(b) Reliability of Biopsy as a Diagnostic Procedure

Every means has been used to discredit biopsy as a diagnostic procedure in bone tumours. It has been stated by some radiologists and by some surgeons that biopsy is "unreliable and often misleading." If there is any truth at all in that statement surely the radiologist, the surgeon, and the pathologist concerned should co-operate more closely to improve their joint efforts. It has been stated by some few radiologists that radiography is a more *conclusive* diagnostic procedure than biopsy! In considering the relative merits of radiography and biopsy in the diagnosis of lesions of bone, from the very outset we must avoid an elementary mistake which is too commonly made by the masters of radiology. It is not reasonable to match a pathological David with a radiological Goliath. For any fair test of the kind, deplorable as such a test must always be, we are bound to presume that the radiologist, the surgeon, and the pathologist participating in the test each knows his job. If these conditions are fulfilled it is merely absurd to continue the discussion, because the microscope is an instrument of infinitely greater precision than the radiographic machine. The microscopist will occasionally make false interpretations of his material if he is human: so also will the radiologist if he is not superhuman. The precision is a function of the instrument, not of the man. In stating these facts I do not disparage the magnificent achievements of radiography, but merely recall that, like every other science, including pathology, radiography has its limitations. One would not use a microscope to diagnose a simple fracture of the humerus, let us say, because that is the job of the radiographic machine. On the other hand, if the fracture were a pathological one the microscope might inform the radiographic machine that the real lesion was a secondary hypernephroma and direct it to the kidneys; the radiographic machine would inform the microscope which of the two kidneys was involved. In short, radiography and pathology (in the procedure of biopsy) are not rivals: the two sciences are complementary, one to the other.

(c) Necessity of Biopsy and Summary

The one sure fact that we know about the biological behaviour of bone sarcoma is that it metastasizes early. Probably, but not certainly, dissemination of viable tumour cells has already occurred in most cases before a single radiograph can be convincing enough to justify any operation so radical as amputation or wide resection. Serial radiography and the radiodiagnostic test are dangerous by reason of delay in amputation. We know that an open biopsy in bone sarcoma is not lethal, and there is no direct proof that the procedure is dangerous—although it may be so in fact. On the other hand, there is experimental evidence in malignant tumours of the rat that a free biopsy is probably not dangerous at all, and certainly less dangerous than lapse of time. There is a faint hope, founded on a reasonable hypothesis, that decompression of the growth may minimize the risk of dissemination of viable tumour cells by lowering the hydrostatic pressure of the tumour tissue.

If these data are acceptable it seems to me that the following routine should be adopted as a logical procedure.

(1) In every surgically accessible and radio-apparent bone lesion which might *conceivably* be a bone sarcoma, by reason of radiographic appearances, site, age of patient, and symptoms, decompression by open operation should be carried out as soon as possible.

(2) During this open operation a piece of tissue large enough to be regarded as a fair sample of the lesion should be excised carefully for the purposes of microscopical diagnosis. If the pathological report is not conclusive another piece of tissue should be excised as before with the least possible delay.

(3a) If the lesion is proved to be a bone sarcoma, amputation or wide resection should be carried out immediately.

(3b) If, happily, the lesion is not bone sarcoma, other appropriate measures should be applied.

This broad statement of policy is submitted as a contribution towards a more enlightened procedure in the early diagnosis and early treatment of bone sarcoma.

I have to acknowledge with many thanks the helpful advice of my colleague Professor K. G. Emeléus, M.A., Ph.D., professor of experimental physics, Queen's University, with regard to the physical principles cited in the discussion. I have also much pleasure in thanking two of my technical assistants, Mr. D. Mehaffy and Mr. J. Davidson, for the willing help they have given me in preparing giant sections on my behalf.

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THORACOPLASTY WITH EXTRAFASCIAL APICOLYSIS*

BY

CARL SEMB, M.D.

