

# Photography in Dentistry

*Theory and Techniques in Modern Documentation*

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## Dedication

*To my two wonderful daughters, Martina and Nicoletta. May they always believe in the beauty of their dreams and have the strength to realize them.*

*Pasquale Loiacono*

*To my beloved daughter, Alice, an irreplaceable source of energy, and to my great friend and master of life, Sandro Rodaro.*

*Luca Pascoletti*

## Foreword

Writing the foreword to a text requires a great moral and ethical commitment and, I would add, is an important responsibility toward both the authors and the readers. When my friends, Pasquale Loiacono and Luca Pascoletti, the authors of *Photography in Dentistry*, asked me to write the foreword to their book, I was pleased and honored to give a brief introduction to this work for two reasons. First, I have known the authors for several years and have followed the path of their professional growth; second, they are dear friends, and I feel a particular bond of affection toward them.

The major innovation represented by this text is the formation of the team of the two authors, who possess extraordinary qualities and gifts. This fine union of distinct talents has resulted in a work that is scientific and, at the same time, practical. The authors have interacted well together to create a text that is cohesive and extremely useful from a didactic point of view. It provides the reader—the novice or

expert dentist-photographer—with a complete guide for obtaining excellent photographic documentation.

I can only express my most sincere compliments to the two authors for achieving a work in which the content and form is well rounded, complete, and supported by excellent illustrations—in other words, a work which I would have been pleased to have written myself. I am, therefore, convinced that this book will be greatly appreciated and put to good use by both novice dentists, aiming to acquire the techniques of photography, and skilled clinicians, who will certainly find theories and ideas to put into practice straightaway.

With my most sincere compliments,

Domenico Massironi, MD, DMD  
Private Practice  
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## Preface

The idea of creating a manual of photography for dentists originated from a specific cultural frame of reference, the Massironi Study Club, which is based upon the philosophy and teachings of Dr Domenico Massironi. We consider this work to be one of the many fruits borne from the tireless and visionary work of our “Maestro.” We are aware that he is not keen on being defined in this manner; however, the influence of his teachings and his scientific rigor leads us to consider him with such profound affection and respect that we are unable to express ourselves in any other way. Thus, a warm thank you goes to him and to all friends of the Massironi Study Club with whom we share an exciting journey of personal and professional growth.

Why a book on photography?

First, we love and strongly believe in photography as a fundamental means towards our professional evolution. On a daily basis, it allows us to verify the path of our learning and to relate, in a positive way, to patients and colleagues alike. Our love of photography, together with our love of our profession, has always led us to wonder how so many competent professionals consider themselves unable to take photographs that are comparable to the quality of their own work. This false conviction deprives them the opportunity to be appreciated

by a wider audience or, more simply, to record their own professional path.

Our second fundamental motivation is an awareness that the current approach towards dental photography is totally lacking in standardized procedures or agreed-upon rules, which are present in all other traditional dental disciplines. Many colleagues turn to nonspecialized photographers to obtain information or to learn how to take dental photographs. However, the answers they receive are vague and often based on strictly commercial interests rather than the outcome of rigorous scientific reasoning.

We believe that any dentist can quickly acquire the rudimentary skills needed to take more-than-adequate photographs or, with very little extra effort, even excellent ones. The real problem is that there are very few comprehensive books on photography designed and written by dentists for dentists. Because we believe that only an insider can be aware of the day-to-day problems that we face in our profession, we were keen to put our knowledge at the disposal of our colleagues, in the hopes of spreading the use of this valuable instrument.

*Pasquale Loiacono and Luca Pascoletti*

# Acknowledgments

My thoughts of gratitude and immense affection go first to my family: to my wife, Marianna, and my daughters, Martina and Nicoletta, for all the time I have taken away from them and, in particular, to my daughters for their contribution as models in this book.

