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THE ADVANTAGES OF THE SO-CALLED DECORTICATION OF THE LUNG IN OLD EMPYEMA *

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In operating for an old empyema we are presented with the problem of closing an old, suppurating cavity with stiff, unyielding walls, the inner wall consisting of the lung with its thick covering of fibrous tissue and fibrin, the other wall being the wall of the chest cavity. It is obvious that to enable such an abscess cavity to close, either the bony framework must be removed from the chest wall, so that it may sink in against the lung, or the thick fibrous covering must be removed from the lung and the lung expanded so as to come in contact with the chest-wall, or a combination of these two methods must be affected. The old mutilating process, with which the names of Estländer and Schede are connected, consists of extensive multiple resection of the ribs, with or without the removal of the intercostal muscles, allows the skin of the chest and soft parts to fall in against the lung, and has for many years been known to present grave objections. In the first place, the mutilation was extensive, the operation was accompanied by a good deal of trauma, hemorrhage and shock, features which rendered it especially dangerous in patients weakened and exhausted by the chronic supuration of an old empyema. In the second place, if it was performed in children during the growing period, the extensive removal of the chest wall would hardly fail to result in a curvature of the spine which, from lack of support of the ribs on the affected side would accentuate itself as the child grew and would be accompanied by increasing deformity.

In 1893, De Lorme in France and Fowler in America both hit on an operation which was designed to substitute for the mutilating operations of Estländer and Schede, and was planned to allow the lung to expand against the chest-wall, instead of letting the chest-wall fall in against the lung; this operation came to be called decortication of the lung. De Lorme noted that in old empyema the shrunken, contracted lung lay in the gully between the ribs and vertebra, covered and bound down by a thick, inelastic membrane consisting of partly organized fibrin and fibrous tissue. He thought that if a sufficiently large opening in the chest were made for the manipulations, and if this membrane were incised and peeled off the lung and removed, the lung might

expand and fill the chest cavity, thus obviating the necessity of extensive removal of the chest-wall in order to accomplish his object. He cut a square flap, including the third to the sixth ribs, the base being at the anterior border of the scapula, the upper and lower margins following the ribs, and turned it backward in the soft parts as a hinge. He found the lung lying in the costo-vertebral angle, the lower surface of the cavity being the vault of the diaphragm, and the cavity extending to the apex of the lung. The parietal pleura was bound down with a membrane 1 to 1.5 cm. thick. He found the position of the lung impossible to define, it was so bound down by this membrane. He incised the membrane a hand's breadth behind the anterior chest-wall, in order to avoid the pericardium, going cautiously to avoid injuring the lung, using first the knife, then blunt scissors. On coming to the healthy lung, he enlarged the incision, peeled off the membrane and as the patient coughed, the middle lobe of the lung protruded through the opening, reached the chest-wall and even projected through the window he had made in it. This was repeated for the other lobes of the lung. After excising the visceral pleura, curetting and excising portions of the parietal pleura, the flap was put back and sutured around a drainage tube in the lower angle. He concludes, (1) that it is possible to free a lung from the membrane, which holds it down even long after an operation for empyema; (2) that the method is applicable not only on the right, but on the left, if one goes far enough behind; and (3) that this is better than Estländer's operation, because it expands and tends to restore the function of an otherwise useless lung. The great deformity and falling in of the chest-wall may be avoided. This, in young patients, might lead to spinal curvature.

At about the same time Fowler¹ of Brooklyn, operated on a woman, 35 years of age, who had a persistent sinus. He removed three and a half inches of five or six ribs and excised a mass of cicatricial tissue surrounding the sinus, and attached to the chest, wall-diaphragm, pericardium and lung. Hemorrhage was stopped by gauze pressure. There was considerable shock after the operation. The cavity was tamponed with gauze. The tampon was removed in twenty-four hours and a lighter one substituted. The cavity was irrigated and the gauze changed every day. The lung expanded and the cavity was closed in twenty-eight days. Thus, Fowler, with no special plan, apparently, of allowing the lung to expand by removal of the tough, fibrous covering, had at about the same time with De Lorme performed this operation. It seems to me that the credit of the operation should belong to De Lorme as he, apparently, had a definite plan to accomplish what he was after. To

* Read in the Section on Surgery of the American Medical Association, at the Sixty-Second Annual Session, held at Los Angeles, June, 1911.
* Owing to considerations of space, the case reports are here omitted. They are given entire in the Transactions of the Section and in the author's reprints, a copy of which will be sent by the author or by THE JOURNAL on receipt of a stamped addressed envelope.