The so-called collapse therapy in pulmonary tuberculosis has been developed mainly on an empiric basis. As far as thoracoplasty is concerned this collapse therapy should first and foremost be a cavity therapy. Cases without cavities may heal without thoracoplasty. Infiltrations in other parts of the same lung or in the other lung may disappear after collapse of the cavity.

According to our present knowledge of collapse treatment three requirements have to be satisfied by a thoracoplasty: (1) It should cause a *complete* collapse of the cavity; (2) it should cause a *selective* collapse of the cavity; (3) the operative risk should be *small*, not above 1 to 3 per cent. mortality.

1. Complete collapse of the cavity should be carried out, because an open uncollapsed cavity represents a potential danger of spreading the disease. The so-called immobilization of the lung by thoracoplasty with incomplete collapse has never been shown to cure pulmonary tuberculosis in a large series of cases. Our follow-up examinations of thoracoplasty patients show that cases with persistent cavities (found by radiographs) after thoracoplasty always sooner or later produce positive sputum. In patients with positive sputum following thoracoplasty a cavity in the lung is usually demonstrable by radiographs.

2. A selective thoracoplasty should be performed for the following reasons. Before operation patients with pulmonary tuberculosis have a diminished respiratory function and therefore need to preserve healthy lung volume as much as possible. The disease may affect the other lung, which may also require collapse treatment. A too extensive collapse at the first operation may exclude bilateral treatment. An extensive thoracoplasty is more dangerous than a limited one (Morrison Davies, 1933):

3. In a chronic lesion like pulmonary tuberculosis a low mortality rate is essential. A high operative risk not only

* Read in opening a discussion in the Section of Tuberculosis at the Annual Meeting of the British Medical Association, Belfast, 1937.

frightens the patient but makes him postpone the operation until a terminal stage. From the patient's point of view it is "better to live with a cavity than die without one."

Localization of the Cavity

This plays a part in the question of a selective thoracoplasty. In 177 cases chosen for thoracoplasty 90 per cent. of the cavities were localized to upper lobes only. Cases with middle or lower lobe cavities had upper lobe cavities also. According to this, 90 per cent. of cases need a

FIG. 1.—Localization of the cavity. Roentgen examination on two planes. P = posterior area. M = medial area. A = anterior area.

partial collapse of the upper lobe; only 10 per cent. require total thoracoplasty. The lateral film shown in Fig. 1 is divided in three areas—the anterior, the medial, and the posterior. In 102 unselected cases 84 per cent. of the cavities involved the posterior area of the lung, mostly in combination with the medial area. No cavity was localized to the anterior area only.

The main question in thoracoplasty is therefore to produce collapse corresponding to the diseased part of the lung—that is, the upper and posterior region.

retraction. I therefore prefer the name "relaxation therapy" to that of "collapse therapy." The retraction of the lung by artificial pneumothorax occurs concentrically from the surface towards the hilum, and this retraction takes place not only in one plane but in three planes—frontal, horizontal, and sagittal (see Fig. 2). In performing thoracoplasty we should aim at mobilizing the lung in a manner similar to artificial pneumothorax, in order to enable that organ to retract concentrically towards the hilum, from the side, from behind, from in front, and from above, and eventually from below.

Ordinary Methods of Thoracoplasty

Sauerbruch's (1930) total paravertebral thoracoplasty produces a collapse mainly from the side. This is often incomplete, non-selective, and even contraselective as regards the upper lobe cavities. The more radical resections of the upper ribs (Graf, 1936) produce more extensive and localized collapse from the side. In order to obtain sufficient collapse Alexander (1932) and Maurer (1935) advocate resection of ribs far beyond the limit of the cavitation, and this makes the operation less selective. The transverse processes are resected also.

The practical results show that these methods, even the most extensive ones, cannot in all cases produce sufficient collapse of the upper lobe cavities. The reason is, in my opinion, that they fail to reproduce the mechanical effect of the artificial pneumothorax. Even after the most extensive rib resection the lung remains fastened, upwards, medially, and posteriorly, by adhesions which prevent it from retracting downwards. This mechanical situation is similar to that in an incomplete artificial pneumothorax, in which intrapleural adhesions above the upper lobe of the lung hinder retraction downwards, thus keeping the cavity open.

