



*With the advent of affordable CBCT,
oral surgeons are adding 3D imaging systems
to their practices in increasing numbers.*

Is it just a trend?

How CBCT is impacting the practice?

Why 3D....?

About 3D Accuracy, Doctor says...



Dr. Nick Fahey

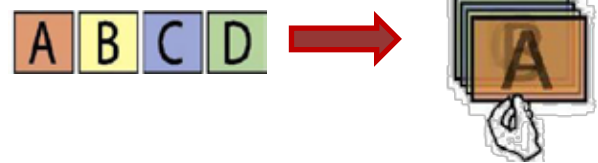
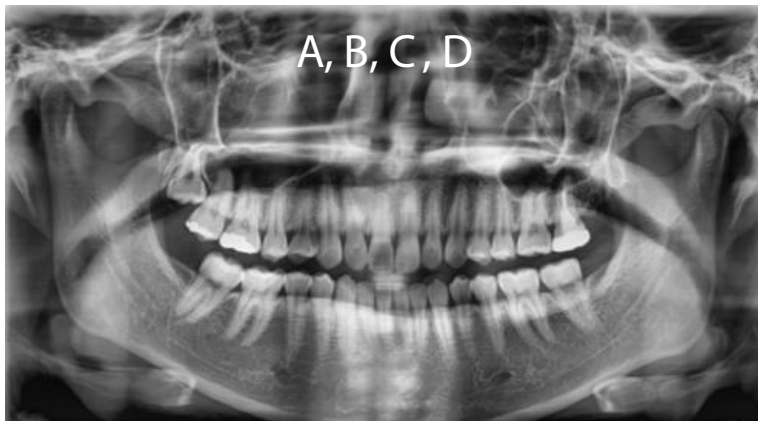
“

The ability to look at a tooth, pathology or an anatomical situation in any direction and orientation, as well as in 3D, eliminates much of the guesswork commonly experienced with 2D radiographs.

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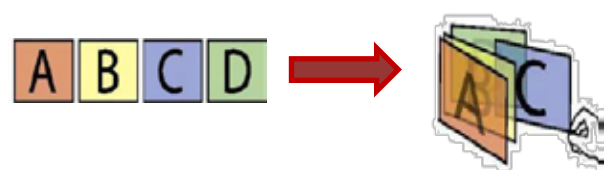
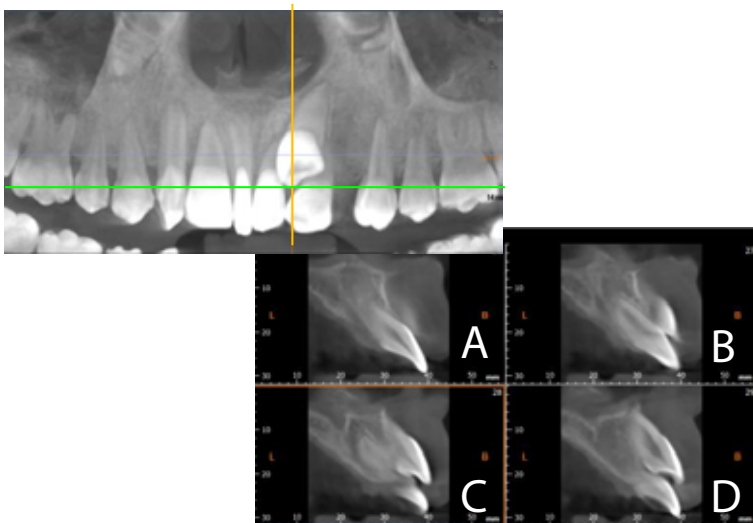


2D Vs. 3D



Images of multiple planes are taken to make up the composite panoramic image.

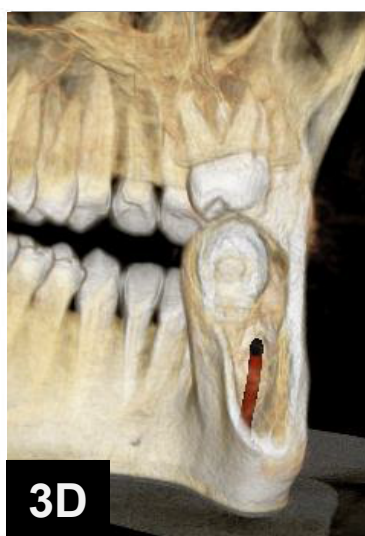
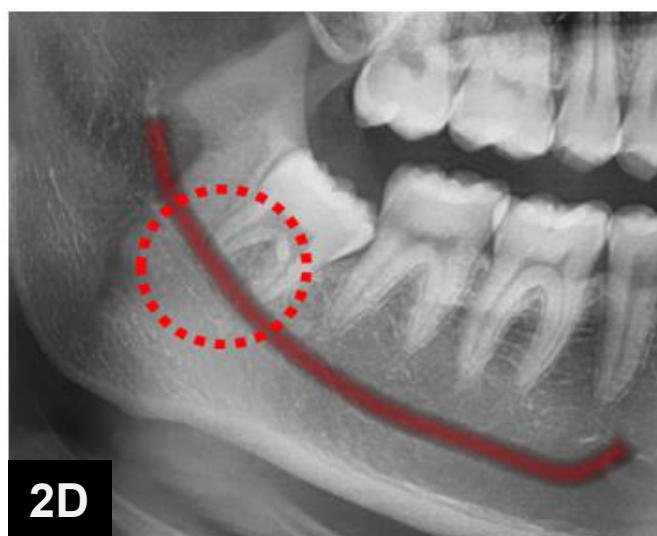
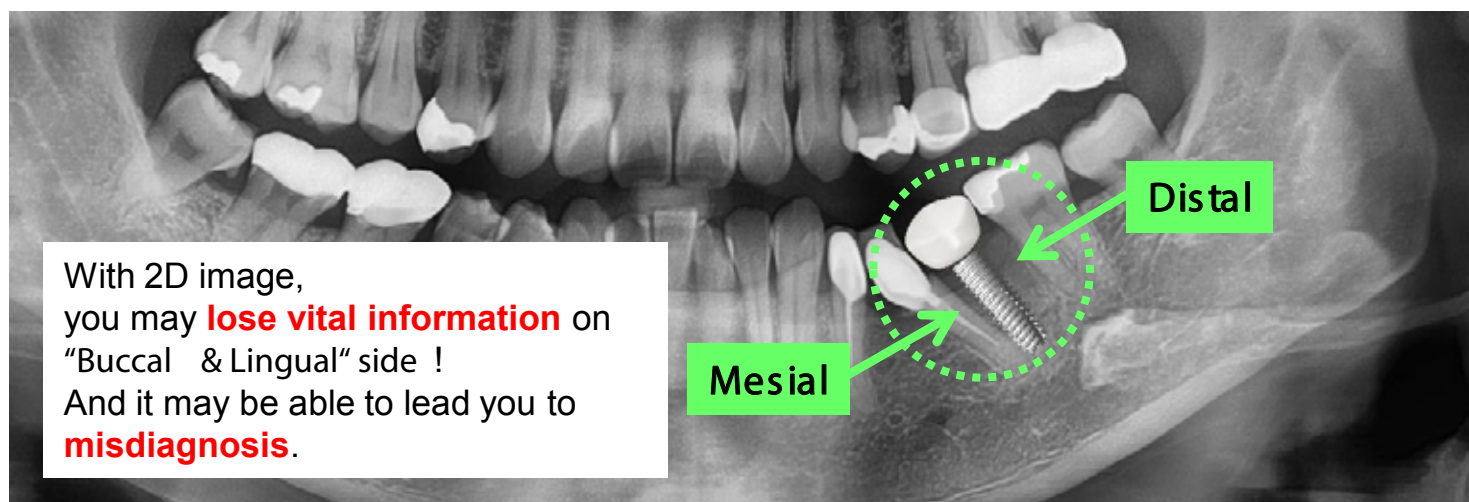
So the anatomical structures are **superimposed and distorted**.



The anatomical structures are **clearly examined with each sectional view**.

It helps in gaining a better view of bone structures and supports a wide range of diagnosis and treatment plans.

Looking from All Sides

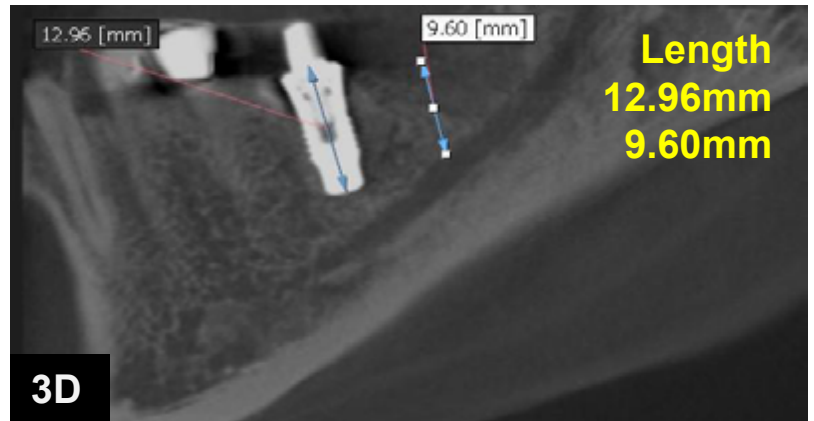
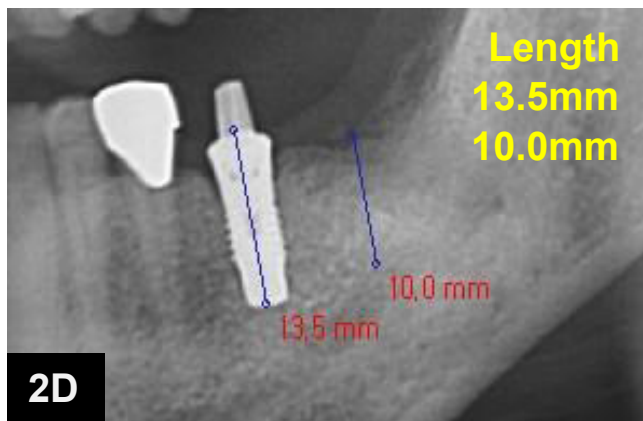


As you can see below, it looks like the impacted tooth is touching the mandibular nerve in 2D panoramic view but, in 3D, you can verify the tooth does not touch the nerve. This way, 3D helps you remove the accident in treatment.