1. Fowler: Med. Rec., Dec. 30, 1903.

this valuable procedure of Fowler and De Lorme, has been applied the clumsy name of "decortication," from the Latin *cortex*, bark, meaning literally, barking or peeling off the bark from the lung. It is not, therefore, as a new procedure that I venture to take up this subject for discussion, but rather for the reason that so little has been written about it that I fear some of us may forget what a valuable resource it is and may, unnecessarily, perform severe mutilating operation when this simple operation would be safer and more effective.

Looking over the literature since that time, comparatively few reports of this operation are to be found. The same is true in regard to the operations of Estländer and Schede. I believe the reason for this to be, that in the primary operation for empyema, resection of the rib and provision of adequate drainage at the proper point has resulted in the cure of so many cases that few chronic cases result. Among the few reports in literature of the results of lung decortication, Charles M. Dowd² of New York, reports excellent results from decortication in old empyema in children. Ransohoff,³ however, finds fault with the results of lung decortication, advising instead of decortication, the making of multiple incisions in the thickened pleura, thus allowing the lung to expand at numerous points. It does not seem to me that this method of multiple incisions can possibly be as efficient as the free and complete removal of the membrane and, as in my hands the free and complete removal of the membrane has been efficient, I thought it worth while to report my experience, which now amounts to seven cases.

Samuel Lloyd⁴ of New York, who has had a very large experience in the treatment of empyema, chiefly in children, in a very interesting article given at the twenty-fifth anniversary of the New York Post-Graduate Medical School, states that in the treatment of old empyema it is not necessary to remove the pulmonary pleura, but simply to break up the adhesions at the borders of the cavity between the parietal and visceral pleura. This is undoubtedly true in early cases, and I believe that such adhesions should at the first operation of draining an empyema be so broken up. In the older cases, however, in which the membrane is thick, firm and rubber-like, it will easily be seen that it will be thickest and firmest at the point of attachment to the chest wall, so that it would be more difficult to break it at this point than where I have done it, namely, at a vertical line starting about the middle of the bottom of the cavity and extending upward along the lung. It is possible also that the lung might expand with this great, heavy thick piece of membrane left on it. In the early cases, the lung would probably expand whatever is done to it, but in the old cases with this great, thick, leathery piece of membrane, the expansion of the lung could hardly be as complete and uniform from having its adhesions broken up at the edges, as it would from slitting it up in the middle and entirely separating it. Anybody who has felt with the finger and seen the wonderful expansion of the lung after the removal of this membrane, which is not a difficult procedure, will hardly advocate, in cases in which the membrane has any thickness at all, the method of simply breaking up the adhesions at the edges and leaving it on.

I think Lloyd's contribution to the subject is of great value, in that he emphasizes the point of removing at

the primary operation a piece of more than one rib, if necessary, in order to get in more than two fingers to break up adhesions to the pleura, and this procedure was adopted in Case 7 of my series of cases, and I shall adopt it more often in the future. It cannot be said, however, to be absolutely essential in the early cases, and in the late cases I do not think it can be as satisfactory as the removal of the thick, leathery membrane or the old procedure of decortication.

In an experience of eighteen years at the Boston City Hospital, where I have operated in a fairly large number of cases of empyema, mostly, however, acute, although greatly interested in the question of lung expansion in these old cavities, I had no opportunity to operate for chronic empyema until April, 1907. This case, which was, briefly, that of a little girl of 14, who had had a sinus for a year, after the resection of the ninth rib in the posterior axillary line. I carried an incision upward, parallel to the anterior border of the scapula, resected portions of four ribs and found exposed a concave surface of the glistening membrane which bound the lung down in the gutter between the ribs and vertebra, so tightly that it hardly seemed as if there was any lung in the chest at all. On splitting this membrane with the scissors and separating it carefully from the surface of the lung, the lung began to expand and when the child coughed at the close of the operation the red, velvety lung blew up like a soap bubble and came up against the chest-wall, where it remained. The lower angle of the wound was drained. At first there was no discharge, until four or five days after when there was a slight discharge from the breaking down of the blood-clot which ran into the bottom of the chest. I show here pictures (Figs. 1 and 2) of the little girl four years later, after she had grown to be a young lady, and it can be seen that the chest-wall is excellently developed and there is no curvature of the spine.

