1937, 1939). The above interpretation of experimental findings cannot in any sense be considered as attempting to exclude the possibility that clinical diabetes may result, in some instances, from primary changes in the pancreatic islets—e.g., those which follow interference with the pancreatic blood supply, and in haemochromatosis (cf. Warren, 1938). Nevertheless, the large number of cases of diabetes in which a definite increase in the mass of the body is apparently a proleptic feature may reasonably be supposed to result from a pancreatic-pituitary imbalance occurring at a level of pancreatic islet activity higher than that operative in the normal animal.

Summary

When puppies are treated daily with doses of crude pituitary extract greatly in excess of those required to produce diabetes in adult dogs they respond with an increased growth rate but do not exhibit symptoms of diabetes. When one puppy was treated daily for nearly five months it eventually became intensely diabetic, and then stopped growing despite continuation of treatment.

When adult dogs that have been rendered permanently diabetic by a short period of pituitary treatment are given a single injection of pancreotropic pituitary extracts, which produces no detectable diabetogenic activity in normal adult dogs, the response may be a transitory attenuation of the diabetic condition with nitrogen retention and increase of body weight, or an exacerbation of the diabetes with loss of nitrogen and of body weight; intermediate responses were also obtained. These differences in response are believed to result largely from differences in functional capacity of pancreatic islet tissue.

It is suggested that an increase in body weight, associated with an increase in function of the pancreatic islets, can be regarded as neutralizing, for a time at least, the diabetogenic influence of the anterior pituitary gland. It is therefore possible that the excessive weight of the adult diabetic patient and the abnormal height of the diabetic child (White) indicate an increased pituitary function which may be of temporary duration only, and of which the diabetogenic action may be completely masked for a time by a protective increase in pancreatic islet activity, induced by the pancreotropic action of the gland. Such a condition might lead first to an increase in the mass of the body and eventually to diabetes.

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TREATMENT OF PULMONARY TUBERCULOSIS BY THORACOPLASTY

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Pulmonary tuberculosis is a disease whose incidence rapidly increases during wartime, and it is important in the present situation that the treatment of this condition should remain in the forefront of discussion. From the public health point of view no patient who is suffering from pulmonary tuberculosis should return to work until his sputum is negative. In our crowded factories and offices any such person with a sputum positive for tubercle bacilli is an anachronism, and subversive both to the health of the community and to the war effort. Under the present conditions of long hours of work, continued stress, and minimal nutrition the dissemination of the disease from one such focus may be considerable.

Thoracoplasty is applicable as a line of treatment to only a small percentage of cases of pulmonary tuberculosis. The results are, however, satisfactory in that in most cases the patient, previously a public menace, becomes non-infective and is able to return to some form of useful occupation.

The following is an account of the indications for thoracoplasty in the treatment of pulmonary tuberculosis as used by the team working at the surgical clinic of the Lancashire County Council Tuberculosis Service at High Carley Sanatorium, Ulverston.

Indications for advising Thoracoplasty

This is probably one of the most difficult problems in the whole of surgery. Only by the closest team-work between the surgeons, the staff of the sanatorium, and the anaesthetist can these cases be accurately assessed. The cases are divided into two groups—those regarded as “good risks” and those as “justifiable risks.” The latter group will contain a number of patients suffering from advanced disease in which the risks of thoracoplasty are greatly above the average. These risks are, however, permissible because there is a definite possibility that by running them the disease may be arrested, and because by no other method of treatment can the patient's life be saved. Apart from the consideration of the individual patient, there is another cogent reason why the immediate and ultimate chances of the patient must be most fully weighed. Sanatorium life is such an intimate one that every patient is fully aware of the results of operative treatment on others, and in order that those in the “good” class shall have no misgivings as to the outcome of their operation the fullest confidence in the results of thoracoplasty must be maintained.