In order to produce a free mobilization of the upper lobe in selective collapse the thoracoplasty should generally be combined with apicolysis. The combination of

FIG. 2.—Complete and selective collapse by artificial pneumothorax. Concentric retraction of the diseased part of the lung in three planes.

Mechanical Principles in Thoracoplasty

Of the different methods of "collapse treatment," artificial pneumothorax in the absence of adhesions at present seems to yield the best results. In view of this, artificial pneumothorax in my opinion should form the model for the thoracoplasty with regard to the mechanical effect on the lung. The artificial pneumothorax liberates or relaxes the lung's own natural ability of spontaneous

thoracoplasty with apicolysis has been tried by Bull (1930), Lilienthal (1937), Sauerbruch (1930), Nissen (1931), Holst (1932), and Lauwers (1929) as different varieties of the so-called "extrapleural" apicolysis—that is, a blunt separation of the parietal pleura from the chest wall (endothoracic fascia, periosteum of ribs). This method has the following disadvantages: (a) it may be difficult, dangerous, or impossible to perform; (b) it produces an incomplete collapse.

(a) The performance of the extrapleural apicolysis may be difficult or impossible owing to peripleuritis, which alters the normal anatomy about the apex of the lung, causing adhesions between the parietal pleura and the surroundings. A risk of penetrating the cavity or the subclavian vein also exists. I have for this reason performed the apicolysis in a more external layer, outside

failure. This extrapleural technique seems to solve the technical difficulties of apicolysis. In cases without peripleuritis this type of apicolysis is easily performed by blunt dissection.

(b) An extrapleural apicolysis may bring about an incomplete collapse. The extrapleural cavity becomes filled with exudate and air, producing an immediately effective

FIG. 3: Thoracoplasty combined with extrapleural apicolysis.—An extrapleural space produced between the periosteum of the ribs (endothoracic fascia) and the parietal pleura. The lung will expand when the exudate in this space is resorbed.

FIG. 4: Thoracoplasty with extrapleural apicolysis.—Apicolysis by cutting the adhesions in the extrafascial plane. Radical rib resection. Cutting of periosteum, nerves, vessels, plus excision of intercostal bundles. The rib periosteum retracts together with the lung; regeneration of ribs fixes the collapsed lung.

the endothoracic fascia, in the extrafascial plane, the so-called "extrafascial apicolysis." The extensions of the endothoracic fascia which fasten the lung to the neurovascular trunk, the vertebrae, and the mediastinum, described by Sebilau-Zuckermandl as "suspension bands," are dissected free and divided (see Fig. 4). By this procedure a radical apicolysis has been successfully carried out in a series of more than 250 cases without a single

collapse. In the course of some weeks the costal periosteum regenerates ribs over the exudate at a greater or less distance from the lung. When the exudate is resorbed—for example, after one to two months—the lung will gradually expand again towards the remaining stumps of ribs or towards the regenerated ribs. These old or new ribs are to some extent "pulling" the lung out again (see Fig. 3). *The ribs should therefore be resected*

thoroughly according to the extent of the apicolysis, or more—that is, according to the thoracic dome. Further, a “dead extrapleural space” should be avoided. Surgeons have tried to fill this space after an ordinary extrapleural apicolysis, but without definite success—P. Bull by free transplantation of fat, J. Holst by inserting a pedicled flap of intercostal musculature and periosteum, which had been cut laterally and posteriorly.

FIG. 5.—Radical rib resection, including the whole first rib. The posterior medial stumps of the ribs are resected past the point of the transverse processes after disarticulation of the costo-vertebral joint. The serratus and scaleni muscles are cut above the periosteum.