The second case in which I employed this procedure was an old empyema following an extensive hemorrhage into the chest, hemothorax, resulting from a self-inflicted revolver wound. The patient had a sinus and a chronic discharge ten months after rib resection, for drainage of the infected blood-clot from his chest. In this case the same procedure was followed, the incision running upward and forward from the anterior end of the drainage incision. Five ribs were resected, the thick membrane covering the lung incised and peeled off with the finger, allowing the lung to expand. As the patient coughed, the lung expanded and nearly filled the cavity. A slight discharge persisted, and five months later I found a small cavity two inches in diameter, in the lower part of the chest which was cured by resecting a small portion of the rib. One month later, the wound healed up and has remained in excellent condition since. The patient was a thin, delicate man, who I feel sure would not have survived an extensive operation of the type of Estländer or Schede.

My next cases, 3, 4 and 5, were the result of what I believe to be misguided attempts to cure acute empyema by the method of Thiersch, advocated by Friedrich when he came to this country and spoke before this Association in 1898. He states that rib resection has been abandoned by him in recent, not circumscribed exudates, because, not here necessarily indicated, it requires a longer time and may be more dangerous through the onset of a pneumothorax.

Briefly stated, the method of Thiersch consists of a puncture of the chest-wall, insertion of a large trocar allowing the pus to escape, and the insertion of a Nela-

2. Clinical News, September 1902.

3. Ransohoff: Ann. Surg., 1906.

4. Lloyd, S.: The Treatment of Unresolved Pneumonia, in Science of Medicine and Surgery, 1908, p. 177.

ton catheter of the same size as the trocar to which is attached a collapsible rubber tube which leads into a bottle of fluid at the side of the bed. The Nelaton catheter is fixed air-tight to the chest-wall by the use of rubber tissue and adhesive plaster. The theory is, that when the patient expires, the pus runs out through the tube and on inspiration the collapsible walls of the tube are sucked together and prevent the entrance of air and cause negative pressure in the chest, favoring expansion of the lung. This is one of the numerous methods of securing negative pressure in the chest, the first of which, I believe, was adopted by Bülow; the others have been advocated by Perthes, Van Hook, and numerous

often found in the cavities cannot be removed, and when the tube has finally to be removed, as it always has, the small opening closes over so quickly that a little pus is apt to be left behind, and the case becomes chronic or requires reoperation.

As stated above, in an experience covering eighteen years and a fairly large number of cases, I have almost invariably treated empyema by resection of two or three inches of the ninth or tenth ribs in the posterior axillary line and the insertion of a large tube. Doubtless, in some of these cases, the lesions have failed to heal and have become chronic, but at all events, patients have not come back to me for treatment. It is an interesting commentary on Thiersch's method, at least in my hands, that three cases of chronic empyema requiring subsequent decortication, resulted in the three cases in which I tried it.

The results of free drainage and the use of the large tube are, in my hands, far better than the use of the air-tight methods and the use of the small tube. It is more important to drain the pus and let the air

Figs. 1 and 2.—Patient, 18 years old, four years after operation for chronic empyema. Note the development of chest-wall and the fact that there is no curvature of spine.

other writers. In many of them, a current of running water supplied by a Bunsen pump, is employed to cause constant suction of the chest. The use of all these methods is based on what seems a well-founded objection in methods of rib resection and leaving a wide opening, namely, that such an opening allows the free entrance of air into the chest, which tends to press on the surface of the lung to prevent its expansion resulting in chronic pneumothorax and chronic empyema. The last, and probably the most efficient, of these suction methods is that advocated by Robinson of Boston, which consists in trephining the rib and screwing in a threaded metal tube, to which the rubber tube is attached, thus furnishing an absolutely air-tight connection between the chest-wall and the tube. The objection to all these methods, to my mind, is that, while they do provide an air-tight connection for a very short time, the opening made is necessarily small and the masses of fibrin which are so

take care of itself than to try to keep out the air at the expense of free drainage of the pus and fibrin. No matter if the air does enter the thorax at first, it is frequently soon prevented from entrance by the pressure of the thick pus-soaked dressing over the end of the tube, which in itself provides a very fair valve, and I believe that the expansion of the lung is more frequently prevented from the reaccumulation of pus from insufficient drainage than by the entrance of air through a large opening.