There are certain general principles which influence the selection of cases:

1. The tuberculous lesion must be undergoing fibrosis and must not be in a state of acute exudation. Rapid compression of the lung, such as occurs by thoracoplasty, is likely, in cases with an acute exudative lesion, to cause a rapid dissemination of the disease with infiltration of the same or opposite side. If, however, the disease is in a reparative stage—i.e., under-

going fibrosis—the lung will stand this rapid compression without such risk of further spread of the tuberculous lesion. A lung lesion which is healing by fibrosis without coexisting cavity formation can become bacillus-free, can heal, and can probably remain healed without the need for operative intervention, though the end-result may be benefited by hemidiaphragmatic paralysis. It is the persistence of chronic cavitation that constitutes the danger to the patient and to the community. A chronic fibrotic case without clinical or radiological evidence of cavitation which does not become bacillus-free should be tomographed, when the presence of cavities will almost certainly be demonstrable. The large majority of cases coming up for consideration for thoracoplasty are those in which a cavity or cavities have failed to close as a result of sanatorium treatment and in which an artificial pneumothorax has proved impossible or ineffectual. Most of these cases have very definite symptoms: the sputum is abundant and loaded with tubercle bacilli, and they may be persistently pyrexial. The general health of others, as a result of prolonged sanatorium treatment, may be good; in some, even, the cavity may be dry, the sputum (if any) tubercle-free, and the symptoms minimal. It may seem drastic to recommend a major operation such as thoracoplasty to patients who are apparently well enough to return to their homes and even to work. The long view must be taken, however, from both the individual and the public health aspects. Sooner or later the disease will light up again, as a result either of overwork or of a coryza or influenza. Not only may the disease spread to those parts of the lung or lungs previously involved, but, more serious still, the patient will become an infecting agent for a shorter or longer time before again being taken under control.

Repeated haemoptyses, whether or not associated with obvious cavitation, provide an additional indication for thoracoplasty, as does also a chronic non-productive irritable cough following upon distortion of the trachea and bronchi due to massive pulmonary fibrosis consequent on partially healed tuberculosis.

2. The main tuberculous lesion must be unilateral. After a total thoracoplasty the patient has only the lung on the opposite side left with which to breathe. If there is an active tuberculous lesion, however small, in this remaining lung, there is considerable likelihood that this lesion will increase and will eventually prove fatal. An old lesion on the contralateral side which is radiologically and clinically healed should still be viewed with suspicion, as any extra work of that lung may cause it to reactivate. It must be remembered that the tubercle bacilli, although surrounded by dense fibrous tissue, are in most cases merely dormant and not dead. Calcification may be taken as a fair indication of death of the tubercle bacilli. The final assessment of the condition of the opposite lung must be based on the clinical examination, and never solely on the radiographic appearances. The slightest evidence of activity should cause the decision for operation to be postponed, pending a further period of rest in bed. Crepitations which are persistently present and unaltered at the opposite apex are not a contraindication. These cases with contralateral evidence of disease or instability are included in the "justifiable risk" group. It is in the assessment of such doubtful cases that the opinion of the medical superintendent of the sanatorium is of great value to the team. A pronounced opinion by him, as a result of his continuous observation of any individual patient, will often tip the scale when decision is in the balance.

3. The size and position of the cavities will influence the decision as to whether thoracoplasty will be of permanent benefit. It may be asserted as a general rule that the smaller the cavity and the less extensive the lesion the easier it is to obtain complete control by a thoracoplasty. Complete control of cavities near the hilum or in the base is more difficult than control of those in the upper lobe. Large cavities, especially if surrounded by a thick wall of fibrous tissue, are not readily compressed. Extensiveness of the disease, provided it is unilateral, is no contraindication.

4. As pneumothorax is the simplest form of collapse therapy it should have been tried in all cases. If the pneumothorax is impossible, or is producing inefficient collapse of the affected area which cannot be improved satisfactorily by internal pneumolysis, then thoracoplasty must be considered. Any residual

pneumothorax should be allowed to reabsorb or be removed before thoracoplasty is attempted, as collapse of the ribs is prevented when there is a cushion of air between these and the lung.

