

Lung Resection in the Treatment of Pulmonary Tuberculosis*

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IN the period before World War II there was a high degree of agreement in the Western European countries regarding the treatment of pulmonary tuberculosis. The treatment consisted of a more or less rigorous sanatorium regimen which was often supplemented by collapse therapy. Only as to a few details was there any difference of opinion. In the Netherlands, for example, the sanatorium treatment was carried out extremely strictly and a large proportion of cavities was healed by those means only. Intrapleural pneumothorax was little used and only when the process had largely become inactive. As a result of this, one saw but rarely, on the one hand, tuberculous empyemata after application of intrapleural pneumothorax, but on the other, the application of this therapy was frequently unsuccessful in the later stages of the disease, on account of extensive adhesions. For this reason extrapleural pneumothorax was extensively used in this period.

Apart from these relatively slight differences, there was a large degree of agreement, as to the best method of treatment. With the introduction of the antibiotics the situation changed completely. As a result of the anti-tuberculosis organization, set up before the war in the Netherlands, practically every case passed through the tuberculosis dispensary and the treatment was from the outset either conducted or controlled by the lung physician. When it appeared, sometime after the introduction of streptomycin, that after long continued application of this drug resistance could develop, in certain cases remarkably quickly, it became necessary to take account of this possibility at the beginning of the treatment of each case. We have therefore been extremely economical with streptomycin in the Netherlands, particularly in those cases where the possibility of eventual surgical treatment had to be considered. A large proportion of the patients treated surgically by us, had received no streptomycin before the operation. The

problem of resistance to this drug in surgical cases was of little significance. There has thus developed in this respect, a definite difference in the mode of treatment in different countries.

In France, for example, every case of tuberculosis receives streptomycin, I.N.H. and PAS from the beginning, so that in practically every case coming to operation, one should be prepared for resistance to one or more of these substances. I have also the impression that in England one tends to apply the chemotherapeutic and antibiotic agents on a much larger scale, and this in my opinion, leads to limitation in the application of resection therapy.

These differences in therapeutic methods, make it important to compare large series of treated patients. However, in such a chronic disease as pulmonary tuberculosis, it is only possible to discuss definite results after the passage of at least 10 years and the time is nearly ripe to draw conclusions. It may, however, be of value to report a large series of treated patients and to discuss the results in those cases treated between 5 and 10 years ago.

Lung resection for tuberculosis has been carried out in the Netherlands for approximately 10 years. In the University clinic of Utrecht, up to March 1, 1956, 1173 lung resections were carried out for tuberculosis, 1161 under cover of chemotherapeutic and antibiotic drugs.

Pulmonary tuberculosis is a medical disease. The majority of sufferers from this condition may be clinically healed by medical treatment only; surgical therapy, including lung resection, should really only be considered when medical therapy has failed. In the Netherlands, despite this fact that resection therapy is carried out on a large scale, it is nevertheless utilized for not more than approximately 30 per cent of sanatorium patients.

It is not only so, that lung resection is indicated only when medical therapy has preceded operation, but it is also of the greatest importance, that this preoperative treatment of the patient has been as

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complete as possible. A strict sanatorium treatment is essential, preferably with absolute bed rest, which includes mental rest. At the same time it is advisable to administer PAS, which may, if necessary, be combined with INH. Streptomycin is, as a rule, not given as preoperative therapy in Dutch sanatoria. However if this drug is used, this occurs only on special indication, e.g. in the presence of hematogenous spread or tuberculous bronchitis and in those cases with extensive processes, which have not responded to the other medical treatments. One tries however, in view of the possibility of a future operation, to reserve streptomycin for the postoperative treatment of the patient and to control its use in such a way that resistance to the drug does not occur.

If, after six to twelve months sanatorium treatment, healing has either not occurred, or is still so incomplete that the probability of recurrence is great, surgical therapy must be considered.

