The Frontal View of the Nose: Lighting Effects and Photographic Bias

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Abstract

Background: Most aesthetic rhinosurgeons rely on proper photographic documentation of the nose using several different views. The frontal view is probably the most important, but it is also the most demanding.

Objectives: In the frontal view, delicate, 3-dimensional (3D) anatomic structures require special photographic skills. Lighting is crucial for detail rendition and 3D reproduction of the nose, and for apparent photographic bias.

Methods: We compared the quality of reproduction and photographic bias with different symmetric and asymmetric lighting in common clinical practice described in the literature. The photographs were compared for anatomic reproduction, shadowing, 3-dimensionality, and apparent changes of nasal shape (bias).

Results: Symmetric lighting did not satisfy the demands of the rhinosurgeons because of marginal 3-dimensionality, reduced detail rendition, or photographic bias. Strongly asymmetric lighting altered the nasal shape adversely for bias depending on the side of illumination, but led to very good 3-dimensionality. Slightly asymmetric lighting demonstrated the best results for detail rendition and 3-dimensionality.

Conclusions: Classic symmetric quarter light is a practicable lighting technique with limitations in the rendition of detail and 3-dimensionality. Slightly asymmetric lighting offered a perfect compromise, with substantially improved detail rendition and 3-dimensionality. Strongly asymmetric lighting may lead to photographic bias depending on the side of illumination. Frontal documentation of the nose with asymmetric lighting should, therefore, always be performed in duplicate, with asymmetric lighting from the right side and from the left side, to prevent misleading interpretations.

Accepted for publication October 23, 2014; online publish-ahead-of-print April 22, 2015.

Cosmetic surgery of the nose requires a skilled surgical hand, considerable experience, and exact planning of each surgical step. Most nose surgeons rely on pre- and postoperative photographic documentation of the nose for the purposes of planning the procedure, mental preparation, and quality control. Standardized complete photographic documentation of the nose should include several different views: a frontal view, a profile view, a three-quarter view, a basal view, a helicopter view, and a smiling profile view. In daily practice with cosmetic rhinoplasty patients, we have noted difficulties in obtaining authentic photographic documentation of the complex 3-dimensional (3D) shape of the nose in its entirety and of the fine anatomical contours of the bridge, the tip, and the base of the nose in the frontal view. Similar to other authors, we have observed that in the frontal view, different lighting changes the appearance of the nose, and that the direction of the light can be used either to enhance or to mask details on photographs, resulting in so-called photographic bias. The advantages and disadvantages of symmetric (equivalent illumination from both sides) and asymmetric (main illumination from one side) lighting have been discussed in the literature. How differences in lighting may affect the frontal view of the external contour of the nose remains unclear. In this study, we compared the quality of reproduction and photographic bias with 7 different symmetric and asymmetric lighting...
lighting techniques in common clinical practice described in the literature.

Our goal is to raise awareness among readers of the problem of photographic bias, particularly with the frontal view of the nose, and to share our experience with photographic documentation of the nose for medical and scientific use. We invite the interested reader to closely compare the examples of the various lighting methods side-by-side to judge the subtle changes in the presented photographs.

METHODS

We requested permission from a small group of aesthetic rhinoplasty patients to take preoperative frontal photographs of their noses. All patients gave written informed consent, including consent to the publication of the photographs in medical journals and presentation at meetings. In accordance with our standardized photographic report for the frontal view of the nose, the patients, sitting on a swivel chair with a head rest, looked directly into the lens, and the patients were requested to remove make-up, glasses, and jewelry, and to attach their hair if necessary. As per our standard practice, a black cape covered the patient’s clothing. The camera, installed on a tripod, was oriented to the natural horizontal head position (external ear on a level with the columella). The flash lamps were positioned on the same horizontal level as the camera. The distance from camera to patient was 2 m. All photographs were taken in portrait format with vertex, ears, and chin as the outer boundary. For the illustrations in this publication, we zoomed identical image areas using a computer graphic program (Adobe Illustrator; Adobe System Incorporated, San Jose, CA).

