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Digital Panoramic Radiography: Improving Efficiency in Patient Care

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What makes some practices sparkle, while others may be comfortable for the dentist but look like drab, gray, old clunkers to patients? Part of the practice sparkle comes from the judicious, prudent integration of new technologies that have sound, proven track records. Digital panoramic radiography is now such a technology.

When I graduated from dental school in 1977, panoramic x-rays were still considered to be "screening tools." The gold standard was the 1-inch intraoral x-ray. But times have changed. Panoramic radiography is now considered to be a minimum standard of care for orthodontics, oral surgery, and implantology. With the development of digital panoramic radiographs and the price reductions of volume sales, many general dentists have discovered they are no longer an adjunct. Digital pans have become a primary diagnostic tool and the new gold standard for restorative dentistry.

This article describes how my digital pan benefits both my patients and my practice. It also makes the argument that a digital pan is the first and most important purchase a non-digital office should make as it moves into digital radiography. Lastly, it illustrates why digital radiography is now better than conventional film technology (Sidebar).

Patient Benefits

Let's face it: patients hate x-rays! They make the patient gag when you take them, they cost a lot of money, and a patient can never see whatever it is that you tell them you see when you hold that little piece of plastic up to the big view-box in the ceiling. To help counter these innate prejudices in new patients, I always do an exam before I discuss any x-rays. During the clinical exam, I ask patients about the last x-rays they had and how recently they had "the big one that goes around your head."

Most of the time, they have never had that one, only the "little old-fashioned ones you gag on."

Figure 1. *Dr. Jason Chen can co-diagnose Julie's dental treatment while his assistant, Tiffany, enters treatment plans and notes or schedules appointments using the handheld iPAQ, which is wirelessly connected to the office practice management software.*

Figure 2. *Although this image is not as clear in print as it is when displayed on a good monitor, you can see the extent of the dental problems, including the caries on the mesial of tooth No. 18 and the early enamel mesial caries on the magnified section of tooth No. 31. Note also the contrast between the enamel and dentin at the DEJ, the hallmark of good diagnostic capability.*

After the clinical exam, the first and sometimes the only radiograph I order is a digital pan. Because it is on the screen just a few seconds after the machine stops moving, I can immediately "co-diagnose" with the patient using the 19-inch image (Figures 1 and 2). They look over my shoulder as I "tune" their image and show them all the things I am checking for: caries, calculus, periodontal changes, TMJs, sinuses, periapical lesions, signs of osteoporosis, extra teeth, impactions, soft-tissue calcifications, and carotid artery atheromas. (An additional discussion of how I handle medical referrals for the things I find on pans can be found at PaperlessDentistry. com.) It does not take any longer to "co-diagnose" an image with the patient watching, and he or she suddenly begins to realize just how my office is different. I have shown them things that no one else ever has. If I need any supplemental images, I can show the patient the reason why. I was surprised to find that because of the clarity of software-enhanced digital pans, I need additional small images only about half the time. In other words, for a new-patient examination, the digital pan is the only image I need in about 50% of the cases. I always emphasize that all our images are digital, so they expose the patient to

much less radiation for the diagnostic information we get. Usually I don't have to show patients the "penny" example (Sidebar Images 1 and 2), because they can watch me enhance their own image and bring out details right in front of them. While every patient is unique, all have exactly the same comment: "Wow!"

So that patients don't forget just how wonderful my office and my digital radiographs are, I print a paper copy of their pan, circle the areas of concern, and give it to them to "take home and put on your refrigerator!" When I "recapitulate" their needed treatment at the end of my exam,

I also remind them of the benefits to them of digital radiography: more diagnostic information with much less radiation, increased comfort, and faster results. I also repeat that should they have to see another dentist, I can encrypt and e-mail all of their images anywhere in the world in just minutes. And of course, we never charge to duplicate and "mail" images for our patients.