Accurate Measuring

Distortions inherent in panoramic imaging because of projection geometry produce discrepancies in the angular measurements in the mandibular third molar regions on panoramic radiographs. Interpretation of third molar angulation from panoramic radiographs is often unreliable and may not accurately reflect the true orientation of the tooth. Apparent tilting of the tooth across the arch on the panoramic radiograph exacerbates the problem and appears to correlate with the bucco-lingual inclination of the third molar as visualized on reformatted CT images.



The difference between 2D & 3D

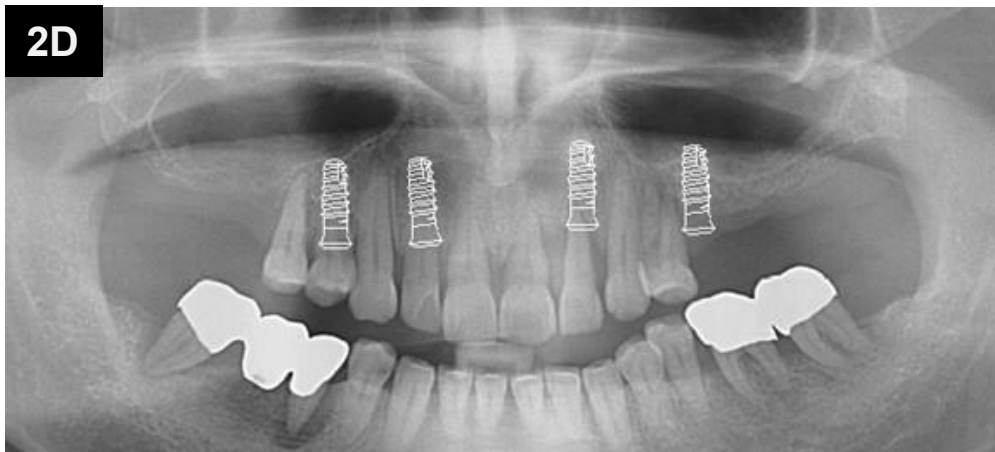
Implant Fixture **+ 0.54mm**

Length to canal **- 0.40mm**

Reference : Thesis 'Accuracy of angular measurements and assessment of distortion in the mandibular third molar region on panoramic radiographs.'



No Superimposition



In 2D panorama view, **palatal bone is superimposed**.
So it is hard to figure out sinus, septa and other adjacent structures.



Single sectional images are available with 3D.

So it is easy to gain information like septum of the sinus.
These information is very vital for successful maxillary sinus implant surgery.

About 3D Simulation, Doctor says...

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Without question, 3D imaging allows us to directly interpret the anatomy and challenges of the area of interest before direct visualization.



This information allows us to optimally create and sequence the best possible surgical and prosthetic treatment plan.

Most importantly, overall morbidity can be decreased as a result.

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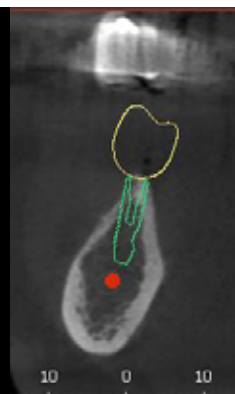
Better Prepared for Treatment

Improve Treatment Outcomes with Pre-simulation

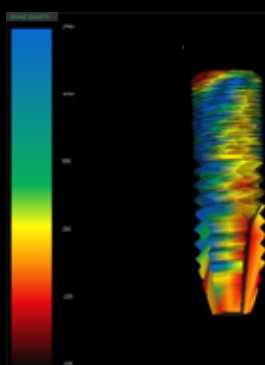
Appropriate use of CBCT absolutely improves treatment outcomes in the oral surgery practice. There is no doubt that using CBCT makes you to be better prepared going into a surgical procedure than with 2D imaging alone, and your results will reflect it.



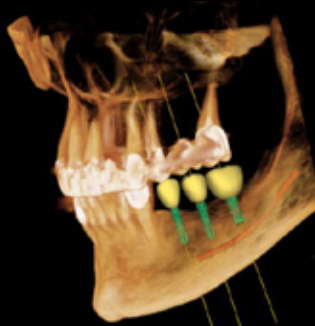
#1
Get real feedback
from 3D; reducing
risk of incidents



#2
Make the position
accurately in 2D
slice images



#3
Get real feedback
from 3D; checking
bone density



#4
Check the overall
view and be
confident!



Improve Your Patient Journey



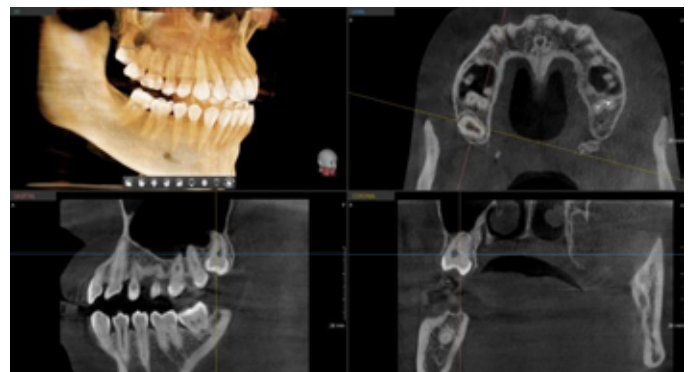
"3D diagnosis is so essential to doing the best for our patients that most of us will provide the service at a reduced cost, or even gratis in some cases. We then have an opportunity to provide confident, high quality care."

- Dr. Michael APikos-

This is the best care you can do for patients.

As you know well overall 3D evaluation of patients' present anatomy, as well as identify potential incidental pathologic findings is imperative.

The information 2D provides you is limited and there is high probability of doing treatment just what patients ask.





Improve Your Patient Journey



"I use a large flat panel monitor and take time to explain what the images represent in 3D.

This is an invaluable experience as they understand and take ownership of their condition, diagnosis and proposed treatment."

- Dr. Michael APikos-

It's a far cry from days when you consult with 2D.



Showing a patient what needs to be done with 3D is necessary and invaluable, and a far cry from the days when a dentist would hold up a tiny black and white film image and expect the patient to understand it. It absolutely raise the acceptance rate and improve satisfaction.

About **Diagnosis Range**, Doctor says...

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My partners and I use CBCT for a variety surgical procedures such as third molar impactions, impacted maxillary canines, supernumeraries, and so on.



The volume of cases I do translates into a good return to justify cost of this technology.

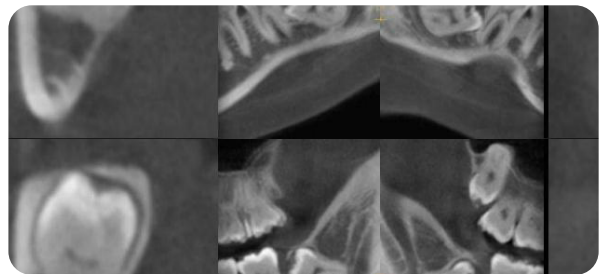
Beyond this, having an in-office unit gives me many benefits.

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Broaden Spectrum of Patients Beyond Implant Surgery!

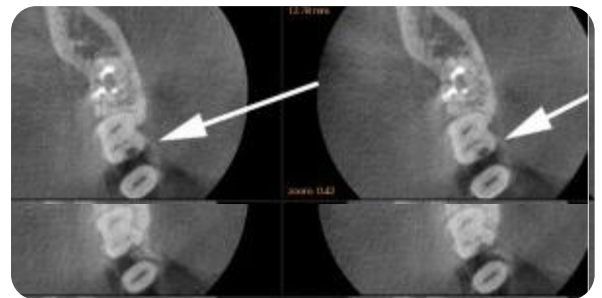
01. Tooth Impaction

Such as third molars, impacted maxillary canines, supernumeraries, mesiodens



02. Pathology Identification

Such as cysts, dentoalveolar lesions, root resorption, periapical disease



03. Maxillofacial Trauma

Such as bony fractures, tooth fractures, sinus treatment



About In-House Unit, Doctor says...



Dr. Ajay Murgai

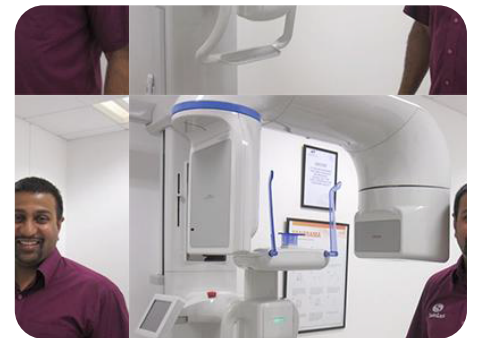
“ I’ve come to realize that we can only ensure our patients get the very best treatment journey, catering to all of their needs, **if everything can be done in-house**. Up until last year we could offer in practice every service, except for 3D imaging.

Unfortunately, we had issues where we were referring patients out for scans and patients weren’t getting the kind of service that we would like them to receive. ”

Take Extra Benefits from Having 3D!

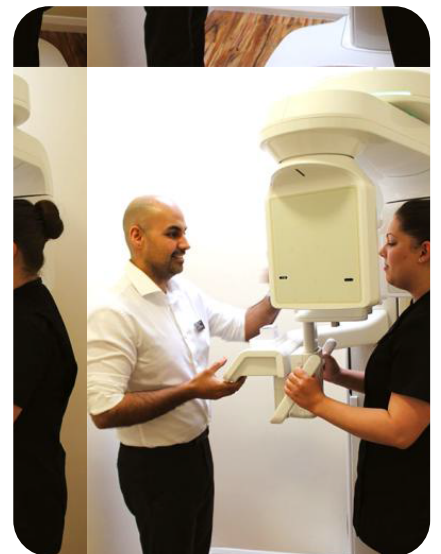
01. Save Time to See Patients

It is essential to have an in-office unit for immediate utilization to eliminate the logistics and inherent problems with referral and delay for an external diagnostic



02. Be More Competitive

Both clinicians and patients have been realizing that 3D scan is truly necessary thing for treatment. Having 3D imaging in your office speaks a lot more than other promotions.



