

ent from that of Dr. Marcy. It has always seemed to me that the important point in the Bassini operation was the method of placing the sutures. His method of suturing the canal in a single layer from the inside to the outside is liable to failure without some such suture as the metallic suture. Bassini's operation divides the cord. I would like to call attention to the catgut which has been introduced in these cases. The cases which have relapsed have always been cases which have suppurred. Dr. DeGarmo states that he has had only one case suppurate in children. This has been my own experience and I suppose it is because the parts are more resistant, although there are a certain number in which suppuration will certainly take place.

Dr. E. D. FERGUSON of Troy—If the suppuration is superficial and does not involve the fibrous layers of the skin, your results will be good; if it is deep and does involve the fibrous layers it will probably fail. If you use the metallic suture it is permanent. We want sutures to last a certain length of time, and they should hold the parts together thoroughly for several weeks, but at the same time they should not be a permanent suture. Whatever the nature of the suture may be, it is a question of restoring the obliquity of the canal for a sufficient length of time to establish firmness, and a question as to whether a certain suture may be used is a matter of minor importance. The question of establishing the union of the fibrous layer on the posterior wall of the canal, especially when pressure comes from the abdominal side, is an important one. This is what Dr. Marcy claimed before Bassini operated at all.

Dr. DEGARMO of New York City—We are indebted to Dr. Marcy for his demonstration as to the causes of hernia. There is a question about his having preceded Bassini in the operation of restoring the obliquity of the inguinal canal, but so far as I know Dr. Marcy was the first one to do this. Bassini uses silk in his operation. I have twice excised the testicle on the side of the hernia. As to phimosis, twenty years ago there was something written on this point. If a child has phimosis circumcision should be done. If we go to a Hebrew institution where the children have been circumcised in early life we will find as many cases of hernia as anywhere else, but I do not wish today to advocate operating on infants in all cases, although it will be well to do it in many. Many children 7 or 8 years of age can not be cured by a truss and they should be operated on. I have seen hydrocele associated with undescended testicle and it was as large as a hen's egg. In this case the testicle was brought down, but I have seen instances of undescended testicle where the cord was too short. I merely clear the space outside of the perineum and cover muscular tissue over it. In one man there was very marked relief by this method, but if the cord is long enough the testicle should always be brought down. We are perfectly safe in leaving the testicle outside of the peritoneal cavity and in the muscular structure. Tendinous structures need about six weeks for union, and I would like to use something which is not absorbed, but this is difficult to do. Kangaroo tendon suits me very well.

ON THE TECHNIQUE OF PNEUMOTOMY.

Presented to the Section on Surgery and Anatomy at the Forty-eighth Annual Meeting of the American Medical Association, held at Philadelphia, Pa., June 1-4, 1897.

BY CARL BECK, M.D.

PROFESSOR OF SURGERY, NEW YORK SCHOOL OF CLINICAL MEDICINE; SURGEON TO ST. MARK'S HOSPITAL, ETC.
NEW YORK, N. Y.

While the surgical principle, "*Ubi pus, ibi evacua*," is nowadays held up more than ever before even in those parts of the human body that are accessible only under great difficulties, there seems to be some exception in regard to pus accumulations in the lungs, although they are by no means of rare occurrence. This lack of enthusiasm in attacking lung abscesses by the surgical knife is apparently caused by the widespread prejudice that they are all of a tubercular character and could consequently not be cured by simple evacuation. But while there is no doubt that the presence of one tubercular abscess necessarily presupposes the affection of a more or less extensive area of lung tissue, the nature of which would certainly be but little influenced by the opening of the single abscess, still there are many abscesses

which are caused by preceding inflammatory processes, by suppurative bronchitis, bronchiectasy, etc. These are of a non-tubercular character and are curable, if treated after true surgical principles. If this fact were fully realized, the medicamentous armamentarium of euthanasia would be given up in many cases of alleged phthisis. And here is the salient point in the difficulty of the diagnosis. Still, the diagnosis of the presence of lung abscess is much easier than its localization.

The presence of copious purulent expectoration, its admixture of elastic fibers and blood pigment, the history of a preceding inflammatory process, particularly of pneumonia, which ran no typical course, the physical signs of the presence of a cavity, the absence of tubercular manifestations, etc., should point to the existence of a lung abscess. As to localization, it has to be borne in mind that while cavities of the apex contain more or less air, those situated further below contain purulent secretion only. If in the latter variety expectoration is copious, so that the cavity becomes evacuated, the respiratory sounds become tympanic on percussion and are well perceptible on auscultation. If, on the contrary, the cavity is filled up, there is complete dullness and the respiratory sounds are hardly, if at all, audible, pectoral fremitus also being entirely absent.