I would also like to thank Dr Domenico Massironi for the great affection with which he has always supported, guided, and motivated me in both my personal and professional growth; my friend, Dr Bruno Alia, for his competent advice on medicolegal matters; Professors Luciano Meligrana and Aurelio Piserà, for their masterly stylistic advice; my dental technicians, Marcello Aiello, Gianluca and Francesco Barbagallo, and Evio Sirianni, for the professional passion and friendship that we share; Rosemary Barber, for her valuable collaboration in the translation of the text; Marco Forelli, for the skills that he has put at my disposal; Fabio Rodaro, for the attention he has devoted to my ideas and the care and skill with which he has executed the illustrations; my friend, Salvatore Accorinti, for the long and valuable conversations about computing and various methodologic and technical details. Another thank you goes to my close friend, Nando Ricciardi, the first person to believe in this project, for the support and affection he has always shown toward me.

*Pasquale Loiacono*

I would like to thank my great friend and Maestro, Dr Domenico Massironi, who has proved to be an invaluable guide both in my life and my profession. He has believed in and supported this project, providing us from the outset with important and essential advice. I would also like to thank my model, Sara Lirussi, who has willingly and patiently sat for numerous photographic sessions.

Other thanks go to expert professional photographer Alberto Cuoco, for the simplicity with which he has performed the often tricky photographic sequences and the skill with which he has demonstrated the positioning of the operators and the photographic equipment; to our illustrator and friend Fabio Rodaro, who, with wisdom and intuition, has managed to transform often ultratechnical images into pleasing and original drawings.

A heartfelt thanks goes to our orthodontist friend Luca Conoscenti, for his valuable collaboration, which has always proved helpful in developing and achieving often ambitious projects; to Piero Corsi, an irreplaceable friend with whom I share much of my free time, for his visual ideas for teaching and the unconditional friendship that he has always shown toward me.

A particular thank you to my assistants, Silvia Della Ricca, who has actively collaborated in the realization of this book as assistant photographer, and Daniela Baiutti, with whom I have shared my entire professional life and growth, for her help and patience.

