Use of CBCT in implant dentistry should follow justification and optimisation

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The European Association for Osseointegration (EAO) recently updated its guidelines for the use of diagnostic imaging in implant dentistry, which now include cone-beam computed tomography (CBCT) and are supposed to address the As Low As is Reasonably Achievable principle as well as to optimise both conventional radiography and new procedures. A commentary by Prof. Keith Horner, University of Manchester, UK.

**CBCT is the most** significant development in dental imaging during the last 25 years. It brings cross-sectional imaging into the dental practice and has obvious uses in implant dentistry. Concerns have been raised, however, over the radiation doses, which are usually higher than those of conventional dental radiography.

When the word “radiation” is used, alarm bells ring for everyone. One of the most common questions asked by dentists is how the dose of one X-ray examination (e.g. a panoramic radiograph) relates to another (e.g. CBCT). This is almost impossible to answer because there is a wide range of possible doses from any type of X-ray examination, reflecting differences in equipment, the image receptor, the field of view and so on. Recent reviews indicate that doses from CBCT are typically an order of magnitude greater than those from conventional dental radiography. The health risks from such exposures are also proportionately higher; although we can perhaps console ourselves by remembering that risk falls with patient age, and that many implant patients are in the older age groups.

The foundations of radiation protection of patients are justification and optimisation. Justification embodies the principle that all exposure to X-rays should give a positive net benefit to the patient. It is implicit within this that the X-ray imaging strategy should be "prescribed" for each patient and therefore that no imaging should be performed until a history and clinical examination have been performed. Referral criteria are an essential aid to the justification process, being clinical guidelines based on, at best, a solid body of evidence or, where the evidence is lacking, consensus. Optimisation is the principle that all exposure should be as low as reasonably achievable. As radiation exposure factors are reduced, image quality will fall, but lowering exposure to a point at which image quality is still adequate is an important strategy, as well as cutting down the size of the field of view.

So, where do we go from here? CBCT is a great technological advance, but that does not mean we must use it if a conventional radiograph, or good clinical examination, would be sufficient. We have to recognise that regulatory authorities dealing with radiation in Europe are aware of CBCT in dental practices and are keeping a watchful eye on how we use this technology. The best way for us to demonstrate that we are appropriate users of CBCT is to follow the principles of justification and optimisation—and to show that we follow them. This means only using CBCT when it is going to answer a question that cannot be answered by other methods involving less, or no radiation.

When we use CBCT, we should never just "press the button" using a standard exposure for everyone, but we should adjust the exposure factors to a level that gives adequate image quality and use the smallest appropriate field of view. These simple steps will reassure our patients that we have their best interests at heart; that is what we really want—isn’t it?

**about the author**

Keith Horner is Professor of Oral and Maxillofacial Imaging at the University of Manchester’s School of Dentistry. He was also a contributor to the latest revision of the EAO’s guidelines for the use of diagnostic imaging in implant dentistry.