Summary of: Radiation protection in dental X-ray surgeries – still rooms for improvement

G. Hart*[1] and M. Dugdale[2]

FULL PAPER DETAILS

[1]YourRPA – Independent Radiation and Laser Protection Adviser, 96 Sefton Road, Morecambe, Lancashire, LA3 1UD; [2]Radiation QA Services Limited, Thorniehurst, The Woodlands, Roundwood Road, Baildon, BD17 6SP
*Correspondence to: Graham Hart
Email: YourRPA@yahoo.co.uk

Refereed Paper
Accepted 7 December 2012
DOI: 10.1038/sj.bdj.2013.274
©British Dental Journal 2013; 214: E16

CORE VERIFIABLE CPD PAPER

Aim To illustrate the authors' experience in the provision of radiation protection adviser (RPA)/medical physics expert (MPE) services and critical examination/radiation quality assurance (QA) testing, to demonstrate any continuing variability of the compliance of X-ray sets with existing guidance and of compliance of dental practices with existing legislation. **Method** Data was collected from a series of critical examination and routine three-yearly radiation QA tests on 915 intra-oral X-ray sets and 124 panoramic sets. Data are the result of direct measurements on the sets, made using a traceably calibrated Unfors Xi meter. The testing covered the measurement of peak kilovoltage (kVp); filtration; timer accuracy and consistency; X-ray beam size; and radiation output, measured as the entrance surface dose in milliGray (mGy) for intra-oral sets and dose-area product (DAP), measured in mGy.cm^2 for panoramic sets. Physical checks, including mechanical stability, were also included as part of the testing process. **Results** The Health and Safety Executive has expressed concern about the poor standards of compliance with the regulations during inspections at dental practices. Thirty-five percent of intra-oral sets exceeded the UK adult diagnostic reference level on at least one setting, as did 61% of those with child dose settings. There is a clear advantage of digital radiography and rectangular collimation in dose terms, with the mean dose from digital sets 59% that of film-based sets and a rectangular collimator 76% that of circular collimators. The data shows the unrealised potential for dose saving in many digital sets and also marked differences in dose between sets. **Conclusion** Provision of radiation protection advice to over 150 general dental practitioners raised a number of issues on the design of surgeries with X-ray equipment and critical examination testing. There is also considerable variation in advice given on the need (or lack of need) for room shielding. Where no radiation protection adviser (RPA) or medical physics expert (MPE) appointment has been made, there is often a very low level of compliance with legislative requirements. The active involvement of an RPA/MPE and continuing education on radiation protection issues has the potential to reduce radiation doses significantly further in many dental practices.

EDITOR'S SUMMARY

One of the joys of editing a journal, and particularly the *BDJ*, is the overview that it gives of the world of dentistry. From science to opinion, from clinical to behavioural, and practice to research. On the one hand I receive a lot of letters and emails describing at length the huge current burden of regulation and officialdom on practitioners' time, while on the other we read this paper which paints a very poor view of our attention to detail on radiological safety and its optimum use.

We have also had in the Journal in recent times a vigorous debate on the merits of continuing professional development (CPD) and how useful it is or is not. I really do not need to remind readers that one of the 'core' subjects, a mandatory topic, is radiography and radiology. How does this look to an outsider I wonder?

I think there are several points to be taken from this research. Firstly we need to sharpen up our collective act on radiological safety in dental practice both for the protection of our patients and the dental team. This is going to mean moving the matter much higher up the agenda of 'important' things to do. However, there is also clearly a disconnect between practice, knowledge (or lack of it), training and further education. Radiology CPD is difficult to find and whenever it is offered it is fallen upon in a feeding frenzy (I suspect this paper will be no exception). A clear message therefore is that there needs to be an increased and improved provision of education in the matter, which we as professionals need to take very seriously.

Undeniably there are many calls on our time, more than ever before but the GDC has not chosen the three core CPD subjects, this one, infection control and medical emergencies just to be awkward. We need to take safety seriously or we cannot legitimately claim to be looking after our patients' best interests.

The full paper can be accessed from the *BDJ* website (www.bdj.co.uk), under 'Research' in the table of contents for Volume 214 issue 6.