*Luca Pascoletti*

*Pasquale Loiacono*

*Part One*

# Theory



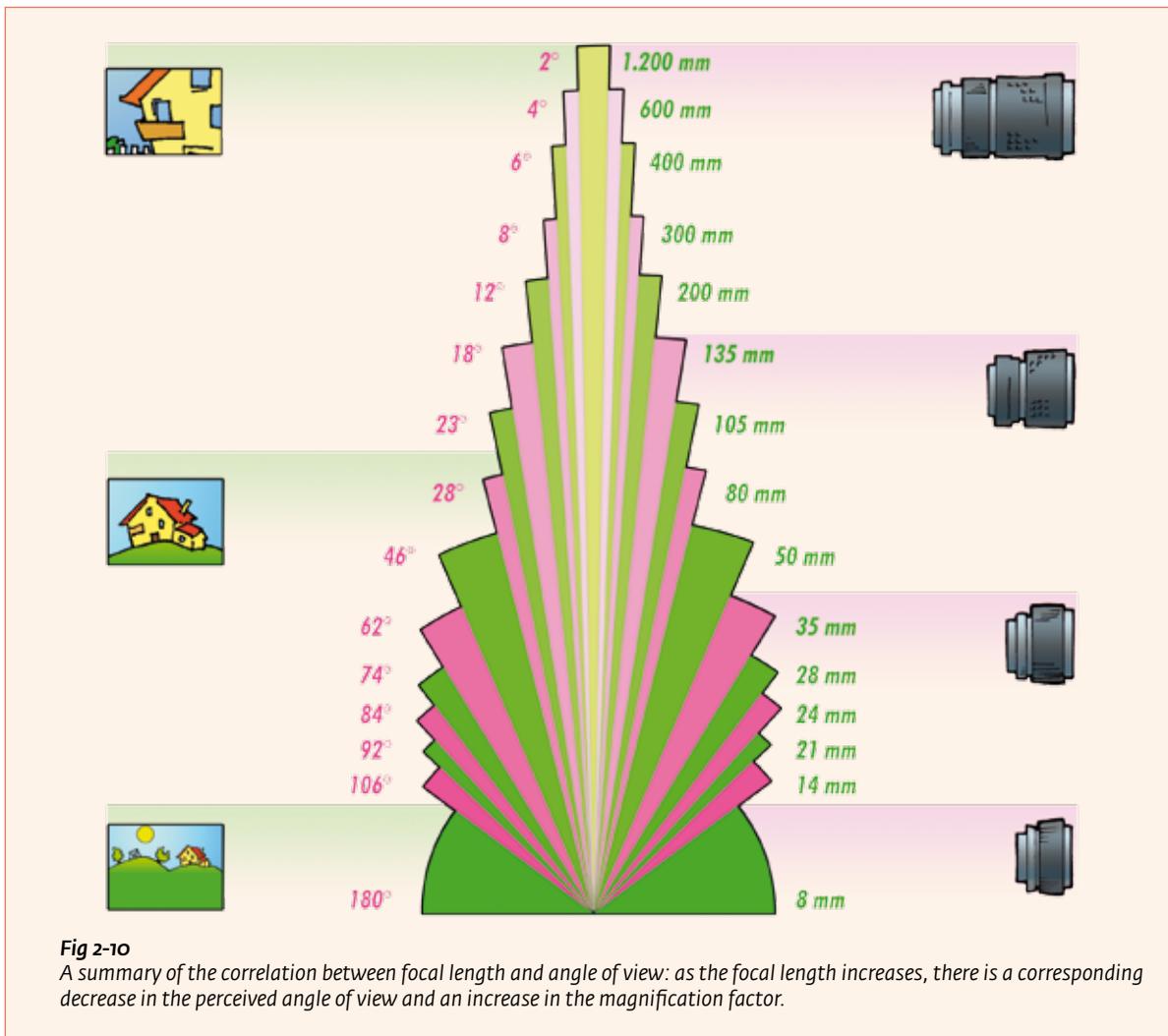
*Chapter 1*

# General Principles of Photography

magnification factor is a multiplicative factor. Each multiple of the focal length corresponds to a multiple of the magnification factor.

If the focal length is multiplied by four, the resulting magnification factor is 4×. Similarly, when the focal length is reduced by half, the magnification factor is 0.5×, creating an image half the size of natural vision. To summarize, reducing the focal length results in an increase in the perceived angle of the field of view and a decrease in the magnification factor. An increase in the focal length results in a

decrease in the angle of view and an increase in the magnification factor, or size of the object perceived by the observer (Table 2-1). In this instance, there will be a cropping effect so that a smaller portion of the subject will be included in the photograph, and it will appear magnified (Fig 2-10). The prismatic magnifying system commonly used in clinical practice has a *magnification factor* of 4.3×, meaning that the practitioner's vision of the scene is magnified 4.3 times with respect to normal vision.



**RELATIONSHIP BETWEEN FOCAL LENGTH, ANGLE OF VIEW, AND MAGNIFICATION FACTOR**

As the focal length <i>INCREASES</i>	Angle of view <i>DECREASES</i>	Magnification factor <i>increases</i> ; Image of object is <i>magnified</i>
As the focal length <i>DECREASES</i>	Angle of view <i>INCREASES</i>	Magnification factor <i>decreases</i> ; Image of object is <i>reduced</i>

**Table 2-1**

**Fig 2-11**

The characteristics of a lens are inscribed on the lens itself: 28 mm indicates the focal length; 1:2.8 indicates the lens speed, or maximum aperture;  $\varnothing$  49 mm refers to the diameter of filters or ring accessories that can be attached if required; and the words "wide angle" describe the type of lens. Because the focal length is 28 mm and the lens speed is f/2.8, the maximum aperture is 10 mm ( $28 \div 2.8 = 10$ ). "MC" indicates that this is a macro lens with a short minimum focusing distance.



