Introduction to dental photogarphy

basic edition

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dental photography

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ABSTRACT

Whether they are used for patient communication, consultation with a laboratory or colleague, diagnosis, clinical or legal records, or scientific presentation or publication, images are a much more powerful means of communication in the field of dentistry than the spoken or written word. However, dental photography is lacking set standards that would allow the continuity and reproducibility essential to clinical and scientific documentation.

To address this need, this hand book presents guidelines for photographic documentation that will enable practitioners to produce images that faithfully convey clinical data. Precise instructions, including the positions of the patient, assistant, and practitioner; camera settings and flash positions; aiming and focal points; and the types and positions of required accessories are detailed in text and images, and an example of the desired final image is provided. This comprehensive booklet provides clinicians with all the information they need to feel confident in creating effective and compelling dental images.

Introduction to

Dental photography

Digital camera systems:

A better understanding of digital photography can be ascertained from a knowledge of the function and operation of the conventional film based single lens reflex (35 mm SLR) camera system. the conventional 35mm camera system creates an image by using lights to activate film though a chemical reaction, light sensitive molecules in the film emulsion are electrically changed in proportion to the amount of light that strikes each area of the film, later during the film processing stage each charged molecule is enlarged and stained to become a grain, the basic visible unit of film image detail, together the grains combine to collectively make up the photographic image.

The digital 35mm camera system uses light to activate a solid state sensor through an electrical reaction, a CCD or CMOS photodiode detector stores an electric charge in proportion to the amount of light that strikes each portion of the sensor. the image is initially converted into dots of digital color information that combine to create the final image, each dot represents s a pixel, the basic visible unit of digital image detail. the greater the number of CCD or Cmos elements. the better the surface detail and image quality.

During the digital image capture. the sensor elements detect and convert light stimulation into an electrical analog signal, the analog signal is then analyzed and converted into a computer readable digitized binary code, the better the resolution of analog digital converter, the greater the number of luminance levels that can be distinguished, for example , a digitizer with 8bit resolution can convert the analog signals produced by the photo sensor into 28 digital values allowing 256 levels of light to be distinguished . digitizer with a 12-bit resolution is able to convert the analog signal into 212 digital values capable of discriminating 4,096 different levels of lights.

There are myriad of digital cameras on the market for general photography, the simplified controls of lower cost system may initially seem appealing, but they often possess several limitations in dental applications. a few of these inadequacies include inconsistent image control, inconvenient flash options, insufficient close up lens, distortion, unrepeatable magnification, long lag times, and lack of manual exposure

Although various modifications have been developed to adapt and promote these systems for dental photography applications, the most predictable and diagnostic results are achieved with professional DSLR camera

Clinical applications of digital photography:

The use of digital photography is becoming a standard of case for today's modern dental practice through photographic documentation of clinical findings prior to initiating restorative treatment, digital intraoral photography has greatly influenced the ease of documentation and storage of clinical images of specific clinical situations, there are numerous applications for digital photography in restorative dentistry that include the following:

Diagnosis and treatment planning:

During the pretreatment assessment, the digital photograph is invaluable as a diagnostic tool. It provides the clinician, specialist, and technician with an instant visualization of the clinical setting without the patient being present. also, preoperative digital photography can be utilized as a significant diagnostic tool that often influence the patient to accept treatment.

Legal documentation:

Photographic images document pretreatment conditions as well as esthetic changes that were achieved through the delivery of dental care potential legally threatening clinical situations should be photographed, dated, and filed so as to be easily retrievable.

Forensic records:

Identification of human remains and analysis of dental related trauma (ie human bite marks) can be facilitated through digital photographs, which provide accuracy and reproducibility of detail

Patient education and communication:

A series of photographic images of previous treatment accomplished with other patients can provide a detailed explanation of a specific dental procedure and treatment alternatives, a combination of photographic information with oral and written description provides a more through informed consent, furthermore, this visualization process stimulates patient awareness and involvement, which can enhance the clinician –patient relationship

Laboratory communication:

Color photographs can illustrate shade comparisons to the surrounding dentition and to the underlying substrates, relative distributions of enamel staining, intensity of characterization, and the different degrees of translucency and opacity within the incisal edge can be adequately captured , black and white photographs can provide a visual description of surface texture in addition to value comparison, the relationship of the incisal edges position of the provisional and the final restoration to the contour of lower lip and to the horizontal plane can be evaluated. in addition, photographic post-operative critique can be provide feedback for self-assessment to each member of the restorative team and the opportunity to learn and improve from positive and negative results.

Professional instructions:

Instructional photographs illustrating the armamentarium and protocol of specific clinical procedures can be utilized by auxiliaries to improve organization and efficiency. in addition, photographic series can be used to describe a clinical condition or to communicate ideas and concepts with other colleagues in lecture presentations, publications, and for professional certification

Insurance verification:

Digital images of preexisting clinical conditions can indicate and reinforce treatment requirements and expedite authorization for an insurance claim.

Patient education and motivation:

Periodic photographs of the patient clinical situation can provide immediate visual illustration of improvements or progression of a disease process

Camera system: integrated components

Camera body

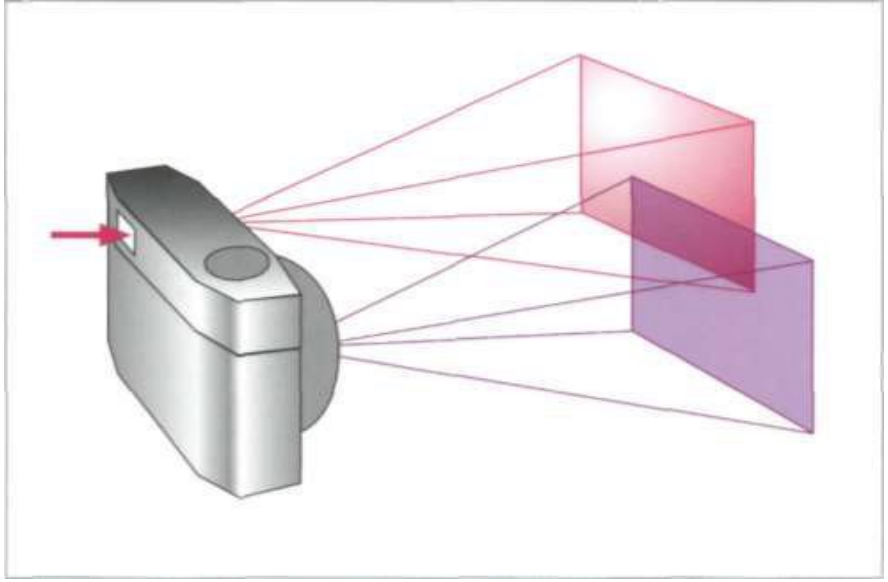
There is no more discussion in the literature that the single lens reflex (SLR) system is most suited to medical photography. This is true for both conventional and digital photography. In principle, it is not necessary to choose the most expensive body in a product range. It makes more sense to spend the money saved on lenses and flash equipment

Disadvantages of digital viewfinder cameras

Digital viewfinder cameras offer many sophisticated features. When used for "normal" photography, results are superb. Therefore, many dentists believe that these cameras can be used for medical documentation as well. They often realize after a short time that results are not consistent enough for medical documentation. Some shots are perfect, but there are many images which are far from being acceptable. Hence, digital viewfinder cameras are suitable for medical documentation only to a very limited extent. Some of their properties restrict their use significantly.

Viewfinder parallax

Like conventional rangefinder cameras, digital models have a viewfinder parallax. This means that the image in the viewfinder and that recorded by the sensor are not the same. This can be overcome by using the LCD screen of the camera.



Shutter lag

Most digital viewfinder cameras have a very long shutter lag. This is the time from pressing the shutter release button until the picture is taken. Within this time the image is focused (if autofocus function is switched on), white balance is performed, exposure is metered, and the ISO value is determined. All these functions are time consuming, especially finding the focus, which is performed in viewfinder cameras by using the CCD image. In clinical photography, pictures are taken "by hand" without using a tripod to stabilize the camera. Therefore, small camera movements cannot be avoided. The result is that the camera is no longer "in focus" when the picture is taken: the image is blurred. The best way to avoid these problems is "pre-focusing" by pressing the shutter release button halfway down. Then the image is framed and the shutter is released.

Insufficient viewfinder information

When looking through the viewfinder of a point-and shoot camera, the information is very limited compared with the information of a SLR viewfinder. Users often look at the LC display (LC = liquid crystal) on the camera back instead of into the viewfinder. Controlling the plane of focus is not possible in this way.

Macro function is not sufficient

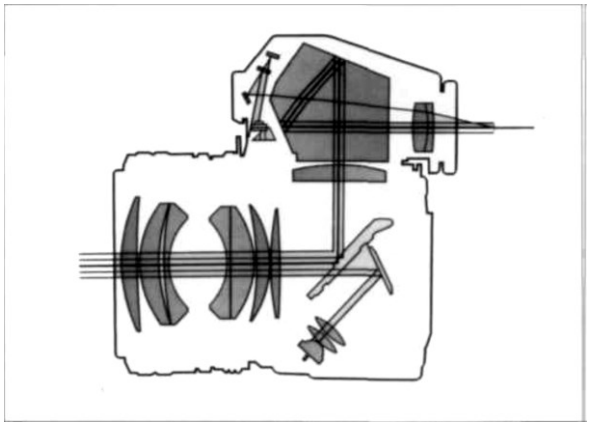
Digital viewfinder cameras frequently offer an astonishing macro capability, but only when the zoom lens is in its wide-angle position. Wide-angle position means short distance to the object. Short working distance means distorted images, which cannot be used for medical documentation

Flash too far from camera lens

To avoid the "red-eye effect," the built-in camera flash is often located as far as possible from the lens, thus producing difficulties when photographs of the oral cavity are taken from a short distance. Further disadvantages of digital viewfinder cameras for dental photography sometimes include a low frame rate, rapid battery consumption, and a long time lag between turning on the camera and being able to take the first picture. Therefore, if complete control over the photographic procedure is mandatory, digital SLR cameras (DSLRs) are strongly recommended.

Single lens reflex cameras (SLR)

The Single Lens Reflex Camera (SLR) is the most versatile type of camera, in which the light passing through the lens is directed by a mirror angled at 45 degrees to the optical axis onto a matte screen. By looking at this matte screen, the photographer is able to frame the picture, and check its sharpness and depth of field. With only a few exceptions, only 35 mm (24x36mm) SLR cameras and digital SLR cameras are used in medical documentation.



Important properties of digital SLR cameras (DSLR)

To make the step from conventional to digital photography easier, manufacturers modified conventional camera bodies so that it is possible to use the old camera equipment—such as lenses and flashes—with the new body. An exception in this respect
is the Olympus E-1 system, which was completely redesigned especially for the demands of digital photography, including lenses and flash accessories
If a DSLR is used for dental photography,

it should include the following features.

- ***Manual exposure/aperture-priority***
- ***automatic exposure control***

Correct exposure of an image is always the result of two factors: aperture and exposure time. A large aperture is coupled with a faster shutter speed and vice versa SLRs generally allow the exposure to be selected manually or automatically, in which case various auto exposure modes can be chosen. The method of choice in this instance should be aperture-priority automatic exposure control, in which the aperture is selected and the appropriate shutter speed determined and set automatically by the camera. To use the aperture-priority mode, set the camera to the symbol "A" for aperture priority. Choosing this exposure mode has the advantage of being able to select the aperture and thus influence the critically important depth of field (see below).
Depth of field is determined by the aperture for a given magnification ratio.

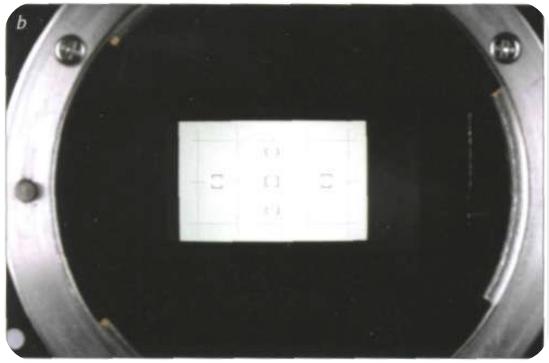
Cameras used with TTL (through the lens) metered flashes can be set to manual (M) as well. With a pre-selected aperture and an appropriate shutter speed (e.g., 1/125s) the flash is set to TTL mode, thus ensuring a proper exposure of the image. This is the method of choice for Canon Digital SLRs.
In addition, the manual mode (M) is important for copy work and for clinical shots taken for color determination.

Short shutter lag

One of the biggest advantages of SLR cameras compared with digital viewfinder models is the ultra-short shutter lag. The main reason for this is that digital SLR cameras use special detectors for focusing while viewfinder cameras have to use the CCD image. Short shutter lag means better control not only of the time you take the picture
but also of image sharpness if you use the autofocus function.

Focusing screens

The focusing screen is part of the focusing system. The mirror projects the image onto the screen; this image is flipped horizontally and vertically by the pentaprism so that it is the right way up and corrected for left-to-right reversal, allowing us to view the image through the viewfinder.
It is advisable to replace the standard focusing screen with a fine matte focusing screen with an engraved grid. The advantage of such a grid screen cannot be overestimated in practical work. Some cameras offer a feature to switch on a grid screen electronically. This is the case in Nikon-based models such as Nikon D200, D 70s, and Fuji FinePix S3 Prof.