The periosteum of the ribs (plus the intercostal muscles, nerves, vessels, and fascia) should not, therefore, be stripped off to any great extent from the surface of the lung. These structures should be severed from their attachments to the vertebrae and eventually from the sternum according to the extent of the apicolysis (see Fig. 4). By this method we liberate a portion of the lung which is covered by the endothoracic fascia and partly by periosteum of the resected ribs and intercostal muscles. These structures retract together with the lung and form the bottom of an “extrafascial space.”

FIG. 6.—The extrafascial apicolysis is carried out as an open dissection. The adhesions to the neuro-vascular trunk, the vertebrae, and the mediastinum are severed sharply or bluntly. Periosteum of ribs, vessels, nerves, and intercostal bundles are cut.

Cart. = cartilage of first rib. V. = neuro-vascular trunk. Plex. = brachial plexus. A. = Subclavian artery. P. = periosteum C.I.

The liberated part of the lung may now develop its own power of retraction concentrically towards the hilum. The retraction may take place in three planes—the frontal, the horizontal, and the sagittal plane—as in our model, the artificial pneumothorax. The exudate and air in the

extrafascial cavity prevent temporarily the lung from attaching itself to the surroundings and from expanding. During this period, in the course of one to three months, fibrous tissue is developed from the fascia, and ribs are slowly regenerated from the periosteum over the surface of the lung, while the lung is retracted. These structures keep the retracted lung fixed and prevent it from re-expanding.

Thoracoplasty with Extrafascial Apicolysis

This method of apicolysis is characterized by three chief points:

1. Apicolysis in the extrafascial plane by cutting the so-called suspension bands of the lung sharply or bluntly.
2. A radical rib resection according to the extent of the apicolysis, or more.
3. Preparation of an extrafascial space by cutting periosteum of ribs, etc., in such a manner that they are not loosened from the surface of the lung.

FIG. 7: The extrafascial apicolysis, first stage.—The apex of the lung has retracted downwards 5 to 8 cm. from the neuro-vascular trunk—covered by periosteum of ribs. The subclavian vessels (V.), the internal mammary artery, and the cartilage of the first rib are seen (Cart.).

This extrafascial type of apicolysis gives both relaxation and subsequent fixation of the collapsed part of the lung. Our follow-up examinations have shown that the cavity closes gradually by retraction in the course of weeks or months following operation.

Technique

An extensive local block anaesthesia—with 1/2 per cent. novocain and 1 in 2,000 pantocaine—has been successfully used. The advantages of local anaesthesia are: quiet respiration, preserved power of coughing, little haemorrhage. If the patient is apprehensive it is of help to administer intravenously small doses of sodium evipan or pentothal. According to Ronald Edwards (1937) this type of local anaesthesia prevents the onset of shock.

In the first stage from three to five upper ribs are resected, usually the whole of the first, most of the second, and decreasing lengths of the third and fourth ribs (see Fig. 5). The apicolysis is carried out as an open dissection. The intercostal bundles, nerves, vessels, and the periosteum of the upper ribs are cut (see Fig. 6). The adhesions or "bands" between the apex of the lung and the neuro-vascular trunk, the vertebrae, and the mediastinum are dissected free and severed. These adhesions show a rather variable development. They are normally fragile, but become dense and fibrous after a previous peripleuritis (see Fig. 7). The intercostal bundles are usually excised, as they are liable to necrose. The resection of the subjacent ribs is usually performed in one or more later stages. Simultaneously parts of the anterior stumps of the previously resected upper ribs are usually re-resected. The best time for the second stage is within four weeks of the first stage. Later the regenerated ribs are resected, and sometimes two or three transverse processes.

The extent of the operation in each case should be in accordance with the localization of the cavitation, so that the collapse becomes as effective—and at the same time as limited to the diseased part of the lung—as possible. An exact radiographic localization of the cavity in two planes is therefore necessary. The lateral cavities collapse more easily, and need less rib resection and apicolysis than the lesions near the mediastinum. Young relatively soft lesions require less radical operation than the old stiff-walled fibrous cavitations. On account of the oblique course of the ribs a cavity situated posteriorly in the lateral plane lies more in relation to the lower ribs than a cavity localized anteriorly at the same level in the frontal plane (see Fig. 8).

