

four surfaces of the wound with the finger, to determine the question of tumor. Nothing unusual could be felt in either direction. The only abnormal thing observed was an unusual toughness and thickness of the dura.

Although great care had been taken in his anaesthesia and no unusual quantity of blood had been lost, the patient's pulse became very feeble, and it was thought prudent not to subject him to further exploration. The wound was carefully closed without replacing the bone, for the pressure from within the skull was so great as to make it impossible to do so. An antiseptic dressing was applied, heaters and stimulants used, and he was removed to his bed. He had a good reaction, his temperature rising to  $103^{\circ}$  at ten o'clock on the night following, and his pulse 110. On the following morning his temperature was  $99\frac{1}{2}^{\circ}$ , his pulse 85, and respirations 25. There had been no recurrence of convulsions, nor had he recovered consciousness, but had been comatose since the operation. From this time his temperature gradually rose until the following day at half-past five, when it reached  $108\frac{1}{2}^{\circ}$ , just before death; the pulse and respiration increasing in frequency and diminishing in strength. With the results of the autopsy, you are already familiar from Dr. Putnam's description.

The case has been reported, not alone for its intrinsic interest, but for any value it may possess for others in the comparative study of unusual cases; as, for instance, certain anatomical specimens are only valuable through their classification with others. Investigation and treatment may be conveniently divided into three sections:

- (1) That connected with the diagnosis and localization of symptoms.
- (2) The operation and its details.
- (3) The after-treatment.

The first has been thoroughly disposed of by Dr. Putnam, but I will add, with his acquiescence, that as far as one case goes, this one is interesting in helping to establish the fact that intra-cranial pressure from a tumor may cause such symptoms, by the irritation of a more sensitive region at a distance, as to mislead the operator in the location of the growth. Other things being equal, such a condition would be most likely to occur in large tumors, and, consequently, in those least suitable for surgical treatment.

With regard to operative details, it is probable that the earlier stages are likely to be simple in character and confined to the reflection of a flap of skin and periosteum of varying size, yet so planned as to permit the freest drainage and the arrest of such hæmorrhage as may ensue. The latter should be easily controlled by a rubber tube applied about the head and below the point of incision. In this case the bleeding vessels were secured by snap forceps. It may be a useful point in practice to mark the centre for the trephine in the flap by a suture rather than to depend upon nitrate of silver for the marking, which might be easily lost sight of during the process of disinfection. It seems to me that the first exploration should be made with a trephine of at least an inch and a half diameter; for, in many instances it might furnish all the opening that would be essential.

In that way the time required for a second trephining, which might be considerable if the skull were as thick as in this instance, would be saved. A practical point in replacing the button of bone in the wound

occurred to me, but unfortunately I could not avail myself of it on account of the great pressure from within the cranial cavity. This was to notch the bone and the corresponding edge from which it was removed with the saw, that when it should be replaced the sawn blood channels of the diploë could be properly matched, believing that the nutrition of the bone would be better provided for by a continuous channel, and a greater chance of its living thus secured. The question of how much can be done in the way of exploration after opening the dura is an important and practical one, and for the present must be left to the discretion of the operator and his advisers at the time. The needle, the knife and the finger have their advocates, as shown in published reports, and while my instinct is against exploring the wound in the brain with the finger, on account of the contusion that seems inevitable, I cannot ignore the contrast between a well-calculated manipulation of such description by a competent surgeon and the rough-and-tumble bruising and laceration of the soft and hard parts incident to a bad fracture of the skull, which are commonly seen in the accident rooms of any large hospital. Such cases may do well, as we all know, with attention to the removal of loose fragments, the arrest of hæmorrhage, and the maintenance of an adequate aseptic condition of the wound and its surroundings. The needle or the knife alone would hardly be competent to decide some cases; time may give us a better substitute. Until it does I suppose we must be content with believing that cases dependent upon such exploration are probably so grave in their prognosis that it can make little or no difference with the result. It may be, as Dr. Putnam suggests, that other openings may furnish a way out of the difficulty. The special emergencies of intra-cranial hæmorrhage and its complications, the particular resources to be applied in cases extraordinary from the position of growths or their attachments must depend upon the same skill and readiness of its application that have already distinguished many operators in the field of abdominal surgery where experience has taught so much. The after-treatment, with some unusual exceptions, resolves itself into the accepted formula for compound fractures of the skull; namely, adequate drainage and asepticism.