Data back

For conventional cameras, data backs were a very useful aid. They have lost their importance, however, because now every image file gets its own unmistakable number. Beside this, a considerable amount of technical information is added to the file (EXIF file, see below).

Depth of field preview button

Depth of field is always critical in close-up photography (see below). This can be checked visually in the viewfinder only if the camera has a depth of field preview button. In focusing, the lens aperture is normally fully open to achieve the brightest image in the viewfinder. Pressing the depth of field preview button stops the lens diaphragm down to the aperture which is set (working aperture). Although the image becomes darker, it is possible to visually check the depth of field, an important feature for object photography.

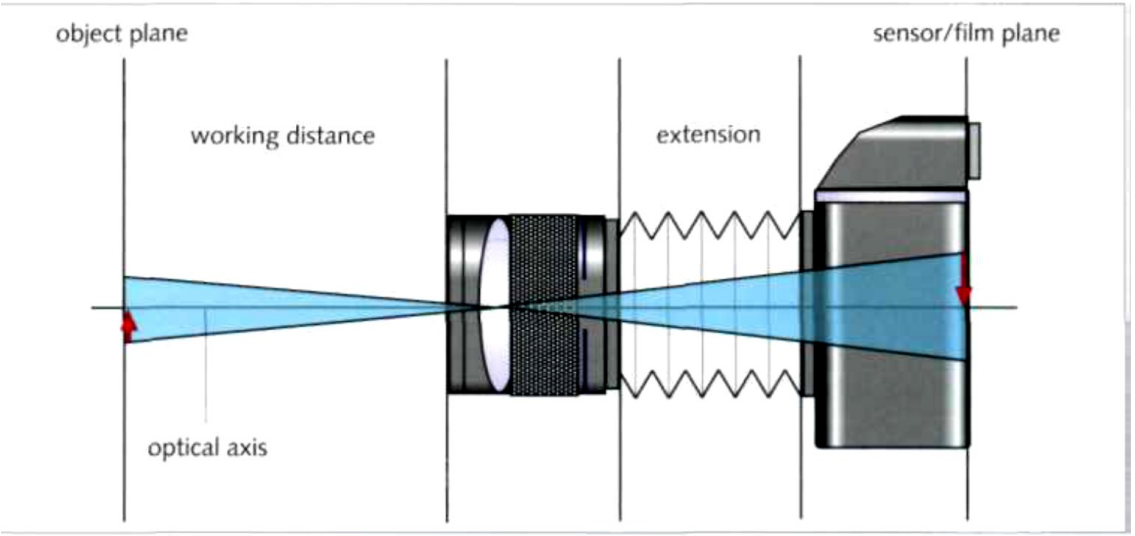
Autofocus function

Modern cameras with the appropriate lenses allow autofocusing. This feature is important in sports and action photography and also for copy work.
However, in clinical photography this autofocus function should be turned off and focusing should be done manually (Fig. 2.8). Since photography in this field is mostly hand-held, it is difficult to avoid a small amount of camera shake. This would mean that the lens motor would continually have to refocus the lens. An even more important reason for switching off the autofocus mode is the fact that the autofocus focusing point is in the center of the viewfinder in most cameras. However, the closest point of the subject is often in the center, too, such as is the case when photographing a set of teeth. If this point is focused on, nearly 50% of the depth of field (that is the area in front of the nearest point) is not used (see below). Thus, it would not be possible to have the entire set of teeth in acceptable focus. For this reason, the autofocus function should be switched off in clinical photography

The lens

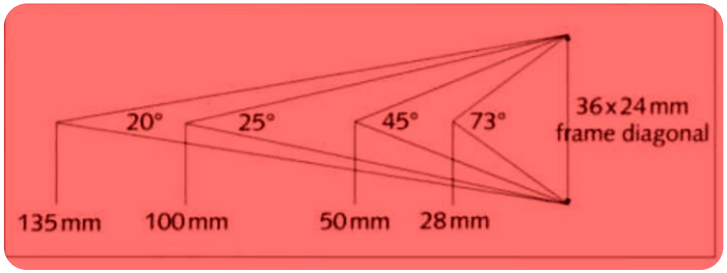
Dental photography is mostly close-up photography, calling for macro lenses. Zoom lenses with a "macro setting" are not suitable for this purpose, since these can be set only to a reproduction (magnification) ratio of about 1:4.

To focus on an object which is closer to the camera than "infinity,"
the focus setting ring on the lens is turned to increase the distance between the center of the lens and the sensor plane. Most normal lenses are designed to produce a maximum magnification ratio of approximately 1:10 to 1:7. The lens cannot be moved further away from the sensor plane. If the photographer wishes to focus on a subject which is closer, the distance between the lens and the camera must be bridged so as to allow no light leakage. This can be achieved in various ways, for instance by using extension rings, bellows unit, macro tubes, etc. This is easiest with macro lenses, which generally have the means by which the lens can be extended farther than normal. More modern designs permit greater magnification through the use of floating elements. Another advantage of these macro lenses is their ability to compensate for image problems inherent in close-up photography.
These lenses are designed and corrected for close-up photography. Normal lengths of macro lenses are 50mm, 60mm, 90mm, 100mm, 105mm, and 200mm; the 100 or 105mm lens is best suited to our purpose



Angle of view

The angle that the lens "sees". Normal lenses have an angle of view which roughly corresponds to that of the human eye (about 45 to 55 degrees).
Wide-angle lenses have a larger angle of view and telephoto lenses a smaller one When a conventional lens is used with a digital camera,
the crop factor must be taken into account,
as the sensor is usually smaller than the film format 24x36mm. That means that the angle of view is smaller for a digital camera, if its sensor is not a full format sensor.

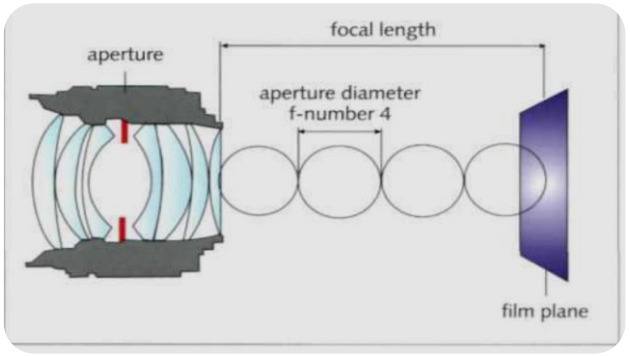


Aperture

Opening in the lens which regulates the amount of light. Mostly an iris aperture consisting of overlapping metal blades. Stopping down (closing) the aperture reduces the image brightness and increases the depth of field. The next higher aperture reduces the amount of light by half and the next lower one doubles it. The area of a circle increases with the square of the radius. To double the amount of
light (=area of circle), the radius has to be increased by the factor of the root of 2(about 1.4). This produces the aperture numbers.

Lens stop

Reciprocal of the aperture ratio. The lens stop is the ratio of the diameter of the opening (aperture diameter) and the lens focal length lens. F/4, for instance, means that the aperture diameter fits four times in the focal length of the lens. The aperture settings form the "international aperture sequence" of 1, 1.4, 2,2.8,4,5.6,8, 11, 16,22,32,45.

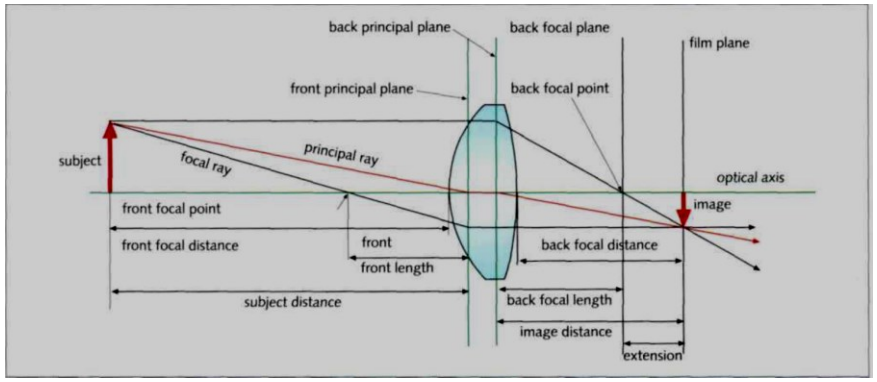


Focal point/focal length

Distance between the focal point to the lens plane. The back focal length, which differs from the front focal length in asymmetrical lenses, is engraved on the front of lenses. In normal lenses, the focal length is approximately equal to the diagonal of the picture frame. In 35-mm cameras with a 24x36mm film format, this is about 43.5 mm. Lenses with a shorter focal length are termed wide-angle and those with a longer length telephoto lenses.

Lens speed/relative aperture

The maximum aperture ratio of a lens is called lens speed or relative aperture. This is cited in the ratio of 1 :X. A 50-mm lens with an aperture diameter of 27mm thus has a lens speed of 27:50 = 1:1.8. Lenses with extremely wide apertures are not recommended for dental photography as they are not only very expensive, but the image in the viewfinder has a very shallow depth of field. The advantage is their very bright image in the viewfinder. When the shutter release is pressed, this depth of field becomes greater, of course, as focusing is always done with the aperture wide open. When the shutter is pressed, the lens is stopped down to the selected aperture. Nevertheless, a very shallow depth of field in the viewfinder often causes the operator to overlook some details of the subject.



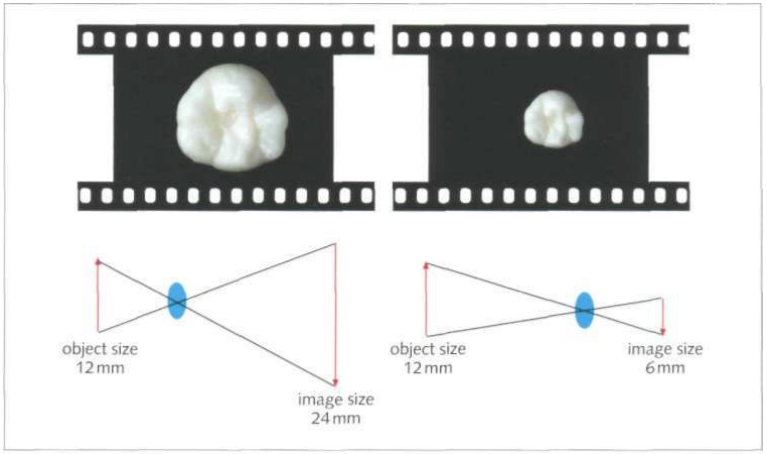
Macro lens

Lenses between 50 mm and 200 mm which are specially designed for close-up photography (clear color rendition, good resolution, lack of distortion, good field flattening).
Today most macro lenses have floating elements which are coupled to then distance setting and allow large reproduction ratios, mostly 1:1, without the use of additional accessories, achieving good image quality.
Since these lenses can also be set to "infinity," they can also be used in normal photography.
The lens determines a number of optical and image parameters, and thus it is more important to use a high quality lens than a costlier camera. Unlike in conventional photography, the quality of lenses can only be judged when tested together with an individual camera, as the camera sensor influences image quality as well.
Lenses influence the following parameters:
. image quality (image sharpness, color rendition, contrast)
. magnification
. working distance
(and by this the lighting angle, when a macro flash is attached)
. depth of field (via aperture setting and magnification)

Reproduction ratio/magnification ratio

Reproduction ratio is defined as the size of the subject relative to the image on the film. A reproduction ratio of 1:2 means that the subject on the slide or negative would have half its actual size. A reproduction ratio of 2:1 means that the subject would be two times its real size .

In digital photography, film is no longer used. Magnification ratio in digital photography means the ratio of the size of the image projected on the sensor to the object size. The projected image in a digital SLR camera has the same size as the image inside a conventional camera. What differs is sensor size and viewing field. As sensors differ in size and resolution from camera to camera, talking about magnification ratio may thus be confusing.



