

# THE MOULAGE AS A RECORD EMPLOYED AT THE ARMY MEDICAL MUSEUM \*

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Medical institutions in Europe are famous for their wonderful collections of reproductions in wax of dermatologic lesions and pathologic conditions, and for their models of embryology, histology and anatomy.

The great educational value of these artistic records has long been appreciated by Americans who have taken graduate medical courses in these foreign clinics. All who have studied abroad remember the great assistance these models have afforded, and return with regret that their own country lacks this impressive manner of teaching.

America has awakened; she has gradually unfolded until she now stands equal with the world of nations. To hold this lofty position which she has acquired she must prove herself equal to teach the science of medicine as she has taught the world her prowess in war and industrial achievement.

To make her medical course complete, the art of illustration is essential. Max Brödel and his pupils have demonstrated the value of medical illustration to literature, and the realistic moulage is necessary to complete the teaching of the medical sciences.

The art of wax modeling should be taught in our universities. Every large medical clinic should have a modeler on its staff, to reproduce the usual and the unusual pathologic states. All large cities are rich in clinical material that can be recorded and made available to the medical student and the graduate.

A course in wax modeling should include a brief study of histology, pathology and anatomy as an aid in reproducing the various structures in their normal and abnormal conditions. The technic required in making the uncolored wax model is quickly learned, but accurate coloring will depend on the interpretation of the surface markings of the wax positive. This course should also include a study of the chemistry of pigment and its durability, the association of color with disease and its diagnostic value, the memory of color, the taking of color notes and sketches, and the application of color to the surface of the wax.

Many physicians have artistic ability and will rapidly acquire a knowledge of the various steps necessary in the production of a moulage. To them, it is hoped, this short paper may be of assistance, as it briefly outlines the method now in use in the Army Medical Museum in Washington, D. C.

A moulage or wax model of the skin and underlying structures must truthfully represent a map of the topographic structures of the normal tissues and their pathologic states. It must be a positive in wax, unaltered by tooling or handling.

The negative or plaster mold is the matrix from which the wax impression is obtained. The plaster negative bears the same truthful relations as does the negative film in photography.

The wax impression must possess all of the delicate tracings of the normal skin as well as those of the altering or destructive processes of disease. An uncol-

ored wax positive or impression is translatable to those who are familiar with the histology and pathology of the skin.

The formation of a wax model is divided into four steps: (1) negative plaster impression; (2) positive wax impression; (3) mounting, and (4) coloring.

The first step comprises the preparation of the patient and selection of the field from which may be reproduced the lesion or lesions, and in which there will be sufficient evidence of landmarks to indicate the location of the eruptions.

The preparation of the patient consists in placing the subject in the most comfortable position necessary to expose the field of operation. Papers are placed on the floor to collect particles of plaster; towels are spread to cover bedding or clothing; the part is shaved if it exhibits much hair, and the lesion is cleansed of exudate. A dam is now built around the area selected. The most satisfactory material for this purpose is made by saturating gauze or cheesecloth in a thin mixture of plaster of Paris and water. The dam should extend about 1½ inches above the surface of the skin. This method is very good, as it reinforces the edge of the cast and thus eliminates the possibility of breakage in the transport of molds. The method we now employ is to use wet towels as a dam. When the plaster is poured on the towel, it leaves an impression of the fabric which is reproduced in wax, affording reinforcement as well as an attractive border.

When the dam is formed, the surface of the skin and the lesions is oiled with a thin oil. This is done to prevent particles of plaster from adhering to the skin or hair on removal of the cast. When a distinctly hairy region is to be cast, such as the head, bearded face, axilla or the pubic region, petrolatum is a good medium to clump the hairs together. These are then smoothed down and a thin oil applied as on any other surface.

