CORE CPD: ONE HOUR

Radiography for the dental team

By **Jacqui Elsden**[1]

As a registered dental care professional (DCP), it is understood that there is a requirement to uphold the General Dental Council's (GDC's) standards for the dental team, to act in a professional manner and to work within the many aspects of legislation related to our roles.[1]

This approach to patient care and working with colleagues is paramount when using radiation for dental diagnosis in the workplace.

When radiation is used in dentistry, it is known that all patient radiation exposures must be justified and carried out by appropriately trained dental professionals.[2-5] It is also known and understood that as part of professional registration, dental professionals must continually update their knowledge and the application of that knowledge, to promote radiation safety.[6,7]

Even though the radiation dose in dentistry is very small, compared to medical exposures,[8] it still carries a potential risk of harm to the patient and operator, and we therefore have a duty to protect our patients and colleagues.

Radiation and the biological effects of radiation

Sources of natural radiation exist in our day to day lives in the form of:

- Cosmic rays (in the Earth's atmosphere)
- Gamma rays (in the Earth's crust – rocks and soil)
- Radon gas (naturally present in granite)
- Ingestion of radioisotopes (present in certain foods such as fruit, vegetables and meat).[8]

CPD questions

*This article has four CPD questions attached to it which will earn you one hour of verifiable CPD. To access the **free** BDA CPD hub, go to **http://bit.ly/2e3G0sv***

Exposure to natural radiation sources is unavoidable and contributes the greater part of our annual radiation dose compared to that of artificial sources of radiation.[9] Sources of artificial radiation include:

- Fallout from nuclear explosions
- Radioactive waste

[1] *Jacqui Elsden MSc RDN, Dental Education Facilitator, London and the South East, Health Education England working across Kent, Surrey and Sussex. Jacqui is also a member of the* BDJ Team *reader panel*

- Medical and dental diagnostic radiation
- Radiation from occupational exposures.[8]

When putting radiation into perspective, therefore, the fact that we use a small percentage in dentistry means that although we are responsible for small doses, compared to those in other professions and industries,[9] we should always be aware that each dose has the potential to cause biological harm.[8]

The form of radiation used in dentistry for diagnostic purposes (X-rays) can be found on the electromagnetic spectrum. Each form of radiation has a range of wavelengths; X-rays possess both short and long wavelengths. Due to X-ray interactions at the atomic level, this form of radiation is referred to as *ionised*, hence the term ionising radiation.[2,9]

It is the shorter wavelength X-rays that have the most penetrating power and that are the most useful in producing radiographs, but these X-rays can also cause possible changes to cellular structure.

Classification of biological effects

The effects of ionising radiation are divided into two main categories. These are:

- Tissue reactions (deterministic effects)
- Stochastic effects.

Tissue reactions are defined as non-cancer effects that will definitely happen after a high dose of radiation, such as skin erythema or osteoradionecrosis.