For practical reasons, the magnification ratio may be referred to 35-mm film format. If the frame includes a distance of 36 mm, we speak of a magnification ratio of 1:1. If a full frame includes 18 mm, we are speaking of a magnification ratio of 2:1. In dental photography the following reproduction ratios are important (approximate):

- **1:10 portrait photography**
- **1:3 image of whole mouth**
- **1:1.2 whole set of anterior teeth**
- **1:1 anterior centrals with partial laterals**

Given the same aperture, the depth of field decreases with greater magnification; with the same focal length, the working distance also decreases

Depth of field

When focusing on a tree standing in a meadow, it is obvious that a certain distance in front of and a greater distance behind the tree is still in focus. The distance from the nearest to the furthest point of perceived "sharp" focus in a picture is called depth of field (DOF). Depth of field depends on the aperture and magnification

It does not depend on the focal length of the lens. A 50-mm lens at a subject distance of 5 m at f8 yields the same depth of field as a 100mm lens at a subject distance of 10m. The smaller the aperture (and the higher the aperture number), the greater the depth of field. Depth of field reduces sharply with greater magnification, so that depth of field in the distances involved in dental photography is only millimeters

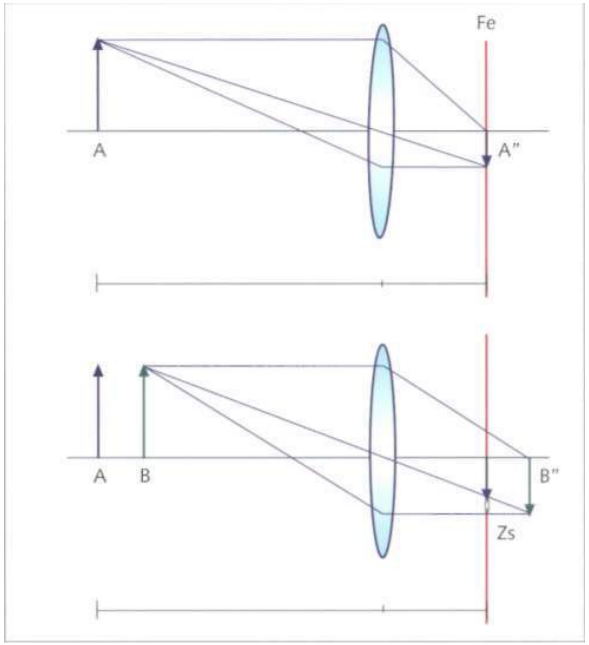
In dental photography, this means that generally photos can be taken only using small apertures. "Standard" apertures should be f/16 or (better) f/22. These require high power flashguns, which is not always the case with ring or macro flashguns. Another option is to increase light sensitivity of the camera (e.g., ISO 200 instead of ISO 100).

It is especially important that depth of field is not sacrificed. It should also be kept in mind that the entire depth of field is both in front of and behind the focusing plane. In normal photography approximately one third of the overall depth of field is in front of this and

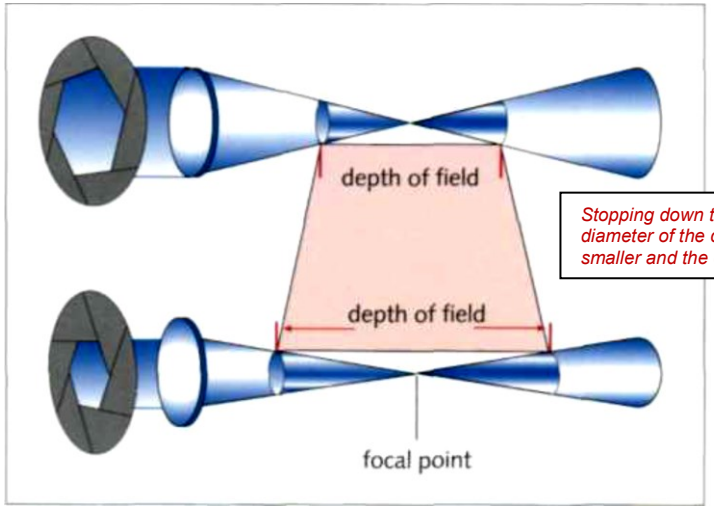
two thirds behind. In close-up photography with a reproduction ratio of 1:1, this ratio changes, with about 50% of the total depth of field in front of and about 50% behind the distance focused on. This means that if the closest part of the subject is focused on, 50% of the overall depth of field is in front of the subject and thus not used.

When photographing a set of teeth from the front, the photographer should not focus on the center of the image (contact point of the central incisors), but on the canines. Only in this way can the entire depth of field be used; otherwise it is not possible to keep a set of teeth in sharp focus from front to back.

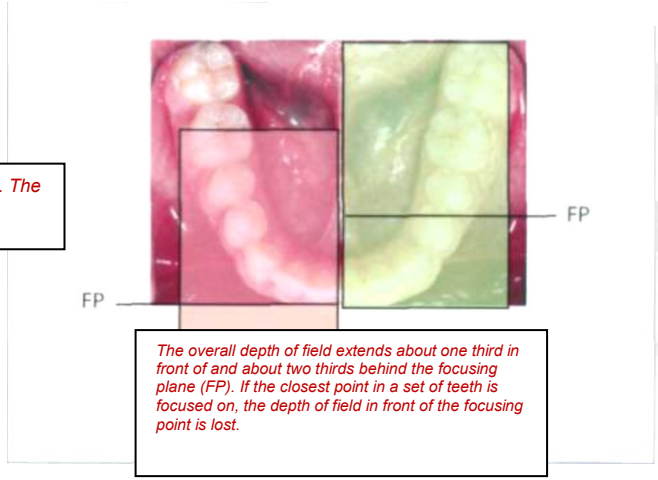
In object photography, the problem of shallow depth of field can in many instances be overcome by placing the object parallel to the sensor plane. This is possible only to a certain extent in intraoral photography.



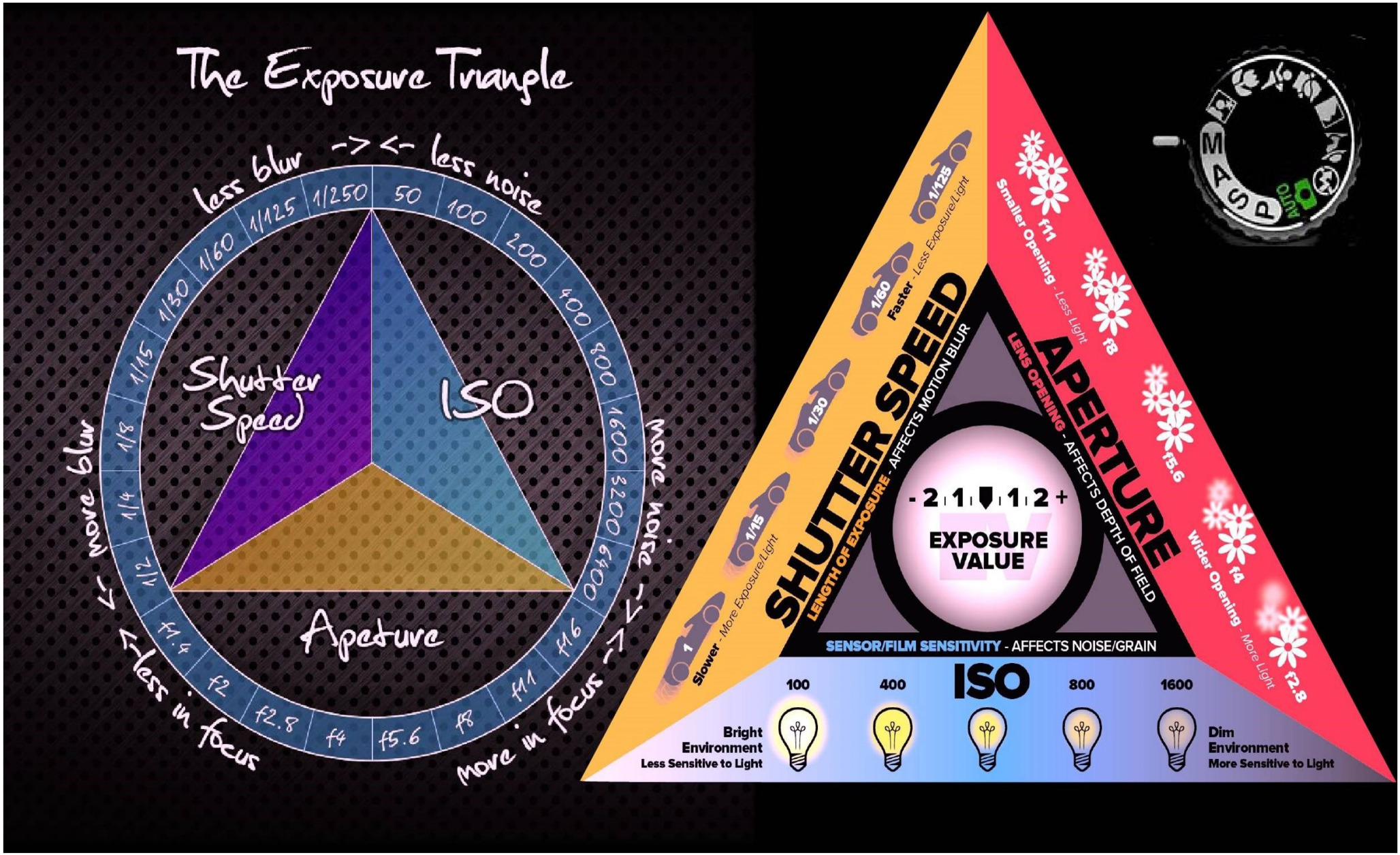
A correctly focused object (A) leads to a sharp image on the film/sensor plane (A"). An object which is closer (B) would be sharp behind the film/sensor plane (B"). The image point of the top of the object is not exactly focused as a point, but as a so-called circle of confusion. If this exceeds a certain size, we perceive the images being blurred.



Stopping down the aperture reduces the beam. The diameter of the circles of confusion becomes smaller and the depth of field increases.



The overall depth of field extends about one third in front of and about two thirds behind the focusing plane (FP). If the closest point in a set of teeth is focused on, the depth of field in front of the focusing point is lost.


The Exposure Triangle
less blur -> <- less noise
more blur <-
<- less in focus
more noise ->
more in focus ->
Shutter Speed
ISO
Aperture
1/250
50
100
200
400
800
1600
3200
6400
1/125
1/60
1/30
1/15
1/8
1/4
1/2
f1.4
f2
f2.8
f4
f5.6
f8
f11
f16
SHUTTER SPEED
LENGTH OF EXPOSURE - AFFECTS MOTION BLUR
Slower - More Exposure/Light
Faster - Less Exposure/Light
APERTURE
LENS OPENING - AFFECTS DEPTH OF FIELD
Smaller Opening - Less Light
Wider Opening - More Light
- 2 | 1 | 1 | 2 +
EXPOSURE VALUE
SENSOR/FILM SENSITIVITY - AFFECTS NOISE/GRAIN
ISO
100
400
800
1600
Bright Environment
Less Sensitive to Light
Dim Environment
More Sensitive to Light

The Exposure Triangle

- ISO *(International Standards Organization)*
  - The measure of the sensitivity of the Film or Digital Sensor
- Shutter Speed
  - How long you expose your film or sensor to the light from the lens.
- Aperture
  - The size of the opening in the lens when the picture is taken

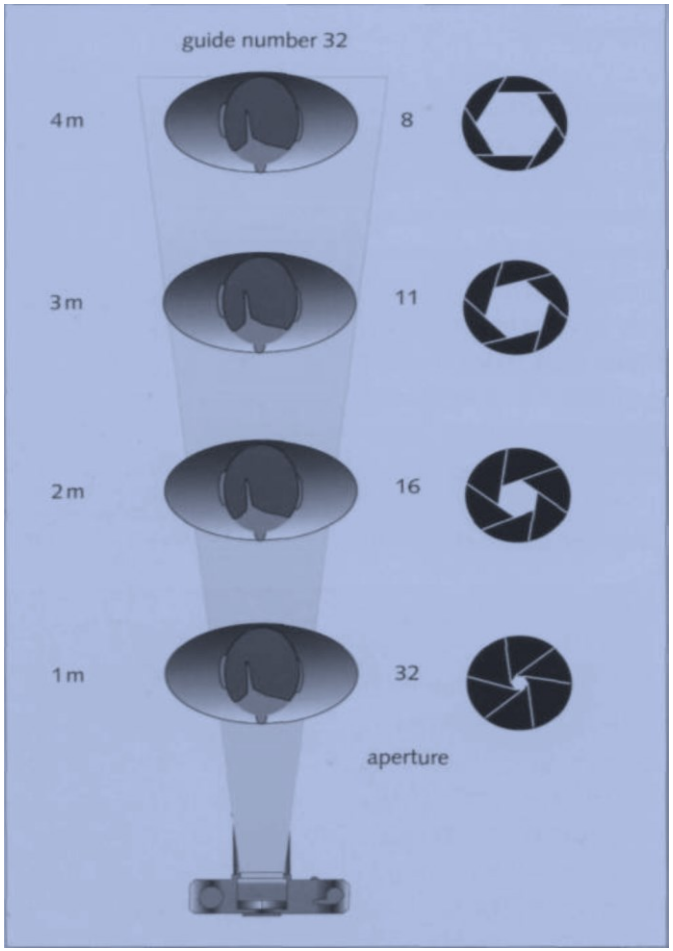
Light and electronic flash

Photography means "writing with light". Therefore, light is the most important factor. Clinical dental photography is undertaken almost exclusively with the aid of flash, unlike in object or portrait photography, where constant lighting can be used optionally. The undoubted advantages of flash photography are:

- short duration of flash, eliminating the influence of camera shake
- . great intensity of light, allowing smaller apertures
- color temperature has the characteristics of daylight; white balance can be pre-setto "flash"
- . flashguns are compact, permitting hand-held photography
- little heat, no stress to patient

The main difficulty in using flashguns is proper dosage of light and estimation of the light-shadow distribution of the image, the latter being determined by arrangement and form of the flashguns

Guide number



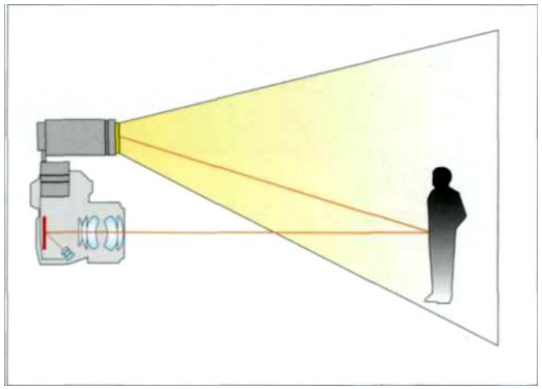
Value which indicates the light output of a flashgun. It is based on a film speed of ISO 100 and equals the product of the flashgun-subject distance (in m) and the aperture:
Guide number = distance (m) x aperture
Example: For a flashgun with a guide number of 32
and a subject distance of 4 m, an aperture off/8 must
be set
At close ranges, calculations with guide numbers are inexact. In order to achieve the correct values, exposure bracketing series are recommended. It is simpler to use TTL controlled flashguns.
If two flashguns with the same output are fired in the same direction (e.g., a twin flash system), the overall guide number is calculated by multiplying the guide number of one flashgun by 1.4

Dosage of light/flash exposure
When using flashguns, the camera must be set to the correct flash synchronization speed (usually between 1/60s and 1/250s). At the correctly set synchronization speed, the amount of light falling on the film is determined solely by the amount of flash light. There are different ways of determining this amount when using digital cameras:

- manually setting the aperture
- TTL (through the lens) flash metering

Manually setting the aperture

At a specific reproduction ratio and a given lens aperture, the amount of light reflected from an object with normal reflectivity (normal subject) back to the camera is always the same, as the object-camera distance and the amount of light produced by the flash are also always the same. For a particular camera system, the correct aperture can be determined for various reproduction ratios and thus for various subjectto-camera distances. These apertures then have to be set manually before every exposure.
With a little bit of experience, it is possible in this straightforward manner to achieve good, reproducible results.
This procedure is necessary if no TTL flash is available for the digital camera. As DSLRs allow an immediate image control, this is no significant disadvantage compared with TTL-metered flashguns.