**Fig 2-12**

The Yashica Dental Eye camera uses a classic 24 × 36-mm film format. Next to the camera is the additional 2× lens required to increase the magnification factor. The additional lens is a focal multiplier. The direct relationship between focal length and magnification ratio is clearly evident.



Exposure may also need to be corrected in the presence of metallic accessories such as rubber dam clamps or base supports for shade guides. These can cause reflections that can deceive the exposure meter, resulting in an extremely underexposed image. Even objects placed onto a black or dark background can deceive the exposure meter, resulting in an overexposed image. This is common when photographing prostheses or orthodontic appliances.

Every camera is fitted with an exposure correction button that allows the operator to achieve excellent results by means of rapid consecutive adjustments (Figs 3-5a to 3-5c). There is a similar button for the flash, giving the operator two methods to correct the exposure (Figs 3-5d and 3-5e). The result of using either button is the same, because they both affect the duration of the flash as determined by the camera-exposure meter synergy.

The exposure can be corrected after recording the image by means of special programs at the processing or postproduction stage. However, a photograph should be excellent at the stage of image acquisition; it is unacceptable to manipulate an image to make it appear suitable for a particular purpose, even if software allows it. The basic aim is to faithfully document reality, not to manipulate it to make it appear better than it is. It is neither ethical nor scientifically correct to manipulate images beyond slight corrections of exposure, contrast, or color; minor modifications, such as slight cropping or rotating of the image, are admissible to correct the magnification ratio or the orientation of the image.



**Fig 3-4a**



**Fig 3-4b**



**Fig 3-4c**

**Figs 3-4a to 3-4c**

A tooth is photographed against three different backgrounds, with no exposure correction. The tooth against the white background appears less bright, while the white background itself looks gray. Against the black background, the tooth appears much whiter and more luminous than in the other images, and it appears more natural in its brightness against the gray background. The exposure meter has interpreted the white background as standard gray, and the camera has greatly underexposed the image. The opposite has occurred against the black background, resulting in overexposure. The different brightness or value of the tooth is the primary parameter perceived by the human eye, much more so than the difference in color of the tooth. This is a fundamental concept in esthetic restorations. This series of photos effectively demonstrates the physiological phenomenon of simultaneous value contrast.



Fig 3-4d



Fig 3-4e



Fig 3-4f

**Figs 3-4d to 3-4f**

The series of three photographs is repeated with an exposure correction of +1 exposure value (EV). Against the white background, the tooth is represented more realistically, but against the black background, overexposure has created a decidedly poorer-quality image.



Fig 3-4g



Fig 3-4h



Fig 3-4i

**Figs 3-4g to 3-4i**

The series of three photographs is repeated with an exposure correction of -1 EV. Against the white background, the image of the tooth is poorly lit, but the image is much better exposed against the black background. Different exposure settings result in considerable variation in the perception of the brightness of the tooth. A simple photograph is not a reliable method to transmit information relating to the brightness of the tooth. To convey the value of the tooth more effectively, it should be photographed with appropriate exposure corrections alongside an object of known brightness to which it can be compared, such as a shade guide.



Fig 3-4j



Fig 3-4k



Fig 3-4l

**Figs 3-4j to 3-4l**

This series of photographs shows the influence of background brightness on the exposure. To convey the correct brightness of the tooth itself against different backgrounds, the following corrections were made: +1 EV against the white background, -1 EV against the black, and no change in EV against the mid-tone gray. The perceived differences in brightness depend on the physiological phenomenon of value contrast.

*By the term frame, we mean the area of space included and visualized in the photographic image. What makes up the frame is the choice of the magnification ratio, which is the mere expression of the photographer's will.*

### Concept of Framing

The *frame* is the area of space included and visible in the photographic image. As previously discussed, the magnification ratio is the means used to distinguish elements that are important to include in the image from those that must be excluded.

