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Clinical Photography in an Orthodontic Practice Environment Part 2

Abstract: The previous part of this article discussed why to take clinical photographs and the benefit of high quality pictures to the clinicians as well as the patients. The second part of the article will describe contemporary photographic equipment and the many essential accessory products, as well as how best to store the images. In addition 'Top Tips' will be proposed to allow the best possible results to be reliably achieved.

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Which photographic system to buy?

There is no perfect photographic system for clinical use. For convenience, many operators would prefer a small 'snapshot' type digital camera, which are easy to hold and use. The problem with many of these compact cameras is that they do not have a lens/flash combination that can produce high quality intra-oral images, in a standardized form, that will allow comparison between time points. Most of the consumer cameras also produce some image distortion as the lenses are rarely up to the job of close-up photography.

The professional single lens reflex clinical cameras fitted with a 100 mm macro lens and ring flash are quite heavy. It can take the clinician some time to get used to supporting the weight of the camera with one hand and holding the retractor for the soft tissues or the handle of the occlusal mirror in the other hand (Figure 1).

The camera system that we currently recommend is the Cannon EOS 50D with a 100 mm f2.8 Macro USM lens and Cannon MR14 EX macro ring flash assembly.

The Fuji system S1-S5 Pro has

in the past been a very popular series of camera bodies which utilized both a Nikon ring flash system and Nikon lenses. The progression for clinicians who do not wish to upgrade their lenses or ring flashes, would be to move to a Nikon D300 which is compatible with the Nikon macro speed light SB29s and the Nikon AF Micro Nikkor 105mm lens, 1:2.8D. Sadly, the Nikon SB29 is no longer in production but Sigma produce a Nikon compatible flash.

One significant advantage of the latest camera models is the large 60 x 45 mm LCD screens which means that detail of the images taken can easily be seen on the screen, without requiring the magnification facility. If it is not possible to view the images on a screen at the chairside, with camera systems with smaller screens, it is always worthwhile using the zoom facility on the LCD screen to check for perfect focusing, before the patient is discharged.

Essential accessories

The accessories required to ensure high quality clinical photographs are firstly a front surfaced rhodium mirror. Ideally, this should have a long handle to allow the photographer complete control



Figure 1. Clinician holds correct retractor and retracts firmly just as photograph is taken.

of the mirror position and to ensure that the operator's hands are well away from the field of view. The mirror should also be autoclavable. It is essential to have a front-surfaced rhodium mirror to avoid the double images that occur using a rear-coated mirror that causes a 'ghost' reflection in the front glass surface of the mirror.

Whilst it is also important to have a selection of mirrors available (Figure 2), the largest mirror will be used in 95% of occlusal photography and the medium mirror is only occasionally required for



Figure 2. Three sizes of long handle retractor are available.

patients who have particularly tight soft tissues. The smallest mirror is used when photographing cleft babies.

The size and shape of the dental retractors, chosen for photography, is also important to ensure that the photographs are of high quality. Two sizes of dental retractors (Item no. 852763 and 852764, American Orthodontics, Riverside House, Mill Road, Marlow, SL7 1PX 01628 477921) are recommended when taking a series of intra-oral photographs (Figure 3a). Assistants need to be trained to use the correct retractor in the appropriate manner. The large end of the larger retractor is used to achieve vertical retraction of the soft tissues on the front intra-oral shots. The retractors need to be pulled forwards towards the photographer rather than the natural tendency to pull back towards themselves.

For the lateral intra-oral photographs, the large retractor on the side being photographed is turned to 180°, which allows more horizontal than vertical retraction on that side (Figure 3b).

It is essential that the photographer is the one who holds the retractor on the side being photographed. Only he/she knows the exact moment when the shutter will be pressed. A split second before this occurs it is possible to retract the soft tissues by another 5 mm. An attempt should be made on every buccal view, to photograph the distal surface of the first molars and, if possible, the distal surface of the second molars or third molars, if this is achievable, without causing the patient undue discomfort. This retractor combination will be usable in all but a very small number of patients.

In Class II Division II cases, with a reduced lower facial height, there is genuinely insufficient height between the basal bone of the mandible and the maxilla to allow the patient to close in maximum inter-cuspalation with the large end of the

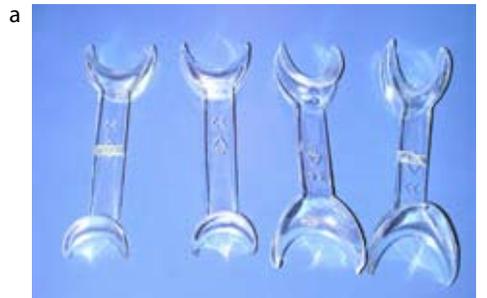


Figure 3. (a) Two sizes of retractors necessary for every set of intra-oral photographs. **(b)** Small end of large retractor gives horizontal retraction where needed.



large retractors in place (Figure 4). In this very small number of specific cases, the large end of the smaller retractor can be used for the vertical soft tissue retraction, although the smaller end of the larger retractor is still used to give distal retraction of soft tissues when taking the buccal shots.

For occlusal photographs the small end of the smaller retractor is always the one to use. When used correctly this will allow the soft tissues of the lips to be pulled up laterally and also forwards, to give a backdrop of oral mucosa against which the teeth are contrasted. Practice will be required with the person doing the retraction to perfect this technique.

The patient can be asked momentarily to hold on to the mirror handle, whilst the camera is being adjusted to zoom out slightly and change the aperture (change from F32 to F20) for the occlusal photographs. Before the photograph is taken, but after all the saliva has been completely aspirated, the photographer should take hold of the long mirror handle so that the mirror can be positioned to allow the whole area of interest to be included within the photograph (Figure 5).