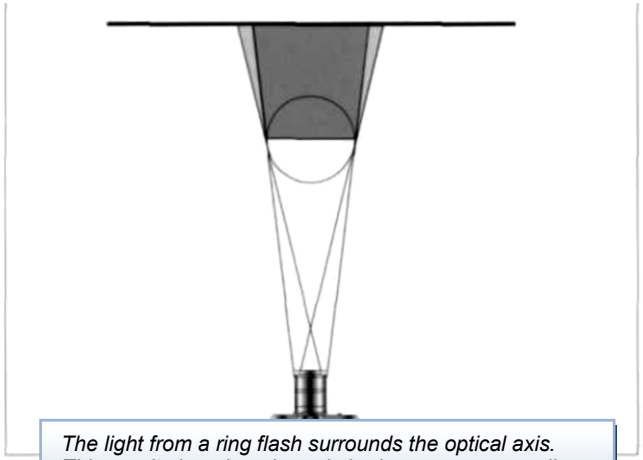
TTL flash metering
Through the lens flash was originally patented by Minolta, then taken over by Olympus in 1976, and since then offered by every camera manufacturer. TTL means that for flash metering using conventional cameras, only that amount of light is measured which strikes the film through the lens and is reflected from the film surface onto a sensor, generally placed on the camera base The advantages of this are obvious. Even in close-up work there is no light parallax.
Only that light which was effective for image exposure is measured. Thus, it is possible to control the aperture (and consequently the depth of field) and use light-absorbing accessories such as polarizing filters or bellows units without the danger of incorrect exposure.

TTL flash metering with digital SLR cameras

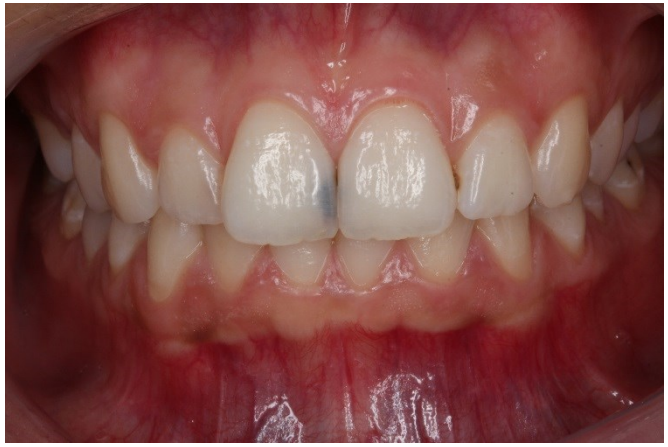
As the reflectivity of an electronic sensor is completely different from reflectivity of a film surface (mainly due to the micro lenses), TTL metering for DSLRs had to be modified. Instead of an internal metering of the reflected parts of light, digital cameras use a pre flash, which is fired just before the "main" flash. In a split second, the camera determines correct exposure on the basis of the reflected light metering of the pre flash falling onto the outer surface of the shutter and adjusts the amount of light necessary for the suitable exposure with the second flash. In addition, data concerning the camera-to-object distance are taken into account. Unlike in conventional photography, where the light reflected from the film surface was metered (shutter open), in digital SLR cameras, the light falling on the shutter surface is metered and the flash is adjusted for the last time when the shutter is still closed. TTL flash metering for conventional cameras means metering the light and controlling the flash during exposure. In digital SLR photography, it means metering the light and adjusting the flash before the exposure.
These advanced TTL flash metering systems are called eTTL or eTTL II (here color temperature of the flash is also metered) by Canon, iTTL by Nikon, sTTL by Sigma, and by Minolta ADI.

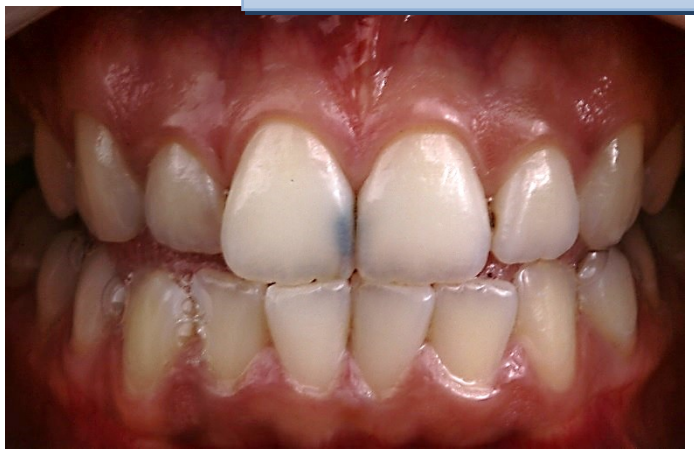
Ring flash, sector flash

Ring flashes are widely used in taking images in body cavities, and thus also in the mouth. These types also include sector flashes, in which two to four individual flash tubes are arranged around the lens.
In the case of a genuine ring flash, one flash tube surrounds the lens. Sector flashes with four flash reflectors and ring flashes do not differ appreciably in terms of lighting effect. In both of these types, the light practically surrounds the optical axis. The main advantage of this arrangement is that relatively inaccessible objects deep in the oral cavity can be evenly lit, even when ring light is partially obscured by the lips or cheeks. Inexperienced photographers, too, are thus able to produce correctly exposed and illuminated images in inaccessible areas. Another advantage of this type of front illumination is natural color rendition. However, ring flashes have the disadvantage of producing an image almost without shadows. Images tend to look flat and frequently not very brilliant because the shadows, which are necessary to create a three-dimensional effect, are lacking. This does not substantially affect images taken in the mouth, since light is always partially obscured here anyway, and the characteristics of the ring flash are not evident. For this reason, images taken with ring flash can generally only be distinguished through direct comparison with images taken with side lighting.



The light from a ring flash surrounds the optical axis. This results in a ring-shaped shadow zone surrounding the subject and a flat, shadow less image of the subject



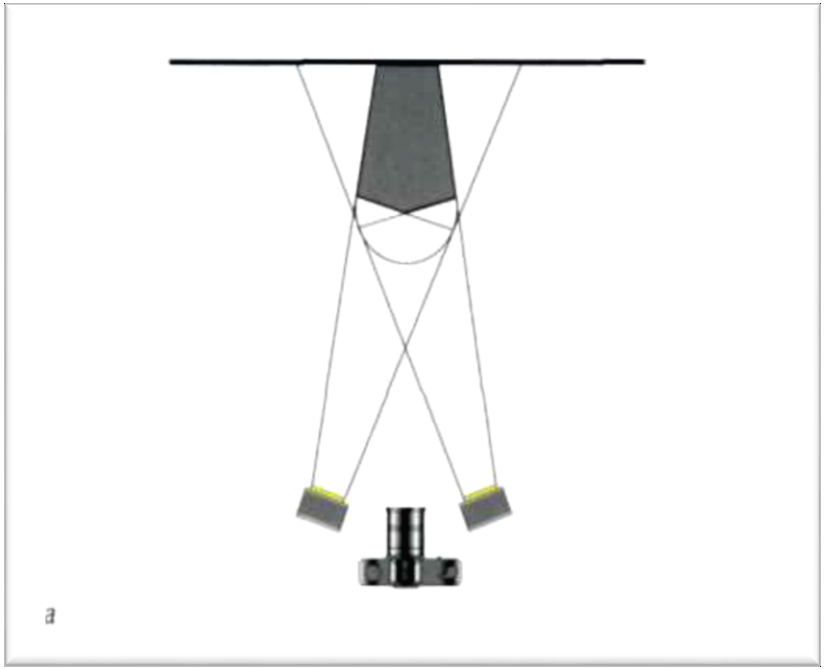


Point flash

A point light source from the side produces a directional light with strong shadows which aids in the three dimensional appearance of the final image. Macro flash units with bilateral flash tubes provide the option of switching off one tube completely and only using the other tube.
If a twin flash is used with swiveling single flashes, one of these can be turned completely away. This can be necessary for lateral shots to avoid unwanted shadows cast by the second flash.
Depending on the part of the mouth which is to be photographed, the position of the side lighting has to be altered before each exposure. This requires some experience. Overall, front views require the flash to be located at the 12:00 o'clock position; for side lighting, the positions are at 3:00 and 9:00 o'clock. With very short subject- to-camera distances the flash must be located very close to the optical axis to avoid disturbing shadows. For this purpose, a rotatable side flash unit which is mounted close to the lens would be suitable.

Combinations

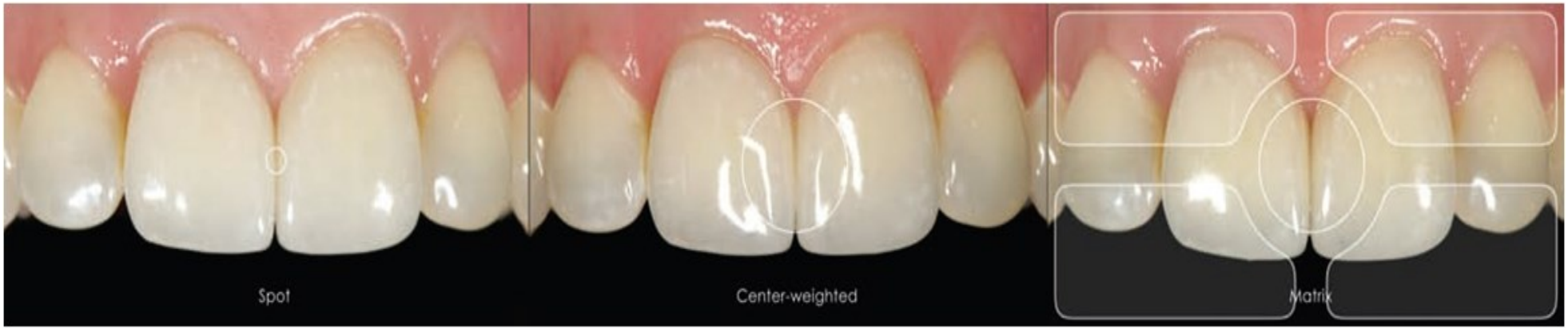
To compensate for the disadvantages of ring and side flash, or to combine their advantages, several flash units can be combined. The use of ring and side flash together is not prevalent. Lester Dine (USA) offers a flash unit with both point and ring flash. The flashes can only be used alternatively. More often, twin flash systems are used with two flash units to be mounted to the left and right of the lens, the resulting light is intense enough to allow the lens to be stopped down quite far, having a positive effect on depth of field. This set-up achieves illumination even deep in the oral cavity, while at the same time yielding greater plasticity of the image. However, in order to achieve the best possible results, the direction of the flash heads has to be checked and adjusted before each exposure, depending on the subject-to-camera distance. The output from one of the two flash tubes can be reduced by using a diffuser. The use of dual flashes also requires some experience on the part of the operator, if uniformly good results are to be achieved.
Summary: the deeper the object is in the oral cavity and the greater the magnification ratio, the more suitable a ring flash is. Side flash should be used for images taken outside the mouth. Ring flash should be avoided for object or portrait photographs.
The use of a bilateral flash system is optimum, but requires a certain amount of experience on the part of the user. Moreover, they are heavier and clumsier to use than ring flashes.
A disadvantage of many macro flash units is their low output. This is indicated by their guide number. A low guide number, such as 8, can mean that higher ISO values (e.g., ISO 200) must be used in order to achieve small enough apertures.