03. Impress Your Patients

Patients think it looks like space age technology. It helps to show that you are cutting edge.





*However,
Still many clinicians have difficulties
to utilize 3D in their practice.*

*Why is that?
What makes them be passive to use it?*

Why **SMART**....?

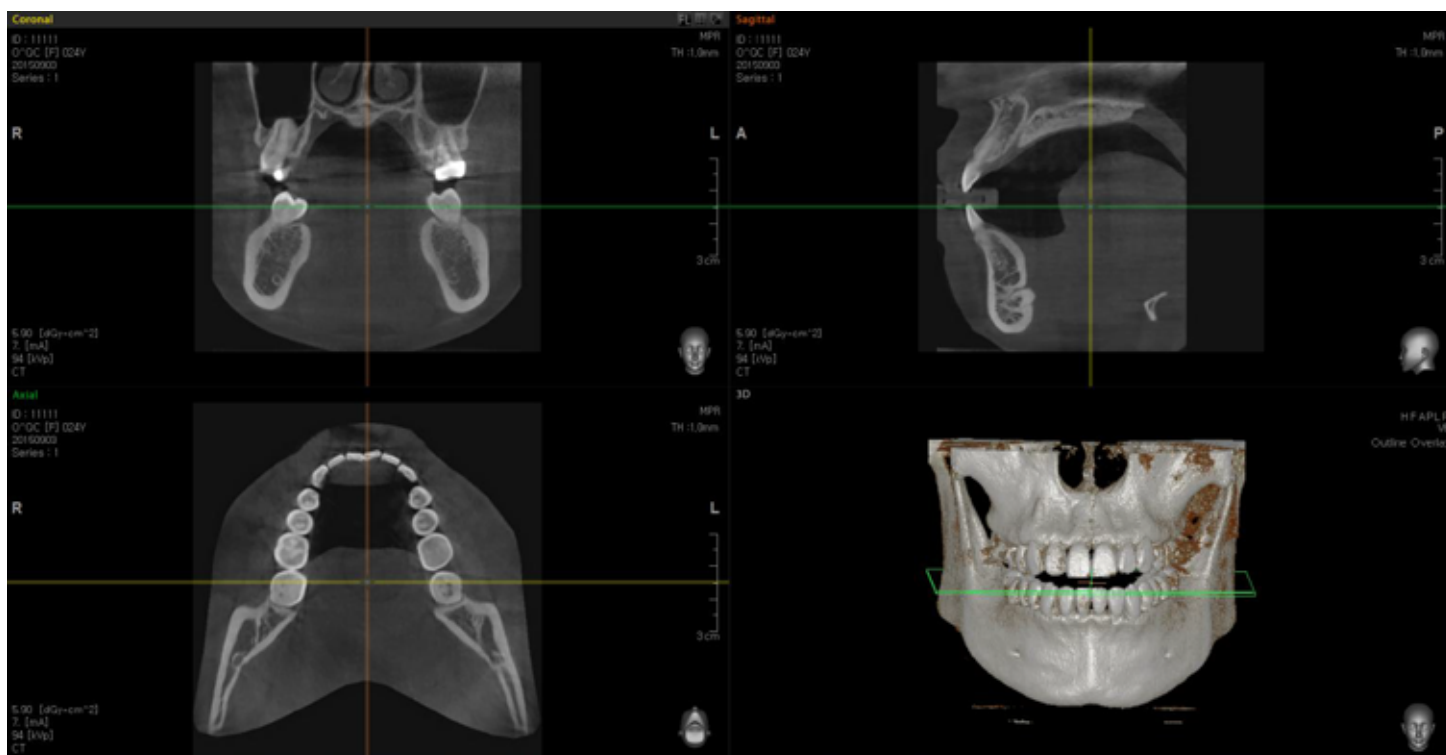
"Is 3D Software really for me?"

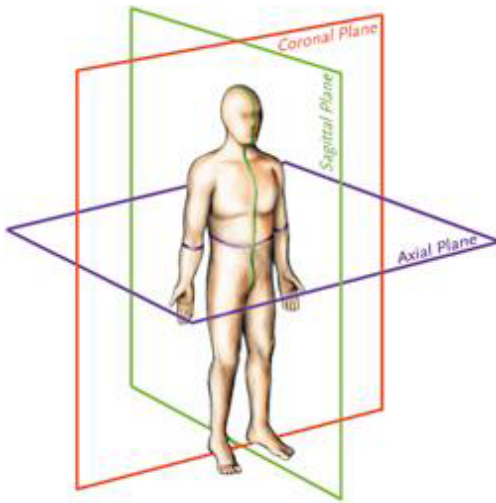


Many clinicians have thoughts like "It is too difficult to utilize everyday"

These are not wrong questions because there are some **obstructive factors** making These questions make sense. It is true that 3D software is difficult to deal with and it results in not just making many clinicians to be stressful but also underutilizing.

What are the obstructive factors and how they are changed?





Axes moving makes clinicians get lost and confusing to get the sectional images of ROI

AXIAL
SAGITTAL
CORONAL

Actually, about **70% of clinicians** have difficulty to utilize 3D software quite freely because axes moving and getting to ROI is too complicated and confusing.

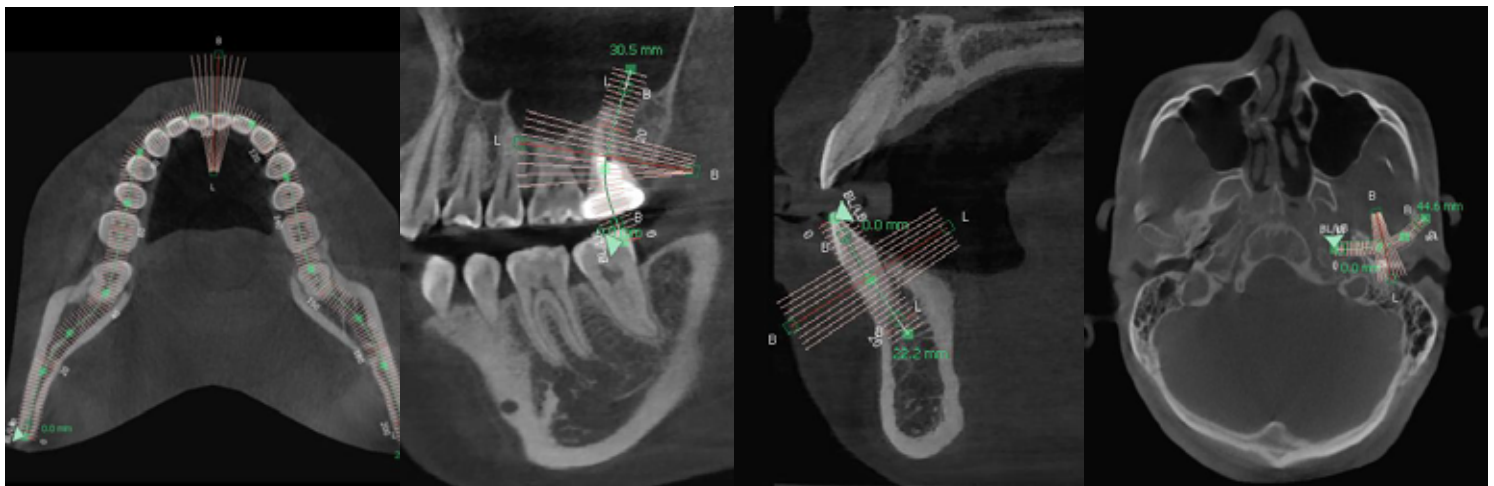
To get accurate sectional images of ROI(Region of Interest), you are required to adjust axial, coronal, sagittal axes and draw the panoramic curve but in this stage you just get lost.

Even though you are accustomed to this process, it takes much time from you and staff.