Lighting and Materials

All lighting techniques were simulated in our photographic studio. For all tests, the same professional camera (Nikon Dx3; Nikon Corporation, Tokyo, Japan), lens (Nikor 105 mm; Nikon Corporation), and settings (aperture 18, 1/125 s) were used. The exposure was determined by through-the-lens (TTL) metering controlled by the camera’s histogram function. The 7 lighting arrangements tested were as follows: (A) Classic “quarter-light arrangement” with a flash–flash distance of 4 m and an object–flash angle of about 45° (symmetric) (Figure 1); (B) “Quarter-light arrangement” with an additional light reflector on the patient’s right side (asymmetric) (Figure 1); (C) “Quarter-light arrangement” with an additional ring flash on the patient’s right side (asymmetric) (Figure 2); (D) “Quarter-light arrangement” with reduced (2 m) flash–flash distance (symmetric) (Figure 1); (E) “Frontal light arrangement” with a ring flash above the camera (symmetric) (Figure 3); (F) “Key light arrangement” with the main flash on the patient’s left side (asymmetric) (Figure 4); (G) “Key light arrangement” with the main flash on the patient’s right side (asymmetric) (Figure 4).

The original digital photographs were carefully inspected and analyzed on a calibrated professional monitor by 2 independent photographically trained rhinosurgeons. The photographs were compared for photographic reproduction of the nasal anatomy, disturbing shadowing, 3-dimensionality, and changes in nasal shape (photographic bias).

RESULTS

Compared with asymmetric lighting, the classic symmetric quarter-light arrangement showed limited detail rendition.

Figure 1. Schematic of lighting arrangements A, B, and D. (A) Classic “quarter-light arrangement”; (B) “quarter-light arrangement” with an additional light reflector on the patient’s right side; and (D) “quarter-light arrangement” with reduced (2 m) flash–flash distance.
in the area of the nose tip, nasal wings, and bridge, and reduced 3-dimensionality because of missing shadowing, resulting in a balanced and idealized nose shape (Figures 5A, 6A, and 7A). With increasing asymmetric light, as for example the asymmetric modifications of the quarter-light arrangement with a light reflector (Figure 5B) or with an additional ring flash (Figure 5C, 6B, 7B) on the patient’s right side, the detail rendition was enhanced and the 3-dimensionality improved, along with slightly increased shadowing. A symmetric modification of the quarter-light arrangement by reducing the flash distances to half (Figure 5D) changed the shape of the nose tip because of bias; owing to merging light reflexes, the nose tip became more slender and subtle. In the frontal light arrangement (Figures 5F, 6D, and 7D), the nose bottomed out because of absent 3-dimensionality, and appeared flat, broad, and clumsy. The anatomic details of the nose were badly reproduced. Strongly asymmetric lighting (key) led to excellent plasticity with good detail rendition in the area of the nose tip and base, despite increasing shadowing. Moreover, bias was noted in the area of the nose bridge, with adverse effects on shape depending on the side of illumination.

In our patients, with a curved nasal dorsum, illumination from the left side led to increased curving of the nose bridge (Figures 5G and 6E), whereas illumination from the right side straightened it (Figures 5H and 6F).

**DISCUSSION**

Photographic documentation of the nose from the frontal and the oblique view is crucial because these are the views that a patient normally sees in a mirror. Precise illustration of these views thus allows detailed analysis of the nose, both from the surgeon’s and the patient’s perspective, as
Figure 4. Schematic of lighting arrangements F and G. (F) “Key light arrangement” with the main flash on the patient’s left side; and (G) “key light arrangement” with the main flash on the patient’s right side.

Figure 5. Photographs of a 31-year-old woman in different lighting conditions. (A) Frontal view with classic quarter-light arrangement. (B) Quarter-light arrangement with reflector on the right side (asymmetric). (C) Quarter-light arrangement with an additional ring flash on the patient’s right side (asymmetric). (D) Quarter-light arrangement with reduced flash distance with fusion of light reflections. (E) Same arrangement as in (D). The tip of the nose is coated with a thin film of fat. (F) Frontal light with ring flash flattens the nose, forehead, and philtrum. (G) An asymmetric arrangement with illumination from the convex (left) side of the nose raises 3-dimensionality but has a strong influence on the rendition of the nose bridge. (H) An asymmetric arrangement with illumination from the right side leads to “photographic nose bridge plastic surgery.”
well as realistic discussion of the aims of the planned surgical corrections.

In the frontal view, assessment of nasal symmetry, shape, and tip contour is feasible. The information gathered from this assessment should include the shape and width of the bridge of the nose with its lateral borders, asymmetries of the upper lateral cartilage, configuration of the nasal tip with its cartilages, the lateral crus, the intermediate crus, the soft triangle, the nasal base with the nasal wings, the columna, the inferior septal border, and nasal sill asymmetries. The oblique angle helps to view asymmetries of the bridge of the nose that are not well visualized in the frontal view—often a pseudohump or pseudosaddle due to the obliqueness of the nasal pyramid. Such asymmetries may be revealed by comparing the oblique views of both sides. As shown in Figure 8, by means of a patient with a tilted dorsum, the comparison may be easier after mirroring the oblique view of one side on the computer.