Exposure measurement

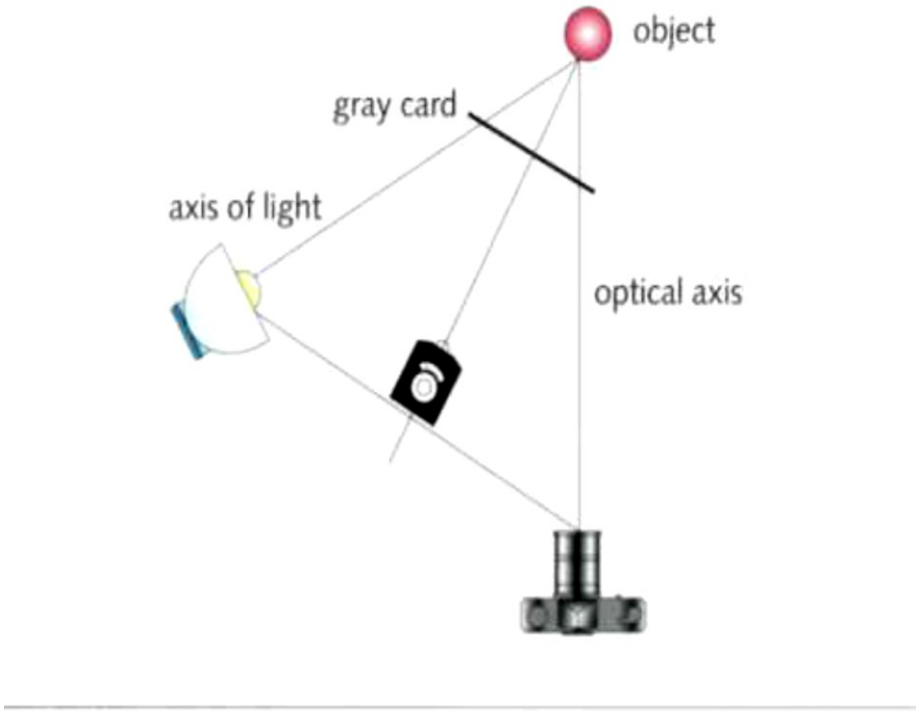
To find the proper exposure, light intensity has to be measured. This can be done more or less automatically by using the bulit-in light meters or with a separate hand-held meter. There are two methods of measuring light:
Incident reading and reflected light reading. To take an incident reading, the hand-held meter is pointed in the direction of the camera. The measuring angle is increased through the use of a translucent dome over the light receiving element. One variant of this way of measurement is flash metering using a flash meter. In taking a reflected light reading, the light reflected by the subject is measured. Camera light meters have different types of measurement depending on the ratio of the sensor surface to the size of the field being measured:

- ***averaged metering***
- ***selective metering***
- ***spot metering***
- ***matrix metering***



With averaged metering, the overall brightness of the subject is measured. With selective metering, the most important part of the image is measured. Most SLRs have center-weighted averaged metering. This means that although the overall light intensity is measured, the center is given greater prominence (e.g., 80%). Modern light meters use a matrix; certain parts of the image are given greater prominence in determining the exposure. Spot metering covers an extremely small angle (e.g., 1 degree). In many instances it makes sense to take a substitute reading, for example, when the subject cannot be directly measured because it cannot be reached, or when a subject varies substantially from an average reading (bright crowns filling the image frame, portrait of a dark-skinned person), or the subject is high contrast. The photographer's own hand can be used for a substitute reading. In many instances, for example, in technical photography and copy work, the use of a gray card makes sense. This is a piece of cardboard or sheet of plastic which reflects about 18% ("normal"object).

This means that 18% of the light is reflected back from the surface. All meters are calibrated to this medium gray value. The gray card is held as close as possible to the object in a front view, in the direction of the camera, and with side lighting, positioned between the axis of the light and the optical axis.
If metering is done with the camera's own light meter,
the camera is set to "manual" (manual light reading) and an aperture/shutter speed combination is selected which achieves the correct exposure.



Thereafter, the gray card is removed and the image is taken using the values set.

Controlling exposure

One of the key advantages of digital photography is the possibility of checking the proper exposure directly after the shot, not by looking at the LCD image on the camera back, but by checking the histogram. Built-in light meters of modern cameras adjust the exposure in a way that a standard 18% gray reference card is rendered as a midtone.
Modern cameras read multiple areas of a scene and average out the readings, hopefully resulting in the best compromise exposure for that scene.
Digital cameras offer a histogram function. A histogram is a bar graph showing the distribution of all tonal values in the photograph.
This graph can be superimposed on the reviewed image or displayed separately. The horizontal axis represents the tonal values, beginning with the dark tones on the left and ending with the bright ones on the right. If the distribution of tones is shifted to the left, the image is underexposed or it is a low-key image with numerous dark tones. If the distribution is shifted to the right, we have an overexposed image or a high-key image. By checking this histogram after each exposure, perfectly exposed images should be the result. Therefore, the histogram is sometimes referred to as the 21st century light meter.

Accessories for intraoral photography

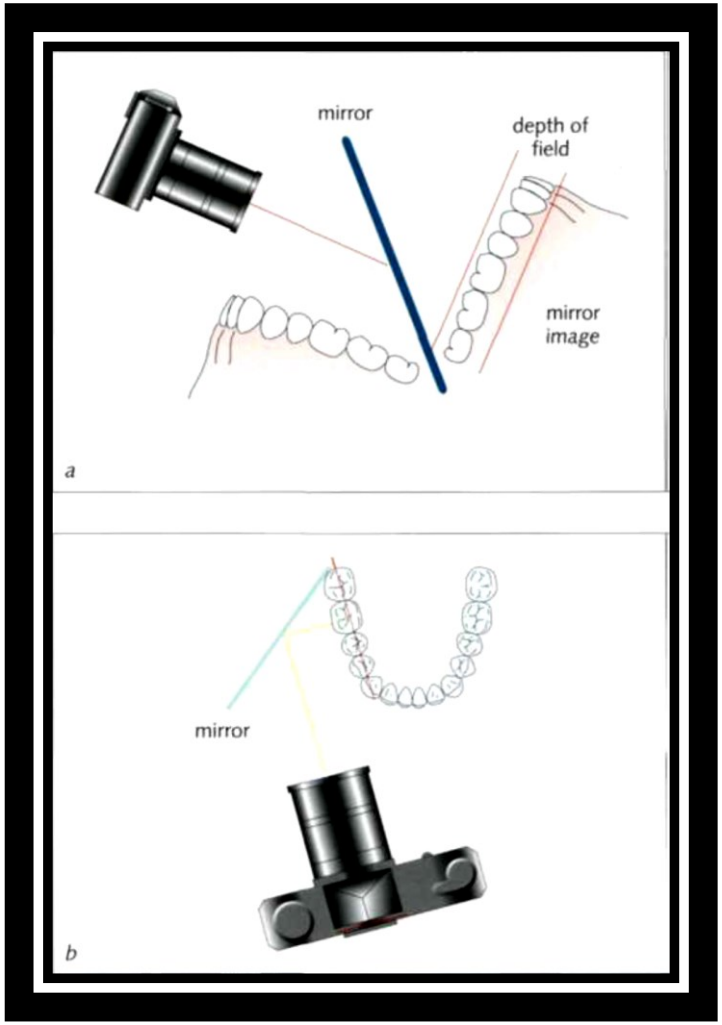
In addition to the camera equipment, a number of aids for intraoral photography are necessary. They enable subjects which are hidden behind lips, cheeks or the tongue, or which are not accessible for a direct view due to their position, to be made visible and photographed.

Lip and cheek retractors:

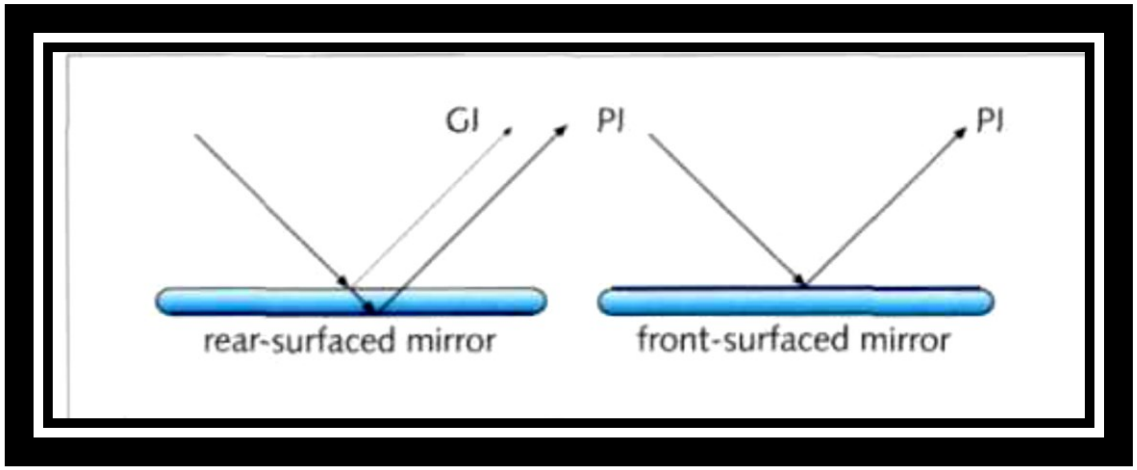
Good intraoral images are not possible without the use of lip retractors. Opening the oral cavity with the use of retractors is not only necessary in order to access the zone to be photographed, but also to achieve optimum illumination
The most commonly used lip holders are those made of clear plastic; these are available in a variety of sizes. They are the most comfortable for the patient and, if photographed, do not interfere with the image, since they allow the underlying structures to shine through. They also have the advantage that their size and shape can be altered. It is recommended that one or two pairs be modified by separating a handle or cutting off one end. This allows mirror photography to be done more easily. Retractors made of wire are also in use, which have a larger or smaller bend at either end. The disadvantage here is that the center of the lips is not held and that the highly polished metal can cause reflections.

Dental photo mirrors:

Intraoral mirrors permit the indirect photography of areas of the mouth which are not directly accessible and, if correctly placed, alleviate the problem of depth of field
There are two types of photographic mirrors. Metal mirrors are less expensive, robust, and can easily be sterilized in an autoclave. Optically, they are inferior to glass mirrors, especially on the edges. Metal-film plated glass mirrors are more fragile and expensive, but yield far more brilliant mirror images and are therefore to be preferred
A set of coated mirrors is commercially available, consisting of two palatal mirrors in varying sizes and a buccal mirror (Manufacturer: Evaporated Metal Films Corp.; PTJ International France). This set permits overall views of the maxilla and mandible and buccal and oral partial views. This type of intraoral mirror is available with and without stainless handles. The handle of the buccal mirror functions as a built-in retractor.
A set of mirrors developed in Professor Rateitschak's Department of Periodontology (Basel, Switzerland) is also commercially available. These are coated glass mirrors with a plastic handle affixed to the back in the manner of a cake knife. The plastic handles make them easier to manipulate (Manufacturer: Filtrop, Liechtenstein)
Rear-surfaced glass mirrors produce a double image, depending on the angle of the mirror and the thickness of the glass. The main mirror image is produced by the back of the mirror, and the secondary mirror image is produced by the glass surface. This often makes the image appear to have camera shake . Thus, they are not recommended for our purposes.
Coated glass mirrors should be cleaned and disinfected carefully to avoid damaging the delicate metal coating. Soap and water or alcohol are suitable for cleaning before chemical sterilization.
Some points must be kept in mind in order to achieve good images using mirrors.

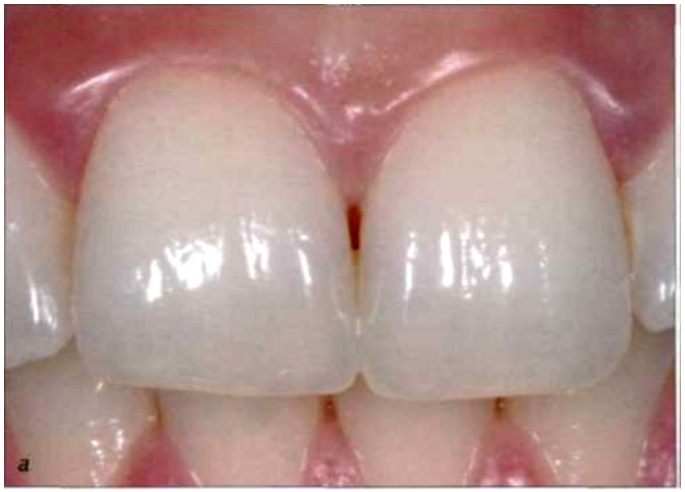


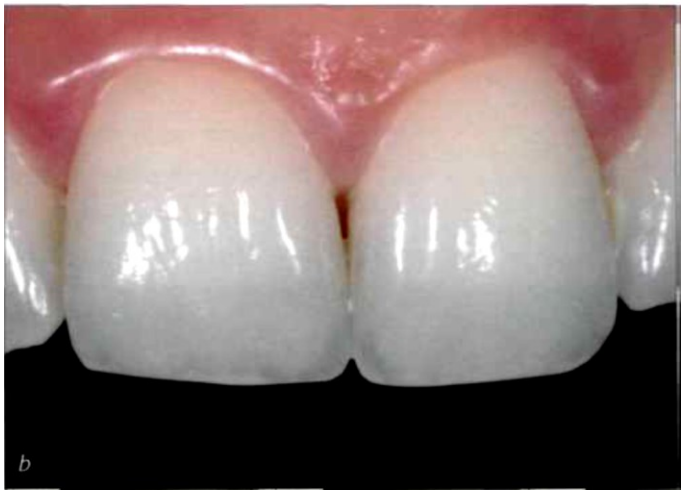
- If possible, the image should be framed so that only the mirror image of the teeth is captured. The
- image can then be reversed and then resembles a photograph which was taken directly. Structures or edges of the mirror should be hardly or not at all visible.
- The fingers holding the mirror should be as far to the front as possible so that they do not appear in the photograph. Mirrors with handles are an advantage.
- Fogging on the mirror's surface can be prevented if an assistant warms the mirror first or directs air at it. Anti-condensation liquids can also be used.
- The patient is instructed to breathe in through the mouth and out through the nose during photography.