Cavities of recent origin are easier localized than old cases, not only because the course of the precursory disease furnishes some elucidation, but also because the physical symptoms are much more clearly pronounced. Old cavities are, with few exceptions, deeply situated and can, according to clinical experience, generally be reached below the lower angle of the scapula.

Exploratory puncture, while absolutely reliable in pyothorax, often fails to disclose lung abscess and has, therefore, to be replaced by exploratory pleuro- or pneumotomy. (Compare the writer's article on exploratory pleurotomy and resection of costal pleura, *N. Y. Medical Journal*, June 15, 1895.)

The principles of treatment are governed by the same as those which are determining in any case of abscess, that is, thorough evacuation and drainage. This can only be done well by making a wide opening in the chest wall. To accomplish this the resection of at least two, preferably of three or four ribs is required.

The technique is as follows: Thorough asepsis is just as necessary as in any other operation. Particular attention must be given to the skin of the patient and to the hands of the surgeon, scrubbing with green soap first for three or four minutes, then washing with alcohol or ether, and subsequently with bichlorid, 1 to 500. To sterilize the skin of the patient thoroughly, it is advisable to cover the field of the operation with a poultice of green soap. If there is enough time, the poultice may remain for twenty-four hours. I regard this an essential factor for the disinfection of the skin, because I do not believe that under ordinary circumstances the epidermis, which shelters a multitude of pathogenic bacteria, can be rendered sterile by the usual methods of disinfection, which are generally not carried out longer than from ten to fifteen minutes. A period of twenty-four hours gives the soap a chance to permeate the epidermis thoroughly, so that scrubbing on the following day is much more effective. Sometimes indeed the poultice macerates the epidermis so that it can be

wiped off easily. All the appliances needed at the operation must be sterilized; the instruments, ligatures, etc., in boiling soda solution, and the towels, sponges, etc., in steam.

As a rule the eighth rib is selected. The incision, about five inches in length, should be made in the center of the selected area, and should be carried directly down to the periosteum of the rib. An incision is then made along both borders of the rib, and the periosteum, both in front and behind, is raised by means of a periosteal elevator. Having freed the periosteum, the elevator is pushed beneath the rib, between it and its posterior periosteum, and allowed to rest on both edges of the wound. With a blunt hook the tissues are retracted along the rib toward the axilla, and by means of a bone shears the rib is cut between hook and elevatorium. Next, the elevatorium is pushed toward the sternum, forcing the rib from the last fragment of adhering periosteum; the retractor is inserted into the end of the wound, and with the scissors the rib is cut through on the other side. Now the costal pleura underneath is incised and a large aneurysm needle is introduced through one of the pleural incisions and conducted underneath the costal pleura to the other. With strong silk sutures the tissues, containing fascia, muscles, periosteum, costal pleura, and intercostal arteries are ligated close to the surface of the rib; then a vertical incision is made through the tissues between the two ligatures, thus creating a wide opening. By retracting the skin forcibly the skin incision can be utilized for the resection of the rib above. If, as rarely occurs in these cases, adhesions should be absent, the lung may collapse, so that it is found impossible to draw it forward. Then the final incision has to be deferred for a day or more. If the lung moves freely beneath, it is essential to shut off the pleura by packing gauze tampons around the margins in order to prevent infection from the escaping pus. This procedure renders suturing of the pleura to the lung, as well as artificial formation of adhesions by the use of caustics, unnecessary. Especially if the abscess is located superficially, infection of the pleural cavity might be caused by the stitch-canals. The further steps must be undertaken with a great amount of care and patience. If palpation of the pulmonary area has failed to give information, an exploratory needle of moderate size may slowly be pushed into the lung. If necessary this must be repeated on different points. If the focus is not reached by the needle, the pulmonary pleura is carefully divided and the thin, slightly red-heated point of a Paquelin cautery thrust into the suspected portion. I found it advisable to construct a thin director, made of platinum, which fits round the heated platinum tip of the Paquelin cautery, just as a stylet fits to a trocar. After tip and encircling director have perforated the lung tissue, the tip is withdrawn and the director left *in situ* to ascertain whether any pus appears at the groove of the director. If so, a small Péan forceps is introduced and the opening is gently dilated. The great advantage of the Paquelin cautery is that it prevents infection. The exploratory needle, while entirely harmless in pyothorax, is apt to cause infection in the lung tissue.

After the cavity is exposed, no irrigation nor exploration with the finger is advisable, as these procedures might provoke hemorrhage. A narrow strip of iodoform gauze is carefully introduced into the cavity. The pleural cavity is then once more thor-

oughly cleaned and revised, and packed with iodoform gauze. The whole is protected by a large piece of moss-board. The dressing need not be changed more frequently than every second or third day, except there should be signs of retention of pus. It is advisable to tell the patient to blow at intervals with his mouth and nostrils closed, which helps evacuation of the purulent discharge.

