

“Seeing, newly defined.
CBCT brings light into the darkness
of the endodontist’s world.”

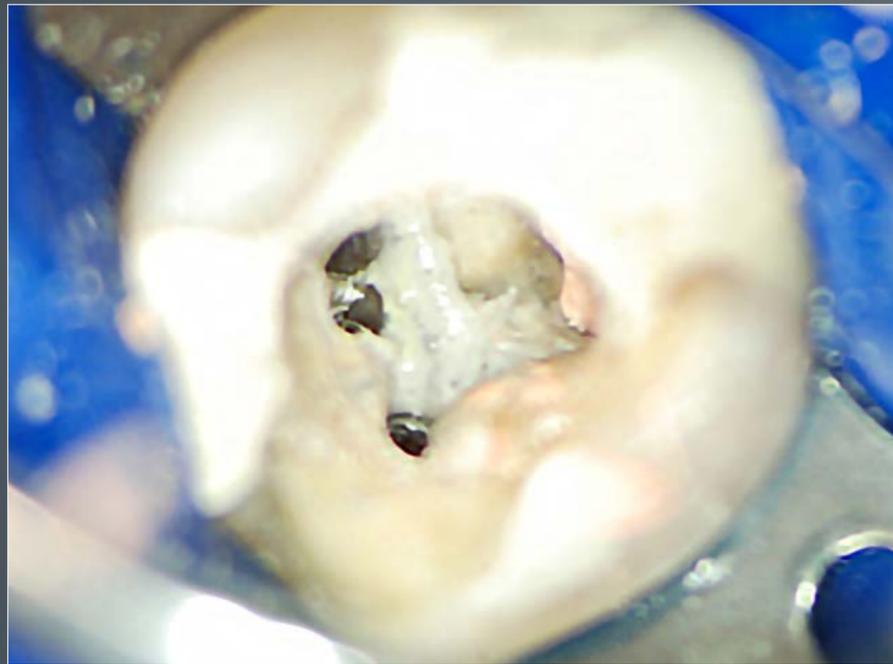
Dr. Emanuele Ambu
on his experiences after more than 10 years of using 3D images for endodontics.



“About 35% of apical lesions, such as granuloma, cannot be spotted by intraoral 2D examination, not to mention that about 50% of these lesions are not visible in a panoramic examination*. So a CBCT scanner not only lowers the risks during planning and diagnoses, it also increases the predictability of the outcome – and helps me to overcome the limits of endodontics so far.”

* according to Estrela C, Bueno MR, Leles CR, Azevedo B, Azevedo JR. Accuracy of cone beam computed tomography and panoramic and periapical radiography for detection of apical periodontitis. J Endod. 2008 Mar, 34(3), 273-9.

“CBCT is as revolutionary to endodontics in the 21st century as the microscope was last century.”



Clinical aspect of one tooth with confluent canals – not visible with 2D X-ray.



Radiological aspect of same tooth with confluent canals – visible with 3D images.

Why should an endodontist invest in a CBCT scanner?
Well, the correct question is: why not?

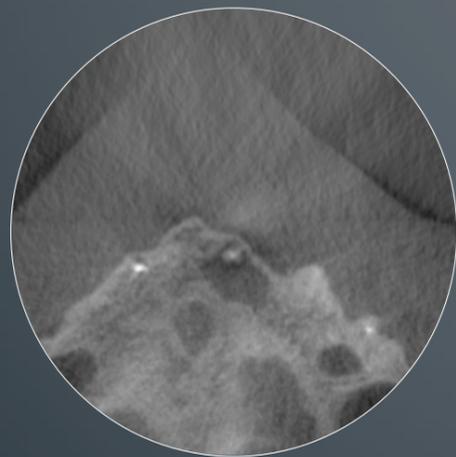
Endo is the area of dentistry where you “see less”, as an endodontist operates in a small, narrow and dark environment – the root canal. The first high technology that was brought to endodontists’ attention was the microscope, and it is indispensable for all dentists who practise endo. However, this important device is able to get only as far as the light and the eye can go.

Using CBCT, an endodontist will overcome the limits of the microscope, integrating and completing its vision, especially in cases where planning of endo surgery is needed. Giving an endodontist a real insight view of the area he treats, a CBCT scan lowers the risks and increases the predictability of the outcome of any endodontic treatment. Seeing all the details of small anatomical structures as root canals, root fractures, apical delta, calcifications and more, a CBCT scan can help the clinician to be the best endodontist he can be.

“For endodontists it is easy to overcome your clinical limits, sometimes you just have to overcome your prejudices about CBCT.”



Lesion invisible at 2D examination but visible with 3D X-ray exam – as cortical bone is present.



