In recent government guidelines on digital imaging, the focus has been on patient safety as much as accuracy and image clarity, so any system that can reduce radiation exposure is a must-have for the conscientious practitioner. In the last 10 years imaging technology, in dentistry as well as other fields, has come on in leaps and bounds and the emphasis in most new machines is on lowering potential radiation exposure.

One piece of equipment that has met with much praise in both general and specialist dentistry is the 3D Cone Beam Computerised Tomography (CBCT) scanner, not just for its increased safety but also for its impressive versatility and convenience.

Willi Kalender

Volumetric CT scanning was developed in the 1980s by Willi Kalender, who nicknamed it ‘spiral’ CT because of the helical trajectory of the rays, and fast became a favourite in the medical profession. Renamed ‘cone beam’ the main advantage of the CBCT scanner was that, unlike traditional flat x-ray plates, the cone generates a full 3D image of the area being x-rayed to give the clinician access to the image from all directions.

This is an invaluable tool in dentistry as it affords a comprehensive view of the patient’s dento-maxillofacial anatomy. It can facilitate diagnoses and allow for better planning of treatment by giving the clinician a better idea of any problems the patient may be facing. As the imaging picks up both bone structure and soft tissue, it can also be an excellent visual tool when it comes to explaining procedures to patients.

Limiting radiation

Government regulations (namely IRR99 and IRMER) state that, with regards to radiography, dentists have a statutory duty to take into account the best ways to limit radiation doses when buying equipment. With the Health Protection Agency (HPA) recommending that the starting point for the optimisation of patient dose be set at 250 mGy cm², low radiation dose should be a serious factor in one’s choice of equipment. The HPA does recognise, however, that local diagnostic reference levels should be set after consultation with the user’s local Medical Physics Expert (MPE) because of differences in equipment models. When considered in light of this, a 2004 study found...
that overall exposure levels for CBCT systems, whilst higher than those used for conventional dental radiography, were nonetheless lower than those for CT. A further study in 2008 confirmed the benefits of CBCT:

“Dental cone beam CT scanners provided adequate image quality for dento-maxillofacial examinations while delivering considerably smaller effective doses to patients compared to the multi-slice CT.”

To further limit radiation exposure, the HPA also recommends that clinicians consider purchasing equipment that enables both large and small Fields of View (FOV) as this can lower the dose to patients by focusing only on the essential parts of the image. Other than safety, the advantage to using CBCT is that its powerful software and accurate scanning capabilities produce a superior image. The cone beam scanner can pick up considerably more information than a traditional flat plate x-ray and the data is processed and interpreted more efficiently by the associated software. The HPA have noted, however, that CBCT should not yet replace conventional CT imaging completely because of limitations in CBCT with regards to the level of soft tissue detail that the scanners are capable of generating. The imaging quality is still sufficient in most cases however and, given that the image is 3D, CBCT scanners can prove a considerable boost to diagnostics and treatment, combined with the relative safety, led the NHS Purchasing and Supply Agency to conclude that, with regards to a comparison with CT scanners:

“The image quality of 3D images produced with CBCT is evidenced to be as good as or better than conventional CT for most examinations at a significantly reduced dose.”

However, it should be noted that not all CBCT systems were born equal. A machine may out perform others in one area, but fall behind in another, so it is important for clinicians to consider all their options before deciding which piece of equipment is best for them.

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