To repeat the one essential rule that underlies the reasoning and methods of close-up dental photography, the two priorities are magnification ratio and depth of field.

A corollary of this general rule is that *the choice of the magnification ratio determines the frame*. Related to this rule are two problems particular to dentistry. First, the practitioner needs to use soft tissue retractors and specially shaped mirrors for many types of images, especially for posterior and occlusal views. Second, the center of the frame often does not coincide with the desired focal point. There is often a difference between the point at which the camera is aimed and the point to be put into focus. The tasks of framing and shooting are facilitated when these two points coincide. When these points differ, additional effort and thought are required to obtain an excellent documentary photograph.

### Accessories for Intraoral Photography: Retractors and Mirrors

All intraoral images require the use of accessories to retract the soft tissues and allow correct framing with respect to the desired magnification ratio. Moreover, they remove unwanted peripheral elements or elements of visual tension. Cheek retractors are made of plastic or metal, in various shapes and sizes, and are chosen according to the image to be taken (Figs 7-1a and 7-1b). Some photographs require the aid of mirrors, which are also available in a variety of shapes to reflect the targeted area (Figs 7-1c and 7-1d). Without the aid of these devices, it is impossible to directly photograph the complete arch from the occlusal aspect, because to do so would exceed the anatomical limitations of the patient's mouth opening (Fig 7-2a). Similarly, it is not possible to take a lateral view without a mirror, because the cheek requires complete retraction (Fig 7-2b). The accessories recommended for various images will be illustrated.



Fig 7-1a



Fig 7-1b



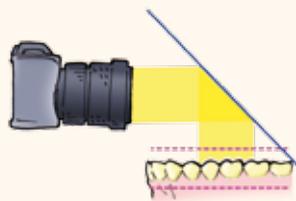
Fig 7-1c



Fig 7-1d

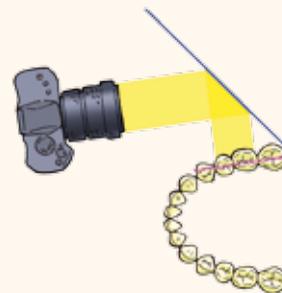
**Figs 7-1a to 7-1dc**

*Mirrors and cheek retractors are available in various shapes and sizes for different kinds of images and patients.*



**Fig 7-2a**

*An occlusal photograph of the entire arch requires the use of appropriate mirrors. This image cannot be framed directly because of the anatomical limitations of the patient's mouth opening.*



**Fig 7-2b**

*The presence of perioral tissues prevents the practitioner from taking certain shots directly. In this lateral photograph of arches in occlusion, the use of appropriately shaped mirrors is necessary to photograph a reflected, rather than direct, image. The image will not be real, but instead will be reflected and inverted; with appropriate programs for handling the image, it is easy to invert the image again and render it true to life.*

## VIEW 9

**Degree of difficulty: 5**

**Position of the patient:**

- Backrest of the treatment chair inclined 135 degrees (Fig 12-21a)
- Head turned 70 degrees towards the practitioner

**Position of the assistant:**

- Seated at the 12-o'clock position (Figs 12-21a and 12-21b)
- Cheek retractor held in the left hand; mirror in the right hand

**Position of the practitioner:**

- Standing at the 7-o'clock position (Figs 12-21a and 12-21b)