Rear-surfaced mirrors provide a primary image (PI) from the back reflective surface, but also a secondary image from reflection off the front glass surface ("ghost image" = 01). Such mirrors are inexpensive, but not suitable for our purposes.

Black background/contrasters





In images, particularly those taken of the front teeth, structures in the back are often disturbing. This can be rectified by placing a black background made in the dental practice in back of the teeth.

Black plexiglass is most suitable for this purpose (available from do-it-yourself or hobby stores). This should be cut to size and rubbed with fine sandpaper to achieve a matte surface. Black cardboard or black plastic are also suitable, although less so for use near the posterior teeth. The black background makes the front teeth appear in isolation. The image is improved because attention of the viewer is focused on the teeth to be shown. A black background is particularly recommended if the translucent regions of the teeth are to be shown. Black backgrounds are commercially available as "contrasters" (PTJ International France, PhotoMed International or Background (Anaxdent).

Clinical photographic techniques

Instructions before Use

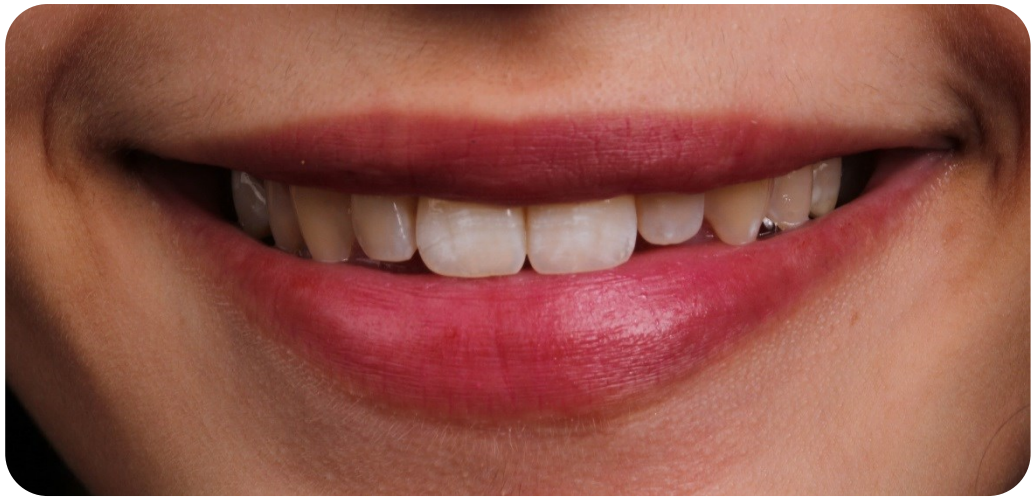
- ❑ Make sure all barriers are in place. The intraoral wand is faced to the white side of the packet sleeve; then the outer layer is removed.
- ❑ Prepare your tray set-up with 2x2's, mirrors, retractors, contrasting medium, moisture control, isolation materials, lip lubricant agent, and other equipment of choice.
- ❑ Prepare the computer log-in according to what computer system you are using.
- ❑ Explain to the patient that your practice uses a camera to assist in demonstrating their possible need and that one of the primary uses is for patient education. Always obtain a consent form, giving their permission for photographs to be taken. They need to be assured that the photographs will be stored on a computer file along with an explanation as to why pictures are taken and that they can take a copy of their pictures at the completion of their appointment.
- ❑ Prepare the body parts of the camera: lens (macro allows close-ups), and the ring flash.
- ❑ Turn the camera on and make adjustments following manufacturer's instructions. Recommendations are: Flash setting 1/200 of a second, F-Stop to F 22, manual setting as this allows you to make changes, manual lens focus (auto focus is not normally used in dentistry). Use a macro 1 for a very close up and/or a 1-3 for normal use. Be sure the flash has been turned on.
- ❑ Position the patient and dry the area with 2x2 gauze and place cheek retractors. Cheek retractors are available in either metal or plastic, single or double ended. The patient can hold the retractors; however, a gloved assistant could possibly be more consistent when moving from right to left.
- ❑ Extra-oral photographs consist of 5 basic shots: Teeth in occlusion or front on, maxillary occlusal using a mirror, mandibular using
- ❑ a mirror,

  a right lateral view and a left lateral view. For the frontal view, use a 1-3 focus with the midline of the patient at the middle of the screen.

  (Pictures can be cropped on the computer.) Side views use the canine and 1st pre-molar as your guide. For the maxillary arch, position the mirror as far back as possible and focus on the mirror with an F-18 Stop. Ask the patient to breathe through their nose to keep the mirror from fogging. A mirror will also be used for the mandibular arch positioning it again as far posterior as possible.

Comprehensive diagnostic image series

1) Full smile frontal view (extra oral view):



Magnification ratio: equivalent of full frame 1:2.
this magnification is displayed in a horizontal format and reveals corners of the mouth, lips, and teeth in a full smile.

Patient orientation:
The patient is in upright position, the head should be perpendicular to the floor while the shoulders are parallel to the floor. the chin should be slightly depressed so that the occlusal plane I parallel to the floor, therefore, if asymmetry is present, it will be reflected in this view

Photographic composition:
The lips should be positioned in the center of the frame with a slight border of the skin displayed beyond the lips. the focus should be on the canine with the nose and chin are not visible. the philtrum of upper lip should be in the center of the frame vertically, the image should be centered horizontally in the frame so that the distance between the top border of upper lip and superior border of the frame is equal to the distance of the bottom border of the lower lip and the inferior border of the frame. a background is not needed.

Position of camera angle:
The camera should be positioned to create horizontal image, and the lens should be perpendicular to the front of the patient face. the photographer is positioned in front of the patient. the body of the camera should be parallel to the horizon. this will accurately depict what exists in the mouth.

Types and position of light source:
Light can be provided by twin flash, point flash, ring flash or studio strobes, the twin flash system provides optimal details and contrast, if the point flash is used, it should be positioned at 12 o'clock.

2) Full smile right lateral view (extra oral):

Magnification ratio: equivalent of full frame 1:2.
this magnification is displayed in a horizontal format and reveals corners of the mouth, lips, and teeth in a full smile from this angle.

Patient orientation:
The patient is in upright position, the head should be perpendicular to the floor while the shoulders are parallel to the floor. the chin should be slightly depressed so that the occlusal plane I parallel to the floor, therefore, if asymmetry is present, it will be reflected in this view

Photographic composition:
the focus should be on the lateral incisor, and it should be nearly in the center of the frame. This view should display the contralateral central incisor to the canine depending on the width of patient. a background should be uniform and non-distracting.

Position of camera angle:
The camera should be positioned to create horizontal image, and the lens should be perpendicular to the front of the patient face and to the right canine. the photographer is positioned to the right of the patient. the body of the camera should be parallel to the horizon.

Types and position of light source:
Light can be provided by twin flash, point flash, ring flash or studio strobes, the twin flash system provides optimal details and contrast, if the point flash is used, it should be positioned at 3 o'clock.

3) Full smile left lateral view (extra oral view):

Magnification ratio: equivalent of full frame 1:2.
this magnification is displayed in a horizontal format and reveals corners of the mouth, lips, and teeth in a full smile from this angle.

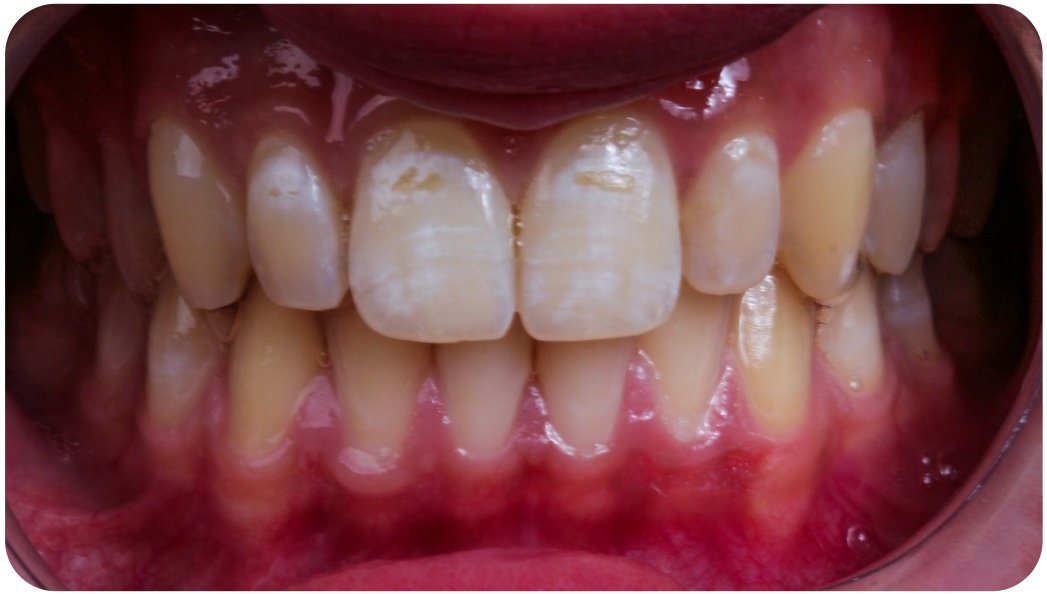
Patient orientation:
The patient is in upright position, the head should be perpendicular to the floor while the shoulders are parallel to the floor. the chin should be slightly depressed so that the occlusal plane I parallel to the floor, therefore, if asymmetry is present, it will be reflected in this view

Photographic composition:
the focus should be on the lateral incisor, and it should be nearly in the center of the frame. This view should display the contralateral central incisor to the canine depending on the width of patient. a background should be uniform and non-distracting.

Position of camera angle:
The camera should be positioned to create horizontal image, and the lens should be perpendicular to the front of the patient face and to the left canine. the photographer is positioned to the left of the patient. the body of the camera should be parallel to the horizon.

Types and position of light source:
Light can be provided by twin flash, point flash, ring flash or studio strobes, the twin flash system provides optimal details and contrast, if the point flash is used, it should be positioned at 9 o'clock.

4) Maxillary /mandibular retracted frontal view (intra oral view):



Magnification ratio:

equivalent of full frame 1:2.
this magnification is displayed the maxillary\mandibular anterior teeth and gingiva. It can be photographed in maximal intercuspation and \or with teeth separated 2 to 3 mm. the retractors should be pulled as firmly as possible so as not to display the retractors in composition.

Patient orientation:

The patient is in upright position with the head supported in the headrest. The head should be perpendicular to the floor while the shoulders are parallel to the floor. the chin should be slightly depressed so that the occlusal plane is parallel to the floor, the patient's teeth should be separated 2 to 3 mm or in maximal intercusation.

Photographic composition:

The view should display the maxillary and mandibular incisors in the middle of the frame. the teeth should be centered in a vertical dimension with the upper and lower lips bordering the edges of the frame. the midline of the face should be in the center of the frame vertically. and the incisal plane of upper teeth should be in the center of the frame horizontally. the buccal corridors should be visible with a limited view of the retractors. the gingiva should be evident in the top and bottom positions of the frame

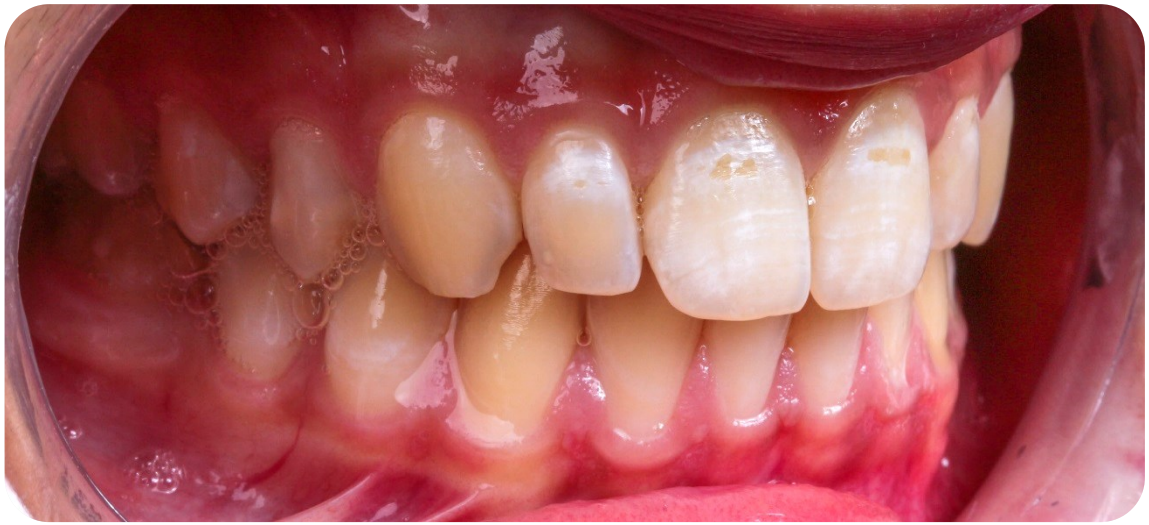
Position of camera angle:

The camera should be positioned to create horizontal image, and the lens should be perpendicular to the front of the patient face. the photographer is positioned in front of the patient. the body of the camera should be parallel to the horizon.