5. Although no absolute age limits can be given it is generally inadvisable to perform a thoracoplasty for pulmonary tuberculosis under 15 years or over 45 years of age. In children it is inadvisable owing to the exudative form of disease that occurs and also the subsequent effect on growth. In the more elderly the cardiovascular changes and the diminished ability of the remaining lung to compensate for the loss of aerating surface may be contraindications. Exceptions to this rule are, however, not uncommon.

6. The better the general condition of the patient the greater is the probability of success. Once it is accepted in a given case that healing of the lesion cannot be obtained except by a thoracoplasty, then, however well stabilized the patient may be for the time being, it is wrong to wait for the period of decline to set in. When, on the other hand, the general condition is poor the operation must be deferred in the hope that improvement can be effected by bed rest, even at the risk of a relapse or extension of the disease during this period of delay. Amyloid disease if advanced will contraindicate operation, but if mild this should clear up when the pulmonary lesion heals following thoracoplasty. A transient gastro-enteritis will delay operation, but an established tuberculous enteritis is a direct contraindication. Involvement of the larynx does not necessarily prohibit operation unless there is ulceration causing pain or oedema producing stridor: healing will be promoted once the infection in the lungs has been obliterated. The presence of other lesions, such as bone and joint tuberculosis and genito-urinary tuberculosis, only contraindicates operation if these are advanced. Anaemia should be treated by haematinics. The main thing to be remembered is that tuberculosis is a general disease of which the lung lesion is but a local manifestation. The lung is, however, in most cases the important lesion, and as such should be given prior consideration. Elimination of the pulmonary focus will cause improvement elsewhere. If the patient is the subject of recurrent bronchitic attacks or has an asthmatic tendency, thoracoplasty should not be undertaken.

The Operation

The standard operation employed at this clinic is the ten-rib paravertebral thoracoplasty with removal of the transverse processes, done occasionally in two, but more often in three, stages. Partial thoracoplasties are rarely undertaken. This procedure is considered only in the type of case with extremely limited disease in one apex, and then as an alternative to an extrapleural pneumothorax. Most lungs with apical lesions show involvement to some degree, generally of the mid-zone, and often of the lower zone. Furthermore, the lymphatic interconnexions between the various parts of the lung are so numerous that the tuberculous infection extends over a much wider area than the clinical or radiological evidence would suggest. The partial collapse of a lung produced between the collapsed and uncollapsed portions of the lung a line of tissue strain in which it is no infrequent occurrence to see later a reactivation of the disease. It is admitted that in some cases a total thoracoplasty does produce an apparently unnecessary collapse of seemingly healthy lung with some resultant loss of vital capacity, but it is felt that the disease is much more securely arrested.

Anaesthesia is produced by a preliminary induction with 6 to 10 c.cm. of intravenous barbiturate, followed by inhalation of oxygen with 3 to 5% of chloroform vapour to maintain narcosis. Infiltration of the whole operative area is undertaken with 1% kerocain (procaine), and at the stage of rib exposure the intercostal nerves are infiltrated as they pass out on to the neck of the ribs. It is our opinion that, while the operation is performed essentially under local anaesthesia, light narcosis should be maintained throughout.

The first stage of the operation consists in the removal of the whole of the first and second ribs up to the costal cartilages and 13 cm. of the posterior ends of the third and fourth ribs. The third and fourth transverse processes are also removed. At the second stage, undertaken fourteen days later, 13 cm. of the fifth to eighth ribs inclusive are removed together with the transverse processes. At the final stage, a fortnight after, 13 cm. of the ninth and tenth ribs are removed. Occasionally the operation is performed in two stages by removing five ribs at each stage. The wound is drained for twenty-four hours through a separate stab incision.

Considerable pressure is maintained laterally and anteriorly on the collapsed portion of the chest after the first twenty-four hours by means of elastic strapping and pads of wool and sorbo rubber. Weights are applied later on to the front of the chest to assist the collapse, and finally an elastic brace is fitted which maintains constant pressure on the chest for some months. Exercises are given to counteract the tendency to scoliosis and to regain full arm movements. Rest in bed is continued for two to three months after the operation.