The two main reasons that prevent endodontists from investing in a 3D imaging solution are that they don't precisely know everything this technology can do for them – and they may be concerned about radiation dosage.

Addressing the first point, it is clear that with a CBCT scan you can see precisely what otherwise you cannot see! According to studies*, more than one third of all apical lesions, such as granuloma, cannot be spotted by intraoral 2D examination, not to mention the fact that about half of these lesions are not visible in a panoramic examination. Moreover, 2D exams can in some cases lead to a wrong diagnosis, making an endodontist think that a problem is absent when there is one or even vice versa!

Regarding the concerns about X-ray exposures, you need to understand that nowadays the CBCT 3D scanners have significantly lower doses than traditional medical CTs. There are scanners available providing very high resolution at small fields of view especially developed for endodontic imaging. For post-treatment evaluations or other indications the Low Dose Technology™ at 5 x 5 cm can be 80% less compared to a standard 2D panoramic X-ray**!

For all dentists who do endo – whether rarely, frequently or as pure endodontists daily – a CBCT device is a must-have because it helps you to overcome clinical limits. I would go even further and say: Not to use one is a mistake, just because it increases the risk of making a mistake.

* according to Estrela C, Bueno MR, Leles CR, Azevedo B, Azevedo JR. Accuracy of cone beam computed tomography and panoramic and periapical radiography for detection of apical periodontitis. J Endod. 2008 Mar, 34(3), 273-9.

** Study by Ludlow, John B., "Report of Dosimetry of ORTHOPANTOMOGRAPH™ OP300 Maxio," North Carolina Oral Health Institute, Chapel Hill, NC, USA, February, 2014.

“To be a must-have for endodontists, a CBCT scanner must have three features.”



With 120 micron resolution the 4th canal is displayed.



With 1 mm resolution the 4th canal is not visible.

The first and most important feature, especially for endodontists, is a small field of view. Using a SFOV, the patient receives fewer X-rays, the resolution improves and, looking at a small area of interest, the dentist minimises the risk of missing a potential problem present outside his focus.

Coming to a recommendation, a FOV with 5 x 5 cm or 6 x 4 cm is very good in my opinion. Additionally, the possibility of adapting the FOV to the specific anatomy of the patient is another extremely helpful option. Using FOVs that are too large is surely one of the main mistakes that endodontist can make using a CBCT scanner.

Another “must-have” is the special resolution for endodontic needs. Even if in general is stated that about 120 μm voxel is enough, I would recommend about or below 100 μm to be on the safe side. When it comes to selecting the right device, it is very important to pay attention to the voxel size as the main value for endodontists: I remember, for example, cases where some protocols for endo were advertised because of the low-dose benefits. This is not suitable, but having both options – super high resolution for the endo findings and low dose (eq. lower resolution) for other needs is very valuable.

The third feature, a metal artefact reduction function (MAR) is an important feature for an endodontist, to investigate teeth with perns, guttaperca material etc. All current programs are able to reduce artefacts, but unfortunately have an negative impact on the image resolution.

“With free positioning of the FoV you can focus on the region of interest – important especially at a resolution needed for endo.”



Child treatment with a significant resorption – before and after.

When it comes to radiation dosage we have to be clear there might be some misunderstanding. Patients often believe that CBCT and CT are the same exam, which actually is not the case. Furthermore, dentists have to consider that, from a sensitivity perspective, the age of the patient is of importance: A 10 year old child has a 3 times higher sensitivity to X-rays than a 30 year old adult, and an even 10 times higher sensitivity than a 55 year old adult*.

The resolution also plays an important role. To verify if a tooth is fractured or not, a 3D examination with a resolution of only 500 μm can give the answer, so there is no need for a higher dosage. To see if there is enough bone to place an implant, a resolution of 400 μm can be sufficient. So coming to endodontics: especially in cases where a high resolution of 100 μm or even lower is needed to clearly see the root canals, a scout view function to exactly position a small volume or the possibility to adjust the collimation depending on the patients anatomy are really important. A free positioning of the FoV is crucial to cover all cases without special patient positioning and allows the patient to stay still which is important for the high resolutions needed in endo.

* SEDENTEXCT, Guidelines on CBCT for Dental and Maxillofacial Radiology, Final Guidelines 2011, page 21.



Tooth with hole, vestibular lesion and periapical granuloma – before and after the successful treatment.



