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Several times we have observed my colleagues getting annoyed because of a less-than-perfect result obtained with the latest high-ended camera. What are the weak points in clinical facial photography? The principal variables are the type of camera, the quality of the lighting, the lenses, the film (or the CCD), the background panel, patient positioning, and camera positioning (framing) during the photographic shoot. Additional important steps are film developing and printing, as well as picture storage.

After years of direct experience and commitment, I am convinced that the most demanding aspects of clinical photography are patient lighting, the topic of this chapter, and patient positioning and framing, which is discussed in Chap. 3.

2.1 Lighting Techniques for Clinical Facial Photography¹

The taking of clinical photographs, to record and to utilize during surgery, is an essential part of the activities of every professional practice or facial surgery department. The narrowness of the office, the cost of the equipment, and a vague lack of time do not constitute excuses for less precise patient documentation.

To obtain the best quality and consistency of results, many suggest the use of a professional lighting system composed of two or more flash

¹Adapted from [5]

Fig. 2.1 Photographic set. The patient holds, with her hands, a small rectangular reflecting panel positioned horizontally against the chest, just under the collarbone. The operator easily adjusts the monolight vertically and horizontally



units. Thus, an entire room or a large part of it should be permanently reserved for this use.

In the past 8 years, I have utilized a system of lighting based on a unique source of light (monolight flash), which is ceiling-mounted in a corner of a room also dedicated for other activities, with good results. This chapter presents a description of the key technical points and the rationale for using single-light equipment. All the clinical facial photographs that illustrate this book have been obtained utilizing this lighting system.

2.2 Equipment and Technique

The studio lighting equipment consists of a single professional flash (System 300 professional compact flash by System Imaging Ltd, UK), which is ceiling mounted on a straight rail parallel to the background panel. The total length of the rail is 0.95 m. The distance of the flash unit from the background is fixed at 1.6 m. A pantograph (Friction Pantograph 3250 by I.F.F., Calenzano-Firenze) holds the monolight and allows unrestricted vertical adjustment. A rectangular 0.75×0.35 m soft box (75 Light Bank by System Imaging Ltd, UK) fits on the flash unit, softening and diffusing the light. An alternative smaller and more practical soft box,

0.4×0.3 m (Chimera Lightbanks, Boulder, Colorado, USA), has also been utilized during the past 5 years.

The distance from the monolight to the subject is fixed (about 1.1–1.2 m), so each photograph is taken at the same F-stop of 16 with 100 ISO films.

The lighting is directed toward the subject in all views, maintaining the flash unit at a higher level. The rectangular soft box is held in a horizontal position.

In order to eliminate the problem of shadows on the submental region and under the nasal base, the patient holds, with her hands, a small rectangular reflecting panel of 0.35×0.7 m (Fig. 2.1). This panel is positioned horizontally against the chest, just under the collarbone.

The ceiling-mounted rail allows the adjustment of the monolight to a side or central position (Fig. 2.1). It easily follows the rotation of the subject from the frontal to oblique and lateral views. Figure 2.2 shows the basic positions of the flash unit used in the different views to achieve the best results. An important rule is to maintain the subject's position close to the background panel itself in order to avoid the need for an adjunctive flash unit to light the background panel.

For a routine set of photographs consisting of full-face portraits and closeup views, I use the 105 mm Micro-Nikkor lens.

