

Digital Photography in Your Practice:

Filling in the Gaps

Martin Goldstein DMD,FAGD

I. Introduction

1. Fundamental reasons for processing of digital images in your practice

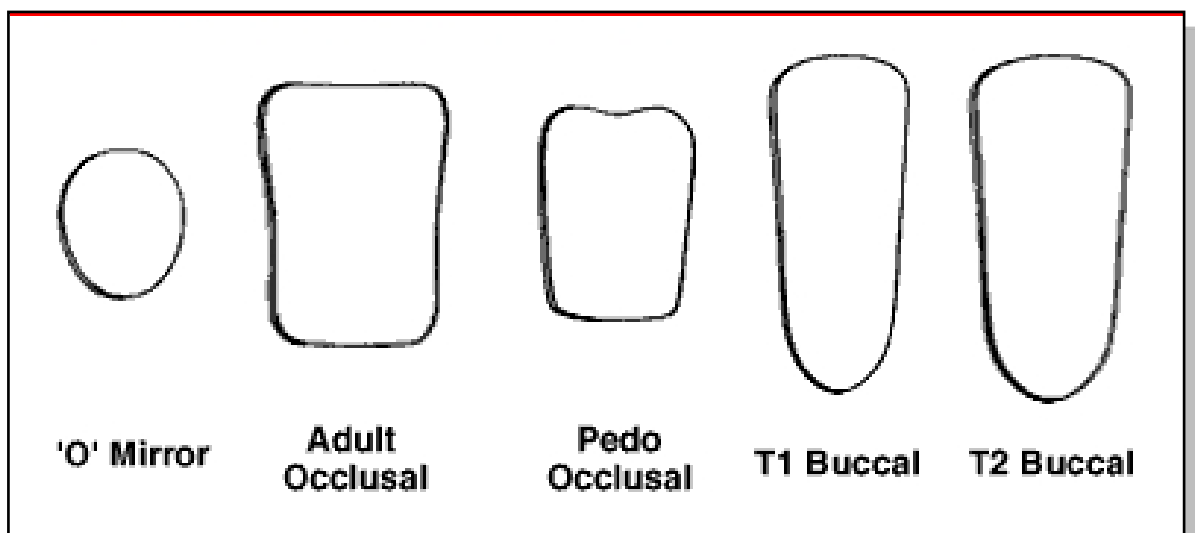
- Educate patients on conditions that they are not aware of
- Enable patients to co-diagnose their own dental issues
- Show patients what the doctor is capable of: **a dental trophy case**
- Third party payment validation (Insurance company inquiries)
- Enables cosmetic simulations for marketing of cosmetic/restorative treatment: Smile Vision
- Documentation of pre-existing conditions. (oral health prior to treatment)
- Multiple System emulation: intra-oral camera, Digital X-ray, Surgical Microscope

II. 1. The digital darkroom

- A PC; the “developing room”
- A digital camera and digital film
- A digital film reader; the conduit to get the images from camera to computer
- Imaging software; allows viewing and editing
- A color printer; allows us to create a hard copy; ink jet vs dye sub printers; current models to choose from

2. Necessary Accessories

- Cheek retractors; steel or plastic; pros and cons
- Assorted mirrors; must have: Adult and Pedo Occlusal, Buccal
- Mirrors can have handles for easier placement
- Contrasters from Photomed for blocking out undesired background
- Extra sets of batteries and battery chargers



Popular mirror shapes.....

III. 1. Camera Basics:

- Single lens reflex vs point and shoot systems: basic differences
- What's a jpeg file?
- What is camera resolution and how does it relate to a CCD or CMOS?
- What is image compression and how does it effect image or file size
- **Aperture Priority:** What is an F stop and how does it effect my dental image?

IV. 1.The Basic Shots to augment the routine dental examination

- Portrait
- Anterior retracted (open and closed)
- Relaxed smile
- Maxillary Occusal
- Mandibular Occlusal
- Quadrant shot
- Buccal shots

The Portrait:



1. Stand your patient against a neutral wall or backdrop and coach proper posture.....shoulders upright, somewhere between attention and comfort....

2. Alter the patients stance so that your lens is pointed in a straight line to the nose that is perpendicular to the plane of the face.....avoid shooting down or up...You may need to crouch....

3 .Distance yourself far enough away from the patient so that the patients face fills most of the LCD viewfinder. This is typically 5 to 8 feet from the patient....Have camera set at no less than F5.6 so as to obtain visually focused teeth. Portrait or auto settings have a tendency to set the F stop too low....

4. Have the patient bare their teeth before shooting so that you can position the center of the view finder on the teeth and press the shutter half way down so as to lock in focus on the teeth....now raise camera to center head in the vertically oriented LCD.... Have your patient assume a relaxed expression, licking their lips

if the lips are dry....(If women have lipstick with them, it helps to apply it....particularly in the "after shot".)