FIG. 8.—Variation of the rib section according to the localization of the cavity in the sagittal plane.

With cavities in the upper and posterior part of the lung the rib resection is usually carried down to two ribs below the bottom of the cavity. With cavities in the medial or anterior area one or two ribs less are resected posteriorly, and somewhat longer pieces anteriorly. The apicolysis may also be varied accordingly. With cavities in the medial or lower third of the lung the apicolysis should be less radical. In these cases, also, it is usually an advantage to begin the resection from above. The radical resection of the upper ribs increases the descent and thereby the collapse also of the lower ribs. Not infrequently total collapse follows upon resection of eight to nine ribs by this method.

The usual first stage varies between resection of three to five ribs and apicolysis from a posterior incision. A too extensive resection of the anterior stumps of the second, third, and fourth ribs in the first stage may give severe paradoxical respiration. These stumps may be resected during the next stage if necessary. The smallest first stage from behind represents a resection of the whole of the first and decreasing lengths of the second and third ribs plus apicolysis. The first stage may be performed as a resection of the anterior parts of the first and second ribs only. The apicolysis is then performed from behind in the second stage.

Evulsion of the Phrenic Nerve

This operation should not usually be performed previous to a thoracoplasty. In the rare cases with lower lobe cavities a phrenicectomy may be indicated. In cases with upper lobe cavities the collapsing effect of phrenicectomy is very limited. A paralysis of the diaphragm also sacrifices the sound lower lobe—that is, gives a contraselective collapse. It excludes the advantages of a selected apical collapse, and may exclude sufficient collapse treatment on the other side, if this is necessary.

Paralysis of the diaphragm increases definitely the risk of pulmonary complications after the thoracoplasty (Holst, Semb, and Frimann-Dahl, 1935). The explanation of this is that the suspended mobility of the diaphragm interferes with the effectiveness of cough. This diminished effectiveness may result in a "drowned lung." Presence of air in the bronchioles and alveoli of the lung is necessary for cough to act explosively and force the secretion out of the bronchi. Active ability of inspiration is therefore necessary: after a thoracoplasty this has been reduced by resection of ribs. This lack of inspiration following phrenicectomy explains the diminished effectiveness of coughing and the resultant atelectasis. It is a sound plan, therefore, to try to avoid a phrenicectomy previous to thoracoplasty. It may, however, give effective collapse *after* a thoracoplasty.

Relation of Extent of Operation to Post-operative Reaction

Of the three requirements mentioned in the beginning of this paper two have already been discussed. The technique of the thoracoplasty with extrafascial apicolysis fulfils the two mechanical requirements for a complete and selective collapse. The third requirement necessary to maintain a low operative risk is a matter of small and several stages. Our material is well fitted to demonstrate the advantage of using small stages in this operation, as both one-stage and multiple-stage methods have been tried.

TABLE I

Ribs resected in One Stage	Total No.	Dead within Two Months	Post-operative Reaction			Atelectasis
			Slight	Medium	Severe	
C. I-III, IV ..	103*	% 2	% 63	% 31	% 6	% 4
C. I-V ..	53	2	55	36	9	9
C. I-VI ..	57	4	40	40	20	25
C. I-VII, VIII, IX, X, XI ..	43	16	39	18	21	62
Second to third stage	83	14	75	20	5	5
Total ..	339					

* Several cases operated on in a terminal condition.

In Table I the operations are classified according to the extent of the procedure in one stage in order to clarify the relation to the post-operative complications. The post-operative mortality rate increases with the number of ribs resected in one stage, especially with resection of six ribs or more (see Table I). By operation

in two or more stages the mortality is reduced to about 3 per cent., in spite of the fact that patients who were very bad risks have undergone operation (see Tables II and III).

