Core subject: Radiography and radiation protection

Greater exposure to IRMER

Radiography regulations in practice – including IRMER

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CPD: 1 hour

Educational aims and objectives

The reader will leave with a clear understanding of the regulation and laws surrounding radiography and radiation protection, including IRMER. This includes dosage comparisons, why protect ourselves and the public, a radiation riskometer, the regulations for the use of radiography equipment and the administrative bureaucracy required of the dental practice

Anticipated outcomes

The reader will have an armament of rules and regulations and protocols to be able to implement a radiography and radiation protection regime in the practice, in conjunction with professional advice.

Greater exposure to IRMER

Julian English overviews the radiography regulations in practice - including IRMER

Radiography and radiation protection is legally controlled by IRR and IRMER. Documentation requirements of IRR and IRMER look at radiation risk assessment, ultimately trying to help dentists achieve less X-ray retakes.

SO WHAT IS THE LEGISLATION?

The Ionising Radiation Regulations 1999 (IRR) is the law governing this area and it is concerned with protection of staff and the public, and the equipment aspects of patient protection.

The other regulation is Ionising Radiation (Medical Exposure) Regulations 2000 (IRMER). This regulation is concerned with patient protection and mainly requires written procedures to be in place. They were written for larger hospitals not dental practices. Both are excellent but not tailored to dental practice and it shows.

Legal obligations are enforced under the Health and Safety at Work Act 1974, and the Healthcare Commission (including CQC) who is charged with enforcement. Failure to comply can lead to a practice being given notice of closure and or prosecution by HSE or the Department of Health. There can be fines and imprisonment and a probable GDC misconduct hearing.

SOURCES OF RADIATION

Common sources of radiation include microwave ovens, smoke detectors, laptops and wifi, mobile phones, Bluetooth, flying, radon gas and the sun. Did you know that eating a banana a day over a year gives the same dosage as 18 bitewing X-rays. Nuts are sources of radiation too as well as potatoes, kidney beans and coffee.

Radiation in the practice can be roughly broken down into the following in Table 1.

Table 2 is a riskometer, suggesting the number of days the average human will lose of their life related to radiation dosage.

Is it important to have perspective and Table 3 provides it. Ironically, radiation is also used as a cure for cancer.

RESPONSIBILITIES IN PRACTICE

One of the partners in the practice should be appointed the legal person. They are responsible for staff training and there should be written down notes of when there was training. The legal person must do core training every five years.

One person in the practice should be there for implement day-to-day items and the 'operator' is a person who processes, takes and inspects the X-rays. This can be any number of people. These people need to be trained, have core training every five years and should have a certificate too. Then General Dental Council continuing professional development (CPD) demands five hours of verifiable CPD every five years.

Additionally, every three years an X-ray device needs an 'MOT' and to be re-certified. It is rumoured that it might become annual, but it's been a rumour for several years now. *Dentistry* magazine will keep you up-to-date if this ruling ever changes.

Acceptance test on devices and routine tests must be carried out. Then there must be warning livery in the practice in the right places. Warnings for how close to be when X-rays are being taken should be printed on wall where everyone can see them. Distance and/or shielding are key.

STAFF REGULATIONS

Operators who set exposure parameters and position the film, the patient or the tube should:

- Have a certificate in dental radiography
- Must update their knowledge at least every five years.

Operators who process films or press the button should:

- Have a certificate in dental nursing or NVQ/SVQ equivalent
- If not, must have received adequate and documented training for the duties.
- May be trained for this in-house.

The operator needs to be at least 2m away and they must be able to see the X-ray, warning light and patient. The operator is formally described as any person who carries out all or any aspect of the radiographic examination. The operator is responsible for patient identification, positioning the film, patient or X-ray tube, for setting exposure parameter and for pressing the button. The operator is also responsible for processing of films, evaluation of radiographic quality, exposing test objects. Obviously, but it still needs to be said, all operators must be adequately trained in their duties.

People must be stopped or deterred from entering the room.

Further bureaucracy includes the need

TABLE 1: DOSAGE BREAKDOWN COMPARISONS

Two bitewings	2 microsieverts
Full mouth Pas	10-15 microsieverts
Panoral X-ray	6-11 microsieverts
Chest X-ray	170 microsieverts
Annual background radiation	2,600 microsieverts
Cornwall radiation	7,800 microsieverts

TABLE 2: LIFE DAYS LOST RISKOMETER

Risk factor	days of life lost
Smoking	850
Overweight by 20%	850
All accidents	435
Average alcohol use	130
10 microsieverts per year for 30 years	30
Background radiation	8

TABLE 3: CANCER RISK OF RADIATION EXPOSURE

The risk of a bitewing inducing cancer	1 in 20million
Lottery win	1 in 14million
OPT inducing cancer	1 in 3million
CT chest scan inducing cancer	1 in 2,500
UK population	1 in 4 risk of death from cancer

Radiation is also used as a cure for cancer.

for a radiation protection file with all procedures for testing, safety, procedures, risk assessment findings, staff info, training records, basically everything, contingency plan for a panic, written procedures for how to operate machines and whose who of responsible staff. All should be in one place.