The patient, if at all able, should get up after a few days. During the first few days of the after treatment small doses of morphin are administered for the purpose of immobilization, especially when cough is present. If the pulse be weak, strophanthus and caffeine may be added. Nourishment must be given frequently and in small quantities.

Anesthesia should be administered only if the pulse be strong enough, which is an exceptional circumstance in such cases. Ether being contraindicated in respiratory disturbance, only chloroform can be employed; and I need not call attention to the danger to which the use of this paralyzing drug subjects the heart. Since the operation does not take very long for a well trained surgeon, it would be better to use an ether spray or ethyl-chlorid, and to give a morphin injection before the operation. Even cocaine has its dangers. If chloroform is employed, only a few drops should be poured into the mask at a time, and the pulse, the respiration and the color of the face should be very carefully watched.

My own experience comprises four cases of lung abscess, all of which recovered. In two of the cases the diagnosis of pyothorax, and in one of subphrenic abscess had been made before resection. Only in one case the diagnosis of lung abscess was made before operation, wherefore I may be permitted to give its history:

M. B., 31 years of age, merchant, Austrian by birth, had pneumonia when ten years of age; in November, 1895, pleuropneumonia, after which cough and copious expectoration of an offensive odor remained; once in a while hemoptysis, chills and dyspnea. The treatment had consisted in the administration of expectorant mixtures and inhalations of turpentine. On Feb. 21, 1896, the following was present:

The anemic patient shows a flat thorax, which expands symmetrically. The left lung is normal. On the right side anteriorly below, tympanitic sounds, râles during inspiration. Posteriorly below, extensive dullness. Correspondingly bronchial breathing and râles. Above the apex of the heart systolic murmur. Pulse soft, 110. Urine contains large quantities of indican. Sputa muco-purulent, about 180 c.c. in twenty-four hours. Pus corpuscles in abundance, also elastic fibers. On the following day, since the patient expectorated but little, the dullness is much more pronounced and the respiratory sounds are less audible. After the patient had coughed considerably, the bronchial respiratory sounds become more audible again above the region of the ninth rib, where sometimes amphoric breathing can also be perceived.

On Feb. 24, 1896, the weak patient slightly anesthetized with chloroform and an incision made over the ninth rib, extending from the posterior axillary line to the transverse process of the ninth dorsal vertebra. After the ninth, eighth and tenth ribs, together with their soft tissues, were resected, the lung collapsed slightly, but soon expanded again. The pleura was packed with aseptic gauze and then an exploratory needle was pushed forward into the center of the exposed area. About one inch behind the pulmonary pleura gray pus, which contained air and which had a very offensive odor, was aspirated. After the opening was dilated, the needle having served as a guide, a little over an ounce of pus was discharged. While the cavity was packed with a small strip of iodoform gauze, the patient coughed excessively. There was no hemorrhage and no signs of shock. Twenty-four hours after the operation the patient had a temperature of 104 degrees F., a soft pulse of 130 and a respiration of 30. There was considerable cough and copious expectoration with foul odor. Thereafter the temperature went down gradually and the patient improved rapidly. From March 6 the patient was out of bed.

The wound was obliterated by the end of April, two months after the operation. Gain in weight twenty-three pounds. No cough, pain nor fever; once in a while a slight cough only, with expectoration of clear mucus. According to the latest news received from the patient he is perfectly well.

While this article is in print, I had an opportunity to observe another case of this type. Being of unusual interest, it may be reported in addition:

Annie S., four years of age, showing a fair family history, always had a rachitic appearance, according to Dr. S. Ellsberg, to whom I am indebted for his report. The patient also suffered more or less from catarrh of the upper air passages. About March 1, 1897, she took sick from pneumonia (temperature of 106 F. in the beginning). First the left upper lobe was affected. On the seventh day normal temperature. March 9, renewed attack of fever, 105 F., which with slight fluctuations lasted until March 24, the left lower lobe now being affected, and five days later the right upper lobe participating. After March 24 the temperature oscillated between 100 and 101, sometimes exacerbations up to 104 taking place. Great emaciation. April 5 the diagnosis pyothorax was made, and a large amount of pus discharged by simple incision. Full recovery five weeks later.

About June 15 the patient was attacked by violent cough and slight elevation of temperature. First the diagnosis whooping cough was made, but Dr. J. Winters, who was called in consultation, discovered that there was still a small accumulation of pus in the pleural cavity, which had finally perforated into a bronchus. He advised immediate resection of a rib, but shortly after the patient expectorated a considerable amount of pus during a violent coughing spell. On the following day the temperature became normal and the patient improved so rapidly that recovery was again thought to be perfect. After one month's euphoria the child became feverish again and had violent attacks of coughing, during which she became cyanotic. The diagnosis pyopneumothorax was made, and Drs. Winters and Ellsberg insisted most strongly upon a resection now, to which, finally, consent was given.