5. Have your patient smile big on the count of three...You smile also....smiles are contagious. Say something funny. Have patient say "hiiiiieee".... (sustained)

6. Use your flash to illuminate the shot....Take five or six shots and check them on the LCD or PC monitor to make sure they are adequately sharp and in focus...

7. Be sure to take a shot with the teeth separated if your wish to have a simulation done. This takes some coaching.

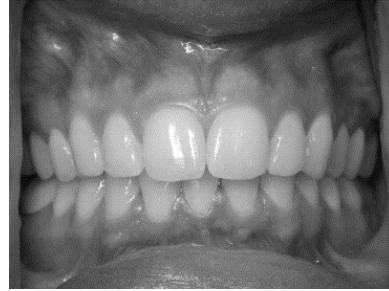
Summary of Portrait Technique

- ▣ Distance: 6 to 8 feet from patient
- ▣ Camera is in auto-focus mode if camera and lens combination allow this
- ▣ F 5.6-6.7 or portrait mode
- ▣ Camera turned vertically
- ▣ Lens perpendicular to the nose
- ▣ Focus on the teeth, (lock focus by pressing shutter release half way down) then frame the face by lifting camera.
- ▣ Have patient say "hiiiieeeeeeee" sustained
- ▣ Take six shots and pick the best one
- ▣ Steady as she goes: count 1....1000 after shutter release

Check for little white focus points

*Consider adding the **portrait accessories** to your armamentarium for professional quality results: Step stool, light diffuser with standard flash, non-reflective background . Photomed's Easy Portrait Kit,Portrait Professional 12.0 software*

Anterior Retracted:



Keep camera lens perpendicular to the buccal surfaces of the incisors while composing shot to minimize superfluous view of tissue retractors and lips. Consider taking an open and closed view. Compose carefully before exposing the image.

- Upper and lower teeth slightly parted
- Show as much gingiva as possible
- Minimize appearance of lips and retractors
- Vertical midline: midline of face
- Horizontal midline: incisal plane of uppers
- Camera 90 degrees to the subject, avoid tilting

The Relaxed Smile:



Include the nose to create a visual reference with respect to facial midline. This image is helpful when needed to assess gingival exposure after having anesthetized patient!!!

- Document the maximum amount of teeth and gingiva shown during a broad smile
- The vertical center is the philtrum of the upper lip
- The incisal plane of the upper teeth should be the horizontal midline of the photo
- Capture any cants or midline discrepancies
- Focus on the centrals and laterals

Occlusal Views:



camera line of sight at 45 degrees to mirror



Upper Occlusal



Lower Occlusal

- Images captured at 45 degrees or more to mirror (the closer to perpendicular to the mirror the better) Mirror held against opposing arch
- Retractors are used to keep cheeks from covering up teeth; pull them up and away for maxillary shots, down and away for mandibular shots
- Mirrors are defogged via blown air or heating under hot tap water
- Important when diagnosing and presenting prosthetic treatment
- More patience is required for these shots.
- Shoot these in front of the patient. They will need mirror rotation in software to orient properly
- The facial surfaces of the centrals should be visible near the edge of the photo
- Minimize mirror edges and lips.
- Patient's nose should be excluded
- Photo should extend from the central incisors to the mesial of the second molars
- Can be taken in front of or behind patient

Details of Basic Exam Shot Taking.....(from AACD Accreditation Manual)

Full Face Frontal View, Non-Retracted

- **Horizontal only with chin near the lower border**
- **Full natural smile, relaxed facial muscles**
- **Patient's nose is the center point, focus on central incisors**
- **Use the interpupillary line and vertical midline of face to orient the camera.**
- **Use a uniform non-distracting, non-reflective background**
- **Take the photo straight on, avoiding angulations**

Full Smile View, Non-Retracted

- **Document the maximum amount of teeth and gingiva shown during a broad smile**
- **The vertical center is the philtrum of the upper lip, focus on central incisors**
- **The incisal plane of the upper teeth should be the horizontal midline of the photo**
- **Capture any cants or midline discrepancies**
- **Focus on the centrals and laterals**

Anterior Retracted View

- **Upper and lower teeth slightly parted**
- **Show as much gingiva as possible**
- **Minimize appearance of lips and retractors**
- **Vertical midline: midline of face**
- **Horizontal midline: incisal plane of uppers. Focus on central incisors**
- **Camera 90 degrees to the subject, avoid tilting**

Maxillary Occlusal View, Retracted with mirrors

- Taken with mirror and retractors
- The facial surfaces of the centrals should be visible near the edge of the photo
- Minimize mirror edges and lips.
- Patient's nose should be excluded, focus on bicuspid
- Photo should extend from the central incisors to the mesial of the second molars
- Can be taken in front of or behind patient

Mandibular Occlusal View, Retracted with mirrors

- Taken with mirror and retractors
- The facial surfaces of the centrals should be visible near the edge of the photo
- Minimize mirror edges and lips.
- Photo should extend from the central incisors to the mesial of the second molars, focus on bicuspid
- The patient's tongue should not hide the teeth
- Can be taken in front of or behind patient

Quadrant shots to zoom in on areas of immediate need:

- direct or indirect with mirrors.