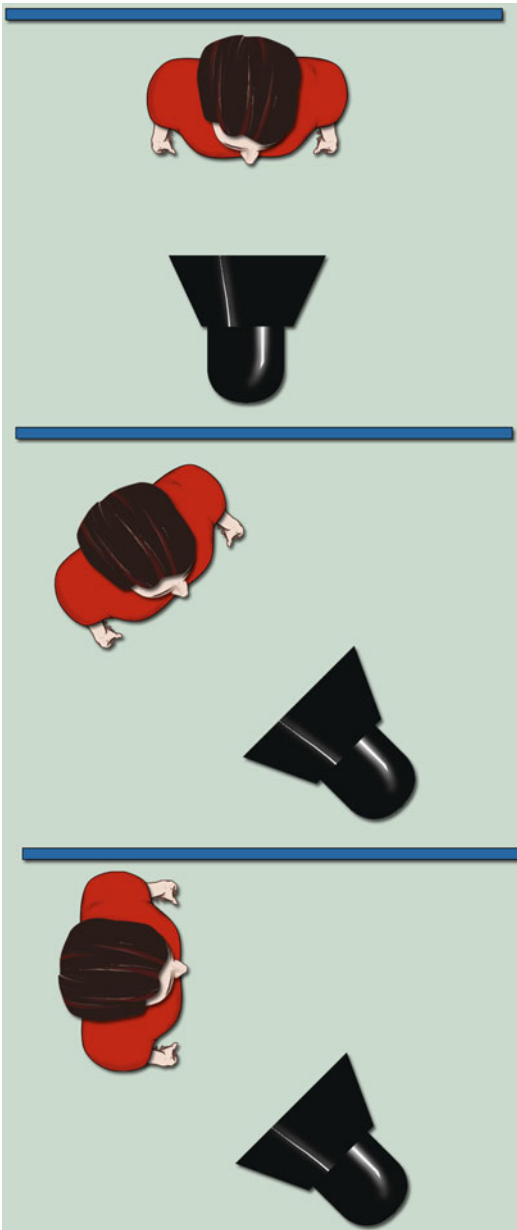


Fig. 2.2 The three main patient/monolight positions utilized to capture the various facial views

I personally do not use a camera tripod for stability because of the very short time of light emission by the flash unit; focusing is done by moving the camera back and forth. A camera tripod also interferes with the positioning of the monolight and the patient's head. In almost every case, I directly help the patient during positioning, touching her chin with my hand (Fig. 2.3). On the other hand, a

viewfinder grid screen is highly recommended to help the surgeon orient the camera precisely.

To avoid using a direct wire connection to the monolight, a small on-camera electronic flash, oriented in a reverse direction, gives the input to the built-in slave unit of the main flash.

The space reserved for clinical photography in the room is rather narrow, as illustrated in Fig. 1.1 of the previous chapter.

Due to the combination of movements permitted by the pantograph and the ceiling-mounted rail, the flash unit can be easily positioned high up, near the ceiling and on the left wall of the room when not in use to leave space for other activities.

The blue background panel, 0.95 m wide and 1.10 m high, is made from a sheet of plastic material for outdoor use. An advantage of this panel is that it is washable without running the risk of losing or changing the color.

The patient and I sit on rotating stools with rollers. The chairs are easily adjusted in the vertical position in order to maintain the subject and the camera at the same height during the capture of the images.

I usually take my clinical photographs personally, without the aid of an assistant, and the entire procedure requires no more than 5 min. For better efficiency and to save time, I follow a specific sequence:

- I ask the patient to meet me in the photo area, turn on the monolight, instruct her on how to use the reflecting panel correctly, and adjust her height on the stool, close to the blue background panel.
- I pick up my camera, turn on the small on-camera electronic flash, and set the standard time/diaphragm couple of 1/125 s–F16 with the monolight adjusted to full-power light emission.
- I shoot the frontal view first, with the patient and the flash unit oriented, as in Fig. 2.2 (top).
- I position the patient's head for the extended and basal views and take the photographs. The position of the monolight remains unchanged.
- I position the patient for the right oblique views, taking care to maintain her close to the blue background panel. The monolight is oriented, as in Fig. 2.2 (central), and the photos are taken.
- I position the patient for the right profile view, taking care to maintain her close to the blue background panel, and shoot the photo.

Fig. 2.3 Positioning of the patient's head



The position of the flash unit remains unchanged, as depicted in Fig. 2.2 (bottom).

- I repeat the two latter steps for the left oblique and profile views, orienting the patient's head and the monolight consequently.

During the procedure, I help the patient to assume a relaxed face and no smile, if indicated. For each view, I systematically take at least two shots to reduce the possibility of photos with the eyes closed and generally to ensure a better choice of photos later.