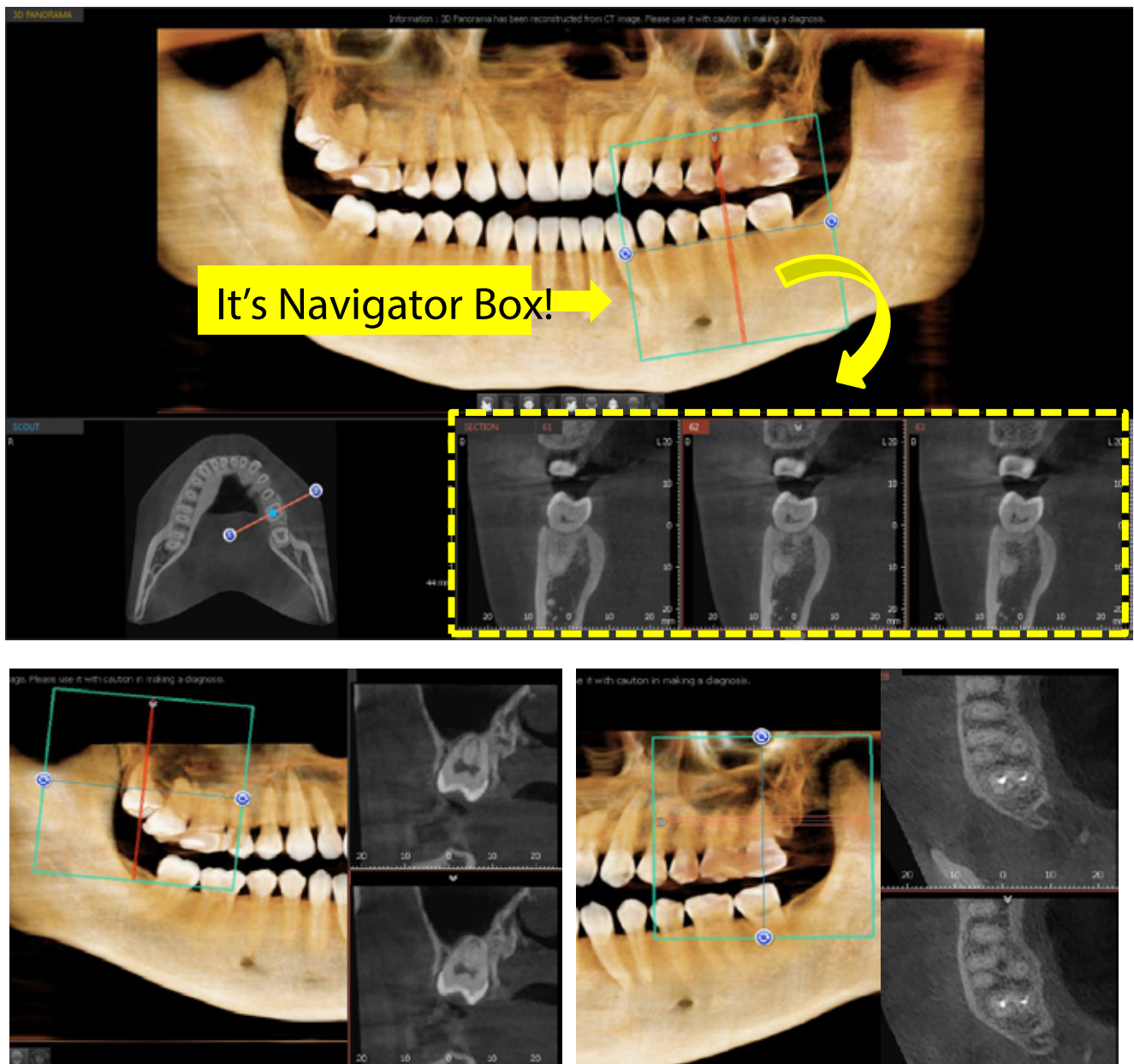


What if you do not need to adjust axes anymore?

What if you do not need to draw panoramic curve anymore?



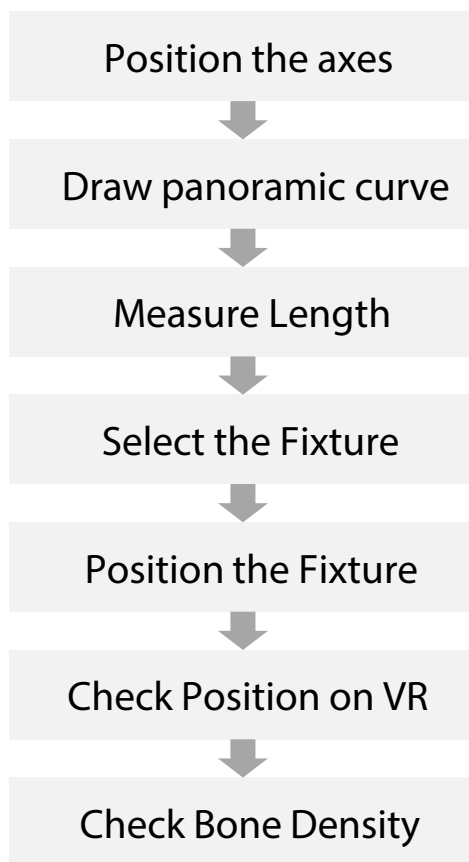
One Click Sectioning Simplifies the whole process.



On volume panorama(It's 3D!), there is a navigator box. **Just position the box!**
 Then the sectional images of the ROI will be shown below. That's it!
 It removes the process of adjusting axes and drawing the panoramic curve.
 Yes, right. You don't need to try to understand complicated axes anymore.
 Let's compare conventional and current process in detail.

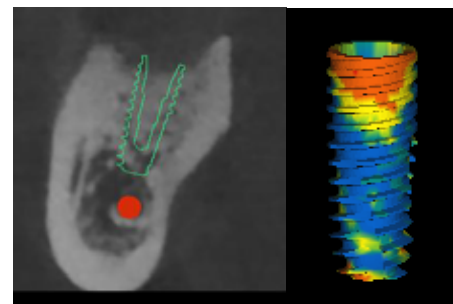
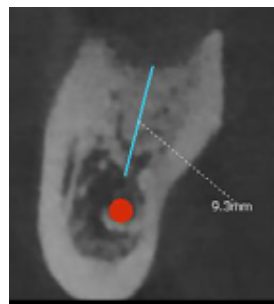
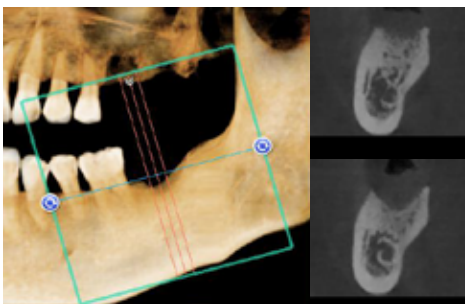
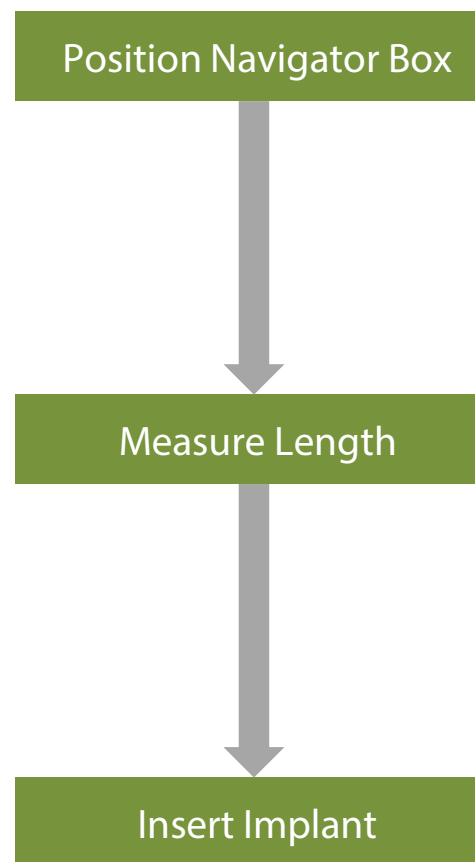
One Click Sectioning Simplifies the whole process.

[Conventional Process]



Vs.

[Ez3D-i Process]

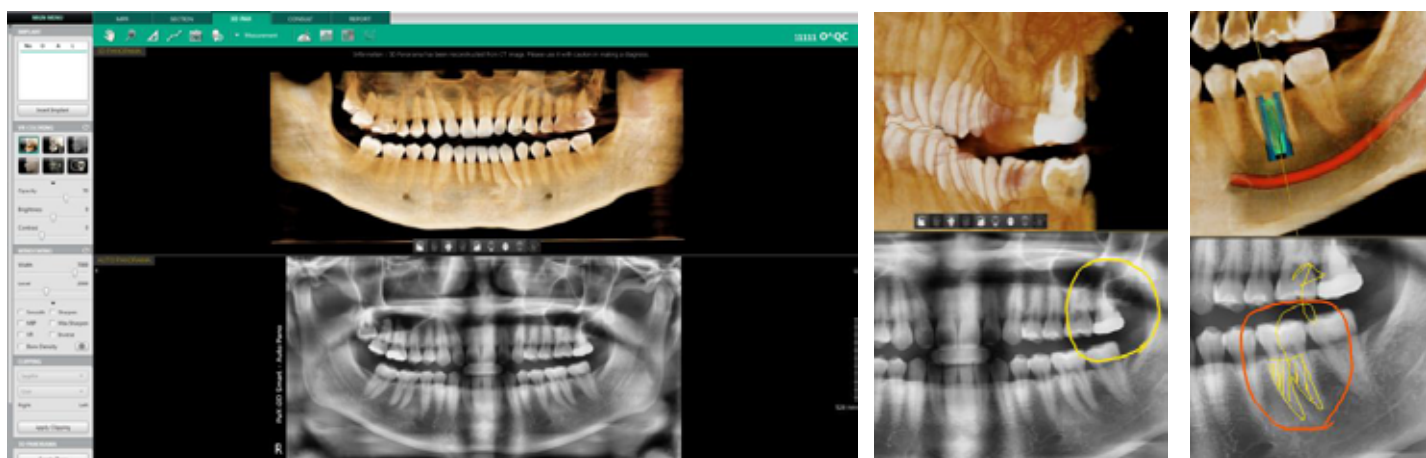


Save time with this simple workflow and see more patients.

Change the paradigm of Diagnosis & Consultation

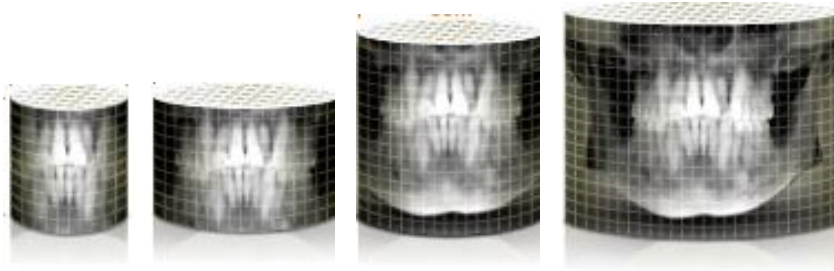


The panorama image you saw in previous pages is not 2D, it's 3D image.
For you who are accustomed to 2D, Ez3D-i stretches the volume.
As it is 3D, it provides you accurate information on anatomy, also as it is 2D, you can verify the condition of dentition at a glance.



When your patients get a scanning PaX-i3D Smart gives you two image; 2D Panorama and 3D Volume. What's greater thing is you can see both images in one 3D viewer together.

We call that 2D Panorama image **Auto Pano**. Do a quick diagnosis first with Auto Pano and examine closely where you are interested in. Also it will be very helpful when you have consultation with patients.



“Buying small FOV CT looks good choice.
It has reasonable price and it can be enlarged with stitching.”