All is then ready for the mixing of the plaster of Paris. This is to be prepared after the dam is built and the parts oiled; otherwise, the mixture would harden before it could be used. The plaster of Paris is sifted into a basin half full of cold water until the saturated plaster fills the basin within an eighth of an inch from the surface of the water. The mixture is gently stirred to drive off the air, and this produces an even combination, free from lumps.

The plaster must be of a consistency approximating whipped cream in order to insure a fine impression. After the proper consistency is obtained by stirring or by adding plaster of Paris gradually and in small quantities, the mixture is applied with a scoop, large spoon or cup. The plaster is first poured around the edges, then on the surface, and last on the lesion or wound. A fine impression is obtained if the plaster is blown with the mouth as it is being distributed. This also eliminates the possibility of bubbles, which often spoil the impression.

The mound is now built up evenly to about the height of 1 inch, and strips of burlap dipped in plaster are placed over the cast. The burlap prevents the cast from breaking if the plaster should happen to crack while it is setting. The mold is now formed and allowed to set about fifteen minutes. The absorption of water by the plaster causes heat to be radiated. When the mold feels warm to the touch, it can be removed with safety, as the chemical action of the plaster and water has then taken place.

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Various areas of the body require special technic so that precautions are necessary to insure a good mold, free from cracks and imperfections.

The greatest difficulty comes in avoiding undercuts. These usually occur in casting angular, rounded or irregular surfaces when making a one piece mold. Two piece molds should be avoided unless the distribution of the eruption requires it; even then, two distinct models mounted on a single board would be more desirable, as for example, in instances of eruptions on the dorsal and palmar surfaces of the hand.

Casts of the face are best made in one piece molds. The dam is built the same as for any other part of the body. Eyebrows are well greased with petrolatum, and the hair well smoothed down in the natural direction of growth. The eyelashes should be treated in the same manner. It is often advisable to cover the eyelids with cigaret paper. Rubber tubing should be placed in the nostrils, and cotton plugs in the ears.

Molds of the chest and of the abdomen should not be taken at the same time on account of respiratory movements. Any slight movement on the part of the patient will crack the cast. Cracks are often unavoidable in molds of this kind; but unless very large, they will not be conspicuous in the finished model.

The procedure of taking a plaster cast is not painful, even in the most sensitive lesions. The only discomfort will be caused by the pulling of hair along with the cast.

When molds of deep wounds are taken, the plaster and all utensils should be sterilized with dry heat by being baked in an oven for an hour. The most important precaution necessary to insure a good mold is to use a good grade of plaster.

The wax impression or model is made by pouring melted wax into the plaster mold. After this is colored and mounted, we have the finished model, which should bear an exact resemblance to the original as regards shape, color and surface markings.

It must be remembered that before making a wax model from a mold the plaster cast should be soaked in water for from twelve to twenty-four hours, until it becomes entirely saturated and free from air. After being taken out of the water it should be thoroughly dried with absorbent cotton.

The wax material is composed of: white beeswax, 2 pounds; paraffin, 1½ pounds; starch, 1 pound; talcum powder, 1 pound, and yellow beeswax, 2 ounces.

The white beeswax and the paraffin are first heated on a water bath until entirely melted, when the starch and talcum powder are slowly added through a fine sieve. When the powders are entirely submerged, the mixture is stirred gently and allowed to remain over the fire for about an hour, with occasional stirring. The yellow beeswax is added to give the mixture the proper color.

This wax combination is now poured into the plaster cast and quickly shaken, so that it will cover rapidly the entire surface, without lines or streaks. The remaining wax is then poured back into the boiler, and the process is repeated until the proper thickness is obtained, usually about one-quarter inch. The wax is allowed to cool, from five to ten minutes generally being sufficient for this purpose, before being removed from the mold. The wax impression should be removed with great care and immersed in cold water.

Care must be taken during all of the processes from now on, so as not to mar the model with the warm

hands or to allow it to come in contact with anything but wet cotton. The impression, as now made, must be kept perfect, otherwise the model is of no value. As a precaution, it is advisable to wear wet cotton gloves while working with the model.