Currently, this lighting equipment is also used with a digital camera (Fujifilm digital camera FinePix S1 Pro) mounted with the 105 mm Micro-Nikkor lens. The quality of the imaging is fairly good, but, in this particular case, the distance between the camera and the subject for a full-face portrait, using the 105-mm lens, is increased to 1.5 m, due to the reduction of the sensitive area of the CCD compared with the sensitive area of the conventional 35-mm film.

Chapter 3 shows a complete set of clinical facial views using the equipment and technique described above.

2.3 Discussion

In plastic surgery, photographic technique and its standardization are an important topic, which has been reported many times in articles and books [3, 4, 7, 8, 15]. Clinical facial photography has been discussed and emphasized in facial plastic surgery [11, 12, 14] and orthodontic published works [1, 6, 9]. The papers of some authors, such as Ellenbogen et al. [4], Claman et al. [1], and Sandler and Murray [9], focus on reproducible, standardized photographs, with less advice on the lighting technique.

Other authors, such as Zarem [15], warn of the poor results obtained with an on-camera single flash or a ring-light flash. The on-camera single flash creates sharp shadows on the subject and background, so many facial details and contours are, unfortunately, lost. A system using a ring-light flash mounted on the frontal element of the lens reduces the problem of shadows on the subject but produces flat, unrealistic images and frames the subject with a dark halo.

The reported literature recommends having professional studio lighting in a dedicated photo room in order to obtain images of the highest quality.

DiBernardino et al. [3] recommend the use of two or more flash units and present a diagram in which two main lights at 45° angles to the subject are combined with two additional background lights, again at 45° angles, to eliminate shadows in the background. Daniel et al. [2] advise the occasional use of an additional light placed overhead to accentuate the hair and highlight certain areas.

Many authors [2, 10, 11, 13] have investigated lighting techniques for facial photographs in rhinoplasty patients. Daniel et al. [2] and Staffel [11], in particular, report their observations on the effects of different positioning of the two main lights on the nasal tip. Both articles point out that any changes in lighting produce a different type of reflection. Simply by moving the lights further laterally, increasing the angle of incidence, the nasal tip appears more pointed, whereas an asymmetric positioning produces an asymmetric reflection on the tip, which could be mistaken for a real anatomical asymmetry. Even in a dedicated room for patient photography, with fixed light sources and a camera mounted on a fixed tripod, the variable of the patient position remains.

In discussing this topic, Jack Sheen stated that “There is no doubt that photographs can be manipulated. And lighting is probably the easiest, most effective way to manipulate an image” [10].

Meredith [6] includes positioning the patient too close to the background in his list of faulty techniques that are responsible for less-than-optimal results in facial photography. In his prescription, there should be at least 0.75 m between the back of the subject’s head and the rear wall, to prevent shadows.

2.3.1 Point, Line, and Plane

Generally speaking, a photograph may be illegible due to underexposure (too much black) or overexposure (too much white). In clinical facial photography, the shadows (underexposed areas) may be divided into three subtypes: pointed, linear, and

plane. Whereas the first two are positive because they underline some characteristics of the face (for instance, a depressed scar or a sulcus), the third is negative, as it hides other characteristics (for instance, the definition of the chin – neck angle).

In the same manner, the reflexes (overexposed areas) may also be divided into three subtypes: pointed, linear, and plane. Whereas the first two are positive because they highlight some characteristics of the face (for instance, a pointed nasal tip or a prominent zygomatic arch), the third is negative, as it cancels other characteristics.

The main aim of the lighting technique developed is to produce legible images, sometimes with points and lines.

2.3.2 A “Natural” Option

The sun is the main natural source of lighting, but for clinical purposes, it has a weak point: its distance from the subject, in spite of its great dimensions, makes it similar to a point light source, which, on a clear day, produces sharp shadows. Two symmetric lights of the same power, relatively far from the subject, produce unnatural lighting in which one corrects the shadow produced by the other’s illumination. For clinical use, the best natural condition is a cloudy but bright day in which the light of one source, the sun, loses its contrast by the diffusion of the clouds, and the softened shadows on the subject show the main direction of the light itself. In this case, the observer easily perceives the natural modeling effect of the light on the surface of the face, whereas with two symmetric lights, only the reflection of the flash in the pupils of the eyes reveals the type of lighting used. In other words, if the observer is aware of the direction of the light, the reading of the images through its soft shadows is enhanced.