**Camera settings:**

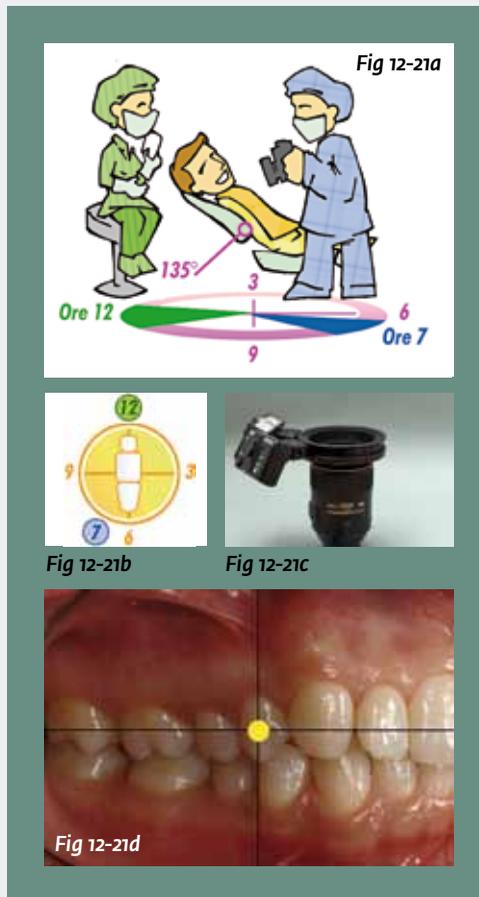
- Camera held horizontally 45cm from the focal point
- Magnification ratio 1:2.7; aperture f/32 (minimum aperture)
- Flash units placed side by side at the 9-o'clock position (Fig 12-21c)
- Aiming point and focal point on the maxillary right first premolar (Fig 12-21d)

**Type of cheek retractor:**

- Handheld cheek retractor

**Type of mirror:**

- Bean-shaped mirror; tapered end used



### ACCESSORIES NEEDED



Fig 12-22a



Fig 12-22b



Fig 12-22c



Fig 12-22d

Fig 12-22a Saliva ejector and air-water spray.

Fig 12-22b Handheld cheek retractor.

Fig 12-22c Bean-shaped mirror.

Fig 12-22d External-handle mirror (Omnia) for lateral views.

Fig 12-22e The correct position of the mirror is shown; the concave-convex edge of the tapered end is positioned above, with the convex one below.



Fig 12-22e

# Right Quadrants in Occlusion

## COMMENTS



**Fig 12-23**  
This image of the right quadrants in normal occlusion, from the central incisor to the second molar, is suitable for orthodontic documentation.

The difficulty of this shot is that it is extremely hard, or even impossible, to view the teeth in occlusion as far back as the second molar while remaining perpendicular to the arches themselves; this shot often has an angulated perspective.

In this procedure, the assistant retracts the lips on the contralateral side using the retractor without excessive force. The drop-shaped end of the bean-shaped mirror is held in the right hand and inserted horizontally into the mouth until the tip reaches the distal of the second molar. At this point, the patient is asked to open widely, and the assistant pushes the mirror towards the cheek while rotating it 90 degrees, bringing the convex edge towards the upper vestibule. The patient is then asked to gently close the teeth without contracting the masseter muscle; this enables the assistant to bring the tip of the mirror, which at this point is distal to the second molars, outwards towards the cheek. This procedure creates the maximum possible space between the teeth and mirror. If the inclination of the mirror is 50 degrees away from plane of the facial surfaces of the teeth, the photograph will conform to the zero-coordinate rule.

The assistant holds the mirror firmly without obstructing the light from the flash units, which should reflect onto the mirror to illuminate the entire frame. The practitioner should make an effort to keep the teeth dry with the saliva ejector and the air-water spray, asking the patient to move the tongue as far as possible from the teeth, towards the back of the throat.



**Fig 12-24a**  
The correct position of accessories and proper grasp of instruments.



**Fig 12-24b**  
The correct position of the practitioner and the flash units.

## ALTERNATIVE METHOD



**Fig 12-25a**



**Fig 12-25b**

**Fig 12-25a**

Because this shot requires the assistant to apply a great deal of strength, a mirror with an external handle can be used.

**Fig 12-25b**

The correct position of the practitioner and the patient, whose head must be correctly rotated.