TABLE II—(Total Material, 1932-7). *One-stage and Several-stage Operations Combined*

No. of Ribs Resected	Total No. of Patients	Dead within Two Mths.	Dead Later	Survivals	Roentgeno-logical Control of Cavitation		Tb. in Sputum		No In-formation
					Complete Col-lapse	Incomplete Col-lapse	Negative	Positive	
C. I-III, IV	18	2	—	16	15	1	13	3	—
C. I-V ..	45	1	2	42	40	1	39	2	1
C. I-VI ..	66	3	6	57	53	3	49	7	1
C. I-VII, VIII ..	92	7	3	82	71	10	68	13	1
C. I-IX, XI	25	2	1	22	19	2	19	2	1
Total ..	246	15 (6%)	12 (5%)	219	198 (90%)	17 (8%)	188 (86%)	27 (12%)	4 (2%)

TABLE III—(1934-7). *Operation in all Cases by Several Small Stages*

No. of Ribs Resected	No. of Patients	No. of Operations	Dead within Two Mths.	Dead Later	Survivals	Roentgeno-logical Control of Cavitation		Tb. in Sputum	
						Complete Col-lapse	Incomplete Col-lapse	Negative	Positive
C. I-III, IV	18	18	2	—	16	15	1	14	2
C. I-V ..	31	33	1	2	28	27	1	27	1
C. I-VI ..	29	46	—	2	27	25	2	25	2
C. I-VII, VIII ..	63	129	2	1	60	55	5	53	7
C. I-IX, XI	8	21	—	—	8	8	—	8	—
Total ..	149	247	5 (3%)	5 (3%)	139	130 (93%)	9 (7%)	127 (91%)	12 (9%)

The general post-operative reaction shows similar figures. The number of cases with severe post-operative reaction increases with the extent of the operation. With resection of the three to four upper ribs, plus apicolysis in one stage, the post-operative reaction is usually relatively slight. With resection of more ribs in one stage the reaction is more serious (see Table I).

Most important are the pulmonary complications. The influence of the diaphragm on these complications has been mentioned. Thoracoplasty reduces the breathing and coughing ability. The continuity of the ribs is broken, and the active mobility, producing inspiration and expiration, is correspondingly diminished. Paradoxical respiration occurs, due to the softening of the thoracic wall. The impaired respiration and the poor support of the soft thoracic wall cause a diminished effectiveness of coughing. This impaired function of the lung is dependent on the number and lengths of ribs resected, and function is further impaired by a paralysis or fixation of the diaphragm. A stabilized mediastinum, however, counteracts and reduces this impairment.

With the smallest operation (see Table I)—resection of three to four ribs plus apicolysis in one stage—atelectasis of the operated lung occurred in less than 5 per cent. With resection of more ribs in one stage the occurrence of atelectasis and pneumonia increases rapidly (9 per cent., 25 per cent., 61 per cent.). In second-stage or third-stage operations the risk of pulmonary complications is small (5 per cent.) provided these operations are not too extensive. Accordingly, pulmonary complications after thoracoplasty are as far as possible avoided by operation in small stages.

Wound Complications

The large extrafascial space may become infected. Prolonged drainage invites infection. The wound is therefore usually closed without drainage. Drainage of short duration (twelve to twenty-four hours) may be used when persistent oozing is present—for example, after the second stage. After the apicolysis the intercostal bundles over the apex of the lung are liable to necrosis, thus favouring infection. These bundles should therefore be thoroughly excised. With these precautions the infection is well controlled.

The application and size of the stage in each individual case depends upon an estimated judgement of the patient's power of resistance, partly before, partly during the operation. In cases with poor general resisting power the stages should be small, as the general post-operative reaction increases with the extent of the operation, and vice versa. The time between the stages should thus be of long duration, in order to allow the patient to recover. This may have to be done in patients with febrile temperature, exudative lesions of the lung, myocarditis, diabetes, and complicating complaints, or who are over 40 years of age. When a severe general reaction occurs during the operation this should be interrupted.

