



# Imaging

## Updating digital photography: what to buy and how to use it

Jack D. Griffin Jr., DMD, FAGD

**T**he office basement has little room left in it due to the technology “gotta-haves” that are no longer being used by my team. Some of this “junk” is a collection of photographic equipment. Normally I wait until others waste their money on something new before I buy, but sometimes I just can’t help myself. After almost 20 years of dental photography, I could probably retire selling these things on eBay®.

Digital photography has changed so fast that it’s hard to keep up. The feeling that I just spent \$1,000 on some gadget that will be out-of-date next week is similar to seeing the postop X-ray and seeing a 3 mm endo overfill. It seems we are at a level of technology where there will be far fewer dramatic enhancements over the next several years.

The quality of digital images has advanced proportionally to the level of dental artistry we achieve today. They have become comparable in quality to what many of us



**Figure 1 — Despite the great advances in digital camera systems, the standard is still film cameras with macro lenses and ring flash.**

experienced with slide film and greatly surpass it in ease of use, storage, and speed. Getting rid of all those mounting sleeves, carousels, and archive boxes was a pleasure for me, but these film cameras are still the standard by which all digital cameras are measured (Figure 1).

### **Beyond megapixels**

It’s easy to get caught up in the marketing megapixel macho race. *Don’t!* We want the best, not the biggest. If bigger is your

goal, Hasselblad (Hasselblad, Gothenburg, Sweden) makes a true 39-megapixel camera with the most advanced color delivery system ever made. The problem is that you would have to sell a couple of operatories and at least one child to afford it.

There are factors that are certainly just as important as pixel count in dentistry. Superior pixels give excellent quality images that are sharp, have no distortion, and show accurate color interpretation. This class of sensors has geometrical accuracy, realistic color, wide dynamic range, low noise, and few artifacts. These factors are all affected by the way the camera, lens, and flash combination work together.

“Pixel” stands for **p**icture **e**lement and is merely a location on a sensor that gathers information. Light goes through the lens, bounces off some mirrors, and hits a photodiode at this pixel site. Here the light energy is turned into electrical energy, which is gathered by the camera and interpreted by its “software” to make an

### **Four major factors that determine pixel quality**

- 1 *Geometric accuracy* — the location and arrangement of the pixels on the sensor which determines “resolution”
- 2 *Color accuracy* — the camera’s ability to “fill in the blanks” between photodiodes on the sensor
- 3 *Dynamic range* — sensors with more accuracy gather more data from each pixel location, basically the size of the photodiode, capturing things you *want* to see
- 4 *Noise* — lower quality sensors capture things you *don’t want* to see because of the factors above

## FOCUS ON: Imaging

image. The spatial arrangement of these photodiodes and how they interpret the light are different for every camera make and type. Having more of these pixels is of no benefit if they interpret data incorrectly ... more *bad* data doesn't help.

### **The photographic equipment**

Purchase equipment that is proportional in quality to the skill level of your work. In other words, if embraces, color, fit, and quality are poor, a point-and-shoot camera with overexposed images printed with a low resolution ink-jet printer will be sufficient. In fact, the poor resolution may hide your defects. If you are showing off great cases done with a quality lab and well-trained staff, then use a camera that

Purchase equipment that is proportional in quality to the skill level of your work. ... If you are showing off great cases done with a quality lab and well-trained staff, then use a camera that will tell that meticulous story.

will tell that meticulous story.

The system is the key. Just chasing the sales hype of more megapixels can leave the practitioner frustrated with dental photography. Consider how the camera, flash, and lens all fit together and how easy it is to consistently capture great images.

A camera with a quality sensor capable of accurate color reproduction, a flash system to correctly light the object, and a lens capable of very close-up images is even more important. Seldom is a 1:1 close-up image used for practice promotion; however, the versatility and quality of these "better" digital SLR cameras cannot be matched

by point-and-shoot compact cameras with regard to shade matching, lab communication, and pathology documentation. PhotoMed (Van Nuys, Calif., [www.photomed.net](http://www.photomed.net)), CliniPix (Wellington, Fla., [www.clinipix-on-line.com](http://www.clinipix-on-line.com)), Doctors Eyes (Vista, Calif., [www.doctoreyes.com](http://www.doctoreyes.com)), and Norman Camera (Kalamazoo, Mich., [www.normancamera.com](http://www.normancamera.com)) can streamline the purchase of these systems and provide needed support.

The following questions are asked repeatedly about the purchase of professional dental photographic equipment.