Is that right?



Of course small FOV imaging machine is inexpensive than large FOV ones because normally FOV size is determined by the size of detector.

However, until when you do single implant surgery only?

To maximize your income, it is important how many patients you see, but if you can do multiple implant surgery from one patient, it will be more efficient. Even if you purchased small FOV one now, someday you will upgrade and it absolutely will make you invest much money.

Then, you might consider double scanning to enlarge the image called ‘stitching’.

Do you really think you can have large image from stitching?



Stitching Technology causes...

- ✓ Double Time-consuming
- ✓ Unnecessary X-ray exposure
- ✓ Possible to image imperfection

Image stitching is the process of combining multiple small images with overlapping fields of view to produce a large single image.



Double scanning means scan time will be double and it means your time to see other patients will reduce.



Stitching has no choice but to require overlapped area for accuracy. It means patients be under over dose.



One of processes is image registration. Matching each point cannot be sure perfect all the time.

It will be concluded to
bad impression to patients



“Is FOV **8x8** really enough?”

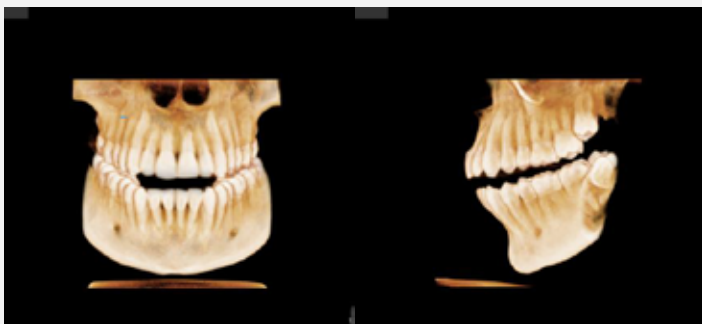


With FOV 8x8,
it's not possible to take
full arch image.

Normally it requires you to choose one capturing mode; capturing area. Every time when the area is changed, your staff need to change the position.

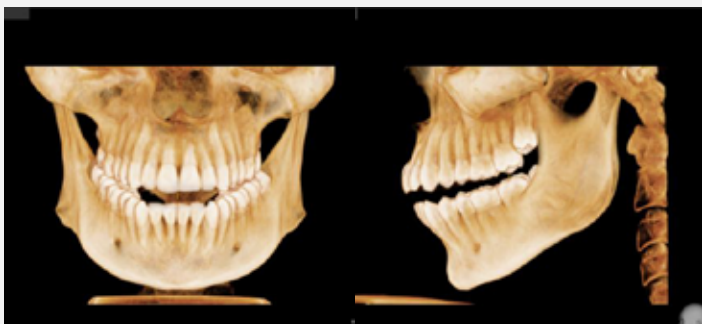
Not just that.

As it does not cover the full arch you will have **limitation on your diagnosis range.**



FOV 8x8

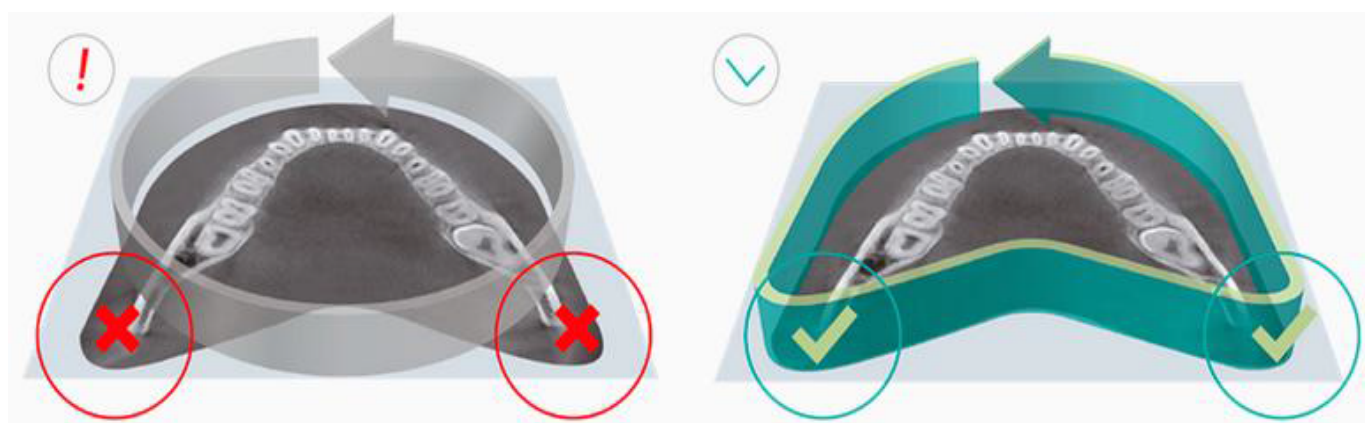
Surgical guides
Complex extractions
Bone grafting



FOV 12x9

Surgical guides
3rd Molar extraction
Sinus lifts for both sinuses
Oral and maxillofacial surgery for mandibular arch reconstruction

Find Hidden Area with Anatomical FOV, 12x9



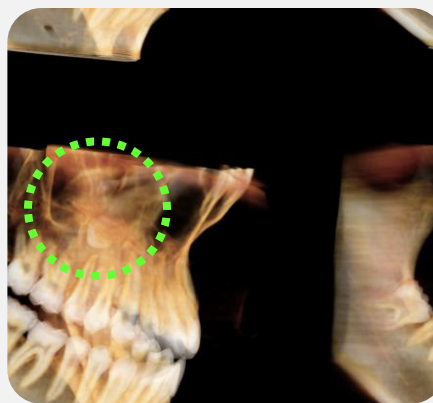
Arch-shaped volume show the dentition of FOV 12x9

Normally, a FOV 10x8.5 image shows tooth #8. However, when the tooth is lying on its side, there is a high possibility that the tooth will be cut out of the image.

With this image, it is not possible to check the correlations between the tooth and the mandibular nerve and increases the risk of medical accident. As you cannot expect which patient would visit your clinic, it is good for you to have CBCT which guarantees to show the hidden-possible area.



Current FOV 10x8.5

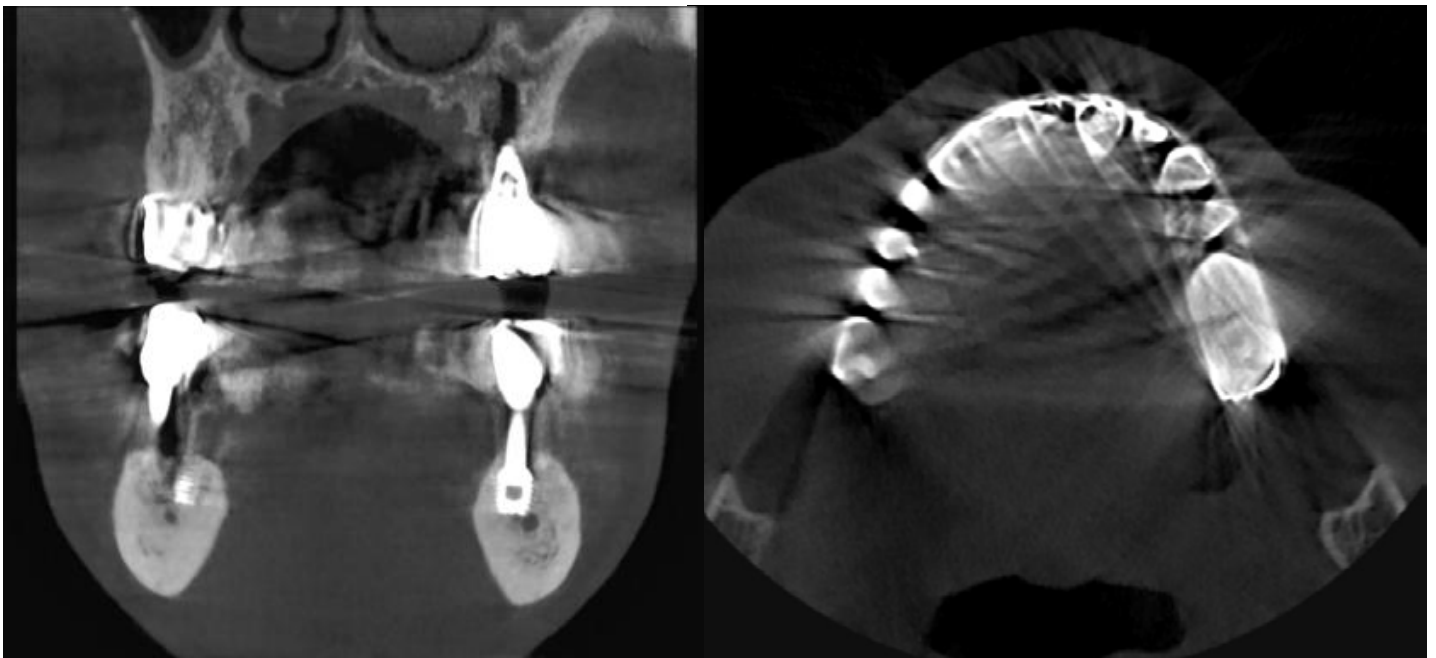


**Anatomical FOV 12x9
PaX-i3D Smart**



“I feel I’m losing diagnostic confidence”

Normally, patients who are considered to take a CT for implant treatment might have some or many metals in their mouths. In this case, **what is most disturbing you?** Can you make a diagnosis with these kinds of images as below?



You might want to diagnose with a 3D image that does not get affected by metal artifacts. That is why many imaging manufacturers develop the Metal Artifact Reduction technology. But in reality, still many practitioners are challenged by unclear and affected image by various types of metal in patients’ mouths such as prosthesis, implants or dental fillings.

In effects, Metal Artifacts...