Stephen Hancocks
Editor-in-Chief

DOI: 10.1038/sj.bdj.2013.300

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IN BRIEF

- Demonstrates the potential radiation dose advantages of using digital radiography and rectangular collimation for intra-oral X-ray sets.
- Increases awareness of the benefits of appointing a radiation protection adviser/ medical physics expert and obtaining advice from them about all aspects of staff and patient radiation safety.
- Dispels some possible pre-conceptions regarding the need for 'lead-lining'.

RESEARCH

COMMENTARY

Radiography is a widely used and invaluable tool for the dentist, providing information that is impossible to obtain by clinical examination alone. Although leading to relatively low dose per patient, the numbers of radiographs taken by dentists is very large. It has been estimated that 20.5 million dental radiographs were taken by dentists in 2008.[1] Consequently it is important that dentists take care to ensure radiography is used safely and in line with legal requirements.

This paper by Hart and Dugdale presents measured radiation data acquired during critical examination or routine quality assurance visits plus information acquired via a questionnaire. The area of greatest interest in the data presented is that of patient dose for intra-oral radiography that demonstrates a worryingly wide range from one practice to another, with a range of ten between the highest and lowest.

Unfortunately, the data presented are for the highest setting used for a standard adult (in my experience this is usually the occlusal view) and are compared to the HPA's recommended national reference levels, which are based on the mandibular molar view. I would expect the occlusal setting to be giving approximately twice the dose of the mandibular molar setting. Hence, the reader must be warned that the patient dose comparisons for intra-oral radiography given in this paper are probably not comparing like for like and this does detract somewhat from the force of the authors' argument. However, even taking this disparity into account, the graphs still indicate that there are a significant number of practices that are likely to be above the national reference levels for their mandibular molar setting and do show that some dentists appear to have retained their film settings when moving over to digital detectors.

Another point that the authors could have drawn from the dose data presented is that there appears to be some dentists who are using worryingly low doses. Such low doses are likely to significantly compromise the quality of the image. In addition, only 25% of practices visited used rectangular collimation. The use of rectangular collimation was recommended in 2001[2] and introduces a dose saving of 44% by limiting the radiation beam to the shape of the detector.

Despite my concerns over the patient dose data comparisons, I fully endorse the authors' conclusions which state that the involvement of an RPA/MPE has the potential to reduce patient dose significantly in many dental practices, and to promote compliance with legal requirements and hence overall safety.

Anne Walker, Diagnostic Radiology and Radiation Protection Group
Christie Medical Physics and Engineering

1. Hart D, Wall B F, Miller M C, Shrimpton P C. *Frequency and collective dose for medical and dental X-ray examinations in the UK, 2008.* Chilton: Health Protection agency, 2010. Online article available at http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1287148001641 (accessed January 2013).
2. National Radiological Protection Board. *Guidance notes for dental practitioners on the safe use of x-ray equipment.* London: Department of Health, 2001. Online article available at http://www.hpa.org.uk/Publications/Radiation/MiscellaneousRadiationPublications/rad80miscpubGuidanceNotesforDentalPractitioners/ (accessed January 2013).

AUTHOR QUESTIONS AND ANSWERS

1. Why did you undertake this research?

The research was undertaken as during the course of work as a Radiation Protection Adviser and Medical Physics Expert (RPA/MPE) it became apparent that there was a large variation in patient radiation doses and aspects of practical radiation safety for staff and patients involved with dental radiography. The data from actual measurements taken during critical examination and routine quality assurance testing, and from the provision of RPA/MPE services, were analysed to see if there were underlying trends from which conclusions could be drawn about how dental radiation safety might be improved.

2. What would you like to do next in this area to follow on from this work?

There are several areas of further work. Firstly to expand the measurement database in order to improve the statistics and strengthen any conclusions drawn; secondly to collect additional information, principally on film speed and type of digital detector, to see if further conclusions can be drawn; thirdly to look at longitudinal studies to examine the consistency of successive measurements as X-ray sets age; fourthly to see if advice has been implemented to reduce the radiation dose where sets were exceeding the diagnostic reference levels; and finally to examine continuing compliance with regulations and optimising staff radiation safety.

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