The danger of pulmonary complications depends chiefly on the patient's power of respiration and expectoration. Large amounts of sputum and large cavities increase this risk. As a paralysis or suspended mobility of the diaphragm increases the risk, a fluoroscopic examination of the mobility of both diaphragms should be carried out before every thoracoplasty, and the size of the stage planned accordingly.

Special tests have been made in order to estimate the stability of the mediastinum—for instance, by radiographs in the lateral position, etc. This, however, can be best ascertained during the operation by observing the occurrence of paradoxical respiration after resection of the first two or three ribs. If pronounced paradoxical respiration occurs, the stage as a rule should be cut as short as possible.

The function of the other lung with regard to respiration and expectoration should also be investigated. With reduced function in this lung—for example, through artificial pneumothorax, an extensive shrinkage of the pleura after previous pleurisy on that side, a fixed diaphragm, or a pronounced emphysema—an extensive operation, which reduces or suspends the function of the diseased lung, may result in insufficiency of respiration. In all these cases this danger is reduced by operating in small and several stages.

The relatively slight risk when this operation is performed in stages enables us to extend the indications for it—that is, perform thoracoplasty in cases which would not stand a more extensive one-stage operation or a less selective one. A small first stage of this operation with resection of three ribs plus apicolysis or resection of the anterior stumps of the upper ribs as previously described may be performed as a "test operation." The next stage or stages may be carried out sooner or later when the patient's condition has improved sufficiently. This holds good in patients who do not fulfil the usual requirements as to a good general condition, a unilateral lesion, a productive phase with pronounced shrinkage, moderate amount of sputum, etc. Also these patients may in this manner get the chance of a collapse therapy.

Thoracoplasty versus Artificial Pneumothorax

The selective collapse and low mortality rate in thoracoplasty with extrafascial apicolysis make it even more possible than before to extend the indications for thoracoplasty to cases with artificial pneumothorax and an incomplete or contraselective collapse—for example, due to adhesions over the apex of the lung. Caution is often dangerous, and prolonged treatment

with a contraselective artificial pneumothorax gives bad late results (Sinding-Larsen, 1937). The basal artificial pneumothorax in these cases should be abandoned previous to the thoracoplasty and the lung allowed to re-expand if possible. Presence of a basal artificial pneumothorax during thoracoplasty has little or no value—it is unnecessary, and represents a potential danger of effusion or empyema. I have no experience of the so-called "extra-pleural pneumolysis (pneumothorax)."

Thoracoplasty versus Plombage

The collapse produced by paraffin packing may be compared to that of the first stage of thoracoplasty with extrafascial apicolysis. The paraffin packing gives an operative mortality of 3 to 5 per cent., while our first-stage thoracoplasty hitherto has 1 to 2 per cent. mortality. The paraffin packing sometimes has severe late complications, one year or more after the operation, with penetration to the cavity and perforation of the skin by fistulae. It may also hinder a further thoracoplasty owing to a fibrotic reaction around the paraffin. The use of paraffin packing, therefore, is not advisable.

Results

The mortality rate within two months of operation has been reduced to approximately 3 per cent. by operation in several stages (see Table III).

Collapse of the cavity and a sputum free from tubercle bacilli have been achieved in about 90 per cent. of the surviving patients. The follow-up examination in some cases is, however, very recent (see Tables II and III).

Of all the cases 90 per cent. had partial thoracoplasty with resection of eight ribs or less. Only 10 per cent. required total thoracoplasty.

In seventeen cases artificial pneumothorax had been induced on the other side, and was present during the thoracoplasty. These patients tolerated the operation surprisingly well, probably owing to a stabilized mediastinum. There were no deaths. In fourteen of the seventeen cases complete collapse of the cavity and a sputum free from tubercle bacilli was achieved. In four cases artificial pneumothorax on the other side was induced after the thoracoplasty.

The operation has also been tried after thoracoplasty performed previously by other methods has failed to produce complete collapse. Complete collapse of the cavity was achieved in fourteen out of sixteen patients who were operated on a second time in this way.