- ☒ Produce **dark bands or streaks** on images
- ☒ **Hinder visualization**
- ☒ **Reduce diagnostic confidence**
- ☒ Lead making **misdiagnosis**
- ☒ Making it **difficult to merge 3D and STL data**

As Dr. Todd says, even though you can avoid small amount of artifacts spending some time and energy, it is not the case always happened. Sometimes you might have to tell your patients "Oh, you have lots of metals in your mouth, so let's take a CT one more". Although the patient is not sensitive to radiation, taking a new scan will be troublesome work to your staff and it takes up your time to see other visitors.

**If you have ever considered using surgical guide,
it is hard to have benefits below.**

- Simplify workflow of surgery
- Reduce possibility of accidents
- Reduce visiting count and consultation hours
- Reduce operation time and inconvenience of patients

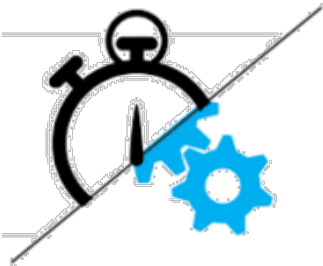


Be Confident with MAR Solution



This metal artifact reducing solution is much developed than before. The accuracy to figure out metals and high-density anatomies such as enamel is higher. It finds out real metals more delicately. It means the side effect resulted from misrecognition is reduced.

AUTOMATIC



Before this solution, users are required to control the on or off of the MAR function case by case. But sometimes it brings mistake and it results in side effects on the image quality.

In contrast, the clinicians using PaX-i3D Smart do not need that. **The algorithm automatically makes decision** applying the solution or not.

High Accuracy to Apply MAR Solution

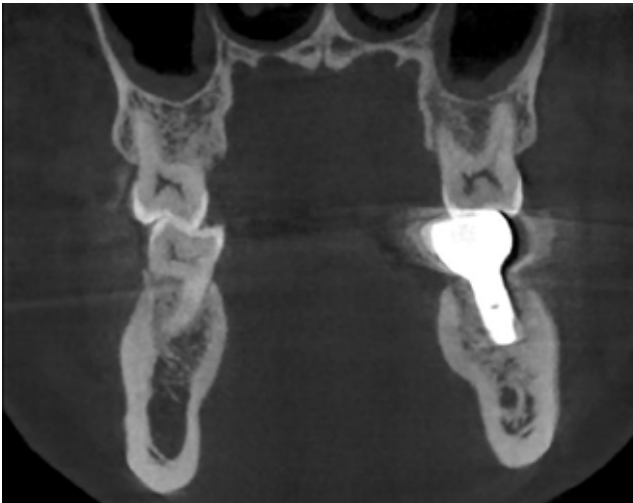
Clear image gives you less stress and more confidence
Leads to accurate diagnosis for implant planning
No extra discomfort to create surgical guide



Streamlined Workflow

It automatically activates the function based on patients' dental conditions

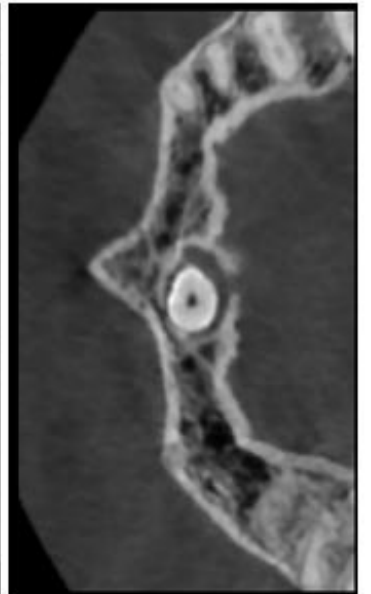
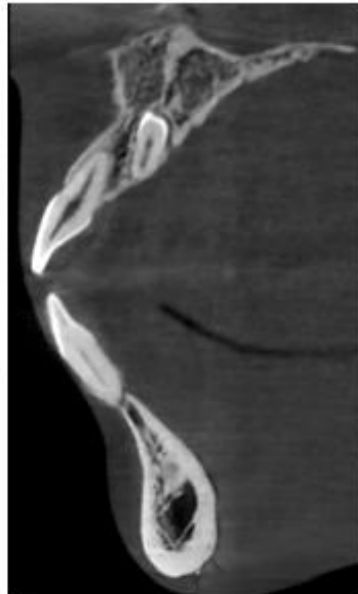
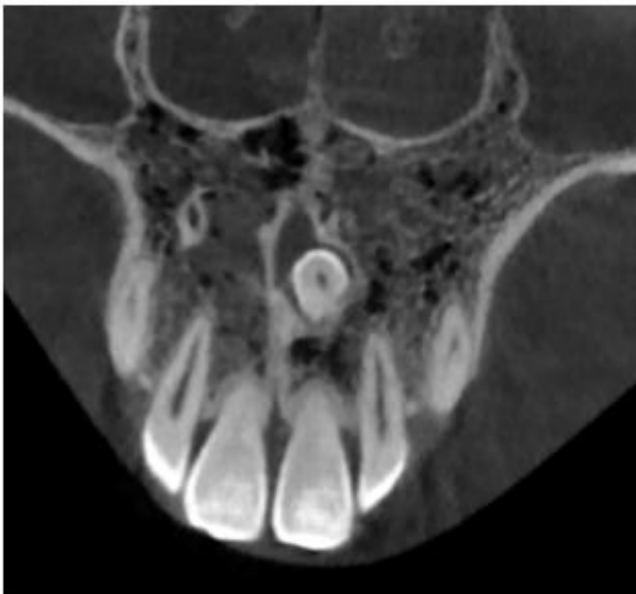
Compare images; SMART MAR **Off** vs. SMART MAR **On**



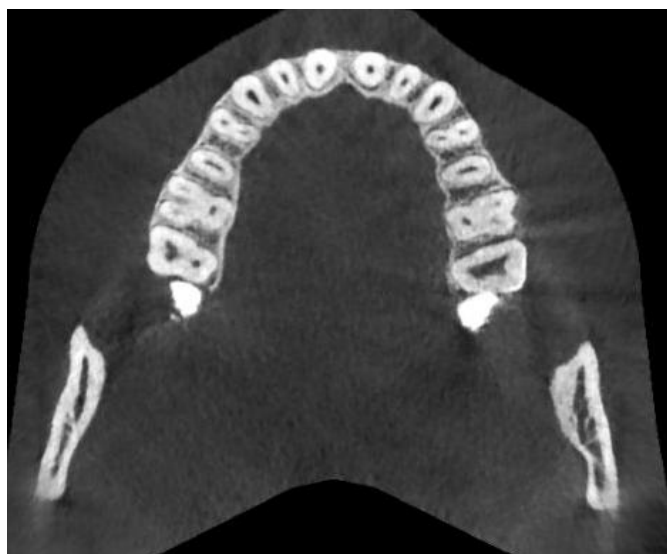
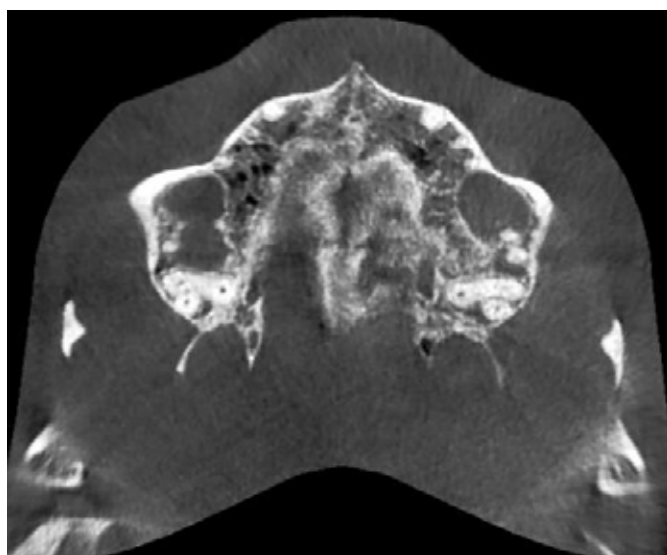
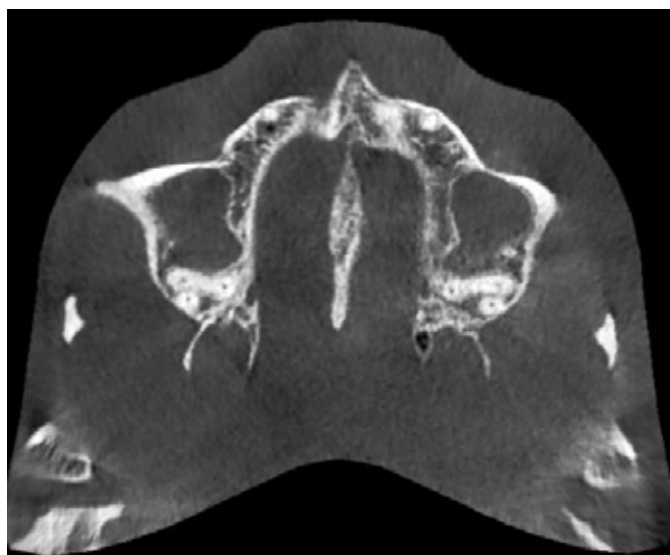
This is No.1 Point to Check ; Image Quality

There are quite many things you need to check before purchasing 3D. But the most important factor is, after all, image quality.

