Use of an X-ray phantom in dental 3-D diagnostics in digital volume tomographs

Dr Georg Bach, Christian Müller & Alexander Rottler discuss 3-D diagnostic techniques

Undoubtedly, digital volume tomography has significantly expanded the range of dental imaging diagnostics. Just as Paatero ushered in a new era of dental radiology at the end of the 1950s with the development of the ortho-pantomograph and the resulting introduction of panoramic view imaging, 3-D processes will, in turn, replace panoramic view imaging.

Although digital volume tomography has to date been mostly used for pre-implantological planning and in reconstructive surgery, now other dental disciplines are beginning to appreciate the value of this process. It is in orthodontics, endodontics, dental surgery and periodontics that digital volume tomography represents a significant improvement of the possibilities of imaging processes. Its significance in the current domain, pre-implantological diagnostics, can be assessed as even greater.

Available digital volume tomographs
Digital volume tomographs (DVTs) have been on the market for a good decade, and the number of suppliers of such devices has increased dramatically.

When observing the device market, two clear trends are evident: the trend towards an all-in-one device (also called dual use) and the trend towards DVTs of various volumes.

All-in-one devices
In addition to offering 3-D diagnostics, the majority of DVTs available on the market also provide the option of producing panoramic view images (real images, not reconstructed from a data record) and sometimes even lateral cephalogram. These devices thus cover the entire range of dental large-scale diagnostics—in contrast with the first generation, which only offered the DVT option.

The DVTs of today’s generation are often similar in design and appearance to traditional DVTs.

The position of the patient with these and other frame devices is typically standing or sitting, while the once dominant supine patient position of the first-generation device is passé, except for that required by one DVT manufacturer.
Various volumes
The first-generation devices featured very large volumes that required time-consuming reworking of the immense data record for problems beyond large and reconstructive surgery in order to be able to evaluate the relevant data and/or regions in a target-oriented manner. Today, numerous manufacturers offer devices with small and medium-sized volumes. Three types of devices are available:
- small volume (4 x 5 cm) for oral surgery and dental procedures
- medium-sized volume (8 x 10 cm and higher) for oral surgery and reconstructive surgery
- large volume (18 x 20 cm and higher) for oral surgery and reconstructive surgery

Problems with small and medium-sized volume devices
Small- and medium-sized volume devices are generally used for preimplantological diagnostics, oral surgery, and orthodontic and endodontic procedures. The limited volume size requires careful device setting and patient positioning so that the relevant structure is accurately captured.

For new users and those who only take volume tomo-grams once in a while, this correct setting can pose difficulties, which was our motivation for developing a DVT phantom that can be used for training purposes and for direct preparation of an image with a patient.

The DVT phantom and its application
The DVT phantom is an X-ray phantom that depicts a medium-sized mandibular and maxillary dental arch with the teeth positioned in ideal denti- culation.

The phantom, which consists of a mandible and maxilla, is mounted on the individual bite or positioning support of the respective device.

Barium sulphate is added to the plastic teeth so that they are visible in the X-ray image. These teeth are made by the manufacturer especially for X-ray applications. The DVT platform is then mounted on the device with the original bite support instead of a patient. The device setting can be done in two different ways:

a. The desired volume is pre-set using the device programme and then manually fine-tuned.

b. The device is manually set directly upon the region to be captured with the aid of the light visors.

Thereafter, the set position-
A prophy paste that also desensitises?
How refreshing.

- Immediate relief of sensitivity
- First prophy paste providing stain removal, polishing and desensitising in one product
- Unique NovaMin® calcium-phosphate technology
What’s Missing?

Three global titles from the Dental Tribune International portfolio are coming to the UK. Published quarterly, each of these glossy, clinically-focused titles aims to bring you the latest developments in the fields of implantology, endodontics and cosmetic dentistry in a clear, easy to read format.

What’s missing?

implants

Fill the gaps... implants, the international magazine of oral implantology, delivers the latest thinking in this fast-moving area of the dental profession. User-oriented case studies, scientific reports, meetings, news and reports, as well as summarised product information, make up an informative read.

You got the look...

cosmetic dentistry

You get the look... cosmetic dentistry - beauty & science presents the most significant international developments in the world of cosmetic and restorative dentistry. With an editorial mix of specialty articles, clinical studies, case reports, industry reports, reviews, news, and lifestyle articles, cosmetic dentistry leads the way.

Enjoy Endodontics?

roots

Down your canal... roots is the place to keep up with the latest developments in the endodontic arena. A combination of comment, studies, case reports, industry news, reviews, and news, those professionals with an interest in endodontics will find roots invaluable.

£30 each for a yearly subscription or as a special offer take all three titles for just £50 per year

‘Time-consuming and tedious setting (aiming) of the DVT on a patient who is already in the device is likely to be uncomfortable for the patient’

ing is saved.

Using the DVT phantom for training and practice

With the aid of the DVT phantom and the abovementioned setting techniques, new users, who are training to become dentists or dental technicians, can learn how to set the device for the regions to be examined, generate one or more individual images using the preview function and check whether the setting was correct. In the event of incorrect settings, a better image can immediately be generated. In this manner, there is a direct learning curve. Using the DVT phantom for preparing a patient image Time-consuming and tedious setting (aiming) of the DVT on a patient who is already in the device is likely to be uncomfortable for the patient. This is where pre-setting the device with the aid of the DVT phantom comes in handy. The desired region is captured with the phantom and, if needed, is checked with the preview function. Then, the phantom is moved and the patient is positioned in the device.

Generally, only one device setting for the patient’s body size and small fine-tuning are required before the image is set.