Results

During the period 1933-40 59 cases of pulmonary tuberculosis were treated by thoracoplasty; 52 were for parenchymatous disease and 7 for tuberculous empyema. 158 operations in all have been performed on these patients. The follow-up results, undertaken in May, 1941, are as follows:

TABLE I.—Cases of Parenchymatous Disease

	Fit and Well, with Negative Sputum	Unfit or with Positive Sputum	Now Dead	Total
1933 ..	1 (100%)	—	—	1
1935 ..	3 (100%)	—	—	3
1936 ..	5 (62.5%)	1	2	8
1937 ..	4 (67%)	—	2	6
1938 ..	8 (67%)	2	2	12
1939 ..	4 (57%)	2	1	7
1940 ..	10 (67%)	4	1	15
Total ..	35 (68%)	9 (17%)	8 (15%)	52

35 patients (68%) are now fit and well, and 30 (88%) of these are able to do their daily work. Nine are still unfit or have a positive sputum (see Table V). Eight patients have died since the operation was undertaken. No death due to post-operative shock occurred, but four of these patients died within three months of the operation. Details of the cases can be seen by reference to Table V (Cases 8, 11, 14, 15, 20, 21, 34, 48).

Of the 52 patients 40 were considered "good risk" cases for thoracoplasty and 12 "justifiable risks" (see Fig.). The results in these two groups were as follows:

TABLE II

	Good Risk	Justifiable Risk
Fit and well, with negative sputum ..	30 (75%)	5 (41.7%)
Unfit or with positive sputum ..	5 (12.5%)	4 (33.3%)
Now dead ..	5 (12.5%)	3 (25%)
Total ..	40	12

There is a tendency to increase the number of "justifiable risks" operated upon, and in some of the later cases the disease would have been deemed extensive enough to contraindicate operation in the early days. A further analysis of the "justifiable risk" group of cases reveals the following figures:

TABLE III

	Fit	Unfit	Dead	Total
1935 ..	1	—	—	1
1936 ..	—	1	1	2
1938 ..	—	2	1	3
1939 ..	—	—	1	1
1940 ..	4	1	—	5

It is as yet too early to forecast the outcome in the 1940 group of "justifiable risk" cases, but one feels a certain degree of apprehension regarding their future. It is possible that by performing total thoracoplasty in this group too much strain is put on the remaining lung, and that a more localized thoracoplasty with maintenance of function of the lower part of the lung may produce better results. It is still important, however, in assessing the line of treatment in this group, to bear in mind the objections to localized thoracoplasty which have been mentioned before.

It is interesting to study the group of cases with large cavities—i.e., 5 cm. or more as measured on the A.-P. radiograph.

TABLE IV

Size of Cavity	Fit	Unfit	Dead
5 cm. ..	4	—	—
6 cm. ..	1	3	—
7 cm. ..	2	1	—
8 cm. ..	—	1	—
9 cm. ..	—	—	1

The value of thoracoplasty in producing collapse of giant cavities has been disputed, and it would appear from this small group of cases that patients with cavities of certainly 6 cm., or over, would be better treated by preliminary suction drainage to reduce the size.

The only satisfactory criterion by which to assess the results of thoracoplasty is a comparison with a similar group of cases in which thoracoplasty has not been done—i.e., those refusing operation. Unfortunately it has not been possible to obtain any figure for such cases from this centre, but they would at any rate be very few in number. Comparable figures have, however, been published by Hurford (1941) and Freedlander and Wolpaw (1937) which show that in the operated group the disease was arrested in 65% (Hurford) and 57% (Freedlander and Wolpaw), and in the unoperated group in 16% (Hurford) and 10% (Freedlander and Wolpaw).

Approximately 50% of all cases considered for possible thoracoplasty on presentation of the history and films are turned down on clinical examination owing to the presence of too active disease on the opposite side or to the general condition of the patient not being up to standard. The cardiovascular system of many of these patients is in an unstable condition due to continued toxæmia, and would be an added hazard to the operation. As more and more experience is gained in this branch of surgery there is a tendency to perform thoracoplasty on increasingly "desperate" cases, with the idea of giving the patient a chance to recover. While such a procedure is justifiable, as death is certain in so many cases in one to two years, the danger of bringing the operation into disrepute must always, as mentioned before, encourage a certain degree of conservatism.

