

Innovative panorama X-raying

Take two!

3D X-raying attracted a great deal of interest at the International Dental Show 2015. But 2D imaging is nowhere near exhausted – and also impresses with new medical and economical arguments in the daily life of the surgery.

by Frank Kiesele

There is hardly a surgery that does not require a panorama X-ray unit with a digital sensor in addition to a digital intraoral X-ray system. The quality characteristics include perfect positioning of the patient and that the curve around the head must be followed exactly by the sensor.

But what does "exactly" mean here? Actually, the conventional X-ray system generally defines a certain curve. Imagine it as a sheet of paper curved in a semi-circle and placed vertically at the mandibular level and, ideally, positioned at the middle of all the teeth. But nature rarely follows an idealised curve. Instead, upper or lower front teeth, for example, are never in the same vertical level. Also, all the teeth have different inclinations and are rarely at a right angle to the mandibular level. Thus, the usual position of the panoramic layer must be regarded as a compromise: The imaging is carried out according to an average dentition – exact, but not individually optimised. Excellent units provide a selection of up to 3 types of dentition.

Digital opportunities – sensibly exploited

Newer, digital panorama units generate "multi-layer images" in a single work step. However, the dentist must manually select the sharpest layer. The X-ray image ultimately used for diagnostics is a compromise of the best individual images of the layers generated.

But the advantages of modern digital image editing can be exploited still further. Because intelligent software can recognise, based on a multi-layer image, which areas of a certain layer have to be displayed sharp and which have to be displayed out of focus.

Advantages for diagnostics

This possibility can be realised by creating images along twenty parallel layers during the rotation, each of them divided into 1000 segments, and only the sharpest version is ever selected from each of the segments – automatically, of course, thanks to software tailored for this challenging dental task. It joins the selected image areas together again, which finally results in the panorama image for diagnostic purposes.

This makes even the requirement for manual selection of the sharpest image unnecessary. Practically "out of nowhere", the new procedure called 'S-Pan technology' immediately provides a panorama X-ray image oriented to the individual anatomy of the patient. Deviations of the dental arch from the ideal form of the average dentition, and different inclinations of the teeth are usually not taken into account here.

The result is an image with impressive precision, in which the dentist can immediately find the diagnostically critical structures: For example, all the roots in the lower and upper jaw, the mandibular canal or also an informative display of the bone structure. This generally enables the diagnostics to be carried out much more quickly and safely than with conventional digital technology or even conventional images.

Advantages in radiation hygiene

As the reconstruction is oriented on the actual position of the dentition, there is the following beneficial "side effect": Wrong positioning can balance out the new technology within the scope of everyday surgery life. This means there are significantly less repeat X-rays. And many patients are exposed to a lower radiation dose.

The VistaPano S combines the S-Pan technology with sensors with caesium iodide as scintillator material. Thanks to a lower scattering loss, it promises an especially high yield of light and, therefore, a better signal-to-noise ratio than conventional materials. The conversion of X-rays to electrical signals is altogether more effective [1]. Even today, a diagnostically excellent image quality is achieved with a low radiation dose using the caesium iodide scintillator technology. This makes it possible to generate a panorama image within 7 seconds using the quick-scanning mode (standard for VistaPano S).

Advantages especially for children

Particularly in the case of X-ray imaging for the youngest patients, the greatest possible reduction of the radiation dose is always desirable. Here, the caesium iodide scintillator technology represents an important advance. Therefore, even with a system already equipped with this technology, the dentist or the X-ray assistant will attach importance to the possibility of radiation field limitation. For the surgery, this can be achieved using special child imaging modes with reduced exposure area. This means the dose can be reduced by up to 56 percent. Nevertheless tooth buds, for example, are displayed better than with conventional procedures because the image is oriented to the form of the jaw and thus anatomically to the dentition of the child.



In addition, S-Pan technology supports the team as regards radiation hygiene by reducing repeat images. Via special imaging modes for children, a modern panorama unit should of course provide further options, such as for half or frontal images, orthogonal bite wing exposures, mandibular joint images for functional diagnostics and sinus images for the paranasal sinus display (e.g. VistaPano S, Dürr Dental, Bietigheim-Bissingen).

For questions regarding orthodontics, a panorama X-ray system that has an additional Ceph function (e.g. VistaPano S Ceph) can be used. This enhancement is visually recognisable from an additional extension arm. With such systems, a scan for cephalometry can be carried out in 4.1 seconds. This is so quick that out-of-focus images due to movement of the patient are avoided right from the start. A total of 5 further imaging possibilities are supported, including "Head Lateral" and "Head PA/AP" for orthodontics as well as the carpus image to check the rate of growth.

Advantages for economical surgery management

Naturally, the integration of a modern X-ray unit into the surgery must also make economic sense. Digital systems generally improve the workflow compared to analog systems. Just think of the prompt availability of the images or of the possibility of sending via email for subsequent discussion with colleagues.

Volume tomography can actually bring advantages for individual indications or even be indexed, for example if the two-dimensional X-ray image provides information on the spatial relationship between the mandibular canal and neck of the tooth [2]. However, if these rarely occur in the daily life of the surgery or if cooperation possibilities with colleagues, diagnostic centres, etc. are used for 3D imaging and complex cases are transferred to specialists, two-dimensional X-raying is entirely medically sufficient and the economically sensible choice due to the significantly lower purchase price.

The use of S-Pan technology also adds the reduction of repeat images which – apart from radiation hygiene – also saves time. Furthermore, the reconstruction of the final X-ray image is carried out fully automatically. The dentist does not need to spend time on any manual segmentation and selection of specific zones with optimum sharpness, but can immediately start with diagnosis.

Conclusion for the surgery

S-Pan technology manages to more significantly highlight the possibilities in the area of dental X-raying even further than many people were able to imagine. In addition to the above-mentioned advantages of the software, thinner panorama layers are also used, which – in other words – allows all images to be even richer in detail per se.



Thanks to the automated adjustment to the anatomy, even everyday incorrect positions are balanced out at the same time. Especially for children, the better representation of the tooth buds directly on the quality of the diagnostics is impressive. Last but not least, compared with conventional units, the radiation dose – which is already lower for 2D compared with 3D X-raying – is lowered further for S-Pan technology. Not only are two dimensions not that bad, they are entirely adequate and provide direct advantages for the surgery regarding radiation hygiene and economy. The VistaPano S Ceph stands out with a quick Ceph which comes very close to a one-shot solution and the price advantage compared with one-shot solutions.

About the author

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Bibliography

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2. W. Hörster, C. Ehrensberger: Pixel oder Voxel in der Implantologie. Wann darf es eine Dimension mehr sein? ZWR 2011;120(9): 368-372



Pic.1: Adult panorama image – sharp, precise image information over all areas of the jaw: the bone structure, all the roots in the lower and upper jaw as well as the mandibular canal are perfectly displayed due to the thin single layers. Thanks to S-Pan-technology, incorrect positioning is balanced out within reasonable limits.



Pic. 2: Ceph image in 4,1 Sec. with all anatomically relevant structures: Thanks to the quick scan, out-of-focus images due to movement of the patient are avoided right from the start.



Pic. 3: Extreme user-friendly handling and navigation: The intuitive 7" touch display visualizes all settings quickly and clearly (VistaPano S, Dürr Dental).

Pic. 4: VistaPano S Ceph presented on IDS 2015: four child programmes plus five for orthodontic purposes plus 13 further special options, e.g. function diagnostics or implant planning (VistaPano S Ceph, Dürr Dental).