Buccal shots can be taken to demonstrate occlusal relationships or specific restorative or cosmetic needs and or accomplishments.



Folder creation:

1. Right click an empty part of your desk top
2. Scroll down to "new" until it highlights, then click the word "folder"
3. Type in the desired name....ie..."patient images"
4. Click to open the new folder
5. Right click an empty space within the folder and scroll down to "new"
6. Click on the word "folder" and type in an individual patient's name starting with the last name.
7. Repeat for any new patient images.
8. Make it a point to back up this data on a frequent basis
9. Add images to folders by selecting image (left click) (cntrl key held to select multiple images) and using copy and paste commands available by right clicking on the selected images....or by dragging images if the folder is visible on the directory tree on the left of the screen.

Or....

- Use the XP, Vista, or Windows 7/8 Wizard to transfer images to your new folders. Simply plug in your digital film and wait for the XP or Vista prompts. Move your images from the digital media to the folder that you've created for them in advance of your transfer. Select the first choice "copy images to a folder" and begin the wizard. After **clearing the checks**, select the images that you wish to transfer and then indicate the patient folder that you created as their destination. Continue to follow the prompts and Windows will move the images into the folder. Click on Finish when done. Use Thumbs Plus 7.0 to examine and edit the images.

Summary of key digital photography Concepts

- "Mega-pixels" or MP's refers to the number of picture elements or "pixels" on the CCD or CMOS chip in the camera. The more pixels, the more detail that the camera is capable of. (mega refers to million) **The more pixels: The higher the camera's Resolution**
- For our purposes, 10MP and up cameras are suitable
- **JPEG is a compression scheme and file type** that we use to produce, store and edit digital images; RAW is a non-compressed format. Dentists work in jpeg unless there is a specific reason not to (AACD accreditation) Compression allows for smaller image files and can be set in the camera or with post processing software.
- Camera settings: medium settings will generally render easily managed images sizes suitable for more efficient storage and emailing.
- You needn't take maxed out megapixel images. 1 megabyte images will work just fine and can be compressed further in a software application.
- F stops refers to aperture setting = amount of light let into sensor....(diameter of light beam)
- High F stop = sharp image ie F22 (intra-oral shots)(F stop is actually a fraction where the number is the denominator. So F22 = a small opening letting in a narrow beam of light.)
- Low F stop = less depth of field ie F5.6-F6.7 (fuzzier background) (better for portraits) Also allows enough light to enter the camera as camera l further from subject

- **Aperture Priority refers to an F stop variable**; depth of field control is the variable. Shutter speed is fixed.
- The greater the depth of field, the more objects are in focus
- Optical vs Digital zoom....Optical moves glass elements and is true zoom and magnification while digital is "in camera" cropping causing loss of image crispness. (ie reduced resolution)
- Exposure is controlled by shutter speed, aperture setting (F stop), ISO setting, light source, exposure compensation and white balance; except for F stop, set them and forget them.
- ISO refers to the sensitivity of the camera's sensor to light. The higher the ISO value the less light is needed to record an image. High Iso for existing light photography:
Velscope.
- The **histogram** is simply a graph that allows you to judge the brightness of an image. You can think of the area under the graph as comprising all the pixels in your captured digital image. The left side of the histogram depicts how many "dark" pixels you have captured; the right side, how many "bright" pixels you have captured. (right rhymes with bright)
- **Exposure compensation** is a pre-determined exposure adjustment matched to the camera's system components; It adjusts the **Exposure Value**. It over-rides what the camera initially tells the flash and adjusts the flash output up or down
- **White Balance** Influences color temperature of image; warm (gold/yellow) to cold (bluish)
- Camera types: 1. SLR (single lens reflex) one views directly through the camera lens, 2. "Point and Shoot" where viewfinder is an LCD, much like a video camera.
- Manual focus vs Autofocus: Manual you will be moving camera back and forth to achieve focus. Autofocus, the lens will focus for you at any reasonable distance . Autofocus is faster and easier but less consistent on image size and magnification ratios.
- Flash Media = digital film (Compact Flash, Memory Stick, Secure Digital Media, etc)
- Printers: Inkjet for text and photos, Dye Sublimation printer for photos only, usually 4X6 inch format, Multi-function ink jet printers for film reading, scanning, faxing and printing photos and text; favorite photo only printer: Epson's PictureMate, www.epson.com
- Back up rules: Back up, Back up, Back up Back up!!!! Somewhere!!!
- Post Processing steps in Photoshop Elements: straightening tool, crop tool, Levels adjustment, Unsharp mask (amount 100, radius 3, 0 threshold)