In the consideration of resection therapy for pulmonary tuberculosis one must always bear in mind the fact, that lung tuberculosis is not a localized process. It affects as a rule a much larger area of the lung than the results of clinical investigation indicate.

It is thus certain that by surgical removal of a lobe, or even an entire lung the disease process cannot in the large majority of cases be completely removed. On this account lung resection for tuberculosis should always be regarded as an incomplete operation and it is of great importance to keep this fact constantly in mind. Experience has taught us that the results of surgical treatment of tuberculosis of the other parts of the body are as a rule unsatisfactory, unless it is possible to remove completely all diseased tissue. In any operation, tissue planes are separated, blood and lymph vessels opened and the barrier which the body has built against spread of the disease is broken down. In connection with the operation it was not seldom seen that a dissemination or local spread of the tuberculous process occurred.

Experience following resection of tuberculous changes in the lung was not more favourable. The operative mortality was appallingly high, according to Thornton and Adams, 45 per cent for pneumonectomy and 25 per cent for lobectomy.¹ The fatal outcome was usually a result of dissemination, reactivation or bronchial fistula development.

In a small series of 12 cases treated by us in 1946, at a time when chemotherapeutic agents and antibiotics were not available, we had a mortality of 25 per cent.

Since the introduction of the use of chemotherapeutics and antibiotics, the state of affairs has completely changed. Streptomycin in particular has a powerful action in fresh tuberculous inflammations and it appears to be possible by its use to prevent dissemination and early local establishment and growth of tubercle bacilli. By the use of streptomycin the incomplete removal of a tuberculous process was freed from one of its greatest dangers.

It was unfortunately soon to become evident that the tubercle bacillus can become resistant to all of the active anti-tuberculous drugs. Should resistance against all these substances develop, the situation is then precisely the same as it was in the days before these drugs were available. It is hardly remarkable, therefore, that the results of resection therapy in the presence of drug resistance are so unsatisfactory and that the likelihood of the development of bronchial fistulae and dissemination is so great. On this account it is advisable to consider operation only when there is susceptibility to at least one of the above named substances, and, in view of the fact that of these the most powerful is streptomycin, it is of the greatest importance that the bacilli of the patient be still sufficiently sensitive to this drug.

Lung resection for tuberculosis has not thus as object the removal of all tuberculosis tissue. The intention of the operation is rather to assist a body, not of itself capable of spontaneous healing, in the attainment of a clinical cure. The surgeon, therefore, must remove those parts which stand in the way of a cure or which have become useless to the body or dangerous to life because of serious anatomical changes. There are however processes such as bronchogenic disseminations which show in general a great tendency to cure and these may, if not too large or too extensive, be left behind undisturbed after the removal of the most seriously affected areas. This opinion is common to many surgeons who have a large experience in this field.

There should be little difference of opinion in the matter of what constitutes functionally worthless or dangerous parts of a lung. If there is a bronchial stenosis with bronchiectasis and reten-

tion of secretion, or if a lobe or an entire lung be practically destroyed by multiple cavity formation, the retention of these parts is of little value to the patient; they constitute moreover a risk on account of a possibility of extension to the remaining healthy lung tissue.

It is more difficult to answer the question as to which of the more limited changes stand in the way of a clinical cure. On the basis of experience the Dutch surgeons have come to the conclusion that it is mainly those foci of lung phthisis, foci of hematogenous origin arising after the primary tuberculosis, usually in the apical and dorsal segments of the upper lobe and in the apical segment of the lower lobe, which should be removed.

It is customary when discussing tuberculosis in general, to distinguish between exudative and proliferative forms. It is usually stated that in the exudative form the process tends to spread, because the balance between the pathogenic agent, on the one side, and the defenses of the body, on the other, is upset to the disadvantage of the body. In the proliferative form, however, the resistance of the body in relation to tuberculosis is relatively high and the spread of the disease process is limited.