Practice Benefits

Those are great benefits for the patient, but how about the benefits to the practice? First and foremost, as you have seen, digital panoramic radiographs tremendously increase communication and credibility. "Inform before you perform" becomes much easier. Patients can actually see the place where I recommend an implant and just how much bone is available. On their paper printouts, I routinely circle caries, draw in the vertical bone height, and draw a second line showing the results of an untreated periodontal infection. I encourage people to ask questions, not only so they understand, but also because it engages their attention. If I refer the patient to a specialist, I always try to e-mail the encrypted image and ask the specialist to e-mail back any images he or she takes. This is much faster for both my office and the specialist's office. If insurance companies want images to document procedures, we print the pan for them on our laser printer. This costs only about 3 cents and is universally accepted for billing purposes. (The laser printer produces a fast, "insurance-quality" print, but we print "photoquality" prints on our inkjet printer for other dentists. "Photoquality" prints cost about 50 cents and are far superior to and cheaper than duplicated wet films.) Because all our images are digital, our employee costs for handling information is greatly reduced compared to our previous paper-and-plastic-based information systems. All that time employees previously spent searching for, refiling, and rummaging through paper charts can now be much better spent in direct patient contact.

My staff can take a digital pan in about 2 minutes, and I charge the same amount as I did for a FMX. (The intraoral digital salespeople love to tell you how much money you save on staff time over a film-based system. Ask them to give you a call back when they can do a FMX in less than 2 minutes!) Because my digital pan is part of my total paperless office, we are much more efficient, and this has significantly lowered my overhead. And speaking of money, many insurance companies do not have the 3- or 5-year restrictions on panoramic radiographs that they impose on full-mouth series. Of course, I don't let an insurance company dictate my treatment recommendations for patients, but when I can get an insurance company to pay for a procedure rather than the patient, it makes me smile!

The Cost

OK, so now you see how a digital panoramic machine is better for patients, enhances credibility, improves patient education, makes billing insurance companies easier, and makes the whole office run more efficiently and thereby lowers overhead. Now "the rubber meets the road." How much does it cost and how do you justify the expense? Well, there is more good news! Some extremely good digital pan systems are available for about $30,000. I calculated that our digital pan paid for itself in less than a year. This is certainly not an insignificant amount of money, but it is not really more expensive than many intraoral digital systems if you must add operatory computers. In some cases, older x-ray tubes do not generate good intraoral digital images. Buying new x-ray tube heads for each operatory is another expense that is entirely avoided with a digital pan. Think outside the box: a digital pan can provide a less expensive, faster, and easier way to add digital radiography to the services you provide to your patients.

You do not need to replace your office management software when you get your digital pan. Most digital pan systems will bridge with most practice management software. And unlike many intraoral digital systems, you may not even have to buy any new computers. Most digital pans will work with most computers sold in the last few years that run Windows XP. Some digital pans can connect as a simple network device using standard wired or wireless Ethernet. Others require a direct connection with a special cable to a nearby but not dedicated computer. In other words, that computer can do lots of other things besides talk to the digital pan. Most companies selling digital pans also have intraoral sensors available for their systems so you can easily add these at a later date. As a caveat, however, keep in mind that many companies selling intraoral digital sensors do not have digital pans available. To have the most long-term compatibility, pick the digital pan first, then the intraoral system. I think it also makes more financial and clinical sense to purchase a digital pan first, and then add digital intraorals later. This way you can immediately add capabilities and advantages you do not now have and replace your older existing film-based intraoral system when your film processor dies. "Going paperless" is most easily done like eating an elephant ... one byte at a time!

Because it allows you to see much more with significantly less radiation, a digital pan is better than almost any other diagnostic tool we currently have in dentistry. It provides clear patient benefits while improving overall office efficiency and lowering office overhead. It adds all the advantages of digital radiography to a nondigital practice and pays for itself in a very short time ... often less than a year. And a digital pan's high visibility with patients adds to the sparkle all successful practices need to grow and to thrive.

Acknowledgment

Sidebar Images 1 and 2 courtesy of Kodak's Dental Systems Group. Sidebar Images 3 and 4 courtesy of XDR/Cyber Medical Imaging.

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Why Digital Is Better Than Film

By Bruce A. Stephenson, DDS

We have all seen a dog-whistle, but none of us have heard a dog-whistle. The frequency of a dog- whistle is out of the human hearing range. We have all seen a film x-ray image, but none of us have seen all the information contained in that image. The human eye and brain can only differentiate about 40 levels of gray, but an x-ray image contains many "invisible" shades of gray that potentially contain significant diagnostic information. Even the lowest resolution digital x-ray image, an 8-bit image, contains 256 levels of gray.