The method of mounting models at the Army Medical Museum has a distinct advantage over the old method used by some artists. The linen draping is eliminated, as it does not add attraction. The small tacks which were used to attach the model to the baseboard are responsible for the cracked models and offer frail support to the specimen.

To mount the model, bolts are screwed into blocks of wood, are embedded in the reverse side of the model, and are held by nuts to the baseboard. The baseboard is selected from well seasoned wood. To prevent the board from warping, cross strips are inserted at both ends of the board. This precaution is necessary, as the slightest warping might crack the model. After the model is safely mounted, it is ready for coloring.

Pure colors in oil, free from opaques, are absolutely necessary for wax. The surface of the wax impression after leaving the plaster cast is receptive to color. All good, permanent, transparent colors are satisfactory, and the accuracy of reproduction is dependent on the skill of the artist.

The wax model can be adapted to illustrate pathologic conditions in the deeper structures of the thorax and abdomen, lesions in the brain and spinal cord, and in various organs. The field for the pathologic mouldage is unlimited and is of extreme value in recording unusual mortuary findings as well as in providing the usual teaching specimens for the student.

When we review the various lesions of tuberculosis and syphilis and their selected territorial invasions, we can appreciate the advantage of permanent records, accurate as to color and structure, over the transient specimen often imperfectly mounted in its preserving fluid in the museum jar. Reproductions in wax of the various types of pneumonia would be of great educational value. Models of surgical anatomy and stages of operations would be of much value to the surgeon, as well as to the medical student.

The Army Medical Museum is now building a collection that will surpass any ever produced in the foreign clinics. Every medical man in this country is going to be interested in the American collection, and many will contribute to its formation and receive honorable mention in our National Museum.

To establish this American collection it is necessary for physicians and clinicians in American cities to cooperate with the museum in obtaining material of interest. This material can be easily gathered if plaster molds of all interesting lesions, rare skin diseases or pathologic findings, with photographs, are sent to the curator of the Army Medical Museum. With the aid of Congress in appropriation of sufficient money to carry on our work, and with a staff of well trained artists, we would accumulate rapidly a fine collection of usual and unusual dermatologic and pathologic models.

The day will come when it will be possible to visit our Army Medical Museum in our national capital and study diseased conditions in its various phases, and leave with the conviction that medicine can be taught in America and can be learned without visiting the well known clinics in European cities.

## ABSTRACT OF DISCUSSION

DR. WILLIAM ALLEN PUSEY, Chicago: I would like to express my appreciation of the work which Dr. Wallis has undertaken. The only large collection of models that has ever been made is the collection in Paris made by Beretta. There is no doubt that good models are the best illustrations of the diseases of the skin which we can have, and I think the work that Dr. Wallis has initiated is one that we should support. Dr. Wallis is a trained dermatologist and he is self-sacrificing enough to take up this work. It has been started under the auspices of the army and it is to be hoped that the army will continue to support the work. If it does, it will in time have a collection that will be worthy of pilgrimages from all over the country, and that will be a source of reputation to the institution that possesses it. There is great room for such a thing in this country. Every medical school that undertakes to teach skin diseases should have a collection of the common diseases. If Dr. Wallis can only develop that work he will be doing a benefit to the dermatologists of the entire country.

DR. J. FRANK WALLIS, Washington, D. C.: I appreciate the interest you have taken in this work. It was largely accidental. I started to carry out the work and then we found that men who were interested in dermatology were expected to make models, but the work was very slow and was given up. I did very little with it until a year ago when I made a model, very quietly, of a case of pityriasis rosea that was developing into a psoriasis. Another dermatologist had also seen the case before I saw it. I made a model of it and it was seen by my commanding officer, but instead of being court-martialed I was sent to Washington and I have been there for a year having a good time. I enjoy it and if I can do anything to help others I shall be glad to do it. America has never had any modeling and I shall be very happy to help carry out the work.