It has for a long time been known that in such chronic disease processes as tuberculosis, surgical therapy gives in general the best results when it is applied in the proliferative phase. As opposed to this, the results obtained by intervention in the florid phase are as a rule bad. This is completely understandable viewed from a biological standpoint. Surgery is not a cure for tuberculosis; it makes a cure possible and gives support to the natural power of the body in the fight against the tubercle bacillus. The surgical procedure produces however at the same time tissue damage. Should surgical therapy be applied under conditions in which the defense of the body is of itself inadequate to offer resistance to the tubercle bacillus, then the results of the therapy can only be disappointing. The results of lung resections for excavated pulmonary tuberculosis were in the beginning particularly bad because little attention had been paid to the basic principles in deciding upon operation.

One cannot insist too strongly upon the fact that lung resection should only be carried out when the process is as reduced in activity as possible.

Early operations should be definitely discarded.

Even when the activity of a process has been reduced as far as possible for a particular case, it is still necessary to observe the patient carefully. Should the operation be carried out in a stage of reactivation such as repeatedly occurs in tuberculosis, there is a great possibility of a bad result. The choice of the right moment for surgical intervention is thus of the greatest importance. This choice can however be extremely difficult, particularly when cavities are present.

Resection therapy of tuberculosis is but a small part of the total treatment of this condition. Surgery does not cure tuberculosis, it makes the cure possible. It is, therefore, essential for this form of surgical therapy to be followed by a strict and intensively carried out sanatorium cure which should last at least 6 to 8 months and sometimes even longer. During this postoperative treatment the various chemotherapeutic and antibiotic drugs, especially streptomycin, are given in order to permit consolidation of the remaining tuberculous processes and the complete clinical cure of the patient.

It is not necessary here to say very much about the indications for lung resection as you are all well acquainted with these, Table 1. I should like, however, to emphasize one of our relative indications, namely the removal of bad cavity scars.

The experience shows that these large scars always represent an inadequate healing of the cavity, particularly when they are surrounded by

TABLE 1—SPECIAL INDICATIONS FOR LUNG RESECTION

<i>Standard Indications</i>	
a.	Tuberculous bronchial stenosis
b.	Destroyed lung
c.	Tuberculous bronchiectasis
d.	Tuberculoma
e.	Filled up cavity
f.	Caseous foci of limited extent
g.	Persistent large primary focus
h.	Cavities persisting after collapse therapy
i.	Tuberculous empyema with or without broncho-pleural fistula and with associated tuberculous processes in homolateral lung
<i>Relative Indications</i>	
a.	Cavities
i.	Under tension
ii.	Thick-walled
iii.	Extremely large
iv.	In middle and lower lobes, also those situated paravertebrally in upper lobes
b.	Bad scars remaining after clinical healing of cavity.

a dense mass of connective tissue. Investigation of these scars reveals the presence of encapsulated caseous material. These incompletely healed cavities are a source of reactivation which occurs in approximately 30 per cent of the cases. Lung resection is definitely indicated whenever an insufficient degree of healing is reached after a recurrence and we consider that one can do better to proceed to resection before the recurrence develops, that is, in every case showing a badly healed scar. In these cases a segmental resection is usually sufficient.

It is hardly necessary to state that resection should only be carried out for tuberculous cavities when the acute stage of the disease has been passed and when the healing cannot be obtained by other means. The operation should never be performed in fresh cases.

Resection therapy for tuberculosis is, in far greater degree than is the case with other modes of treatment, a strictly individual therapy. Apart from the fact that in every case the advantages and disadvantages of lung resection must be carefully weighed against other available forms of therapy, there are certain circumstances which render the operation less desirable, Table 2.

