A SIMPLE METHOD OF MAKING PHOTOGRAPHIC RECORDS UNDER STERILE CONDITIONS

FRANC D. INGRAHAM, M.D., AND CULLY A. COBB, JR., M.D.*

Neurosurgical Service, The Children's Hospital, and the Department of Surgery, Harvard Medical School, Boston, Massachusetts

(Received for publication March 23, 1947)

The great value of permanent graphic records of surgical procedures and of pathological conditions exposed at operation has long been recognized. Drawings and photographs are not only a valuable part of the hospital record but are especially useful in collecting material for classification, study, and teaching. Harvey Cushing made pen and ink sketches as a part of each operative note, and these are studied today with the greatest of interest by the fortunate members of a later generation who have access to the records of his patients. Not all surgeons are so gifted, nor are the services of an artist usually readily available, but the development of photographic methods now makes it possible to record the important findings at most operations without loss of time. Routine use of photography is seen in very few clinics, however, and good photographs form a part of relatively few operative notes. We wish to point out the special requirements in surgical photography and to present a device that offers a simple solution to the problem.

Certain unalterable factors may make surgical fields difficult photographic targets. The exposure is often limited, and the point of chief interest may be deeply situated where lighting is poor. The color of the tissues may be rather uniform and structures in many surgical fields are in constant motion so that long exposures are impractical. Apparatus brought within several feet of the operative field must be entirely sterile, and finally, the perfect field for a photograph may appear suddenly and may be available for only a very short time.

Photographers usually make pictures of small objects by extending the lens of a view camera beyond its normal position, providing adequate depth of field by using very small apertures in the iris diaphragm. To make such exposures with lighting comparable to that of the ordinary operating room an exposure time of several seconds is required. The limitations of this technique are evident: a trained photographer must be available; the camera must be mounted firmly in a position above the operative field; slight loss of detail due to motion must be anticipated. Despite these drawbacks the best surgical photographs have been made in essentially this way.

The modern development of fine grained films, both black and white and full color, makes it possible to provide useful detail in a negative as small as the 35 mm. frame. The use of this type of film has allowed the development of a series of cameras having much greater flexibility than the ordinary larger ones. The basis of this difference lies in the greatly increased depth of field that characterizes lenses of short focal length in contrast to ordinary photographic lenses. Thus in ordinary photography a diaphragm opening of f-4.5 may provide a depth of field of several feet when a nearby object is photographed with a 50 mm. lens. A similar diaphragm opening in a camera having a focal length of 150 mm. and exposing a negative 3½ by 4½ inches in size will produce a photograph having a depth of only a few inches. This discrepancy becomes greater as the subject is approached more closely and the miniature camera is at a great advantage when the subject is as small as a surgical field.

Small objects can be photographed with miniature cameras by adding simple positive lenses called "portrait attachments." A photograph of a field about 6 inches square can be made at a diaphragm opening of f-6.3 with a depth of focus of about 2 inches. When such a field is illuminated by the light of an operating room, an exposure time between 1/50 and 1/10 seconds will give negatives of correct density with films of various speeds. The camera can be

* Resident in Neurosurgery, The Children's Hospital, and Assistant in Surgery, Harvard Medical School, Boston, Massachusetts.
supported by hand but must be at the proper distance from the field.

The container described below was designed with the hope of providing inexpensive equipment which could be included in an ordinary surgical kit. Its outer surface is entirely sterile and available to a member of the normal operating team throughout the operation. It is simple enough so that the services of a trained photographer are not required. It provides for the use of both black and white and full color photographic films.

The device shown in Fig. 1 can be used with several miniature cameras. It consists of a flexible container attached to a rectangular metal frame containing a transparent window.

**Fig. 1.** Insertion of camera into sterile cover. (a) The sterile cover held in position for receiving the camera. (b) The camera is attached to its metal support. (c) The cover is reflected over the camera, its external surface remaining sterile. (d) The open end of the container is tied tightly. (e) The apparatus assembled and in position for use. (f) The camera ready for use as part of the operating kit. (g) The camera in use. (Operation: tantalum cranioplasty)

**Fig. 2.** Extermination of a meningioma.

The camera is firmly attached to the inner surface of the frame. A fixed rod determines the distance between the object and the lens. We have used it with a Kodak Bantam Special Camera having a 45 mm. lens to which a standard 3 diopter portrait lens is added. With the camera set at 3 feet the field is in focus at a distance of about 10 inches. Before it is placed in the sterile container the camera is loaded and the shutter speed and diaphragm are adjusted. The camera is then attached to its metal support by a circulating nurse (Fig. 1 a and b) and
the container is closed (Fig. 1 c and d). The shutter can then be cocked and released through a finger-shaped insert in the side of the container and the film can be wound through the flexible material. The position of the camera is adjusted by means of the rod, the tip of which lies in the plane of the sharpest focus and is placed just outside the picture at the center of one edge (Fig. 1 g). A rectangle about 6 by 8 inches is photographed.

Fig. 3. The exposed brain covered with a sheet of fibrin film.

Photographs are taken without any change in the lighting usually provided for the operation. In the examples shown, 4 100 watt Castle Lights were used and the camera was set at f-8 and 1/25 second for Kodak Plus-X film. It is a simple matter to alter the exposure for other types of lighting by the use of one of the inexpensive exposure meters of the type used in taking snapshots.

We have included this apparatus in the instrument kit for all major neurosurgical operations during the past two years. It is easy to use and has provided satisfactory records of surgical fields and specimens immediately following removal. Fig. 2, Fig. 3 and Fig. 4 show examples of operative fields thus taken. Much additional information is contained in full color photographs and our results with color have proved at least as satisfactory as those with black and white films.
A SIMPLE METHOD OF MAKING PHOTOGRAPHIC RECORDS

Fig. 4. The fresh specimen.