We agree with Galdino et al that the frontal view of the nose, with its complex 3-dimensional anatomy, is the most difficult to illustrate photographically. A contrast-rich and detailed picture without disturbing shadows poses a photographic challenge that demands professional skills, equipment, and lighting technology.

Simple symmetric lighting, the classic quarter-light arrangement (Arrangement A), has been proposed by several authors because of its practicability and reproducibility for...
all views of the nose. In the frontal view, the even illumination provided by this technique reduces contrast and shadowing and hence decreases 3-dimensionality and limits detail rendition (Figures 5A, 6A, and 7A). We believe that the delicate anatomical structures of the bridge, the tip, and the base of the nose are not adequately reproduced by this commonly utilized technique in the frontal view. Because of a balanced and idealizing effect on the nose shape, patients prefer the photographs taken with this lighting technique.

A minor asymmetric modification of the quarter-light arrangement with an additional light reflector for light amplification on the patient’s right side (Arrangement B) increases the light contrast and leads to improved 3-dimensionality and detail rendition (Figure 5B). Unfortunately, placement of reflectors during routine medical practice, where space and time are limited, is both awkward and inconvenient.

Figure 7. Photographs of a 26-year-old woman in different lighting conditions. (A) Quarter-light arrangement. The nose seems to be small and symmetric. (B) Quarter-light arrangement with an additional ring flash on the patient’s right side (asymmetric). The left straight rim of the patient’s noseback is accentuated. (C) Quarter-light arrangement with an additional ring flash on the patient’s left side (asymmetric). The irregularities on the patient’s right noseback edge are accentuated. (D) Frontal light with ring flash flattens the nose, forehead, and philtrum.

Figure 8. (A) Frontal view of a 28-year-old man with a tilted dorsum. (B) The original oblique view from the left side presenting the tilted dorsum as a “pseudosaddle.” (C) The mirrored oblique view from the right side presenting the tilted dorsum as a “pseudohump.”

Figure 9. The light reflections in this 31-year-old woman’s eye hint at the lighting arrangement used by the photographer. (A) Reflection of an asymmetric arrangement with two flashes with a soft box on both sides of the patient and an additional ring flash on the patient’s right side (Arrangement C). (B) The patient’s eye in reflects a quarter-light arrangement (Arrangement A) with two flashes and a soft box on both sides of the patient.
Good results were also obtained with the quarter-light arrangement combined with a lateral ring flash on the patient’s right side (Arrangement C). This simple but technically complex asymmetric variation improved rendition of all anatomical areas of the nose and increased 3-dimensionality (Figures 5C, 6B, and 7B). The additional ring flash, with its harsh light, amplifies light and contrast; both are crucial factors for better reproduction of detail and 3-dimensionality.

Reducing the distance between the two flashes by half in a quarter-light arrangement (Arrangement D)—which has been practiced by some authors, probably due to insufficient workspace—has a pronounced effect on the apparent shape of the tip of the nose. A flash–flash distance reduction from 4 m to 2 m causes fusion of the two light reflections on the nose tip, complicating its evaluation in the digital picture (Figure 5D). The tip of the nose becomes more slender and subtle. This photographic bias is also called “photographic tip rhinoplasty.”

Fanous tried to introduce a new technique of tip rhinoplasty based on light reflections on the nose tip. Since that attempt, the relevance of nose tip reflections as a diagnostic tool has been controversial. In accordance with

Figure 10. Photographs of a 44-year-old man in different lighting conditions. (A) With flash set, directed over the ceiling. (B) With flash set, directed over the left lateral wall. (C) With flash set, directed over the right lateral wall.

Figure 11. Photographs of a 44-year-old man in different lighting conditions. (A) Smartphone, without flash. (B) Smartphone, with flash.
Sheen’s approach, we do not use these light reflections as diagnostically relevant anatomical points that refer to the underlying anatomical structures, but rather as helpful geometric surface landmarks that enable us to compare different patients photographed under identical lighting conditions.\(^\text{15}\) We therefore recommend preserving the reflection points on the nose tip by using an adequate flash–flash distance.

Frontal parts of the face, such as the forehead, nose bridge, and philtrum, are accentuated when illuminated from the front (Arrangement E).\(^\text{7,10}\) The nose bridge appears broad and padded, and the tip and the base of the nose appear pushed in and clumsy as a result of reduced 3-dimensionality, despite high contrast (Figures 5F, 6D, and 7D).