I should like here to emphasize two contraindications which we consider to be important: organic disease of the heart and pulmonary hypertension. Nineteen of the 1161 patients, operated under antibiotic and chemotherapeutic cover up to the first of March 1956 died as a result of the operation. In not less than 13 of these was death due to cardiovascular disturbances, six died of lung embolus, which indicates the necessity for the prompt institution of anticoagulant therapy at the first sign of a developing thrombosis; one patient died as a result of thrombosis of the pulmonary artery at the other side and in the remaining six pulmonary hypertension was almost certainly involved. In addition, of those patients returning to the sanatorium for after-treatment, two died as

a result of cor pulmonale, two of heart infarction and three of late embolism. The presence of pulmonary hypertension, developing as it may in patients with chronic bilateral disease, is extremely dangerous. The investigation of the cardiovascular system in every patient who is to be submitted to lung resection, is of primary importance. In doubtful cases, particularly in middle-aged patients, this investigation should include cardiac catheterization.

A number of complications may arise after lung resection and these may or may not be directly connected with the tuberculous process. The latter are as a rule not serious and heal or tend to heal without treatment, while others, for example post-operative atelectasis leave no permanent ill effect, always assuming that the proper measures are instituted with minimum delay.

More serious, however, are the complications arising directly as a result of the tuberculous nature of the disease. These are principally bronchopleural fistulae, reactivation and extension of the disease.

Bronchopleural fistula always constitutes a most serious complication and occurs most frequently as a result of lung resection carried out for pulmonary tuberculosis. They are particularly dangerous when in association with an open pleura. The invariable result of this combination of circumstances, is the development of an empyema which is always tuberculous.

There are various factors involved in the development of such a fistula. Division of the bronchus too close to the site of the process, is in many cases responsible, but possibly still more important as an etiological factor is a process of relatively high activity. The latter can lead to the development of a tuberculous inflammation, occurring in the bronchus stump with subsequent failure of the closure. Our impression is that resistance to streptomycin also increases the possibility of the development of a fistula.

In the university clinic in Utrecht over the last

TABLE 2—CONTRAINDICATIONS FOR RESECTION

<i>Absolute Contraindications</i>	<i>Relative Contraindications</i>
a. Inadequate lung function	a. Resistance to streptomycin
b. Organic diseases of heart and pulmonary hypertension	b. Activity of the tuberculous process
c. Resistance to all existing anti-tuberculous drugs	c. Tuberculosis in the older age groups
d. Actively ulcerating or granulating tuberculous bronchitis	d. Pneumothorax of the contralateral side
e. Active tuberculosis in the contralateral lung	e. Diffuse ulcerations of the smaller bronchi
f. Extensive active extrapulmonary tuberculosis	

TABLE 3—COMPLICATIONS: FISTULA

	Total	Cured after Treatment			Not yet cured	Died
		Conservative	Thoracoplasty	Re-resection		
Pneumonectomy: 152	13	1	6	—	1	5
Lobectomy: 385	12	2	6 (1 re-resection)	1	—	3
Segmental resection: 528	3	—	—	3	—	—
Lobectomy and segmental resection: 108	4	1	2	—	—	1

3½ years, not one person has developed a broncho-pleural fistula after lung resection for tuberculosis and we attribute this to the accurate closure of the bronchial stump, which is then subsequently covered with pleura of lung tissue. In our entire series, we have seen 32 bronchial fistulae; nine of these patients died, in 18 the fistula was closed operatively and in four spontaneous healing was obtained by conservative measures; in one case the small fistula has not yet closed, Table 3.

Reactivation and spread are complications which as a rule are first met during the postoperative course of therapy in the sanatorium. They have been seen in 75 of the 1173 operated cases, 6 per cent, Table 4. Various factors may be involved in the development of these complications. They are occasionally due to the aspiration of pus or mucus into the remaining tissue. The cause is sometimes to be found in atelectasis or incomplete expansion of the lung, complications which should be treated as quickly as possible, should they develop. In by far the great majority of our cases however, a too great activity of the tuberculosis

was the responsible factor. It is important to note in this respect that more than 50 per cent of these cases of reactivation followed operation for a cavity. We know from experience that, even when the activity of this process has been reduced as far as possible, the immunobiological relationship is less favorable than is the case with a fibrocaseous process or with tuberculoma. In the remaining cases the complication resulted from an inadequate resection or from a reactivation of foci remaining in other areas of the lung or from unsatisfactory after-treatment.