On August 27, when I saw the patient for the first time, I found the following state present: Anemic, thinly built girl; thorax expands symmetrically; nothing abnormal is found on the right side; on the left side, above the fifth intercostal space in the posterior axillary line a large scar, which bulges forward during coughing; posteriorly below slight dullness; bronchial and amphoric breathing above the dull area; the sputa are muco purulent, and contain blood sometimes, especially after a violent cough; elastic fibers and pus corpuscles in large quantities; pulse 144, temperature 101 F.

August 30, after the patient was slightly anesthetized with chloroform, a piece of the sixth rib two inches long, which was situated below the old scar, was resected, the scar tissue being removed at the same time. When the pleura was incised brown pus and air escaped under considerable noise. Slight shock. The anesthetic was dropped at once. The lung did not collapse, this probably being due to the adhesions formed during the healing process of the pyothorax. By introducing the pleural speculum a canal leading into the lung tissue could be seen. Its gentle dilatation with a Péan forceps revealed the presence of a cavity of the size of a small apple, which was wiped out carefully with gauze mops and finally packed with iodoform gauze. The child made a rapid recovery, three weeks after the last operation the opening being closed.

DISCUSSION.

Dr. THOMAS H. MANLEY of New York—Dr. Gaston of Atlanta, has done much work in this line. These cases are always difficult to deal with, and it would seem to me to be a question, when we have an empyema or a pus formation in the pleural cavity, to determine as far as possible first whether that formation is due to the formation of the cells of the pleura or whether it be an interstitial abscess of the lung itself. That being possible to decide, whether or not in some cases it might be advisable, especially as the patient is exhausted and the question of an anesthetic is important, to resort to an exploratory incision, and then inject and flush the cavity, closing the opening with drainage. I would like to ask whether or not we can not succeed quite completely in benumbing the parts with cocaine and using ether spray on the surface; also, whether in certain cases it is not important to spare the resection of the rib.

Dr. BECK—With regard to the exploratory puncture there is

only one thing to do, and that is a resection of the rib. As soon as this is done you can easily find your way into the abscess. As to the anesthesia I know of many cases where death has occurred before the knife had been put into the abscess. Suits for damages have not been infrequent. With regard to the regeneration of the bone after resection of a rib, I am very glad to say that ribs have been known to have regenerated nine months after operation as has been shown by the X-Rays. I believe the X-Rays should be employed after every operation of this kind.

THE SURGICAL ENGINE AND ITS USE IN BONE SURGERY.

Presented to the Section on Surgery and Anatomy, at the Forty-eighth Annual Meeting of the American Medical Association held at Philadelphia, June 1-4, 1897.

BY MATTHEW H. CRYER, M.D.

PHILADELPHIA, PA.

The requirements of a satisfactory surgical engine are, first, that it be so geared that the velocity of the cutting tool is from four to six thousand revolutions per minute, which speed is to be maintained under varying pressures. The hand-piece (the chuck which holds the instrument) should be light, capable of easy adjustment, and so arranged that the instrument fixed in it may be carried with readiness into the recesses of deep cavities. There should be no undue vibration of the instrument while held to its work, as this will lessen tactile recognition of the nature of the tissue being cut. The motive power should be so arranged that it is under perfect control and produces steadiness and uniformity of speed. The hand-piece and its several parts, with the instruments used, must be of such character that perfect sterilization can be readily accomplished.

Surgical engines of several designs have been in use for many years, but, strangely enough, few general surgeons appear to have availed themselves of the advantages to be derived through their use. There is scarcely an operation upon osseous tissues that could not be more quickly and accurately performed by means of the engine than with any of the hand instruments used. Many of these latter are crushing instead of cutting instruments.

Objections to some of the older forms of engines were not without good foundation. As they were chiefly notable for their faults of design and of construction, the deficiencies in mechanical performance might be accepted as a necessary evil, but the impossibility of complete sterilization was an objection not so easily disposed of. These serious drawbacks have one by one been corrected, until in its present form the engine combines all of the features described as requisites of a correct machine. It is simple in design and accurately built, so that there is little liability of the mechanism getting out of order.

The present engine is new in nearly all of its features; it is simpler in design, lighter in construction, and its parts are readily detachable to permit of packing in a small case, a box not larger than those made for croquet sets. The hand-piece is designed with a twofold object, first, with a reference to the mechanical, second, to the pathologic elements involved. It is sufficiently rigid to carry its tools steadily while operating on dense bone, and may readily be rendered perfectly aseptic. The latter point is repeatedly emphasized because of the serious objection to previous hand-pieces, involving the existence of spaces which commonly retained septic matter. That portion of the engine which transmits the power from the large wheel to the pulleys of the hand-piece requires