### ***"Should I buy a point-and-shoot or an SLR?"***

Is it best to have a point-and-shoot camera with an attached lens and flash, or a more sophisticated camera with a separate flash and lens? This is always the first question from someone who doesn't have a digital camera. Basically it comes down to this: If you want the most versatility possible and the ability to capture nuances of individual teeth accurately, then an SLR (single lens reflex) system with a macro lens, ring flash, and quality sensor is the only choice (Figure 2). If you need the camera to merely capture portraits, smiles, and a full arch of teeth, then a point-and-shoot will probably be sufficient.

There is a definite sacrifice in accurate light control, color replication, and the ability to capture fine tooth detail with the compact cameras (Figure 3). The trade-offs in size and "automatic" features of the point-and-shoot are greatly outweighed by the image quality of the other systems. *If you want the most accurate detail in color and tooth character with the ability to communicate those attributes with the lab, to publish, or to teach, there is no choice but an SLR system.*

### ***"Which system is best —Nikon or Canon?"***

Well, everyone has a personal preference, and often the advice being taught is swayed in part by hype, sales pressure, and free goods. The skeptic inside us needs to know these



**Figure 2 — Newer digital cameras approach film in quality and surpass them in ease of use, image storage, and instant feedback of image quality.**



**Figure 3 — Many point-and-shoot cameras are quite capable for portraits and smile shots but rely on bouncing the flash lighting off mirrors while being filtered through plastic to avoid close-up overexposure. This lessens quality and reliability of colors.**

## FOCUS ON: Imaging

factors before considering the advice as objective. (There goes my chance for a Nikon or Canon sponsorship.) Both manufacturers offer quality components that basically work in the same manner with similar setting adjustments and can give excellent results.

The replication of human tissue colors is the key. The more popular “quality” digital SLR cameras are the Nikon D70, D80, and D200 (Nikon, Rutherford, N.J., [www.nikonusa.com](http://www.nikonusa.com)), and Canon RebelXT, 5D, and 20D (Canon, Lake Success, N.Y., [www.canonusa.com](http://www.canonusa.com)). These companies offer systems of components that work well together with the camera, lens, and flash all coordinated to capture better tooth detail. These are more versatile and are nearly as easy to use as their smaller, less accurate, compact brothers.

*Newer is not always better.* Despite high “cool” points, it may be harder for some trendy equipment to offer a noticeable improvement in quality results. Some of the new

Newer is not always better. Despite high “cool” points, it may be harder for some trendy equipment to offer a noticeable improvement in quality results.

lenses feature vibration reduction to reduce blur, and some new flash units are wireless. However, the extra weight makes them more cumbersome and gives no significant increase in quality (Figure 4). An LED flash is nice because there is no flash module on top of the camera, but it is difficult to achieve a suitable white balance for accurate color (Figure 5).

Nikon offers excellent tissue color, grid lines to help in orientation, automatic histogram viewing on each image, and perhaps the most popular macro lens in the history of photography (the 105 mm Nikkor Macro). With Canon, you get a company that makes its own sensors (Nikon’s are made by Sony), a good 100 mm macro lens, a choice to have a sensor as wide as 35 mm film (full frame), and very good skin color replication.

As with all other consumer goods, marketing, support, and sales pressure help determine what people buy. Canon certainly markets heavier in the dental community and also provides more freebies to those who push their products. Nikon, on the other hand, occasionally does goofy stuff like discontinuing the standard of macro ring lights, the SB29s Speedlight, and selling the great D200 and then coming out with the half-priced D80 with the same sensor for less than half the price just a few months later.

So which camera should you buy? Take a memory card to the next dental convention and try the cameras on the exhibit floor. Find out which ones you think are most life-like. Shoot four basic images that are critical for most offices: the portrait, the smile, the retracted view of both arches, and a maximum close-up of the central incisors (Figures 6 through 9). *The camera must be capable in all four of these views.* Assuming the settings used for the cameras are reasonable, there will appear a definite difference in color, clarity, and vitality. Make your choice from there.

### “What camera settings do I use?”

We don’t change anything but camera aperture (f-stop) when taking all of the images we use. Despite owning the smaller cameras, our office uses digital SLR cameras, 105 mm macro lens, and ring flash for all images now. With experience, there is no difference in time or trouble with these cameras. Do all of the light control with the flash setting (a one-time adjustment) and the f-stop (the only adjustment with each image). Leave the camera metering off (TTL).

Two basic settings for these SLR cameras are manual — “M” mode and aperture priority “A” mode. “M” mode allows manual setting of the aperture size and the shutter speed, while “A” allows manual setting for only the aperture. “A” is the mode we shoot in the most, which allows



Figure 4 — At this point in digital development, some advances increase image quality little, if any, and may add weight or hassle to achieving quality images.



Figure 5 — Some new advances in flash lighting change the appearance of the camera, but may make it difficult to get quality lighting and color as with this LED flash.