## THE ANATOMY OF THE BREAST AND AXILLA IN THE OPERATION FOR CANCER.<sup>1</sup>

BY W. M. CONANT, M.D.

THIS paper was written to bring out the important anatomical points to be remembered in the complete operation for removing a cancerous breast and the axillary lymphatics. It was also intended that it should serve as a guide to the younger surgeons, who, like myself, are just beginning to operate.

The patient, after the breast and axilla have been prepared so that they are aseptic, is etherized and placed on the table. By the aid of pillows, the patient is turned so that the side to be operated on will be upward. This enables the operator, by extension of the arm, to make the axillary space more superficial, and also enables him to get good light.

The incision for removal of the breast should be determined by the location of the tumor, and should

<sup>1</sup> Read at the meeting of the Surgical Section of the Suffolk District Medical Society, on February 5, 1890.

be marked out with an aniline pencil before any cut is made.

The breast is, by custom, divided into four quadrants, and unless all of these quadrants are involved, there is no reason why the incision should be circular, as advised by Gross, rather than elliptical. The elliptical form of incision, with proper care, enables one to remove any secondary deposit in the skin that may exist. The immediate examination of the specimen, made possible by the improved methods of freezing, decides whether all affected skin has been removed.

The breast lies in the superficial fascia, which sends processes into its substance that act as ligaments (suspensory ligaments of Cooper).

The blood supplies of the gland are many and of interest, because with the vessels are the lymphatic glands. The upper lobes are supplied by the thoracic half of the acromio-thoracic, a branch of the axillary; the outer, by the long thoracic and external mammary, the latter often a distinct branch of the axillary in the female; and the inner lobes, by the anterior intercostals and the anterior perforating branches of the internal mammary, which inosculate with the branches of the corresponding aortic intercostals. It is by this method that secondary deposits are found in lungs and liver. It is fortunate, however, that only a few lymphatic trunks accompany the intercostal vessels, but that most of them pass into two large glands behind the edge of the pectoral muscles. The lymphatics, from the areola and nipple, pass to a gland nearer the clavicle.

This shows the importance of examining the perforating branches of the internal mammary, and also the necessity of an early operation before there has been much secondary deposit.

The breast is removed with its own fascia, and then comes the extension of the incision for cleaning out the axilla.

Gross and Jacobson advise making the incision from the breast to the centre of the axilla. This incision gives one no guide for finding the axillary vein; there is also more hæmorrhage, and the base of the axillary pyramid is divided in halves.

Dr. Richardson, in his admirable paper on "Removal of Cancer," to be found in the *Boston Medical and Surgical Journal*, 1888, Vol. CXIX, pp. 193, 233, makes his incision along the border of the greater pectoral, and he there speaks of an incision advised by Dr. Mitter, which, as near as can be judged, is practically the same as here advised.

The incision should be about two inches above the border of the greater pectoral, and should extend onto the arm over the swell made by the coraco-brachialis, and then down the arm for about two inches. This incision is advised for the following reasons:

(1) Because it is the natural line when the arm is extended, as seen in the picture of the Sleeping Venus, or on any live model.

(2) Because you keep above the chain of glands along the lower border of the pectoral.

(3) Because it gives, at the humeral side, the bicipital fascia over the coraco-brachialis. Under this fascia and at the inner edge of the muscle lies the axillary vein, which is the key to the entire dissection.

(4) Because there need be no hæmorrhage, except in the flaps.

(5) Because the fascia over the pectorals and the contents of the axilla can be removed *en masse*.

(6) Because deep sutures and drainage-tubes are not needed.

(7) Because the resulting scar is more nearly vertical, and consequently there is much freer movement than when scar is in the axilla.

Having made the incision, it is necessary to remember the shape and boundaries of the axilla, as well as its contents.