The IRMER practitioner must be a dentist in the practice, as it is he or she who has the responsibility for justifying an individual exposure. The IRMER practitioner must ensure benefit outweighs detriment for every X-ray taken. Also the IRMER practitioner should attend a formal course every five years at least.

Each practice must have a legal person too. Responsibility of the legal person includes ensuring all IRMER practitioners and operators have adequate training and continuing education. Training records must be maintained and available for inspection and it is the legal person's duty of care.

EQUIPMENT REGULATIONS

A critical examination of X-ray equipment must be carried out by the installer, who should produce reports on:

- Description of equipment and location
- Evaluation of location, warning signals and exposure control
- Confirmation that radiation protection and safety features are in place and operating correctly.

Acceptance testing must be done at installation, usually combined with critical examination. Baseline values should be provided for subsequent tests from this to determine operating parameters and assessment of typical patient dose.

Routine tests should be completed every three years. Annual testing is not required unless previous tests have shown a fault. Table 4 shows operating facts and parameters.

Operators should be reminded of ALARP – the inverse square law (as low as reasonably possible). This should be used as the general principle behind every X-ray taken. This rule is there to protect the operator as well as the patient.

- 0.5m away from the patient = 640 microsieverts/hour exposure
- 1m =160 microsieverts/hour exposure
- 2m = 40 microsieverts/hour exposure
- 4m = 10 microsieverts/hour exposure
- Double the distance = quarter the dose.

Film holders and beam-aiming devices should be used wherever practicable. They should be used for bitewing and periapical radiography as they ensure accurate alignment of film with the beam.

TABLE 4: EQUIPMENT FACTS

- New equipment should operate within a range of 60-70kV
- Existing equipment should operate at 50-60kV
- Devices operating at 45-50kV should be withdrawn
- Devices operating below 45kV should be withdrawn

JUSTIFICATION

The operator must assess whether an individual exposure is justified, considering:

- Findings on previous radiographs
- Specific objectives of the exposure
- Total diagnostic benefit to the patient
- Radiation risk
- Alternative techniques available that would achieve the same purpose
- Must be preceded by history and clinical examination.

Panorals are justified for:

- Expanding on lesions seen on the periapical radiograph
- Prior to general anaesthesia
- Orthodontic assessment
- Assessment of 8s
- Multiple endodontic/heavily restored mouth
- Assessment for implants.

Panorals are not justifiable for routine screening.

NOTIFICATION PAPERWORK

The IRMER practitioner must notify the local Health & Safety Executive office of the use of ionising radiation on the premises. This only needs to be done if the site has change from being without and X-ray. Renotification of new or replacement equipment is not necessary. Within 28 days, the HSE must be informed if there is a change of ownership or relocation of the practice.

RADIATION PROTECTION FILE

The practice must keep a radiation protection file.

Its purpose is to keep all radiographic information and documentation in one place. The file must contain:

- Local rules (copies)
- Procedures for equipment maintenance and testing
- Record of mechanical and electrical tests
- Processing procedures and records
- Risk assessment findings including recommended dose investigation levels
- Staff information, training records and procedures
- Quality Assessment procedures
- Review process details
- Incident reporting and investigation arrangements
- Contingency plans
- Written procedures (as set out in the guidance notes)
- Staff status (legal person, RPS, IRMER practitioners, operators).

QUALITY ASSURANCE

The practice must have a named person responsible for implementing the quality assurance programme. It should cover image quality, patient dose and equipment, film and processing, training and audits.

Imaging quality should be monitored on a regular basis (at least every six months). Prospective or retrospective analysis must be carried out. Film must be graded into 1,2,3 categories and analyse the results. Imaging quality issues should be identified and it should be discovered whether poor quality is down to technique or equipment. Category 1 is excellent with no errors. Category 2 is acceptable. Category 3 is unacceptable – with diagnostically unusable film. Minimum targets for image quality should be established and charted.

Quality assurance also includes films and processing. Darkrooms and processors should be checked for light leakage (coin test). You should keep records of film stock expiry dates, changes of solutions and cleaning of processors.

Film should be tested with objects after each change of chemicals.

The quality assurance programme should include a register of all staff involved with radiography. All QA records should be reviewed every 12 months.

SUMMARY

There is no summing up or summary or conclusion to radiation protection. It is an ongoing task in the practice, constantly assessed and therefore it should evolve all the time.

Get professional advice if you do not complete all of the tasks and requirements outlined in this article. **CPD**

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