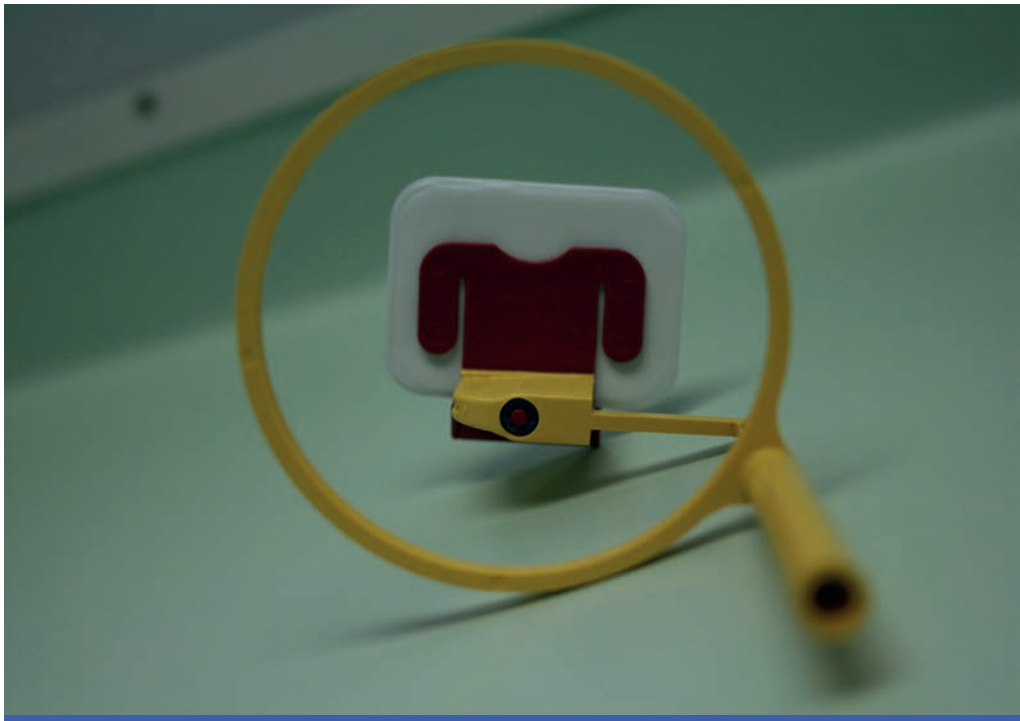
Stochastic effects are defined as effects that may happen following a dose of radiation of any size, and are further sub-divided into *cancer induced effects* and *heritable (genetic) effects.*[8]

It is this biological damage that we seek to reduce when using radiation in the dental workplace. To aid this obligation, we must work within the legislation that governs radiography and that forms part of the Health and Safety at Work Act 1974. The aim is to optimise all exposures to ensure the dose is as low as reasonably practicable (ALARP).[2,6,8]

Legislation for radiography

There are two sets of legislation that govern radiography in the United Kingdom (UK):

- Ionising Radiation Regulations 1999 (IRR99), which are principally concerned with the safety of workers and the public together with equipment aspects of patient safety
- Ionising Radiation (Medical Exposure) regulations 2000 (IR(ME)R 2000) and amendments, which are principally concerned with the safety of patients.



An example of an assembled posterior film holder and film packet

'THE SHORTER WAVELENGTH X-RAYS HAVE THE MOST PENETRATING POWER, BUT CAN CAUSE CHANGES TO CELLULAR STRUCTURE'

Providing the dental team comply with the legislation,[3,10] radiation safety is promoted and the biological effects are reduced.

Interestingly, these two sets of legislation came into force more than 100 years after Wilhelm Conrad Rontgen discovered X-rays in the University of Wurzburg, Germany in November 1895[9] and are now almost 20-years-old.

Guidance

Each member of the dental team has a responsibility for radiation safety in the workplace and to act to minimise the harm.[1] This is especially important for new members of the team who should be subject to a rigorous induction programme to explain their roles and responsibilities in accordance with the aforementioned legislation. Legislation can be complex and difficult to read sometimes; therefore, various sets of guidance have been published over time to help guide the team to comply:

- National Radiological Protection Board, *Guidance notes for dental practitioners on the safe use of X-ray equipment* (2001). Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/337178/misc_pub_DentalGuidanceNotes.pdf
- Health Protection Agency, *Guidance on the safe use of dental cone beam CT (computed tomography) equipment* (2010). Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/340159/HPA-CRCE-010_for_website.pdf
- FGDP(UK). *Selection criteria for dental radiography*, 3rd edition (2013). Available to order from: http://www.fgdp.org.uk/content/publications/selection-criteria-for-dental-radiography.ashx.

These are some of the documents that should be amongst the literature available for the whole dental team in the workplace. Whilst it is understood that some dental nurses do not have extended duties in radiography,[11] and are not IR(ME)R 2000 operators where film positioning and beam

An example of dental X-ray equipment control panel

alignment is applied, it is important that they should have an awareness of radiation safety not only for themselves but for patients.

