Dentistry In the Third Dimension

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By Nilesh R. Parmar

One of the expressions which I always remember from dental school was the words spoken to me by a very wise Professor, "a radiographic image is a 2D representation of a three dimensional object." That phrase has always stuck with me and has casted doubt on all the grey, black and white smudges I have seen on every bitewing, periapical and OPG since I qualified. Clinical dentistry is very much a three dimensional environment, so why have we all spent so long putting up with 2 dimensional imaging.
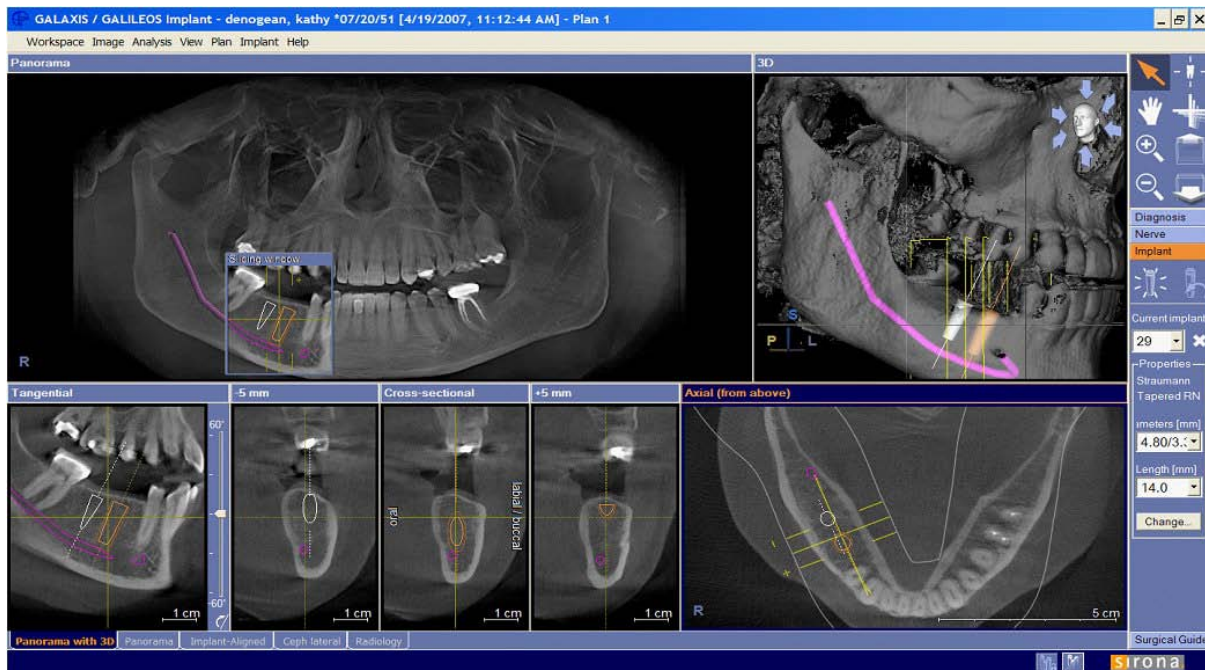

There have been a few reasons, firstly, a lot of clinicians will tell you that we simply have not needed 3D imaging in general dental practice. Clinicians can and should be able to reach a diagnosis based not only on the 2D plain film radiographic evidence but from the patients' symptoms, clinical examination and history.

Secondly, machines which previously provided 3D images were large, costly and exposed the patient to a large amount of radiation. The resulting images were at best, difficult to interpret and required specialist operators to use and interpret the scans. These made them unsuitable for general dental

practice and more suited to hospital based institutions where the necessary infrastructure was available.

With the recent increases in demand for implant treatment, clinicians have required a more sophisticated imaging protocol for the pre-operative planning for implant therapy. This has led to the development of smaller and cheaper, CBCT machines which are able to produce detailed images of the jaws with a coupled with a reduced radiation dosage to the patient.
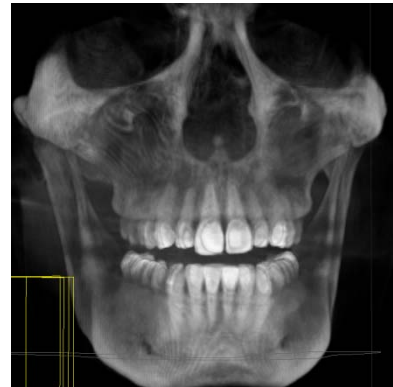
In late 2009 we purchased a Sirona Galileos™ CBCT machine to aid patient diagnosis and treatment planning primarily focused on dental implant applications. Currently, there are several machines available in the UK, all with their pros and cons. The Galileos™ stood out, as it uses an image intensifier screen which allows for a much reduced radiation dose to patients. A study by Ludlow et al in 2006 showed the Galileos™ default scan exposure to be 29 μSv compared to the classic I-Cat standard scan which was 47 μSv (ICRP 1990 calculations). The information obtained is easily manipulated and viewed using the GALAXIS™ software which allows for virtual implant placement, computer aided implant placement and will soon allow for virtual Cerec™ crown placement using Cerec™ BlueCam™ scans of the dentition overlaid onto CBCT scans of the jaws. Recently, a vertical collimation has been introduced to the Galileos™ machine further reducing the radiation dose.

A CBCT scan can aid diagnosis and treatment in several dental disciplines. Although its primary use is aimed at oral surgery and implant dentistry applications, a CBCT scan can provide invaluable information for endodontic treatment, orthodontic treatment planning and periodontal diagnosis. In one 14sec scan the Galileos™ machine will capture and produce a reconstituted DPT, saggital and transgential views of the jaws, a 3D rendering of the entire jaw and a cephelogram.

The availability of an on-site CBCT machine has fundamentally changed my implant practice. The information obtained has allowed me to be much more confident with treatment planning of larger cases especially in the posterior mandible or maxilla where there are anatomical considerations. The 3D rendering of the patients jaw bones with overlaying proposed implant

placement makes explaining treatment plans to patients easier and aids informed consent.