).

Another necessity we have to face quickly is to identify reference dose levels specifically designed for paediatric patients. The European Regulation EUR 16262, which dates back fifteen years and has been in force until now, reported reference dose levels for the various radiological procedures only for adult patients (European Commission 1999). The recent publication of the new council directive 2013/59/Euratom entitled “Laying down basic safety standards for protection against the dangers arising from exposure” (Council Directive (EC) 2013/59/EURATOM) has driven the European Commission to approve a project on the establishment of European diagnostic reference levels

(DRLs) for paediatric patients. The project, promoted by the European Society of Paediatric Radiology, European Federation of Radiographer Societies and the European Federation of Organizations for Medical Physics, aims to provide European DRLs for paediatric examinations and to promote their use in order to optimise children's radiation protection, with a specific focus on CT, interventional procedures using fluoroscopy, and digital radiographic imaging.

Conclusion

We can assert that paediatric radiology is undergoing a cultural change. We have much improved the communication between the different actors in the radiological field, including manufacturers and patients, but we must further grow our awareness about radiation risks in order to choose the most suitable diagnostic tool, and respect appropriateness and optimisation criteria, which acquire a greater value for paediatric patients. We must pay much more attention to our daily practice, especially in radiological sites lacking specific paediatric expertise. The cooperation of all actors in the radiologic area is an essential requisite in order to realise this change.

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