How to obtain a DVT phantom

A DVT phantom can be produced in co-operation with practising dental technicians. The plastic teeth containing barium sulphate are available on the market and a phantom can be made in the manner described above.

An easier option is to send a DVT positioning aid of your device to dtcmfreiburg@aol.com or through www.dtcm-freiburg.de.

Master Dental Technician Christian Müller will then mount a prepared DVT phantom on your positioning aid. Industrially manufactured plastic teeth containing barium sulphate (SR Vivo Tac/SR Ortho Tac, Ivoclar Vivadent) will be used, which are then incorporated into a mandibular and maxillary model made of transparent plastic.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

This article was first published in the international edition of Cosmetic Dentistry Issue 3, 2010

Captions

Figs. 1a & b DVT phantom (the maxillary sinus floor and alveolar nerve of the mandible are simulated with radiopaque wire structures).

Fig. 2 DVT phantom in a DVT (Kodak 9000 3D, small volume) fixated on the original patient biting aid.

Fig. 3 Device settings: with the aid of the light visors, the volume is placed on the region to be captured (here region 26 and the maxillary sinus floor).

Fig. 4 DVT phantom image of the maxilla with the DVT phantom.

Fig. 5 DVT phantom image of the mandible with the DVT phantom.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

Master Dental Technician Christian Müller will then mount a prepared DVT phantom on your positioning aid. Industrially manufactured plastic teeth containing barium sulphate (SR Vivo Tac/SR Ortho Tac, Ivoclar Vivadent) will be used, which are then incorporated into a mandibular and maxillary model made of transparent plastic.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

This article was first published in the international edition of Cosmetic Dentistry Issue 3, 2010

Captions

Figs. 1a & b DVT phantom (the maxillary sinus floor and alveolar nerve of the mandible are simulated with radiopaque wire structures).

Fig. 2 DVT phantom in a DVT (Kodak 9000 3D, small volume) fixated on the original patient biting aid.

Fig. 3 Device settings: with the aid of the light visors, the volume is placed on the region to be captured (here region 26 and the maxillary sinus floor).

Fig. 4 DVT phantom image of the maxilla with the DVT phantom.

Fig. 5 DVT phantom image of the mandible with the DVT phantom.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

Master Dental Technician Christian Müller will then mount a prepared DVT phantom on your positioning aid. Industrially manufactured plastic teeth containing barium sulphate (SR Vivo Tac/SR Ortho Tac, Ivoclar Vivadent) will be used, which are then incorporated into a mandibular and maxillary model made of transparent plastic.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

This article was first published in the international edition of Cosmetic Dentistry Issue 3, 2010

Captions

Figs. 1a & b DVT phantom (the maxillary sinus floor and alveolar nerve of the mandible are simulated with radiopaque wire structures).

Fig. 2 DVT phantom in a DVT (Kodak 9000 3D, small volume) fixated on the original patient biting aid.

Fig. 3 Device settings: with the aid of the light visors, the volume is placed on the region to be captured (here region 26 and the maxillary sinus floor).

Fig. 4 DVT phantom image of the maxilla with the DVT phantom.

Fig. 5 DVT phantom image of the mandible with the DVT phantom.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

Master Dental Technician Christian Müller will then mount a prepared DVT phantom on your positioning aid. Industrially manufactured plastic teeth containing barium sulphate (SR Vivo Tac/SR Ortho Tac, Ivoclar Vivadent) will be used, which are then incorporated into a mandibular and maxillary model made of transparent plastic.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

This article was first published in the international edition of Cosmetic Dentistry Issue 3, 2010

Captions

Figs. 1a & b DVT phantom (the maxillary sinus floor and alveolar nerve of the mandible are simulated with radiopaque wire structures).

Fig. 2 DVT phantom in a DVT (Kodak 9000 3D, small volume) fixated on the original patient biting aid.

Fig. 3 Device settings: with the aid of the light visors, the volume is placed on the region to be captured (here region 26 and the maxillary sinus floor).

Fig. 4 DVT phantom image of the maxilla with the DVT phantom.

Fig. 5 DVT phantom image of the mandible with the DVT phantom.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

Master Dental Technician Christian Müller will then mount a prepared DVT phantom on your positioning aid. Industrially manufactured plastic teeth containing barium sulphate (SR Vivo Tac/SR Ortho Tac, Ivoclar Vivadent) will be used, which are then incorporated into a mandibular and maxillary model made of transparent plastic.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

This article was first published in the international edition of Cosmetic Dentistry Issue 3, 2010

Captions

Figs. 1a & b DVT phantom (the maxillary sinus floor and alveolar nerve of the mandible are simulated with radiopaque wire structures).

Fig. 2 DVT phantom in a DVT (Kodak 9000 3D, small volume) fixated on the original patient biting aid.

Fig. 3 Device settings: with the aid of the light visors, the volume is placed on the region to be captured (here region 26 and the maxillary sinus floor).

Fig. 4 DVT phantom image of the maxilla with the DVT phantom.

Fig. 5 DVT phantom image of the mandible with the DVT phantom.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

Master Dental Technician Christian Müller will then mount a prepared DVT phantom on your positioning aid. Industrially manufactured plastic teeth containing barium sulphate (SR Vivo Tac/SR Ortho Tac, Ivoclar Vivadent) will be used, which are then incorporated into a mandibular and maxillary model made of transparent plastic.

We hope that the fascinating field of 3-D diagnostics will establish itself quickly in dentistry and remain an imaging procedure that significantly expands upon the hitherto range of dental X-ray diagnostics in the long term.

This article was first published in the international edition of Cosmetic Dentistry Issue 3, 2010