Low Dose Mode 95kV / 8.7mA / Scan Time 18sec. / 0.2voxel



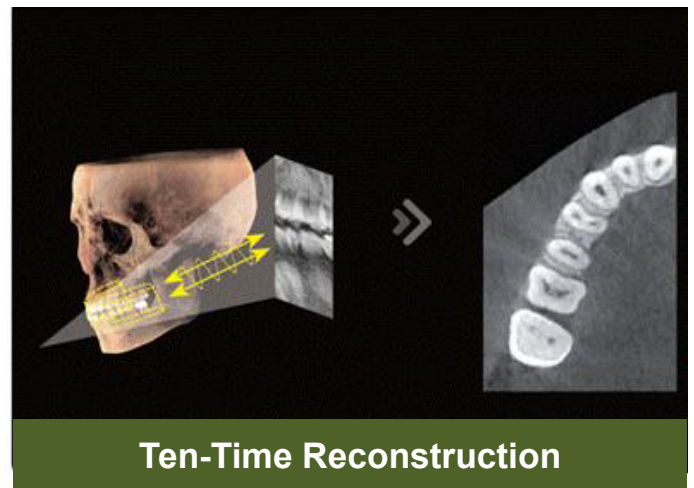
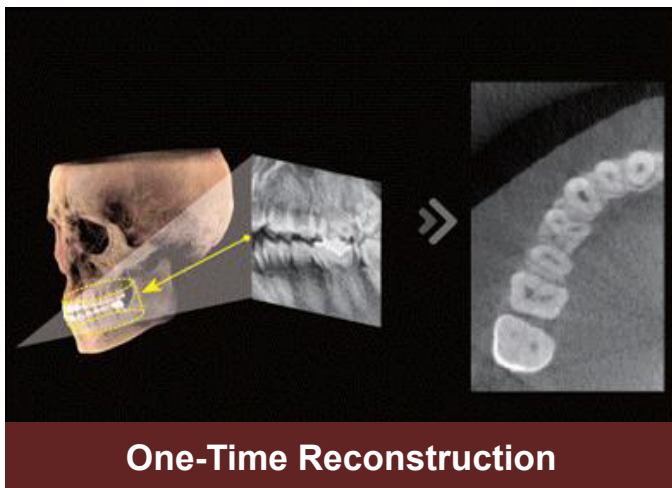
Ultra Low Dose Mode 80kV / 5mA / Scan Time 18sec. / 0.2voxel



Key to Clear Image Quality

VATECH's SMART Iterative reconstruction

VATECH developed this conventional reconstruction algorithm into smarter way. It repeats the reconstruction process about 10 times and it produces high quality of the image as a result. Under the same exposure condition, the image reconstructed using this solution has better quality with the reduced noise and emphasized contrast.



Hybrid Sensor with Small Pixel Size



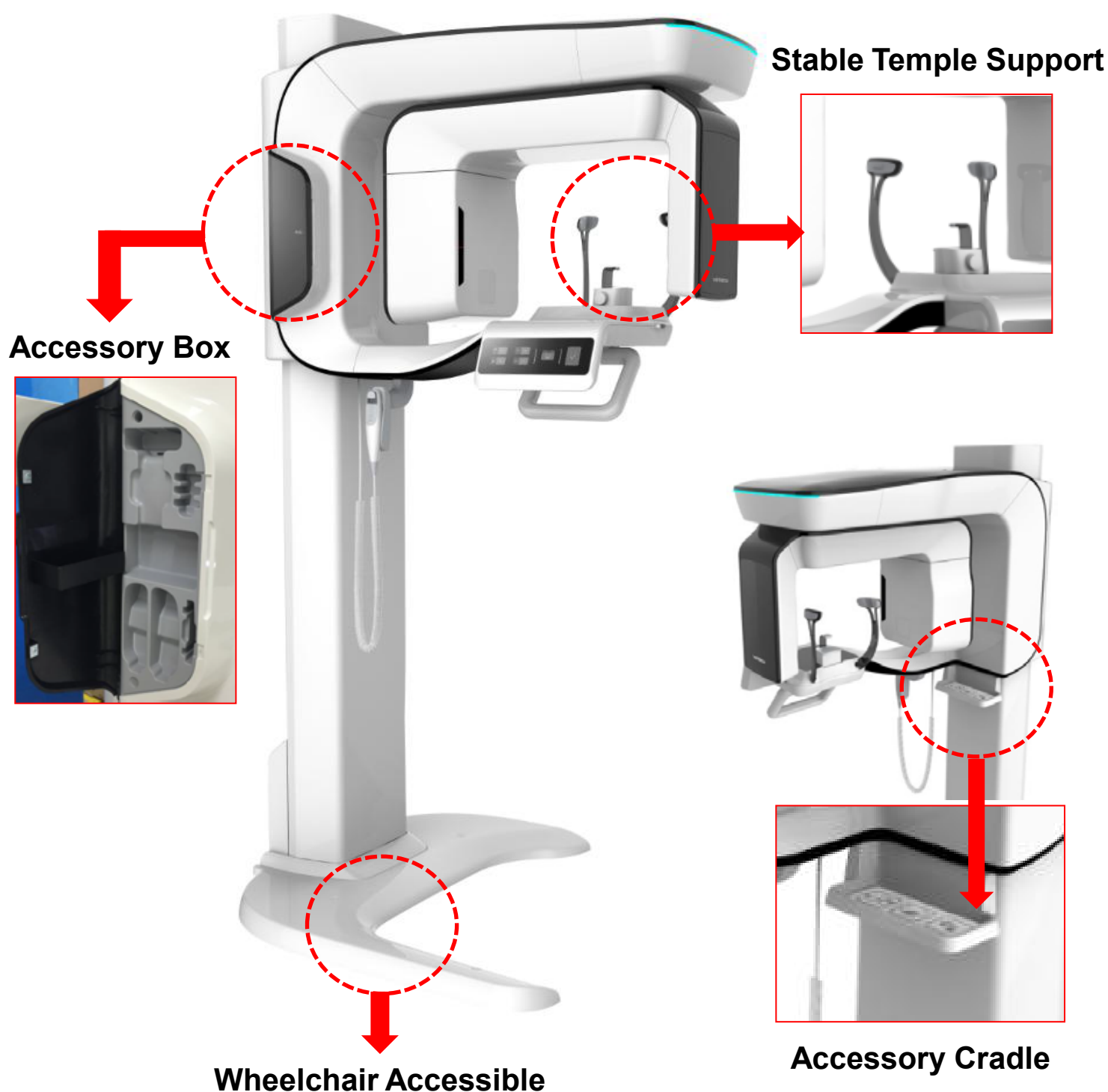
PaX-i3D Smart utilizes **49.5 μ m** high resolution X-ray sensor. With the latest 49.5 μ m pixel size in X-ray sensor, it is the smallest pixel/high resolution dynamic X-ray sensor for CBCT available on the market.



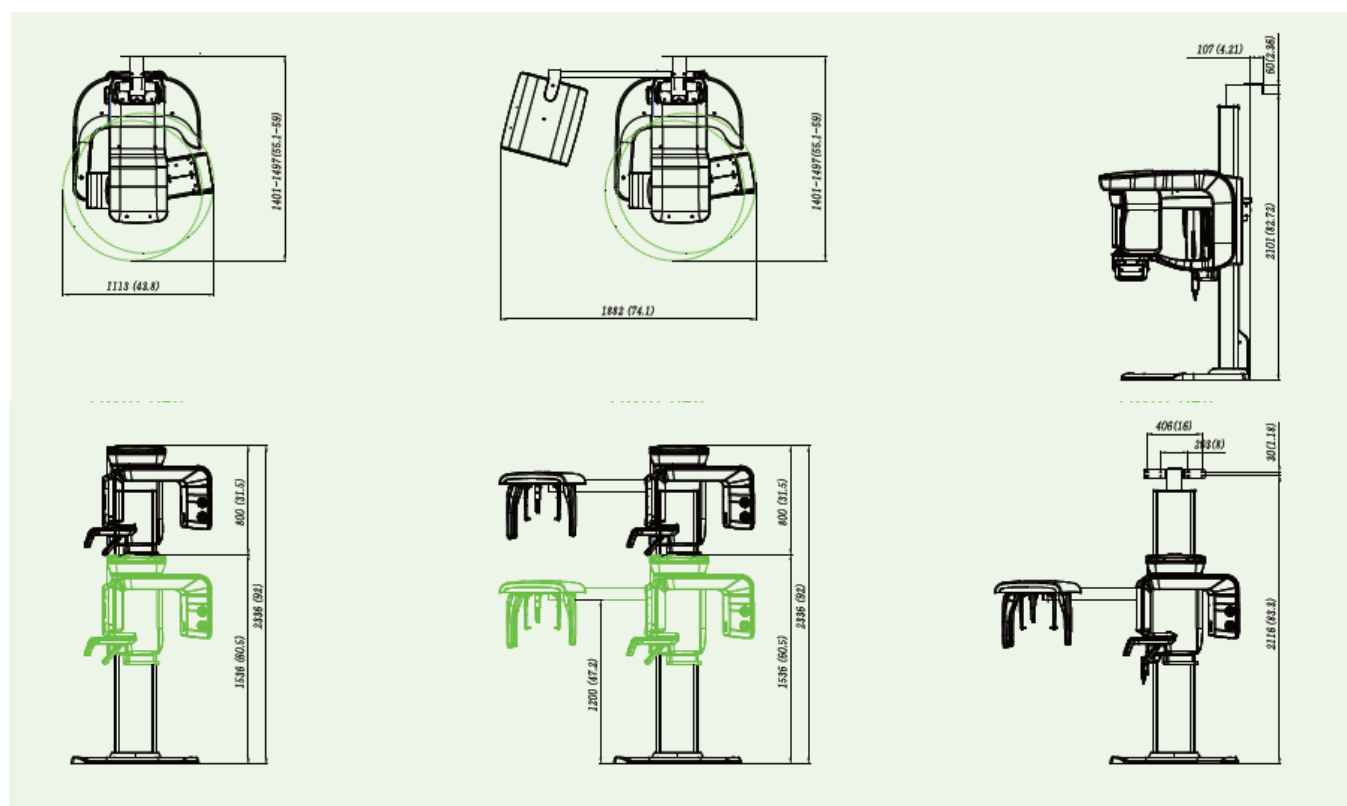
This hybrid sensor is one of the factors to make the image quality fantastic. Physically the smaller the sensor size is, the better the image quality will be. In addition, because of this slot-scan, it reduces X-ray scattered too.

Added Values...

PaX-i3D Smart has not just state-of-the-art features but also user-friendly design. Black and white color will create modern atmosphere in your clinic and detailed structures will help staff utilize PaX-i3D Smart very handily.