Patient 3 was a man of 34, on whom Thiersch's method of drainage was attempted in January, 1910. Seven weeks later he had a free discharge and a large cavity treated by resection of five ribs and decortication. The cavity was of good size, entirely lined by thick, tough membrane. The membrane was split vertically over the lung and peeled back and the cavity partially filled it. The patient went home one month after the operation

with a sinus, went to work and worked for nearly a year, but returned January, 1911, with a reaccumulation of pus and a large cavity. I operated again and this time found the membrane very adherent to the surface of the lung which failed to expand after its removal, therefore an extensive resection was done to six ribs allowing the chest-wall to fall in on the lung. A few days later, the patient died of septicemia. Although the decortication in this case was not successful, I feel that, had an extensive rib resection been done in the first place, the patient would have died just one year sooner. The patient had valvular heart disease.

In Case 4 the empyema was drained by Thiersch's method, except that rib trephining was adopted instead of trocar puncture. Six weeks later, after the discharge from the hospital, however, the patient returned with his chest full of pus again and a sinus. In this case, the sinus was on the left side of the chest, and the incision in the membrane for decortication had to be carefully made behind the pericardium. The lung expanded and filled the cavity. Two large tubes, surrounded by gauze, were placed in the lower angle of the wound for drainage. There was very little shock. The gauze and tubes were all removed on the second day, and all the drainage was removed on the eleventh. The patient made an excellent recovery and regained complete expansion of the lung without deformity of the chest or curvature of the spine.

In Case 5, the patient was a delicate man, 20 or 21 years of age. Thiersch's method was applied in a metapneumonic empyema. Three weeks later the patient was running a high temperature; drainage was unsatisfactory and there was a large cavity. Decortication was performed as in the preceding cases. The lung, as in the former cases, came out and filled the cavity. This operation was attended by a good deal of shock. The temperature gradually returned to normal. The lung, however, did not in this case stay up against the chest-wall, and the patient began to have cough and expectoration. He died six weeks after the decortication, apparently of pneumonia of the opposite lung. He was thought by consultants to have tuberculosis, but no tuberculous bacilli were found in the sputum and no autopsy was obtained. In this case, also, although the result was unsatisfactory, I cannot but feel that a more promptly fatal result would have followed an extensive removal of the ribs.

Patient 6 was a middle-aged woman in whom, contrary to my usual custom, a rib resection had been made in the midaxillary line, thus failing to provide adequate drainage in the recumbent and sitting positions. Chronic empyema resulted and decortication was done six months later by the method previously described. The lung expanded well and recovery, though delayed by the slipping in of a drain which was inserted by the physician in charge during convalescence, was complete as soon as this drain was removed at the third operation.

The seventh case was one of abscess of the lung with pyopneumothorax which had existed six weeks and in which, at the primary operation, the lung was found so bound down and covered by the thick membrane that it was thought wise to decorticate it at the time. The operation was completely successful, and the patient made a rapid recovery. A crater-like ulcer on the surface of the inferior lobe was, to my mind, a very interesting finding.

It will be seen that two of these seven cases were fatal. Neither of them, however, was fatal from shock,

and I think the same result would have followed any method of treatment.

Beck's method of filling chronic empyema sinuses with bismuth paste has not seemed to me applicable in cases with very large cavities, say two-thirds or three-quarters of the entire pleura and, personally, I have had rather poor results with the insertion of any kind of foreign material in an infected cavity.

In regard to the technic of the operation, the method of the resection of $1\frac{1}{2}$ inches of five or six ribs, through an incision running upward and forward from the anterior end of the old drainage incision, has proved, to my mind, very satisfactory. In slitting up the thickened pleura beneath the ribs, I have had in one or two cases, to grab the intercostal artery, but have been very much surprised to find how little trouble there has been from bleeding. The visceral pleura, which is about a quarter of an inch thick and which is more like the sole of an old rubber shoe than anything else, is carefully incised with a knife over the lower part of the lung. The finger is inserted through the incision and as soon as the soft surface of the lung is felt, is swept to and fro with the pulp of the finger toward the pleura and pressing outward so as to cause the least possible damage to the lung. Then a pair of blunt-pointed scissors is inserted and the membrane slit clear up to the top of the chest, and cleared off from the lung with the finger. A wound of one or two of the air-cells resulted in two or three of my cases, allowing the escape of bubbles of air on exploration, but so small an area of the lung was affected that, apparently, no harm resulted.

In regard to the after-treatment, it is probable that after the patient is put to bed, the lung does retract to a certain extent, but the occasional coughing keeps up the expansion. The thick, pus-soaked dressing, if tightly applied, to my mind, acts as a more efficient valve than any mechanical valve which one could employ. Certainly, in most of my cases, expansion of the lung was marvelously preserved, and in Case 5 I think that failure may have been due to the dressing failing to give us an efficient valve. Change of dressing should be accomplished as rapidly as possible and the tubes removed early; in most instances, I think, on the second or third day.