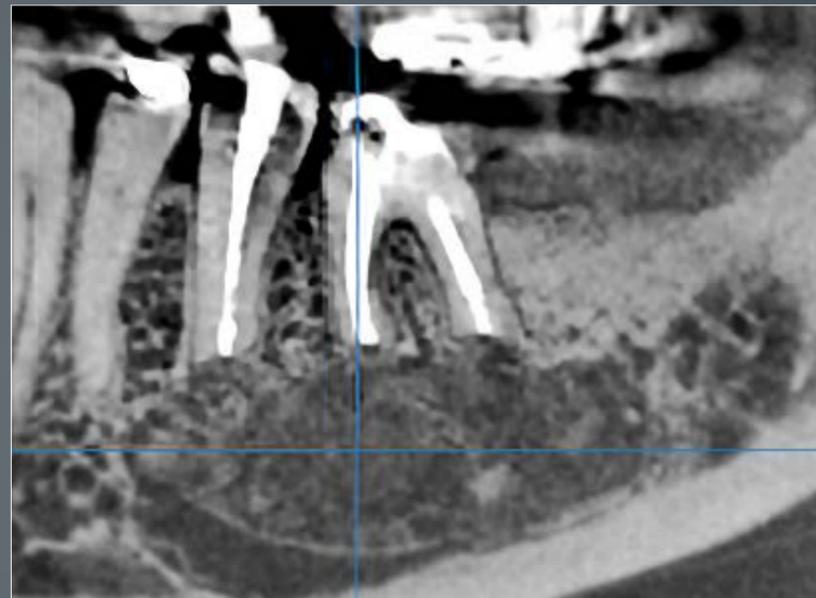
“Even if you do a 2D exam first, 3D technology is the best choice to enhance your output as much as the reputation of your practice.”

From a legal perspective, in some countries an endodontist cannot perform a 3D examination as a first diagnosis, even if it is obvious that the 2D examination won't give the necessary clinical output. Also in cases like caries detection, nowadays there are devices that outmatch a 2D device – for example the KaVo DIAGNOcam, allowing the endodontist to spot caries without requiring any radiation. In other dental cases, though, 2D is good enough, so it is not a question of either-3D-or-2D but 3D-as-well-as-2D in your endodontic practice.

But a 3D scanner is not only unsurpassed when it comes to endodontic diagnoses and planning, it is an instrument to increase the reputation and economic strength of a dental practice. Patients nowadays are much more informed and come to your practice with higher expectations than years ago. So for a modern endodontist a CBCT scanner is part of the essential practice equipment like a microscope, the apex locator or the ultrasonic devices.

The ability of a 3D imaging solution to convey the need for a specific treatment plan to patients, is absolutely convincing – especially if it is financially critical to them. Patients are excited to see the possibilities of 3D technology and to be part of the diagnostic process. When patients realise that you can offer such a service, they trust in your know-how and tend to spread the word among their friends.

“As there is no question that an investment in a CBCT solution will pay off – endodontists have to look for the software and service.”



Big periapical lesion before and 9 months after the surgery.

Even if endo is rarely used in daily routine, with at least 20 different types of applications where 3D technology is needed in the daily practice, the return on the investment in a CBCT scanner is not a problem. Generally speaking, every patient who needs an endo treatment should need a 3D investigation. So when it comes to the decision which device suits best the endodontic needs, it is not only the hardware, but software and service which are crucial.

The most important software features for an endodontist are the flexibility of the tool and the possibility to easily show the image on different planes, so to describe the root canal well. Proven software solutions like OnDemand3D™ offer a broad variety of endo functionalities. Furthermore, the dentist should insist on a 360-degree service, not only from a technical and clinical perspective, but also from a legal perspective. For example, a table with the value of X-rays in microSievert is extremely useful. The dentist is due to state these values in the documentation provided to the patient. Another service would be a user guide including the current legislation. Further, tools like e-books, webinars and other marketing supports are sign of a premium company.

Top aspects for endodontist when investing in a CBCT scanner:



Checklist

- Small FOV, such as 5 x 5 cm or 6 x 4 cm
- Resolution of voxel about/lower than 125 μm or even better about 100 μm
- Filter against scattering
- Small footprint of the CBCT scanner
- Software originally designed for dentistry
- Low Dose Technology™
- Simple installation procedure and maintenance
- Training from a clinical perspective



Dr. Emanuele Ambu

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Dr. Emanuele Ambu works as a dentist in Northern Italy (Bologna). His practice focuses on endodontics and oral surgery.

1989: he received his degree in Medicine and Surgery from the University of Bologna. He completed his postgraduate education in Endodontics at the University of Florence.

Since 1990 he has been practising as an endodontist and an oral surgeon.

He was Professor of Endodontics and Dental Material in the University of Modena-Reggio Emilia from 2002 to 2011. Now he is Clinical Assistant Professor in University of Siena.

Since 1999 he has been an Active Member of the Italian Society of Endodontics, since 2001 an Active/Certified Member of European Society of Endodontology and since 2013 an Active Member of Italian Academy of Endodontics (AIE).

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