How soon should thoracoplasty be undertaken in these cases of fibro-cavernous disease? There is probably a growing tendency to operate earlier, but any degree of exudation must delay thoracoplasty until fibrosis has occurred. Moreover, the exposure of a patient to the risks and consequences of a major operation before every

other method of treatment has been given the fullest trial is deprecated. It is possible that the advent of surgery has encouraged a tendency to haste in the treatment of a disease in which time, bed rest, and sanatorium treatment are essential principles.

One feature of this operation is the scoliosis that occurs towards the side on which the thoracoplasty has been undertaken. The degree of scoliosis is probably somewhat greater if the transverse processes have been removed than

if they have been left, owing to the temporary loss of attachment of the erector spinae group of muscles. This, however, can very effectively be overcome by encouraging the patient to lie on the operated side from the beginning. The degree of scoliosis appears more severe in the radiograph than on clinical examination. When the patient is clothed the deformity is negligible. The advantage claimed for the more efficient collapse of the lung when the transverse processes are removed in our opinion outweighs the

TABLE V

PRE-THORACOPLASTY								POST-THORACOPLASTY							
Case	Sex	Age	Length of Disease in Years	Previous Collapse Therapy	Risk Classification	Sputum		When Sputum became Negative for T.B.	When Patient discharged from Sanatorium	Condition in May, 1941					
						T.B.	Amount in oz.			Sputum	Scoliosis	General Condition	Working	Remarks	
Parenchymatous Disease															
1933	F	28	3	p.	G	+	1	2 years	2½ years	—	tr.	o	Fit	Yes	
1935	F	22	3	ap. ip.	G	+	2	Immed.	7 months	—	nil	++	"	"	
2	F	26	7	p.	G	—	0	—	7 months	—	"	o	"	"	
3	F	26	5	—	JR	+	tr.	6 months	11 months	—	"	o	"	"	8 ribs only
1936	M	20	3	ap.	G	+	tr.	Immed.	6 months	—	"	+	"	"	
5	F	26	1	—	G	+	2	"	7 months	—	"	+	"	"	
6	M	19	2	—	G	+	1½	"	8 months	—	"	+	"	Unemp.	
7	F	20	2	ap.	G	+	1	3 months	6 months	Died 2 years later.	1	+	Spread opposite side		
8	F	25	4	—	JR	+	3	6 months	8 months	+	nil	+	Unfit	No	
9	F	24	1	ap.	G	+	2½	Immed.	1 year	+	1	+	Fit	Yes	
10	F	31	4	—	JR	+	3	—	ND	Died 9 months later.	nil	+	Spread opposite side		
11	F	36	5	—	G	+	1½	Immed.	7 months	—	nil	+	Fit	Yes	
1937	F	36	3	—	G	+	2	1 month	7 months	—	"	+	"	"	
13	F	25	2	ap.	G	+	5	—	ND	Died 18 months later.	"	+	Spread opposite side		
14	F	14	7	—	G	+	3	—	ND	Died 3 months later.	3 months later.	+	Toxaemia		
15	F	20	1	ap.	G	+	1	Immed.	6 months	—	nil	+	Fit	Yes	
16	M	38	5	ap. ip.	G	+	2	1 month	6 months	—	"	+	"	"	Cavity not completely closed
17	F	38	5	—	G	+	2	Immed.	6 months	—	"	+	"	"	
18	F	29	6	—	G	+	1	Immed.	6 months	—	tr.	+	"	"	
1938	F	28	1	pc.	G	+	1	2 months	5 months	—	nil	++	"	"	
19	F	22	5	pc.	JR	+	1	—	ND	Died 10 days after 1st stage.	10 days after 1st stage.	+	Acute Tb. broncho-		
20	F	39	1	—	G	+	1	—	ND	Died 18 months later.	18 months later.	+	Lobar pneumonia. Prob-		
21	F	39	1	—	G	+	1	—	ND	ably non-tuberculous	ably non-tuberculous	+	ly		
22	M	36	15	—	G	+	1	Immed.	5 months	—	nil	o	Fit	Yes	
23	M	26	6	ap. pc.	G	+	1	1 month	1 year	—	tr.	o	Unfit	No	
24	M	31	3	ap. pc.	JR	+	3½	—	1 year	—	2	+	Unfit	No	Cavitation opp. side
25	F	25	3	—	G	+	1	Immed.	1 year	—	tr.	++	Fit	Yes	