Types and position of light source:

Light can be provided by twin flash, point flash, ring flash or studio strobes, the twin flash system provides optimal details and contrast, if the point flash is used, it should be positioned at 12 o'clock.

5) Maxillary\mandibular retracted right lateral view (intra oral view):



Magnification ratio:

equivalent of full frame 1:2.
this magnification is displayed the maxillary\mandibular anterior teeth and gingiva. It can be photographed in maximal intercuspation and \or with teeth separated 2 to 3 mm. the retractors should be pulled as firmly as possible in the photographed side and released from the opposite side.

Patient orientation:

The patient is in upright position with the head supported in the headrest. The head should be perpendicular to the floor while the shoulders are parallel to the floor. the chin should be slightly depressed so that the occlusal plane is parallel to the floor, the patient's teeth should be separated 2 to 3 mm or in maximal intercusation

Photographic composition:

The view should display the maxillary and mandibular anterior and posterior teeth (from the contralateral central incisor to the distal of the first molar) either in maximal intercuspation or separated 2 to 3 mm. the occlusal plane should be centered in a horizontal orientation with the upper and lower lips bordering the edges of the frame. the buccal corridor should be visible with a limited view of the retractor. the gingiva should be evident in the top and bottom positions of the frame

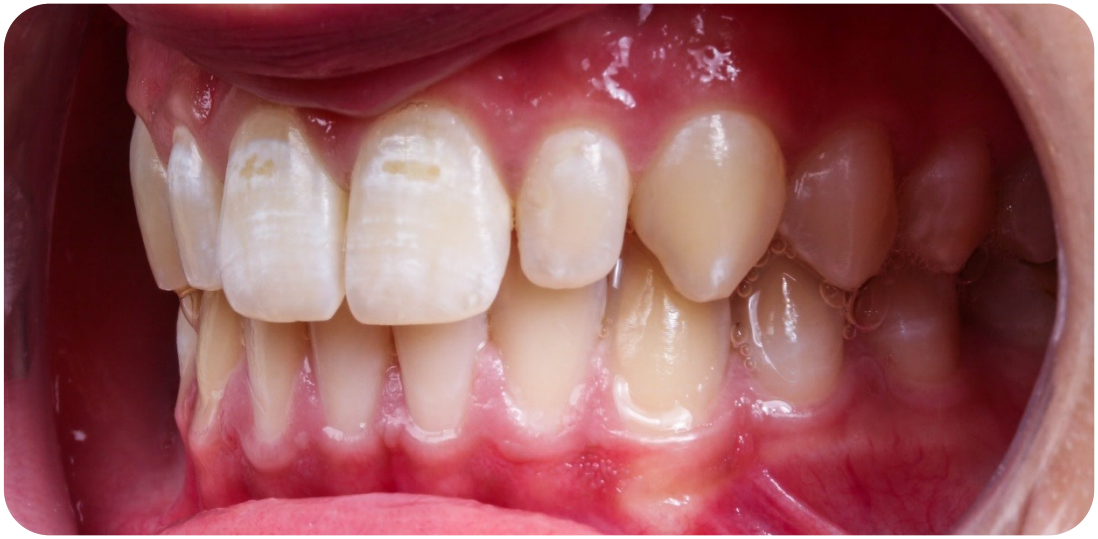
Position of camera angle:

The camera should be positioned to create horizontal image, and the lens should be perpendicular to the front of the patient face and to the right canine. the photographer is positioned to the right of the patient. the body of the camera should be parallel to the horizon. The vertical angle is identical to that of the frontal view but should focus on the maxillary right canine

Types and position of light source:

Light can be provided by twin flash, point flash, ring flash or studio strobes, the twin flash system provides optimal details and contrast, if the point flash is used, it should be positioned at 3o'clock.

6) Maxillary \mandibular retracted left lateral view (intra oral view):



Magnification ratio:

equivalent of full frame 1:2.
this magnification is displayed the maxillary\mandibular anterior teeth and gingiva. It can be photographed in maximal intercuspation and \or with teeth separated 2 to 3 mm. the retractors should be pulled as firmly as possible in the photographed side and released from the opposite side.

Patient orientation:

The patient is in upright position with the head supported in the headrest. The head should be perpendicular to the floor while the shoulders are parallel to the floor. the chin should be slightly depressed so that the occlusal plane is parallel to the floor, the patient's teeth should be separated 2 to 3 mm or in maximal intercusation

Photographic composition:

The view should display the maxillary and mandibular anterior and posterior teeth (from the contralateral central incisor to the distal of the first molar) either in maximal intercuspation or separated 2 to 3 mm. the occlusal plane should be centered in a horizontal orientation with the upper and lower lips bordering the edges of the frame. the buccal corridor should be visible with a limited view of the retractor. the gingiva should be evident in the top and bottom positions of the frame

Position of camera angle:

The camera should be positioned to create horizontal image, and the lens should be perpendicular to the front of the patient face and to the left canine. the photographer is positioned to the left of the patient. the body of the camera should be parallel to the horizon. The vertical angle is identical to that of the frontal view but should focus on the maxillary left canine

Types and position of light source:

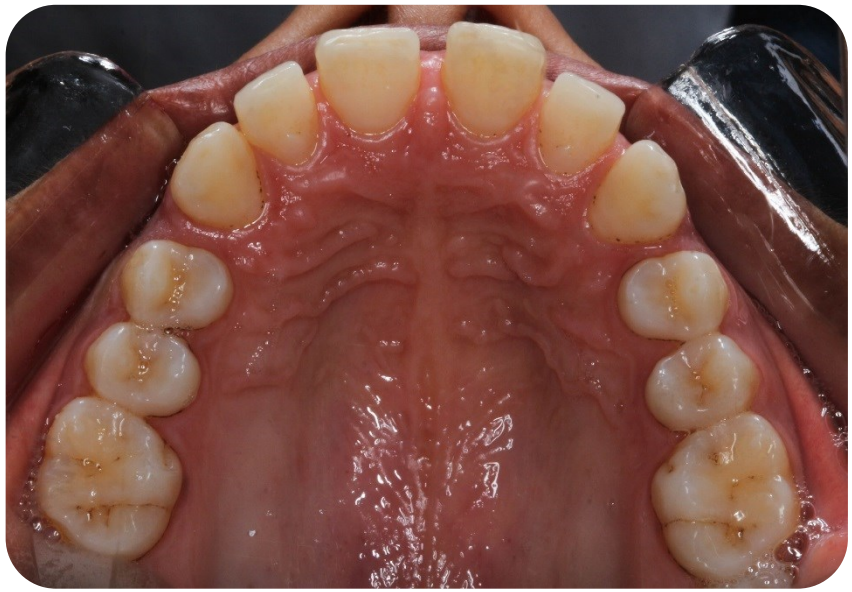
Light can be provided by twin flash, point flash, ring flash or studio strobes, the twin flash system provides optimal details and contrast, if the point flash is used, it should be positioned at 9 o'clock.

7) Maxillary occlusal view (reflected technique)

Magnification ratio:

equivalent of full frame 1:2.

this magnification should display a full view of the maxillary arch. it should extend from the facial of the anterior teeth to the distal of the last molar. incorporating Medio laterally the buccal surfaces of the most distal molar.



Patient orientation:

The patient is positioned in a supine position with the head tilted back. the patient's mouth should be open as wide as possible for proper mirror placement. to prevent fogging of the mirror. one method is to have a gentle air stream on the mirror surface. another method is to place the mirror in a bowel of warm water and dry with lens tissue before placing in the mouth.

Photographic composition:

The view should display a horizontal format of all the teeth of the arch. Extending from the facial of the anteriors to the distal of the last molar. also it should incorporate Medio laterally the buccal surface of the last distal molar. the view should have limited view of the retractors, edges of the mirror, the nose, the reflected teeth. the focus should be on the premolars. And an imaginary line drawn between them should be parallel to the inferior edge of the frame.

Position of camera angle:

The camera should be positioned to create horizontal image, and the lens should be perpendicular to the mirror surface. the photographer is positioned behind the patient.

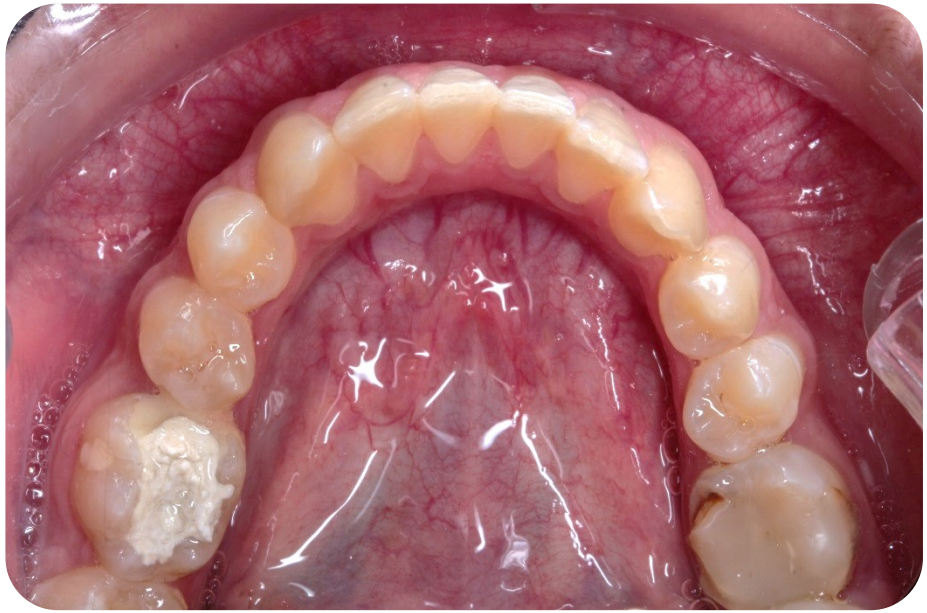
Types and position of light source:

Light can be provided by twin flash, point flash, ring flash or studio strobes, the ring flash system provides optimal distribution of light, if the point flash is used, it should be positioned at12 o'clock.

8) Mandibular occlusal view (reflected technique):

Magnification ratio:

equivalent of full frame 1:2.
this magnification should display a full view of the mandibular arch. it should extend from the facial of the anterior teeth to the distal of the last molar. incorporating Medio laterally the buccal surfaces of the most distal molar.



Patient orientation:

The patient is positioned in a supine position with the head tilted back.
the patient's mouth should be open as wide as possible for proper mirror placement. to prevent fogging of the mirror. one method is to have a gentle air stream on the mirror surface. another method is to place the mirror in a bowel of warm water and dry with lens tissue before placing in the mouth.

Photographic composition:

The view should display a horizontal format of all the teeth of the arch. Extending from the facial of the anteriors to the distal of the last molar. also it should incorporate Medio laterally the buccal surface of the last distal molar. the view should have limited view of the retractors, edges of the mirror, the nose, the reflected teeth. the focus should be on the premolars. And an imaginary line drawn between them should be parallel to the inferior edge of the frame.

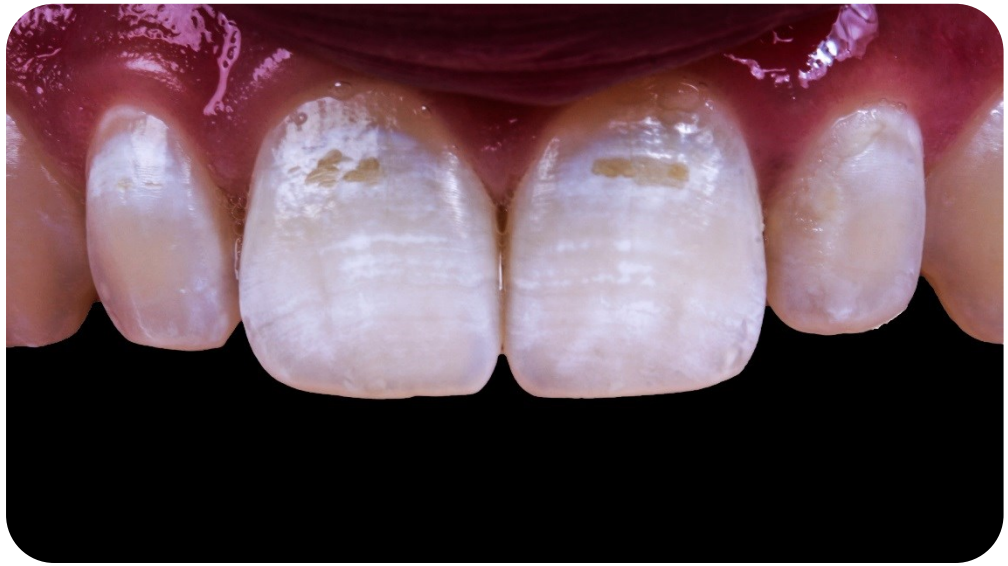
Position of camera angle:

The camera should be positioned to create horizontal image, and the lens should be perpendicular to the mirror surface. the photographer is positioned in front of the patient

Types and position of light source:

Light can be provided by twin flash, point flash, ring flash or studio strobes, the ring flash system provides optimal distribution of light, if the point flash is used, it should be positioned at12 o'clock.