It is essential not to continue to rest the mirror on the distal marginal ridge of the last standing molars for the actual shot. Just before the occlusal shot is taken, ask the patient to 'open twice as wide' which, in most cases, will give another 6-8 mm of mouth opening. This will allow the mirror to be moved about 5 mm away from the terminal distal marginal ridge, which therefore ensures that this tooth is adequately photographed.

Another essential requirement for each of the clinical photographs is the use of the high volume aspirator tip, to ensure that all saliva is completely removed from around the teeth and soft tissues. Saliva will only act as 'noise', which will distract the viewer from the area of interest. Failure to have an aspirator available or to use the aspirator will, at best, result in mediocre clinical photographs.



Figure 4. Class 2 Division II tendency precludes use of biggest retractors.



Figure 5. Occlusal photograph is possibly the most difficult of all.

Manual focusing facility

Manually focusing intra-oral shots is recommended because it is impossible for the camera to 'know' on which part of the frame the operator would like to focus. On the front intra-oral shot the area to focus on is the distal part of the upper lateral incisors or the mesial part of the canines. Once in focus, if a sufficiently small aperture is being used (ideally F32),

the depth of field will ensure that both the labial surface of the upper central incisors and the buccal surface of the upper first molars will be in sharp focus. The temptation is to focus on the upper central incisors, which means that the area in focus is too far forwards. As a result, at the premolars, the image will become less sharp.

On the buccal shots, where depth of field is less of an issue, the operator should focus on the buccal surface of the canines and the first premolars. For occlusal shots, the operator should focus on the occlusal surface of the premolars and, providing the mirror is 45 degrees to the arch and the camera at 45 degrees to the mirror, the whole occlusal surface should be on the same focal plane.

Once this technique has been perfected, taking a series of intra-oral shots should not take much more than a minute.

Avoiding errors in clinical photography

Errors in photography can only be avoided once all the qualities of a good set of extra-oral and intra-oral photographs are appreciated. McKeown published an excellent paper¹ summarizing exactly what to aspire to in clinical photography. The paper also details all common sources of error, along with recommendations on how to avoid these errors. The quality of photographs taken by three different groups of operators has been compared,² and it was demonstrated that orthodontists produced better intra-oral photographs than both auxiliaries and professional medical photographers. Focusing and head tipping was identified as a common problem with extra-oral photographs, whilst the presence of saliva, occlusal plane issues and soft tissue retraction were common problems with intra-oral photographs.

Top tips to maximize quality of extra-oral shots:

- Subject at same height as photographer;
- Patient's hair behind his/her ears;
- Frankfurt plane horizontal;
- Non-reflective background and eliminate shadows;
- Focus on automatic, on nearest lower eyelid on all EO shots;
- Red eye reduction if possible;
- Lips in repose and wide smiling.

Top tips to maximize quality of intra-oral shots:

- Correct retractors;
- Assistant instructed on how to use above;
- Dental light illuminating teeth to aid focusing;
- Manual not automatic focusing;
- Quality camera with Flash/Lens combination allowing F32;
- Photographer holds retractor;
- Occlusal plane horizontal front to back, as well as left to right;
- Use aspirator.

Top tips to maximize quality of occlusal shots:

- Smallest end of small retractor;
- Pulled up, laterally and forwards;
- Long-handled, front-coated mirror.
- Warm mirror;
- Patient to hold his/her breath;
- Patient to open 'twice as wide';
- Aperture compensation 1–2 stops or F20;
- Use aspirator.

How to store the digital photographs

There are many software systems on the market to allow storage and manipulation of digital photographs. The one that the authors currently use is Dolphin Imaging, version 11. There are many advantages of the Dolphin imaging system. It is easy to set up templates into which patients' photographs can be automatically imported with the touch of a button. There is an unlimited number of time points that can be stored for each patient and these time points appear in the top line of the screen.

It is easy to print out either the entire time point template, giving an overview of the case, or individual clinical views which can be given to the parents, the patient or the general dental practitioner. At the end of treatment it is very helpful to print out the start and finish photographs so that the patient and parents can see the enormous improvement during treatment. Also, it is a good PR exercise for the general dental practitioners to receive photographs of the results of treatment.

Digital radiographs can also be imported directly into Dolphin and stored in the appropriate time point. If conventional radiographs have been taken, it is possible to take a digital photograph of them and to import them in a similar fashion to clinical photographs.

To maximize the quality, it is worth converting any photographed radiographs to greyscale, as a resulting black and white image is far preferable to the one with the green 'tungsten glow', which usually results from photographing a radiograph placed on a light box.

There is an extensive editing facility within Dolphin, which offers the opportunity for photographs to be cropped, rotated and flipped until you end up with the ideal views. It is also possible to adjust brightness, contrast, gamma, hue and saturation, and to sharpen the photograph. There is also a red eye reduction facility, which is useful if the photographs are going to be used in any form of display or lecture.

It is possible to export all images that are stored within Dolphin, either individually or as composite templates, which can be subsequently imported into a PowerPoint or a Keynote presentation, as necessary, thus allowing easy presentation of all cases stored in Dolphin.

Summary

Orthodontic photographs are the most useful clinical record it is possible to obtain. They aid effective communication with parents, patients, dentists and lawyers that will be of benefit to all interested parties. Learning how to maximize the quality of your clinical photographs will repay the time investment a thousand fold.

Selection of the correct camera equipment, as well as all the necessary accessories is vital in achieving success with your photography. Modern computer software will allow easy manipulation and storage of all photos so that, with the mere touch of a button, all this information is available at your fingertips.

Anyone involved in teaching orthodontics should realize the potential of having serial photographs for each patient.

References

1. McKeown HF, Murray AM, Sandler PJ How to avoid common errors in clinical photography. *J Orthod* 2005; **32**: 43–54.
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