26	F	36	8	ap.	JR	+	1	"	2 years	—	1	+	Unfit	No	Cavitation opp. side 4 months after op.
27	M	35	4	—	G	+	tr.	"	10 months	—	nil	+	Fit	Yes	
28	F	32	7	p.	G	+	3	3 months	10 months	—	"	+	"	No	Rather dyspnoeic
29	F	26	4	—	G	+	1	6 weeks	5 months	—	"	+	"	Yes	
30	F	41	1	—	G	+	1	6 months	8 months	—	tr.	+	"	"	
1939	F	32	2	—	G	+	1½	Immed.	4 months	—	nil	++	"	"	
31	M	27	6	—	G	+	2½	1 month	8 months	—	"	+	"	"	
32	M	38	9	—	G	+	3	14 months	4 months	—	1	+	Unfit	No	Multiple Tb. lesions
33	M	38	9	—	G	+	3	14 months	4 months	—	1	+	Unfit	No	Tb. bronchopneumonia.
34	F	28	6	ap.	G	+	1	—	ND	Died 17 days after 1st stage.	17 days after 1st stage.	+	Diarrhoea. ? origin.		
35	F	26	3	ap. ip. pc.	JR	+	1	2 months	6 months	+	1	+	Unfit	No	Readmit. 2 mths. later with sprd. opp. side
36	M	38	4	pc.	G	+	1	Immed.	6 months	—	tr.	+	"	"	Tiredness; cavity still just visible
37	F	23	3	ap. pc.	G	—	1	—	10 months	—	tr.	+	Fit	Yes	
1940	F	21	3	ap.	JR	+	tr.	3 months	4 months	—	tr.	+	Unfit	No	
38	F	40	4	ap. ip. pc.	JR	+	1	9 months	ND	+	tr.	+	Unfit	No	Cavity still present
39	M	40	4	ap. ip. pc.	JR	+	1	9 months	ND	+	tr.	+	Unfit	No	
40	F	26	7	—	G	+	1	Immed.	4 months	—	nil	+	Fit	Yes	
41	F	22	1	—	G	+	1	2 months	11 months	—	"	+	"	"	
42	F	29	3	—	G	+	2	1 month	11 months	—	"	+	"	"	
43	M	33	2	ap.	JR	+	2	2 months	ND	+	1	+	Unfit	No	Cavitation opp. side
44	F	27	7	—	JR	+	2	Immed.	6 months	—	1	+	Fit	Yes	Associated bronchiectasis
45	M	30	8	—	G	+	tr.	"	4 months	—	nil	+	Unfit	No	
46	M	34	3	—	G	+	2	"	ND	+	1	+	Unfit	No	Cavity still present
47	M	37	3	—	G	+	2	Immed.	6 months	—	tr.	+	Fit	"	
48	F	39	17	—	G	+	1	"	ND	Died 3 months later with acute spread to opposite side	3 months later with acute spread to opposite side	+	Unfit	No	
49	M	34	12	ap.	JR	+	1½	6 weeks	ND	—	tr.	o	Unfit	No	
50	M	28	7	p.	G	+	1	9 months	11 months	—	tr.	++	Fit	Yes	
51	F	33	7	pc.	G	+	1	Immed.	6 months	—	tr.	++	"	"	
52	M	24	2	ap.	G	+	1	1 month	ND	Positive sputum recurred 3 months later. Cavity not obliterated. For further collapse	3 months later. Cavity not obliterated. For further collapse	+	"	"	
Tuberculous Empyemata															
1937	F	31	3	—	JR	+	20 BF	—	ND	Died 3 weeks after 1st stage. Toxaemia	3 weeks after 1st stage. Toxaemia	+	Unfit	No	
53	F	24	2	ap.	JR	+	1	—	ND	Died 2 years later from spread to opposite side	2 years later from spread to opposite side	+	Unfit	No	
54	F	26	8	ap.	JR	+	11 BF	—	ND	Died 2 months later from spread to opposite side	2 months later from spread to opposite side	+	Unfit	No	
1938	M	26	4	ap.	JR	+	1	2 months	ND	—	nil	+	Unfit	No	Still needs small plastic op.
55	M	26	4	ap.	JR	+	1	2 months	ND	—	nil	+	Unfit	No	Losing weight
56	M	26	4	ap.	JR	+	1	2 months	ND	—	nil	+	Unfit	No	
57	M	24	3	ap.	JR	+	1½	—	15 months	+	tr.	+	"	"	
1939	M	29	9	ap.	JR	+	2	—	ND	Died 9 months later from toxaemia and G.U. tuberculosis	9 months later from toxaemia and G.U. tuberculosis	+	Unfit	No	
58	M	29	9	ap.	JR	+	2	—	ND	Died 14 days after 1st stage. Toxaemia and amyloid disease	14 days after 1st stage. Toxaemia and amyloid disease	+	Unfit	No	
1940	F	26	2	—	JR	+	12 BF	—	ND	Died 14 days after 1st stage. Toxaemia and amyloid disease	14 days after 1st stage. Toxaemia and amyloid disease	+	Unfit	No	
59	F	26	2	—	JR	+	12 BF	—	ND	Died 14 days after 1st stage. Toxaemia and amyloid disease	14 days after 1st stage. Toxaemia and amyloid disease	+	Unfit	No	

