

The Art and Science of Photography in Hand Surgery

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High-quality medical photography plays an important role in teaching and demonstrating the functional capacity of the hands as well as in medicolegal documentation. Obtaining standardized, high-quality photographs is now an essential component of many surgery practices. The importance of standardized photography in facial and cosmetic surgery has been well documented in previous studies, but no studies have thoroughly addressed the details of photography for hand surgery. In this paper, we provide a set of guidelines and basic camera concepts for different scenarios to help hand surgeons obtain appropriate and informative high-quality photographs. A camera used for medical photography should come equipped with a large sensor size and an optical zoom lens with a focal length ranging anywhere from 14 to 75 mm. In a clinic or office setting, we recommend 6 standardized views of the hand and 4 views for the wrist; additional views should be taken for tendon ruptures, nerve injuries, or other deformities of the hand. For intraoperative pictures, the camera operator should understand the procedure and pertinent anatomy in order to properly obtain high-quality photographs. When digital radiographs are not available and radiographic film must be photographed, it is recommended to reduce the exposure and change the color mode to black and white to obtain the best possible pictures. The goal of medical photography is to present the subject in an accurate and precise fashion. (*J Hand Surg Am.* 2014; 39(3):580–588. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)

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THE ADVENT OF photography in the early 1800s served to enhance our perceptual ability, and this new technology would make a similar impression in the field of medicine. In 1845, less than 6 years after the first photograph was taken, the first pre-

and postoperative photographs in plastic and reconstructive surgery were printed in a medical journal by Gurdon Buck.¹ These images were daguerreotypes, the first real form of photography, accomplished through a lengthy chemical interaction between iodine, bromine, and chlorine that required up to 10 minutes to generate a picture. In April of 1850, Charles Gilbert reported several cases in the *American Journal of Dental Science* using photographs to demonstrate pre- and postoperative results of reconstructive procedures, including a forehead flap for nasal reconstruction and a jaw reconstruction following a tumor excision.¹ James Balossa was probably the earliest surgeon to present nasal reconstruction with photography in a book in 1863.² During the first International Congress of Plastic Surgery in 1955, Sir Harold Gillies stated that the greatest advancement in plastic surgery to date was the use of photography in medical applications.³ Recent advancements in computer and film technology have culminated in the complete digitization of photographs, and in the modern era, clinical photography has become an

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indispensable tool in the hand surgeon's arsenal. The advent of the digital camera provides rapid and efficient dissemination of clinical pictures into the research and teaching environment. Now, surgeons rely heavily on preoperative, intraoperative, and postoperative photographs as a teaching tool and to help evaluate outcomes. Obtaining standardized, high-quality photographs has become an essential component of success to many surgical practices.

IMPORTANCE OF MEDICAL PHOTOGRAPHY

There are many advantages to obtaining high-quality photographs in the medical setting: (1) Photographs can be used for scientific presentations and manuscripts; (2) preoperative and postoperative photographs can be used to demonstrate functional deficits or improvements and operative results, providing a tool for evaluation by the surgeon⁴; (3) intraoperative photographs of procedures provide evidence and examples that can prove important for education, communication, and medicolegal purposes. Occasionally, surgeons present their clinical work at conferences featuring pictures that are blurry or contain blood-stained backgrounds or extraneous surgical instruments with no pertinence to the subject of the photograph. All of these oversights detract attention from the theme the photographer is trying to depict and diminish the educational value that a picture is able to provide. Even the best presentation can be compromised by a poor series of pictures, and this same concept applies to medical textbooks and journal manuscripts.

Previous studies that have reported on obtaining photographic documentation in plastic and cosmetic surgery⁵⁻⁹ mainly discussed the technical aspects of the camera such as the lens and lighting.¹⁰ In 1984, Zarem¹¹ described details regarding photography of the hand, stating, "Photographs of the hand may be specialized depending on the specific function in question" and that "The hand should not be touching the background material, so that the position is a true anatomic position." Although this article is not a comprehensive guide for photography in hand surgery, this may be the first paper that mentions how best to obtain medical photographs of the hand.¹¹ However, over the past several decades, numerous advancements have taken place in the hand surgery specialty that necessitate documentation, and now most highly regarded journals, such as the *Journal of Hand Surgery*, have begun to institute standardized criteria for medical photography. It is now generally understood that high-quality photographs of both hands should be obtained in the clinical setting so that any differences in the function or appear-

ance of both hands can be documented before and after operative intervention. In addition, it is important to remember that the goal of medical photography is to present the subject in an accurate and precise fashion, rather than a favorable manner as is done in portrait photography.¹² We aim to provide a set of guidelines that will delineate the critical steps and essential components for hand surgeons to obtain appropriate and informative high-quality photographs that will help them better educate and evaluate treatment options.

CAMERA

The ideal camera for medical photography should feature a large sensor size (minimum pixel pitch of 4.8 μm), which permits more light per pixel, thus providing better images and containing a higher range of contrast as well as better color depth. For obtaining photographs in the medical setting, a camera that is easy to operate with a built-in flash is preferred. For intraoperative photography, it is very beneficial for the camera to have a swivel screen that will enable the operator to shoot at a wide array of angles (Fig. 1). We recommend, for clinical and surgical photography, the point-and-shoot digital camera over a single-lens reflex (SLR) camera because it is easy to operate, cheaper on average, and able to provide high-quality images that easily satisfy the requirements for medical photography.

BASIC CONCEPTS

Aperture and depth of field

It is important for the camera operator to have a basic knowledge of the camera and associated lens equipment. Proper aperture and shutter speed are critical for obtaining high-quality photographs, especially when attempting to highlight the minute details of multiple structures in a small, crowded space.¹⁰ The aperture is the diameter of the opening in the lens and controls the amount of light that passes through the lens, thereby determining the depth of field. The depth of field is the area between the closest and the farthest objects in an image that will appear sharp in the picture; it is quantified as an inverse ratio to the aperture. The aperture is typically designated by a specific f-number (f is the focal length of the lens), and the camera can be set to a series of f-stops that will adjust the depth of field.¹⁰ A large aperture, such as f/2.8, will result in a shallow depth of field and the camera will only focus on a small area, leaving the background out of focus.¹² A small aperture, such as f/8, will produce a larger depth of field, enabling the camera to keep the entire scene in focus. A large depth of field is preferred for medical

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