In the majority of cases, the lung is driven inward so that it extends from the top to the bottom of the chest and at its base is adherent to the diaphragm. This adhesion to the diaphragm, in this class of cases, will have to be broken up in addition to the removal of the membrane covering the lung. In some of the cases, however, the lung, instead of being driven in, is driven both inward and outward, so that it lies contracted along the upper inner wall of the pleura. In these cases, removal of the membrane covering it will be entirely sufficient and there will be no diaphragmatic adhesions to be attended to.

It is possible that an intercostal incision and the use of the modern rib retractor may simplify this operation, but as the incision in the pleura has got to be in the long axis of the lung, it seems to me that multiple rib resection would be better. I have not had an opportunity to employ either positive or negative pressure as an aid in these operations and do not believe that it is necessary if, as should always be done, the ether is taken off as early as possible, and the patient allowed to cough at the moment that the membrane has been stripped off the lung. This facilitates expansion in a wonderful manner. The intratracheal insufflation method of Melzer and

Auer, I believe, will be a distinct aid in these lung cases. One feature which renders it valuable is that it is possible to blow all the ether out of the lung with fresh air at the close of the operation, so that the patient almost immediately comes out. I have not had an opportunity to employ this method myself as yet, but intend to do so at the earliest opportunity. My colleague, Dr. Nichols, has employed this method in one case of decortication and states that he was astonished at the way the lung expanded and filled the cavity when the visceral pleura was removed. His patient made an excellent recovery.

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PLASTIC OPERATIONS ON THE FACE *

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Surgical operations are usually designed to save life or to increase function. Even plastic operations on other parts of the body than the face have as their chief object the restoration of function. Operations on the vaginal outlet are performed for the purpose of correcting malpositions

individual life, but usually few outside of the patient's friends and relatives care anything about it. But the surgeon who corrects a cicatricial contraction about the face or operates on a bad double harelip should have the gratitude of every one who has had to see these unfortunate patients, and is at least as much of a public benefactor as the proverbial philanthropist who causes two blades of grass to grow where only one grew before.

This branch of surgery, then, has to do with improving the patient's personal pulchritude, and the length of the incision, the position of the scar, and the coaptation of the skin are of prime importance instead of being as in most operations matters of secondary consideration. Herein plastic operations on the face differ both in technic and in results from other surgery.

Deformities which make plastic operations on the face necessary may be classed under three heads: First, congenital deformities, of which the most common is harelip; second, deformities produced by injury or disease, which may be subdivided into contractions following ulcers or burns and mechanical trauma; third, deformities that result from operations for removal of cancer or lupus. This third group differs somewhat from the

Fig. 1.—J. M., aged 10. Deformity of the face from burn; from photograph taken two days before first operation.

Fig. 2.—J. M., after lower lip and part of the upper lip had been formed from a flap taken from the left shoulder and arm. A flap is now being transferred from his right arm to cover the right eye. The eyelashes have been shaved and the eyelids closed by suture so the flap is transplanted over both lids at one time.

Fig. 3.—Patient J. M., a few days after flap had been cut from its base on the arm.

of the uterus or of returning the bladder and rectum to their proper position and so rendering these organs better able to functionate normally. Plastic operations on the hands or feet for deformities, on the bowel or bladder for fistulous openings, or on the throat or mouth for congenital defects, are intended to restore to usefulness the parts affected. Plastic operations on the face, however, are done chiefly for their cosmetic effect, as the function of no organ is materially altered by the facial deformities which such operations are designed to correct.

While the correction of facial deformities cannot be classed as life-saving, such procedures when successful benefit not only the patient, but the community. An operation for appendicitis, for instance, may save an

second. Though it may be said to occur as the result of disease, the immediate defect is one that has been purposely made by the surgeon under aseptic precautions and, in a manner, he may control the character of the defect. No operation for cancer should ever be done with any other object in view than complete extirpation of the cancerous mass; still at times the incisions may be so shaped as to make a resulting wound that will not leave an unsightly scar while sacrificing nothing to thoroughness.

Without attempting to give a detailed report of cases, I shall describe some operations and results that may serve to illustrate the second two of these three different classes of cases that have been grouped under the heading of plastic operations on the face.

Deformities produced by disease, and particularly by burns, are peculiar from their marked tendency to con-

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