Typical SLR settings:

- Shutter Speed: Canon: Flash Synch Speed of 1/200 of a second to 1/250 (1/60 in Nikon world)
- F Stops: 22-32 for close ups, 5.6-6.7 for portraits
- ISO = 100
- Quality setting to highest offered by camera (may include simultaneous RAW recording)
- Flash set to ETTL for automatic exposure control
- Color temperature: 5000 to 5700 Kelvin or "daylight"
- Flash Exposure Compensation +1
- All values (except F stop) are pre-set by Photomed before shipped to you; not to worry

Hints for Shade surface and shade matching for lab communications

- Hold shade guide in same plane as tooth your are matching
- Wet both tooth and shade guide similarly; water or glaze
- Use two shade tabs, one lighter, one darker
- Take image at two F-stops (for example: F22 and F25)
- Take shots at an angle the minimizes surface glare (for example 65 degrees)

Five Worst Dental Digital Photo Crimes:

1. Proximity (Don't get too close....)
2. The Shaky Hand (Take a deep breath and hold it)
3. Wasted Pixels (avoid too much background in the image)
4. The wrong angle (too high...too low...just right....)
5. Fog-Area (Blow air on the mirror!!)

Bonus crime: Not taking camera out of box

Bonus photo tips:

- Brace yourself against chair
- Vaseline to lips to ease retractor placement
- Occlusal mirror at 45 to 90 degrees to arch, focus on bicuspid
- Turn patient's head towards you for ease of framing image
- Use Quadrant shots to zoom in on areas of interest
- Wear your glasses when focusing through an LCD
- Use diopter adjustment to correct viewfinder to your own vision
- Use peripheral light from operatory light to assist focus process
- Foot stool for portraits and colored matte backgrounds or Photomed portrait kit
- Occlusal shots need to be flipped for viewing with proper orientation. This is done with software such as Thumbs Plus Pro 7.0
- Mirrors needed: Adult occlusal, Pedo occlusal, T1 buccal mirror, "O" mirror.

Magnification, Manual Focus and Autofocus

1:1.5 = actual size of imaging media = about 3 teeth

1:2 = about 8 teeth

1:3 = full anterior retracted

Use manual focus mode for consistent illumination and magnification

Use auto-focus for speed and convenience if your equipment allows for it.

Jump Start Hot List:

Here is a streamlined recommendation for getting started quickly.

Camera: Get the **Photomed** configured **Canon EOS RebelT3i/T4i/T5i/6i SLR outfit or Nikon 7200D outfit**. They are fool proof way to enter the digital world painlessly. You will be delighted.. Any and all hardware that you would need is included in their kits. Printers are optional.

Alternate: **Photomed equipped Canon Powershot G16** digital SLR quality with point and shoot form factor and familiarity.

Printer: Buy a Canon Pixma series or HP Photosmart series ink jet printer. Think small printers for your operatory such as the Epson Picture Mate series (www.epson.com)

Software: Use Photoshop Elements 12 for PC or Mac (whatever latest version is)

Supply References for materials mentioned during the seminar:

- Photomed Inc for assorted dental digital accessories: www.photomed.net
- Smile Vision for expert cosmetic simulations based upon your portraits: www.smilevision.com
- Surgitel Loupes and Lights www.surgitel.com
- Epson printers www.epson.com
- Canon Cameras and printers: www.canon.com , www.photomed.net
- Best online camera reviews: www.dpreview.com
- What Your Eyes Can't See patient education guide: www.ecdentalsolutions.com
- Care Credit (for patient financing) www.carecredit.com

Dr. Goldstein' contact info:

martyg924@cox.net
www.drgoldsteinspeaks.com
Phone: 203-879-4649

GENERAL PHOTO RELEASE

In consideration of \$_____ paid to me, which I hereby acknowledge, I hereby grant to_____ and to any of their assigns, the absolute and irrevocable right and permission, with respect to the photographs taken of me, or in which I may be included with others; to use, re-use, and/or publish the same in whole or in part, individually, or in conjunction with other photographs, without limitation in perpetuity.. These photographs shall be used specifically and exclusively for the purpose of dental education and or patient education.

I hereby release and discharge_____and assigns, from any and all claims and demands arising out of or in connection with the use of the photographs, including any and all claims for libel.

Signed at_____this day of_____,20____

Legal signature

Name (please print)

Full Address

I, the undersigned, hereby state that I am the (mother, father or guardian)of the above named individual and do hereby consent and give permission to this agreement.

legal signature

Date

Name (please print)