Previous Collapse Therapy : ap., Artificial pneumothorax. ip., Internal pneumolysis. pc., Phrenic crush. p., Phrenicectomy.

Risk Classification : G, Good risk. JR, Justifiable risk.

Scoliosis : o, No scoliosis. +, Slight scoliosis. ++, Moderate or severe scoliosis.

Sputum : tr., Trace. BF, Bronchial fistula.

Discharge : ND, Not discharged.

resulting scoliosis. All too often, when the transverse processes are left, the persistence of an elongated, flattened, but not wholly obliterated cavity can be seen in the costo-vertebral sulcus.

Tuberculous Empyema.—Of the seven subjects of tuberculous empyema treated by thoracoplasty, five are dead, one is alive but deteriorating, and one is well and cured of his tuberculous empyema but still requires a small plastic operation to complete the epithelization of the remains of the cavity. All cases had been treated conservatively for a long period before being presented for thoracoplasty. Operation undertaken at an earlier date before the general effects of the continued toxæmia become too marked and the pleural membranes too thickened would undoubtedly produce more satisfactory results.

Summary

From the public health point of view no person with a sputum positive for tubercle bacilli should be at large in the community.

Thoracoplasty will arrest the disease in a certain proportion of cases and allow return to work.

Indications for thoracoplasty are: The disease should be in the fibrotic stage, and must be mainly unilateral; pneumothorax should have been tried; the cavities should not be too large. The age limit is given as 15 to 45, with exceptions. The general condition of the patient should be good.

Ten-rib paravertebral thoracoplasty with removal of the transverse processes is the operation of choice.

Results at the surgical clinic of the Lancashire County Council Tuberculosis Service in the period 1933-40, with follow-up in May, 1941, are given. Fifty-two cases were operated on for parenchymatous disease: 35 (67%) are fit and well, with negative sputum, and 30 (86%) of these are working.

Seven cases were operated on for tuberculous empyema, with total arrest of the disease in one case only. These cases should be operated on earlier.

Our thanks are due to Dr. G. Lissant Cox, Central Tuberculosis Officer, Lancashire County Council, for permission to publish this report. We acknowledge the great help given to us by the tuberculosis officers of the county in the follow-up of these cases. Our greatest appreciation is due to the members of the medical and nursing staff of High Carley Sanatorium for the after-care of these most difficult patients. The anaesthesia was conducted by Dr. John Halton.