Look at the round disc in Image 1 of this sidebar. You can hold it up to a "hot light," rotate it, squint at it, or manipulate it any physical way imaginable, but it is still going to look like an opaque, round disk. But if you let computer software manipulate and enhance the same image (sidebar Image 2), a lot more information becomes available to your eye and brain. It becomes obvious that the round disk is really a Lincoln penny. Good digital radiology software allows you to "hear" the dog-whistle: it displays the "hidden" information in an x-ray image and extracts more diagnostic information than is possible with film.

Look at the caries on the distal of tooth T (sidebar Image 3). Now look at the same area on the software-enhanced image (sidebar Image 4). The caries is much easier to see. More importantly, look at the dento-enamel junctions (DEJ) on teeth Nos. 30 and 31 in the 2 images. Notice how the contrast in this area, in these ranges of gray, makes it much easier to differentiate the enamel from the dentin in the software-enhanced sidebar Image 4. Because caries appears radiographically in this same gray range, looking at the clarity of the DEJ on any dental image is the best way to judge the ability of that image to reveal caries. Image 5 in this sidebar is a clear image but has insufficient contrast in the DEJ gray range to see caries. Insufficient image contrast, not lack of clarity, detail, or line-pairs, is the primary defect in most digital radiology images.

Some dental radiology software has "Yoon

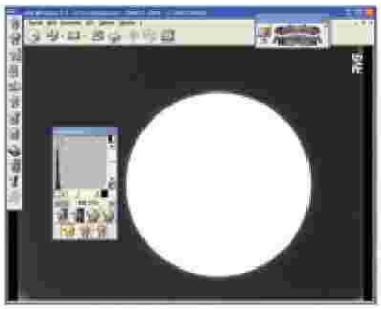

Image 1. *Once it is exposed and developed, a conventional film image is "fixed," and little additional information can be extracted by manipulating the film.*

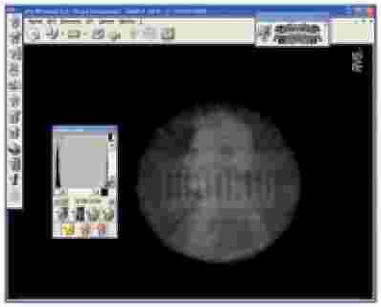

Image 2. *Good radiology software can easily manipulate a digital radiograph so the additional hidden information can be seen. This is why software is more important than sensors!*

Buttons" (visit PaperlessDentistry.com for more on Yoon Buttons and digital radiography) that make it very fast and easy to switch between an image enhanced to show caries and another image enhanced to show soft tissue and periodontal bone levels and quality. You can see the Yoon Buttons in the enhancement toolboxes to the left of the x-rays in Images 1, 2, and 4. Not all brands of radiology software have Yoon Buttons, but when they are available, they make the extraction of diagnostic information much faster and easier. Digital radiography uses less radiation, is less expensive, is much faster and easier to use, and provides much better patient communication than film-based x-rays. All good reasons to switch. But the most important reason to switch from film to digital radiography is because digital allows you, the dentist, to get much more information than will ever be possible using film. The real bottom line is that seeing more information allows you to provide better patient care. Good radiology software makes the "invisible" visible! You can hear the dog-whistle!

Image 3. *Note the caries on the distal of tooth T and the difference in contrast at the DEJ on teeth T, 30, and 31.*

Image 4. *A single click of a "Yoon Button" makes the caries on T much more evident by enhancing the contrast of the DEJ.*

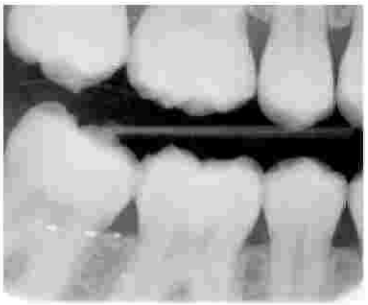

Image 5. *This image appears sharp, but "washed out." You cannot easily see the DEJ, and there is insufficient contrast to detect any caries.*