"The axilla," according to Macalister, "is a pyramidal space, bounded in front by the pectoral muscles and internally by the four upper ribs, covered by the serratus magnus. The hinder wall is formed by the subscapularis, teres major, and latissimus dorsi; it is thicker, and hangs lower than the anterior, and where it and the front wall converge externally, the angle is rounded out by the biceps and coraco-brachialis. Its apex above communicates with the supra-clavicular cervical triangle by a three-sided passage, bounded by the first rib, the clavicle, and the upper edge of the scapula. Its base below is concave, formed by the axillary fascia, which is attached in front to the lower and inner border of the greater, and to the lower edge of the sheath of the lesser pectoral muscles; it is continuous externally with the fascia of the arm, internally with the sheath of the serratus magnus, and posteriorly with the upper edge of the sheath of the latissimus dorsi.

"Imbedded in these tissues, there are usually twelve lymphatic glands. These lie along the lower edge of the great pectoral, one close to the humerus, receiving the cutaneous brachial lymphatics, one close to the thoracic wall, and one intermediate, receiving mammary and superficial thoracic lymphatics. Two lie above these behind the great pectoral, and receive the lymphatics of the areola and nipple. Two overlie the costo-coracoid membrane close to the cephalic vein, receiving the lymphatics from the shoulder, and then rest on the axillary vein, receiving the deep brachial lymphatics. One, upon the subscapular artery behind, collects the lymph vessels of the hinder wall of the cavity, and one lies on the latissimus dorsi close to the scapular quadrilateral space."

Quain practically agrees with this description of the lymphatics, although he does not place them as accurately.

Passing through this pyramidal space are nerves and arteries. At the top, the thoracic portion of the acromio-thoracic, which supplies the pectorals and the anterior thoracic nerves. About the middle, the long thoracic artery directed downward and inward along the lower border of the pectoralis minor, and distributed to the pectorals, serratus magnus, and to the mamma. The posterior thoracic nerve runs much deeper. Below these are the three subscapular nerves, the subscapular artery and vein.

Having found the fascia over the coraco-brachialis, you cut through it and come to the muscle itself, at the inner edge of which you find the axillary vein. This vein is the chief landmark, and the dissection is now easy, as the hæmorrhage can be easily controlled by ligating arteries and veins as they appear. The intercostal-humeral nerve coming through the second intercostal space is first seen, and being cutaneous can be cut close to the ribs. Then remove the fascia over the pectorals; this fascia is thin and is a part of the deep fascia, and should be dissected off to the lower edge of the muscle. Dissecting from above downwards enables one to easily determine the edge of the

muscle, and so the warning of Gross and Jacobson, as to the danger of cutting the muscle, can be disregarded. Starting again at the lowest brachial incision, you come to the subscapular artery, veins and nerves. It is not necessary usually to ligate the artery or veins, and great care should be used not to injure the three subscapular nerves, because they supply the subscapularis, teres major, and latissimus dorsi muscles. If you have removed the pectorals, these three muscles play an important part in the ability to put the hand above the head. The only other branches of the axillary artery and vein that can trouble you are the long thoracic and the thoracic portion of the acromio-thoracic, and possibly, the external mammary when a distinct branch. These arteries, in the ordinary dissection, would not give trouble, but if the pectorals had to be removed (as must be done in certain cases), both artery and veins should be tied near the axillary vein. The branches of the brachial plexus in the arm need not trouble you, if the simple rule is remembered, that, having found the axillary vein, the edge of the knife is always away from the vein and towards the skin. It has been advised that you should enucleate with the fingers, and not use a sharp instrument.

Now the arm should be drawn still more over the head, in order to make the axillary space more shallow. Not only every gland, but every particle of fat, and even the fascia must be removed, for in these lie the lymphatics. Special attention must be paid to (1) the edges of the greater and lesser pectoral, as glands are found between the two muscles, (2) the under surfaces of the pectorals, and (3) the apex of the axilla.