Toriumi et al recommended dual photographic documentation with the frontal light technique combined with the classic quarter-light technique for better interpretation and documentation of all asymmetries of the nose.\(^\text{10}\) We do not agree with this method, because in our own testing, frontal light did not provide satisfactory information in the frontal view.

The key light arrangement, which is asymmetric lighting, produced by an oblique lateral light with an additional central light, proposed by Daniel et al, results in a high-contrast picture with strong modulation of the nose and extensive shadowing.\(^\text{2}\) The increased asymmetry raises 3-dimensionality, but has a strong influence on the rendition of the nose bridge. Illumination from the convex (left) side (Arrangement F) of the nose increases this effect in our setting (Figures 5G and 6E). Illumination from the right side (Arrangement G) leads to an apparent straightening of the nose bridge. We call this bias “photographic nose bridge plastic surgery” (Figures 5H and 6F). The narrow tip reflection points further influence the appearance of the nose tip, as described above.

Asymmetric lighting improves 3-dimensionality and detail rendition by increasing contrast. We demonstrated that asymmetric lighting may lead to apparent changes in nasal shape because of increased lateral shadowing leading to photographic bias, depending on the side of illumination and degree of light asymmetry. To prevent misleading interpretations, frontal documentation of the nose with asymmetric lighting should always be performed in duplicate, once with asymmetric light from the right side and once with asymmetric light from the left side (Figures 6B and C or 7B and C). With this lighting technique, small irregularities of the nose’s bridge and dorsum can be made visible (Figure 7A-C). When evaluating photographs taken by third parties, the lighting technique used should always be examined critically. We suggest that a reviewer can compare the lighting of different pictures by checking the light reflections in the patient’s eye (Figure 9).

Our results are limited by the small number of cases presenting subtle light effects, which are challenging to see.

We are aware of the fact that our photographic documentation method is time and space consuming, and in daily practice, it is only feasible with optimal equipment or if a professional photographer is present. The photographer needs to exhibit attention to details and have trained eyes and focus. For us, this procedure is a component of preoperative mental preparation, providing the opportunity to learn more about the patient’s nose. The presented photographic techniques require photographic skills, space, equipment, and organization; however, our goal here is to raise awareness about light-dependent changes in the nose shape. To ensure that photographs and results are comparable, the same conditions (lighting, camera settings, objective, patient position and distance from the camera) must always be used for nasal documentation until the end of follow-up. Photographs of the same view with different lighting and settings are not comparable. The photographer must also be aware of the patient’s head position in relation to the camera. Changes in rotational axis may lead to a change in nose projection. Seating the patient on a chair with a head rest may be helpful, while the photographer is meticulously controlling the head position through the camera. By maintaining your own photographic standards over a long period of time, you will learn to interpret your pictures and results with greater precision.

Some photographers use downward angled lighting onto the patient’s frontal view, providing more shadowing on the patients face and more detail in the nasal contour. We do not use this lighting technique for the frontal view, because in our experience we have not acquired additional information about the nasal shape.

Moreover with basic equipment and limited space, a trained photographer may produce acceptable and constant photographic results. A simple digital single lens reflex camera, an objective with a focal length of about 80 to 120 mm, and neutral photographic background paper constitute basic equipment. As a simple lighting method, you may use a camera flash set on with its head tilted upward to the ceiling to receive indirect light from above on the patient or tilted to a lateral position to obtain indirect light from the patient’s side (Figure 10). A camera flash with direct light (frontal lighting) or smart phones with limited optical quality should be completely avoided for high-quality documentation (Figure 11).

**CONCLUSION**

In the frontal view, the shape of the nose is strongly influenced by the lighting technique for photographic documentation. The classic symmetric quarter-light arrangement—a commonly applied, practicable, and technically simple lighting technique—has substantial limitations in detail rendition and 3-dimensionality in the frontal view. Asymmetric light greatly improves detail rendition and 3-dimensionality in frontal photographs of the nose, but as we have shown,
strongly asymmetric lighting may lead to apparent changes in nasal shape because of increased lateral shadowing leading to photographic bias, depending on the side of illumination. Consequently, documentation of the nose with asymmetric lighting should always be performed in duplicate from both the right and left sides, to prevent misleading interpretations. We found that slightly asymmetric modifications of the classic quarter-light arrangement offer a perfect but time-consuming and technically demanding compromise. A standardized setting with identical lighting conditions is essential for comparable pre- and postoperative photographic assessment of the nose.

Disclosures
The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Funding
The authors received no financial support for the research, authorship, and publication of this article.

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