LATE RESULTS OF SUPPOSEDLY SUCCESSFUL ABDOMINAL OPERATIONS  
ON THE DIGESTIVE TRACT\*THOMAS R. BROWN, M.D.  
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When one contemplates the marvelous change in the past twenty years in our knowledge of the diseases of the digestive apparatus and honestly tries to analyze what has been the fundamental cause of this change—this metamorphosis from poverty of method and uncertainty of result to our present wealth of diagnostic data and successful therapy—I feel that we must admit that it is to the surgeon and to the physiologist that this great change is mainly due.

The use of the stomach tube has been an aid, and the more refined and newer methods of studying gastric and intestinal secretions have proved of interest; but an attempt to evolve a gastro-intestinal pathology fundamentally on the basis of secretory variations is to lean on a frail reed—and in the stomach the secretory findings must be regarded as but general indexes of the tendency of the functional digestive act rather than as exact expressions of discrete pathologic entities—one of the many clinical data which does not furnish the answer itself but which adds its little to the many other aids at our command at reaching a true conception of the underlying disease process.

From the physiologist we have learned a great deal. The work of Pawlow and his followers, of Bayliss

and Starling and of Cannon has shown us that there is order, not chaos, in the physiology of digestion in both motor and secretory spheres, and has furnished us with normal standards of inestimable value in studying the changes in the various digestive functions due to disease.

But, after all, it is the development of modern surgical technic with its concomitant ability to explore safely and carefully—not disturbed by the factors of time or of pain or of possible infection—the abdominal cavity in its various diseased conditions that has been the fons et origo of our modern knowledge of the pathology of digestion, furnishing us a real comparison of clinical signs and symptoms with definite pathologic changes—both gross and microscopic—a true necropsy in vivo. There is no clinician who is not eager to render to the surgeon full credit for the marvelous increase in our knowledge of the diseases of the digestive tract.

So many of the organic lesions of the stomach and intestine are fundamentally surgical—the results, especially the early results of surgical treatment have been so brilliant—that there has arisen in the minds of most patients, many clinicians and more than a few surgeons the idea that the knife is the sole therapeutic agent of value in this field. Yet, especially within the past few years, there has been a growing feeling that although a condition may be fundamentally surgical, nevertheless, the limitations of surgical method may be such that sequelae may develop which nullify the good effects of the primary operation: and there has been a noticeable lessening of enthusiasm for the surgical treatment of organic gastro-intestinal lesions, notably, of course, those of a chronic nature, for obviously in the severe acute lesions such as acute appendicitis, perforated gastric ulcer, repeated attacks of gallstone colic, empyema of the gallbladder and acute intestinal obstruction, immediate surgery is the one and only safe mode of treatment.

Why is this? There can be but one answer, and that is, that notwithstanding the brilliant early results of surgery in most of the acute and many of the chronic digestive lesions there is a realization that the late results in these cases are often far from ideal, and that the second state of the patient may be no better and even worse than the first, owing to postoperative adhesions or partial obstruction with a recurrence of the same or the development of new symptoms or other causes.

In this short paper I wish to discuss very briefly some of the factors that play a part in this connection, to make certain suggestions as regards postoperative treatment from the point of view of the clinician, and to try to suggest certain principles in the treatment of the chronic abdominal lesions which may, if followed, be likely to produce the minimal percentage of failure.

## METHODS OF AVOIDING COMPLICATIONS

Let us then, in the first place, discuss methods by means of which the aftermath of inevitable abdominal operations may be as free from complications as possible—taking up, in turn, operations on the stomach, on the gallbladder, and on the intestine, these conclusions being based on the careful study of operative treatment and its sequelae in many hundreds of cases during the past ten years. After all, it is to the internist rather than to the surgeon that the patient returns if the results of operation are not so successful as

\* Read before the Section on Gastro-Enterology and Proctology at the Seventieth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1919.