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To meet urgent needs, some of them arising out of the war, four new teaching departments have been set up at Leeds General Infirmary. One is a department of thoracic surgery, another is a school of physiotherapy, the third is a school of radiography and radiotherapy, and the fourth is a school of dietetics. An account of these developments is given in the *Yorkshire Post* of November 21. The thoracic surgery department is especially noteworthy, and by its inauguration Leeds becomes the first of the teaching hospitals in the Provinces to take this step. The founding of the school of physiotherapy has been expedited by the war, for the establishment of such a school, with its own building, was until lately no more than a suggestion for post-war development. Damage to London hospitals has led to the immediate demand for a physiotherapeutic instructional centre elsewhere. The course at Leeds will occupy two and a half years, and is intended to prepare students for the examination of the Chartered Society of Massage and Medical Gymnastics. At the school of radiography and radiotherapy students are in training for the examination of the Society of Radiographers during a two-year course which, as a war measure, will be reduced to six months. The school of dietetics gives six months' practical training for those who have done the theoretical work at a college of domestic science. It will function in close contact with the special kitchen set apart by the Leeds General Infirmary for the preparation of food for patients on a special diet.

AN IMPROVED METHOD OF REGIONAL ANAESTHESIA IN ACUTE ABDOMINAL SURGERY

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The advantages of regional anaesthesia in *grave abdominal cases* have long been recognized. While in America and on the Continent the work of such pioneers as Crile, Labat, Finsterer, and others has been received with enthusiasm, regional anaesthesia has never achieved popularity in this country. This, we think, is because (1) most patients dislike being conscious during an operation; (2) the administration of a regional anaesthetic is often in itself an ordeal for even the most stoical patient; (3) too often anaesthesia proves to be incomplete, and deep general narcosis is found necessary.

Types of Regional Anaesthesia

The forms of regional anaesthesia in use to-day are as follows:

Spinal Anaesthesia.—(a) *Subarachnoid Block*:—By this method an extreme degree of relaxation of the abdominal muscles is obtained together with what Farr describes as "negative intra-abdominal pressure." If the anaesthetic ascends as high as D 5 splanchnic block is also obtained. The liability to grave falls in blood pressure and the risks of sudden collapse make spinal anaesthesia (subarachnoid block) unsafe except in comparatively fit patients. (b) *Epidural Block*:—The work of Dogliotti (1933) and Odom (1936) aroused interest in this method. It is now generally considered that epidural block is neither reliable nor safe.

Field Block.—This method is the most popular in use owing to its comparative safety and ease of administration, and may well be associated with the work of Finsterer (1923). Although anaesthesia at the site of incision is usually adequate, relaxation is often poor; this is a serious defect in an exploratory operation. "Negative intra-abdominal pressure" is absent, and protrusion of the abdominal viscera often occurs, especially if the patient strains; this may be aggravated by inadequate preliminary sedation and rough handling of the viscera by the surgeon. Sometimes, after the abdomen has been opened, it becomes clear that the first incision must be extended or a fresh incision made; local infiltration or additional field block may then be necessary if deep general narcosis is to be avoided. To protect the patient from the effects of traction on the viscera, field block is often supplemented by splanchnic block, the most popular technique being that of Braun (1924).

Infiltration Anaesthesia.—This method, so strongly advocated by Farr (1930), has recently been used by Vishnevsky (1938), Synovich (1940), and Novikov (1940). Injection of large quantities of dilute anaesthetic solution—e.g., equal parts of 0.25% novocain and 1 in 4,000 percaïne—into the fascial pockets surrounding muscles and viscera generally requires the use of a power-driven pump; the aspiration test cannot be performed, and there is always risk of mechanical breakdown. Infiltration anaesthesia carries with it all the disadvantages of field block.

Bilateral Paravertebral Block.—If a true paravertebral block is performed in the manner originally suggested by Sellheim (1905) and perfected by Labat (1922) then the rami