Training

Training becomes an important part of the team approach to dental radiography. IRMER 2000 stipulates that all practitioners and operators involved in exposing patients to radiation must be 'adequately trained'.[3,6,8] Some DCPs such as dental hygienists and dental therapists, orthodontic therapists and clinical dental technicians receive their dental radiography training as part of their primary qualification. This can, however, vary depending upon the year of qualification and training institution attended.[8]

A DCP who wishes to train and become directly involved in selecting exposure settings and positioning the patient, the image receptor and the X-ray tubehead, should possess a recognised post-registration qualification in line with the GDC's extended scope of practice and the legislation relating to IRMER 2000.[6,11]

As previously mentioned, at the beginning of this article, radiation is dangerous and must be respected. As registered DCPs, it is our duty to ensure that our patients and colleagues are in an environment that is monitored for radiation risks and hazards.

Quality assurance

Quality Assurance (QA) in radiography ensures the continued production of good quality radiographs. There are many processes that contribute to a good quality radiograph:

- Patient dose (correct exposure related to patient type)
- X-ray equipment (maintenance of X-ray equipment)
- Operator technique (film positioning and beam alignment)
- Film storage and stock control (away from heat, light and X-rays/expiry dates)
- Processing (good film handling, good maintenance programme of chemical changes and automatic processor)
- Audit of radiographs (refer to National Standards).[2,8]

'IRMER 2000 STIPULATES THAT ALL PRACTITIONERS AND OPERATORS INVOLVED IN EXPOSING PATIENTS TO RADIATION MUST BE "ADEQUATELY TRAINED".'

A QA programme should ideally reveal errors in operator technique, operator processing lack of equipment maintenance and stock control.

Conclusion

It is appreciated that radiography is an essential part of treatment planning and decision making in dentistry but that it carries the risk of detrimental biological effects such as tissue reactions (deterministic effects) and stochastic effects, which should be monitored through the use of robust QA programmes.

It therefore remains our duty as GDC registrants[1] to find out and work within the bounds of the existing legislation to ensure the risks are minimised, not only to ourselves, but to our colleagues and patients.

Furthering your skills

If you have found this article interesting and wish to develop your knowledge and skills in dental radiography, Health Education England Kent, Surrey & Sussex are recruiting for their 2017-8 programme. For further information contact: Cassidy Gourlay on 020 7127 6262 or cgourlay@kss.hee.nhs.uk or register your interest at: http://www.kssdentaltraining.co.uk/courseDetails/1712.

Many other providers also offer post-registration training in dental radiography, including the British Dental Association: https://www.bda.org/dcps/course/radiography.

1. General Dental Council. *Standards for the dental team.* London: GDC, 2013.
2. Faculty of General Dental Practitioners (UK). *Selection criteria for dental radiography*, 3rd ed. London: FGDP(UK), 2013.
3. Department of Health. The Ionising Radiation (Medical Exposure) Regulations 2000. London: DH, last updated 2017. Available at: https://www.gov.uk/government/publications/the-ionising-radiation-medical-exposure-regulations-2000.
4. Department of Health. The Ionising Radiation (Medical Exposure) Regulations 2006. London: DH, 2006.
5. Department of Health. The Ionising Radiation (Medical Exposure) Regulations 2011. London: DH, 2011.
6. National Radiological Protection Board. *Guidance notes for dental practitioners on the safe use of X-ray equipment.* Oxon: Department of Health, 2001.
7. Health Protection Agency. *Guidance on the safe use of dental cone beam CT (computed tomography) equipment.* Department of Health, 2010.
8. Whaites E, Drage N. *Radiography and radiology for dental care professionals*, 3rd ed. London: Elsevier, 2013
9. Fuhrmann A. *Dental radiology.* Germany: Thieme Publishing Group, 2013.
10. Department of Health. The Ionising Radiations Regulations 1999. London: DH, 1999.
11. General Dental Council. *Scope of practice.* London: GDC, 2013.

CPD questions

This article has four CPD questions attached to it which will earn you one hour of verifiable CPD. To access the **free** BDA CPD hub, go to **http://bit.ly/2e3G0sv**

bdjteam201729