Dimensions [Unit: mm]



Specifications [PHT-30LFO]

Function	CT(with Auto Pano) + PanoCeph	
Focal Spot	0.5 mm	
CT FOV Size	Adult	10x8.5 cm
	Child	10x7 cm
Voxel Size	0.2 mm/ 0.3 mm	
Scan Time	CT	18.2 sec
	Pano	13.6 sec / 7 sec (Optional with Magic PAN)
	Ceph	Scan: 12.9 sec / OneShot : 0.7 sec
Gray Scale	14 bit	
Tube Voltage / Current	50~99kVp / 4~16mA	

Appendix. 1 What is Auto Pano?

You might have questions in your mind such as...

How PaX-i3D Smart produces Auto Pano with one scan?

Does it have enough image quality for diagnosis?

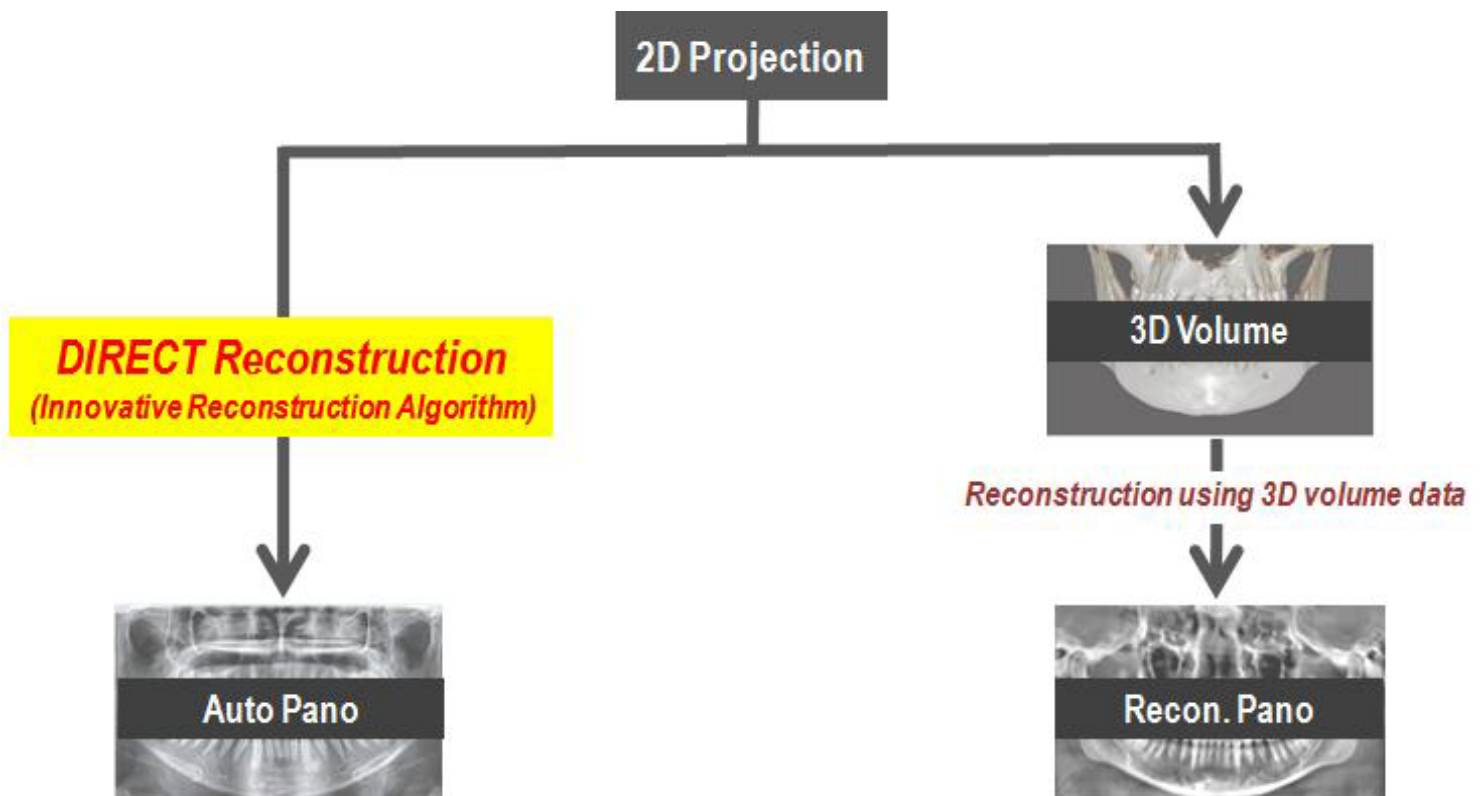
What extra benefits does it have except for radiation and workflow issue?

"As far as I know, 3D viewer can create reconstructed panoramic image. Is it different from Auto Pano?"

Yes. It is totally different.

Auto Pano images are produced from raw data which is acquired during CBCT data acquisition. This process is done separately with 100 μm pixel size before reconstruction of 3D volume. It is very similar way to acquiring real conventional Pano and Ceph images. It is the result of innovative technology of New VATECH algorithms.

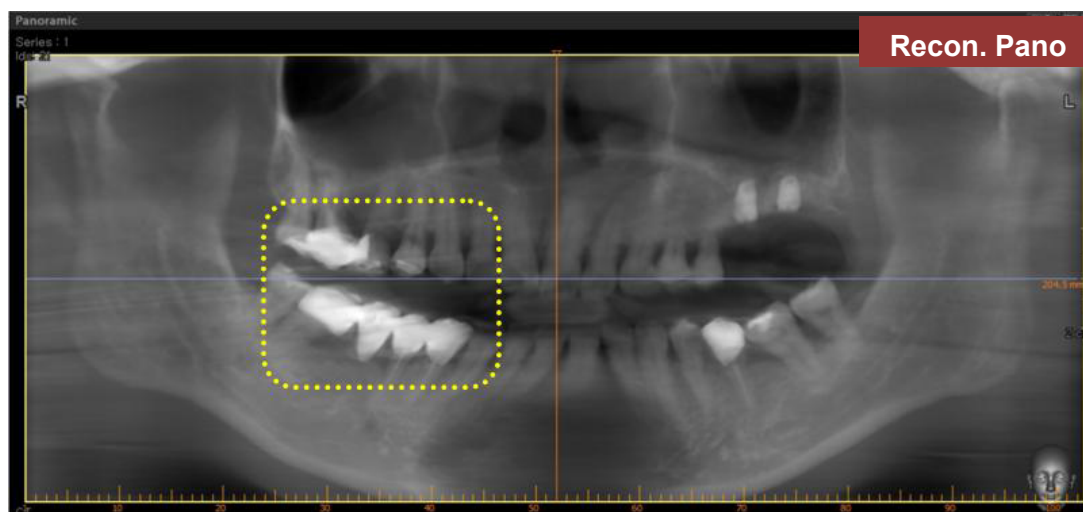
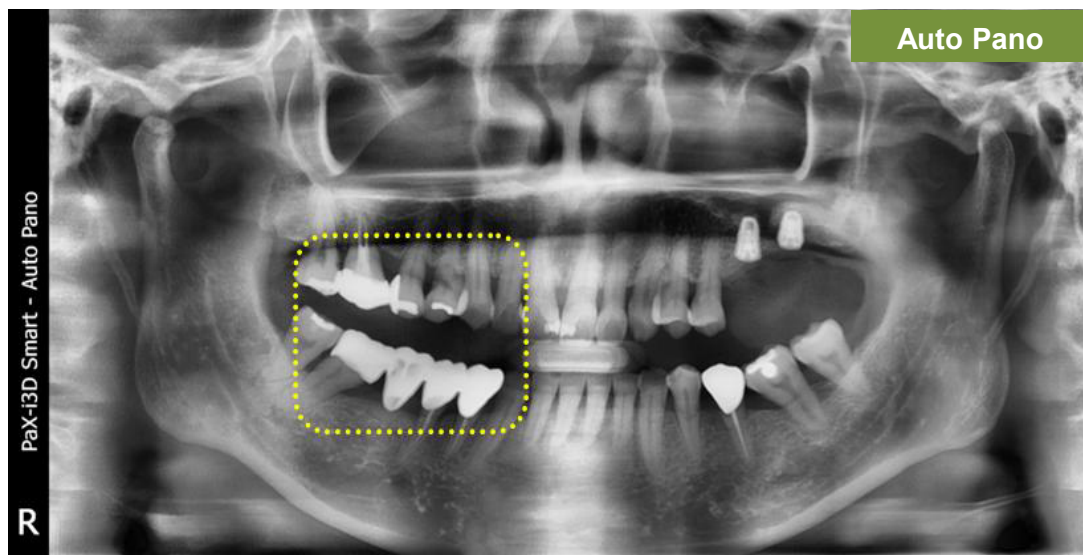
On the other hand, Recon. Pano is literally “reconstructed” image from 3D volume data. As it is reconstructed with fixed level of voxel size such as 200μm, the resolution cannot be greater than what CBCT image has.



Appendix. 1 What is Auto Pano?

The different process of Auto Image and Recon. Image makes different results as below.

	Auto Image	Recon. Image
Image Quality	Higher resolution	Lower resolution
Metal Artifact	No metal artifact	Seen in CBCT image
Image Size	Same size with real conventional panoramic image	Limited image size in 3D volume size (FOV)



Appendix. 2

SMART MAR

VATECH's SMART MAR Technology

VATECH's MAR Solution addresses those problems resulted from metal artifacts. This metal artifact reducing technology finds out the location of metals when radiation is exposed. And it deletes the metal in projection data artificially and fills that part with the similar values to surrounding area. At the same time, it remembers the original location and status of metals and then it inpaints the area with new value which has no streaks.

Refer to the [Figure 1] below will help you understand easier.

The numbers in the box is the values of the image. '2' is the value of dentition area and '9' is metal area. VATECH Algorithm erases the metal, so '9' becomes '0'.

'0' area is filled with '2' and it remembers that locations as metal 'n'.

Then, it replaces '2' to '9'.



This algorithm absolutely is approved than *previous solutions with high probability to find out real metal; 70% to more than 90% and the high accuracy to inpaint the values.



Thank you.