The results of this operation so far indicate that we are moving closer towards our goal—namely: (1) a complete collapse; (2) a selective collapse; (3) a low operative risk.

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CEREBRAL OEDEMA IN CERTAIN MENTAL DISORDERS

BY

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(WITH SPECIAL PLATE)

During an investigation of the static surface tension of the serum in various diseases it was observed that the sera of some cases of mental disease presented certain peculiarities not found in the sera of normal individuals.

If a normal serum be divided into two parts, and one part be heated to 56° C. for thirty minutes and cooled to room temperature, and the two specimens be set up in capillary tubes of approximately the same diameter, the surface tension-reducing substances present accumulate at the concave meniscus, so that at the end of three hours no further change can be detected in the next half-hour and the results are then comparable. If the value of the surface tension at this point be worked out there is an average difference of 4.5 dynes per cm. between the normal unheated and the heated specimens. These results can be reduced to terms of a standard tube of diameter 0.075 cm. This standard has been chosen so as to divide the instrumental error equally between the two stages of the measurement (Lovell, 1922-3). I have occasionally seen variations in persons apparently healthy, but I have never observed an abnormal serum among university students and schoolboys who were undoubtedly fit, the specimens being taken during the day from 10 a.m. to 6 p.m.

It was discovered in 1923 that a large group of anxiety cases showed no difference between the surface tension readings of the unheated and the heated specimens. The mechanism of this was not clear at the time, but the method was of some use in differentiating between the katatonic stage of dementia praecox and the similar stage of acute confusional cases.

About this time we examined the organs in a case of extreme anxiety, in which the serum had shown the abnormal surface tension condition. The patient had died of pancreatitis with haemorrhage. We cut sections of all available pancreases in the museum and divided them into the normal and the abnormal. We then turned up the old case-books and found that in every case in which there was an abnormal pancreas anxiety had been a prominent feature. But as most of these patients had died of some inflammatory disease one was not justified in assuming that the pancreatic changes were directly connected with the mental condition. Moreover, in the pancreas autolytic changes are so uncertain that it is not possible to draw conclusions from the appearance of the parenchyma. Round-celled infiltration and fibrosis of the interlobular tissue are the only criteria (Lovell, 1923).

A whole series of cases then came to light in which pathological anxiety as a mental symptom was associated with evidence of pancreatic disorder. This was confirmed by the work of Drury and Farran-Ridge (1925) and Mann (1925) on blood-sugar curves. To a series of 120 cases the accepted pancreatic tests were applied by Dr. Macaulay, Mr. Majumdar, and others. The tests used were the Loewi test, the sajodin test, and the estimation of diastase and fat excretion. The results were not always confirmatory. For instance, in the sajodin test the material was sometimes retained in the stomach for a considerable time owing to gastric atony, and the appearance of iodine in the urine was consequently delayed. In the fat-

Thirty-three special hospitals in London are making an appeal for funds on October 12, when, by the sale of emblems, it is hoped to raise more than the £30,000 which these hospitals used to collect on separate flag days during the year. Voluntary help is urgently needed, and any suggestion or offers of service will be welcomed by Lord Luke, chairman of the London Hospitals Collections Central Committee, 36, Kingsway, London, W.C.2.

C. LOVELL: CEREBRAL OEDEMA IN CERTAIN MENTAL DISORDERS

FIG. 1.—Normal pancreas.

FIG. 2.—Pancreatic duct showing patchy inflammation.

FIG. 3.—Case of anxiety state, duration three months; pancreas.

FIG. 4.—Case of anxiety state, duration uncertain; pancreas.

FIG. 5.—Case of anxiety state, duration two years; pancreas.

FIG. 6.—Brain in agitated melancholia, showing organized thrombus.

FIG. 7.—Brain in agitated melancholia, showing oedema.

FIG. 8.—Pancreas of a case of schizophrenia; fibroblasts invading parenchyma.

FIG. 9.—Section of brain of same case.