2.3.3 Problems with Two or More Lights

In my personal experience, the use of two or more flash units is counterproductive and unnecessary. The negative aspects of a multiple light system are:

- Increased cost (almost double).
- Occupies more space.
- More complex technique (increases the parameters that potentially require adjustments).
- The effects of any single-light source are difficult to assess due to the presence of other lights.

In a single flash system, the orientation of the light is easily adjusted from one view to another because the operator directly controls the shadows and the reflection on the face with the aid of the floodlighting. The reflecting panel, held by the patient, does not require any adjustment during the change from one view to another (keep the variables to a minimum!).

2.3.4 Avoid a False Asymmetric Face

The main views used to confirm or exclude the presence of facial asymmetry are frontal, extended, and basal. For that reason, any differences in side-to-side lighting during the shooting of these particular images may produce an erroneous conclusion. In any system, using two main lights, the power output of the two units, the type of soft boxes utilized, the orientation, the distance from the subject, the angles of incidence, and the height of the tripods must be identical. In other words, six different parameters set on the right unit must be reproduced exactly on the left. Any deviation from a perfect equilibrium produces a false asymmetric patient or changes the appreciation of a true asymmetry.

With my approach to lighting, symmetry is easily achievable in frontal, extended, and basal views, positioning the monolight directly in front of the subject at a higher level and asking the patient to hold the reflecting panel horizontally against her chest, just under the collarbone. In each case, the camera must be positioned perfectly frontal to the subject.

2.3.5 The Importance of Soft Box Size

The selection of the size of the soft box has repercussions on the quality and the ease of use. In

particular, the large light banks (0.75×0.35 m) produce softer light and, because of their wide and homogeneous lighting, permit easy subject positioning. The small light banks (0.30×0.40 m), on the contrary, produce harder light and enhance the texture of the skin, and it is difficult to obtain the ideal position because the area covered with homogeneous light is smaller, and there is an increased likelihood of undesired shadows.

With the same emission power and distance from flash to subject, the smaller light bank also provides higher intensity and hence greater depth of field (the range within which objects are in focus).

2.3.6 Avoid Shadows on the Background Panel

Meredith's assertion that there is at least 0.75 m between the back of the subject's head and the rear wall to prevent shadows [6] is a misconception caused by poor lighting technique. If the light source is positioned too far from the subject, a sharp shadow is created on the background, even with a large soft box or umbrella to diffuse the light.

In summary, the keys to avoiding shadows are:

- Bring the flash near to the subject and the background.
- Diffuse the light with a 0.30×0.40 m or wider soft box.
- Use a reflecting panel under the face.

2.3.7 Advantages of Ceiling-Mounted Equipment

The advantages of ceiling-mounted equipment are sound. The floor is completely free of cables, tripod, stands, or other objects. The pantograph and rail system permit unrestricted horizontal and vertical movement of the monolight, while maintaining a relatively fixed distance from the subject and the background. Access to the area is easier for the patient, and at the end of the procedure, the equipment can be set aside to gain space for other activities in a few seconds.

2.4 The Seven Rules of Multiple Shots

1. Document every new patient with multiple shots whether or not she will be treated later.
2. Multiple shots of the same view ensure that if the patient blinks, you have plenty of non-blinking shots to choose from.
3. Multiple shots assure a better choice later.
4. After a rigorous capture of the standard view set, if you wish, perform multiple shots to document, in a personalized manner and without restrictions, the features of the face.
5. Use the skin marker to point out any particular deformity or lesion and perform multiple shots from different points of view to avoid shadows and reflections.
6. During capture of the full-face oblique view and full-face basal view, perform multiple shots in conjunction with small differences in head position.
7. Today, with digital cameras, the extra cost of multiple shots is small (one or 100 shots cost roughly the same). The methodology for better documentation must be cultivated daily, applying the seven rules of multiple shots, which also help to develop greater photographic skills. Clinical facial photography is, in a large part, a rigorous procedure, which requires a protocol to assure clarity and consistency, but, unfortunately, it is also, in a small part, an art.

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