## FOCUS ON: Imaging

us to control the light entering the camera by opening or closing the hole (aperture) that the light goes through. The closer the camera is to the patient, the smaller hole size we need. The histogram is the basic graph that allows us to check this light input and can be displayed on many cameras during the capture of each image.



**Figure 6** — A full face with smile is the backbone of quality photography. The skin colors should be real and lighting should look natural without being overexposed. The eye color should not be washed out and the individual hairs should be identifiable. The focus should include the nose tip and the ears. ["A" mode, f/6]



**Figure 7** — A full smile should have good lip color with slight glare on most teeth with embrasures easily identified and gingiva of proper color. ["A" mode, f/22]

### *"Where should I buy my camera?"*

Piecing together your own flash, lens, and body is certainly within the realm of many, but the few extra dollars spent for the service of one of the fine medical camera specialists is worth it. When something goes wrong, it is nice to talk to a human being on the phone who can answer your questions. The companies mentioned on the previous page and others can streamline the purchase of these systems and provide needed support.

Take your time and try out several cameras, if possible, before buying. Many of these companies have demos or loaners that can be used at continuing-education courses, dental meetings, and shows. Comparing images on company Web sites may be helpful as well. Another trick is to go to multiple dental Web sites, look at their portfolios, and e-mail them to see what system they are using.

### *"What other equipment do I need?"*

There are several things that make taking quality images much easier (Figure 10). Retractors are mandatory for in-



**Figure 8** — A full intraoral image should show small blood vessels in the soft tissues and the various shades of tooth color. ["A" mode, f/40]



**Figure 9** — The maximum close up, 1:1, should show everything a lab technician should need to match color, texture, and color nuances of the incisal portion of the tooth. ["A" mode, f/51]

## FOCUS ON: Imaging

traoral photos, because they provide soft tissue retraction to get rid of shadows and remove lips from the image. Plastic retractors hold back tissues better than the wire frame types and are sold inexpensively in several shapes and sizes by many dental camera suppliers.

Mirrors also come in a variety of shapes and sizes. The



**Figure 10 — Mirrors and retractors are standard equipment. The black contrastor is optional, but it is critical for shade and tooth character matching for the technician.**



**Figure 11 — For office efficiency, the assistant should have all photography materials ready at each consultation and cosmetic dentistry appointment.**



**Figure 12 — The assistant is critical to capturing great images and helping with background placement, retractors, contractors, and even shades as needed.**

key property about mirrors — other than that they break when dropped — is called *reflectivity*. There is a huge difference in the amount of light mirrors reflect and the color they impart. Ultra Bright mirrors (Doctors Eyes, Vista, Calif., [www.doctoreyes.com](http://www.doctoreyes.com)) have an extremely high level of reflectivity with almost no change in color. Rhodium-coated glass decreases the amount of light reflected and chromium-coated metal decreases light transmission even more. To prevent fogging, heat water in a cup in a small microwave and then place the mirror into it.

For a professional background, a small, felt-covered bulletin board from an office supply store for about \$25 works very well. They come in many colors and provide a mid-tone, nonglare, no-shadow background behind the patient. These boards are light, easy to move, and fit easily behind patients as they lean back onto them while sitting in the dental chair. This aids in efficiency because every treatment room then becomes a photography studio.

The assistant must be trained to have everything ready in the operatory any time anterior dentistry is being done. The camera, retractors, mirrors, and water are as important as a mouth mirror, explorer, and forceps (Figure 11). The assistant also helps place retractors, hold shade tabs, and position mirrors or contractors as needed (Figure 12).

Perhaps as important as any other photography component is extra batteries. Change batteries regularly (we do this every Monday) and have extras on hand.

### **Be a wise shopper**

“What is the best camera equipment?” is like asking 100 people “What is the best car?” In many ways, it comes down to trying before buying and seeing if the colors are what *you* think are the best. The equipment described here can all work well if the staff is trained correctly in its use. The camera is a very efficient way to become a better dentist and to make your practice grow if you choose the equipment and techniques wisely. **DE**

*Disclosure: Jack D. Griffin Jr, DMD, FAGD, has no financial interest in any way with the products, materials, or suppliers mentioned in this article.*

*Dr. Jack Griffin has maintained a full-time practice in St. Louis County, Mo., since 1988. In a very busy practice, his office has consistently maintained a 50 to 55 percent overhead doing all phases of dentistry with an emphasis on cosmetics. The practice is focused on current technologies, materials, and procedures. Dr. Griffin is the head of the Missouri MasterTrack AGD program and the St. Louis area CEREC study club. He also speaks at many study groups and courses. You may contact Dr. Griffin at [Esmilecenter@aol.com](mailto:Esmilecenter@aol.com).*