Gross's method of treating an involved pectoral with cautery does not seem as good surgery as the removal of the involved portion from sternum to humeral insertion. Jacobson claims that if the glands are enlarged in the above positions, it is necessary to remove both pectorals. This does not seem necessary in all cases, as the fascia can be removed from the pectorals, and the apex can be cleaned from below, and also from above, by going through the triangular space between the inner border of the deltoid and the outer border of the clavicular portion of the greater pectoral. In this space lies the cephalic vein and the branches of the acromio-thoracic. Still another space is between the sternal and clavicular portions of the great pectoral. This space is most pronounced in women and thin persons. Having the axilla cleaned out, the mass rests on the inferior flap, and a few strokes of the scalpel easily removes it from the skin. The flap is then sewed up with either silk or catgut. Some operators put in deep stitches through the serratus magnus, but this is not necessary if a good dressing is applied so that the lower flap is pressed well up against the thoracic wall. The question of a drainage-tube is of some importance. Formerly a long drainage-tube of rubber was placed in the wound with both ends projecting, this has been shortened from time to time, until now a short piece of bone drainage-tube has become the fashion. There does not seem to be any real need of drainage-tubes of any kind, for with care the operation can be performed, and very little oozing will follow. Moreover, with the incision carried as low on the arm as above advised, it will be seen at a glance that the lower end of the incision is the most dependent portion of the wound, and if one fears disturbance from the oozing, the lower end need not be entirely closed. The application of a proper dressing

is of much importance, because it should be used so that there shall be no dependent portion at any point, except at the lowest point of the incision.

Recapitulation of the important points to be remembered in the operation for cancer of the breast:

- (1) Elliptical incision for removal of the mamma.
- (2) Form of incision for cleaning out the axilla.
- (3) Landmarks for finding the axillary vein.
- (4) Boundaries of the axillary space.
- (5) Position of the lymphatic glands.
- (6) Position and course of arteries and veins, and especially the three subscapular nerves.
- (7) Necessity of complete removal of fat, the glands and fascia over the pectorals and serratus magnus.
- (8) Possibility of the removal of both pectorals, and external intercostals, and the axillary vein.
- (9) Neither deep sutures nor drainage-tubes needed.

## THE REPORT ON PROGRESS IN THORACIC DISEASE.

BY FREDERICK C. SHATTUCK, M.D., AND GEORGE G. SEARS, M.D.

### INFLUENCE OF PREGNANCY IN CHRONIC VALVULAR LESIONS.<sup>1</sup>

IN the course of a paper on "Chronic Valvular Disease of the Heart," Middleton reports twenty-six cases in which the patients had successfully passed through one or more pregnancies, in only one or two of which could any doubt exist that the cardiac lesion had preceded the birth of some of the children. Of these cases, nine were suffering from pure mitral stenosis, eight from combined mitral stenosis and regurgitation, and two from pure mitral regurgitation, a total of nineteen with pure mitral disease. Of the others, two had a mitral and tricuspid lesion, two mitral and aortic, and three pure aortic disease. The great preponderance of mitral lesions, and especially of mitral stenosis, is very striking, and, with the histories of repeated pregnancies without much general disturbance, as seen, for instance, in one case where the patient had successfully weathered seven, leads to the inference that the prognosis of valvular lesions, even when complicated by pregnancy, must in cases of this kind be regarded with considerable hopefulness.

### HEART-FAILURE CELLS.<sup>2</sup>

Hoffmann calls attention to certain cells which are found in the sputum in cases of brown induration of the lungs following mitral lesions, myocarditis and pericarditis, and which, from their origin, he calls heart-failure cells. They are recognized by their size, more or less oval form, and beautiful balloon-shaped nuclei; especially, however, by their containing yellow or yellowish-brown to brown, red and black pigment. They are probably derived from the layer beneath the epithelial covering of the alveoli, and have obtained their coloring-matter partly through diapedesis and partly by capillary hæmorrhages. Whatever their source may be, they are almost pathognomonic of brown induration of the lungs, primary pulmonary disease giving rise to them only in the most exceptional instances, and are found as often in white as in red or brown sputum. They are of special diagnostic value in cases where the cardiac lesion is with difficulty recognized,

<sup>1</sup> Lancet, October 26 and November 2, 1889.

<sup>2</sup> Deutsche Arch. f. Klin. Med., 1889, Bd. 45, h. 3 and 4.