9) maxillary anterior incisors view



Magnification ratio:
equivalent of full frame 1:1.
this magnification should display a full view of the maxillary incisors.
it should show from 4 to 6 of the maxillary anteriors .

Patient orientation:
The patient is in upright position with the head supported in the headrest. The head should be perpendicular to the floor while the shoulders are parallel to the floor. the chin should be slightly depressed so that the occlusal plane is parallel to the floor, the patient's teeth should be separated 2 to 3 mm.

Photographic composition:
The view should display a maxillary anterior teeth and the gingiva in the center of the frame. the central incisor should be in the middle of the image and should reveal from four to six of the maxillary teeth, the tip of the papilla between the two central incisors should be centered vertically. black contrastors are used to remove distracting structures, in the oral cavity while improving the isolation of the image

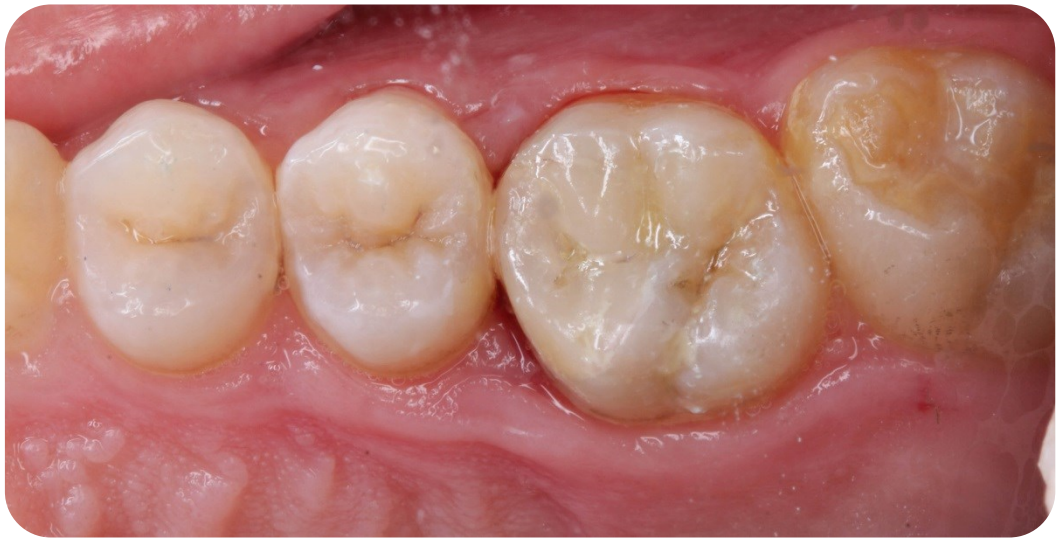
Position of camera angle:
The camera should be positioned to create horizontal image, and the lens should be perpendicular to the front of the patient face. the photographer is positioned in front of the patient. the body of the camera should be parallel to the horizon.

Types and position of light source:
Light can be provided by twin flash, point flash, ring flash or studio strobes, the twin flash system provides optimal distribution of light and contrast, if the point flash is used, it should be positioned at12 o'clock.

10) quadrant occlusal view:

Magnification ratio:

equivalent of full frame 1:1 or 1 :1.5.
this magnification should display at least the distal of the canine to the distal of the second molar. When photographing shade tabs from this view point, it's recommended to use a hemostat, keeping the surface of the tab in the same plane as the occlusal surface and incorporating the shade identification label in view



Patient orientation:

The patient is positioned in a supine position with the head tilted back. the patient's mouth should be open as wide as possible for proper mirror placement. to prevent fogging of the mirror. one method is to have a gentle air stream on the mirror surface. another method is to place the mirror in a bowel of warm water and dry with lens tissue before placing in the mouth.

Photographic composition:

The view should display a horizontal format of teeth. this view should display at least the distal of the canine to the distal of the second molar. When photographing shade tabs from this view point, it's recommended to use a hemostat, keeping the surface of the tab in the same plane as the occlusal surface and incorporating the shade identification label in view

Position of camera angle:

The camera should be positioned to create horizontal image, and the lens should be perpendicular to the mirror surface. the photographer is positioned behind the patient.

Types and position of light source:

Light can be provided by twin flash, point flash, ring flash or studio strobes, the ring flash system provides optimal distribution of light, if the point flash is used, it should be positioned at12 o'clock.

11) **Portrait view**:

Magnification ratio:

equivalent of full frame 1:10.
The magnification is essential because these images are used as references of the teeth to facial features. the image should include the top of the patient's forehead and slightly below the chin. The lens barrel shouldn't be adjusted because it's necessary for the image to be constant, a fixed subject to camera distance should be designated on the floor,

Patient orientation:

The patient is positioned in a standing or seating position in front of a uniform and non-distracting background, the head should be perpendicular to the floor while the shoulders are parallel. the chin should be slightly depressed so that the occlusal plane is parallel to the floor. The interpapillary line should be parallel to the inferior edge of the image.

Photographic composition:

The complete face should be visible, the head should be vertical and not tilted, and the nose should be centered in the middle of the frame, the patient should display a full smile.

Position of camera angle:

The camera should be positioned to create horizontal image, and aligned with the interpapillary line and long axis of the face. The camera should be positioned in front of the face. the photographer is positioned in front of the patient and focus on the patient eye.

Types and position of light source:

Light can be provided by electronic flash, portable speed light or studio strobes, with or with our diffusion.

12) Profile view

Magnification ratio:

equivalent of full frame 1:10 because the width of the average head is 8 to 8.5 inches from ear tip to ear tip and the dimension from the tip of the nose to the back of the head is 9.5 to 10 inches. it's often necessary to eliminate 1 to 1.5 inches from the back of the head.

Patient orientation:

The patient's head should be positioned so that the Frankfort plane is horizontal and parallel to the inferior edge of the frame. the patient is positioned with the body turned at right angles to the camera body. and the patient face should rotate 3 to 5 degree back toward the camera lens to prevent the face from appearing turned away from the lens. the patient should look straight ahead and focus on a designated mark on the wall, the ala –tragus line is parallel to the horizon.

Photographic composition:

The tip of the nose will have a definitive border between it and the edge of the frame. in some patients, this will require elimination of the back of the head, also the ala tragus line will be parallel to the inferior border of the frame. the background should be uniform and non-distracting.

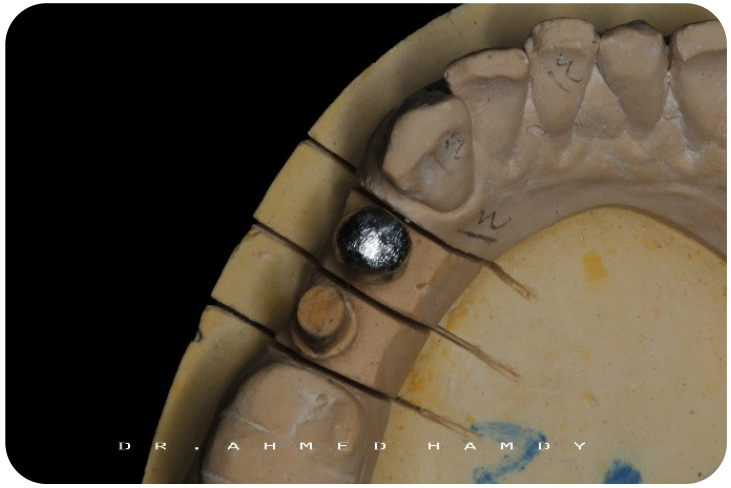
Position of camera angle:

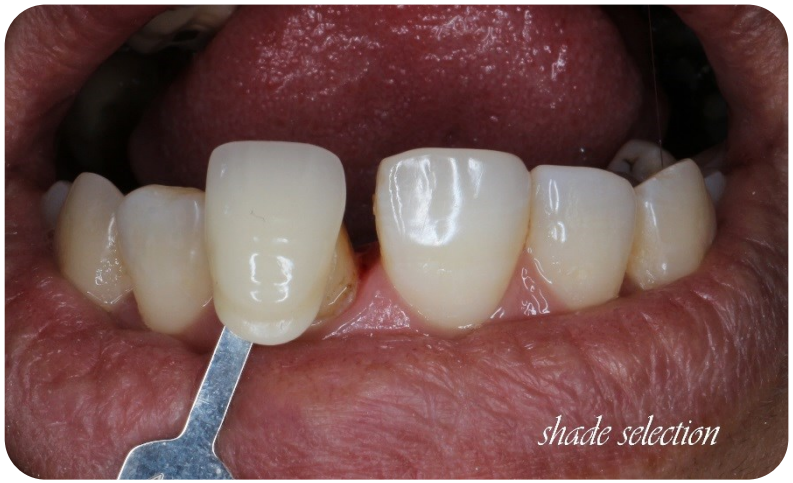
The camera should be positioned to completely fill the frame with the image. the photographer should direct the center of the lens 1 to 1.5 inches above the pupil of the eye. The camera should be to the side so that the lens is directed at the center of the eye. the photographer is on the side of the patient.

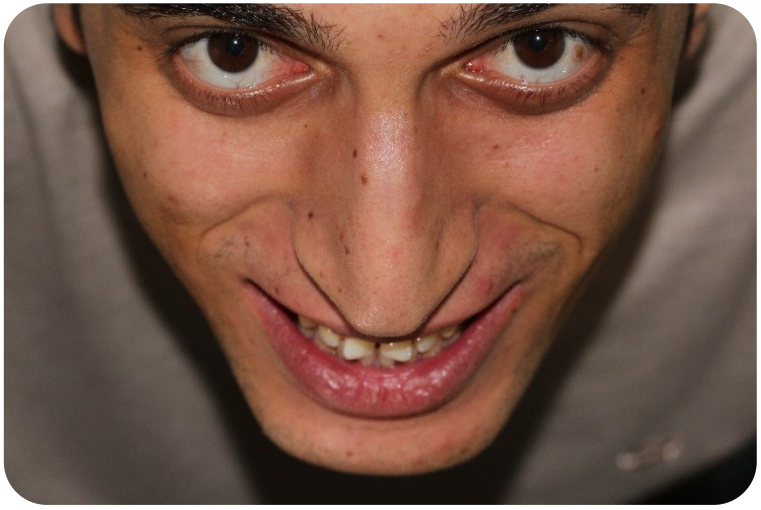
Types and position of light source:

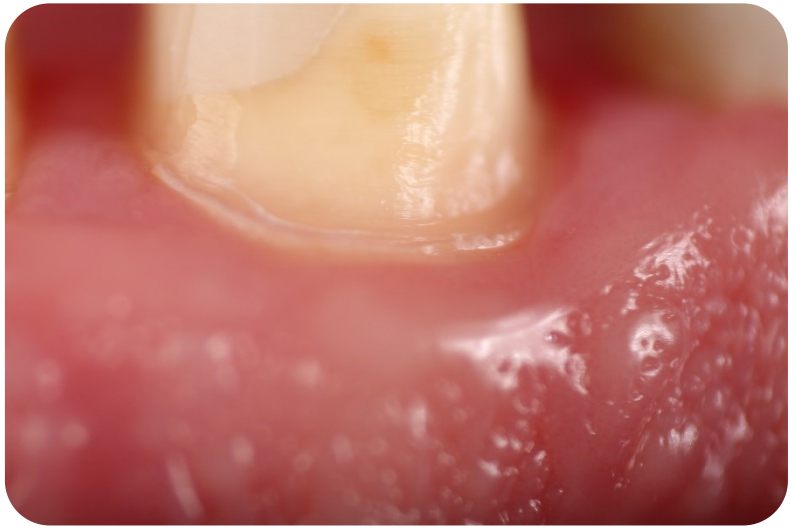
Light can be provided by electronic flash, portable speed light or studio strobes, with or with our diffusion.

Accessory views:









Sources of errors

- There are a number of errors that can occur but they can usually be divided between two groups. The first group includes errors that arise due to inappropriate choice or use of equipment including the camera, lens, flash, retractors, mirrors, suction, or a lack of understanding. The second group of errors relates to any recording medium and involves inappropriate positioning of the subject. These errors need to be minimized to achieve the highest possible quality of photographic records.

Like any new skill…… This will take practice and dedication to master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