Examination of these figures shows without doubt that reactivation and extension of the process have occurred too frequently. When one observes that of the 36 reactivations developing after lobectomy and the 20 after segmental resection, 27 and 17 respectively, were observed to occur in the operated lung, it is reasonable to surmise that the complication should in many cases be ascribed to a too limited resection. In other cases reactivations arise in small foci of lung phthisis which were left behind during the operation, e. g. in the apical seg-

TABLE 4—COMPLICATIONS: REACTIVATION AND SPREAD

	Total	Cured after Treatment			Not yet Cured	Died
		Conservative	Thoracoplasty	Re-resection		
Pneumonectomy reactivation	7	1	—	—	4	2
Lobectomy homolateral	27	7	—	13	5	2
Reactivation heterolateral	9	3	—	2	3	1
Segmental resection homolateral	17	4	1	8	3	1
Reactivation heterolateral	3	1	—	1	1	—
Lobectomy and segmental resection homolateral	12	2	—	7	2	—
Reactivation heterolateral	—	—	—	—	—	—
TOTAL	75	18	1	31	18	6

TABLE 5—OPERATIVE MORTALITY: ENTIRE SERIES

	<i>All cases</i>	<i>Pneumonectomy</i>			<i>Lobectomy</i>			<i>Segmental resection</i>			<i>All cases</i>		
		<i>Num- ber of cases</i>	<i>Opera- tive mortal- ity</i>	<i>%</i>	<i>Num- ber of cases</i>	<i>Opera- tive mortal- ity</i>	<i>%</i>	<i>Num- ber of cases</i>	<i>Opera- tive mortal- ity</i>	<i>%</i>	<i>Num- ber of cases</i>	<i>Opera- tive mortal- ity</i>	<i>%</i>
No streptomycin and PAS	12	6	1	17	6	2	33	—	—	—	12	3	25
With streptomycin and PAS	1161	146	6	4.15	487	10	2.06	528	3	0.57	1161	19	1.63
TOTAL	1173	152	7		493	12		528	3		1173	22	1.87

ment of the lower lobe.

It is usually possible to bring about healing of a reactivation or spread by conservative measures, but it is unfortunately sometimes necessary to perform a re-resection. Unfortunate because one is thus forced to sacrifice one of the great advantages of resection therapy, that is, the cure of a tuberculous lesion with a minimal loss of lung function.

If the indication for resection has been carefully assessed and the pre- and postoperative treatment, including the administration of antibiotic and chemotherapeutic agents, has been carefully carried out, the primary mortality of the operation is low.

Of the 1161 patients operated in the University clinic of Utrecht under, (Table 5), cover of streptomycin and PAS, 19 died of the operation, 1.63 per cent. If one includes the 12 patients treated by us before the introduction of streptomycin the percentage mortality is increased to 1.8 per cent, Table 6. The detailed study of the cause of death in this series reveals the most important factors involved to be cardiovascular disturbances and pulmonary embolism. The late mortality is also low and up to the present time considerably lower than that after surgical collapse therapy. In the

Utrecht department this late mortality to date is 1.9 per cent and in the series operated in the University of Groningen (Eerland) 2.1 per cent late mortality in 863 cases has been reported.

LATE RESULTS

The significance and the value of a particular method of treatment can only be judged from the definitive and permanent results. Similarly the significance of resection therapy for the treatment of pulmonary tuberculosis can only be estimated from a consideration of the late results. Because we are dealing with a chronic disease, the observation time after the completion of the treatment should be at least 10 years. Because resection therapy is still in its youth, the results of 10 years and more are as yet hardly known and, therefore, no absolute comparison with other surgical methods of treatment is possible. The results which are quoted here should thus be regarded as provisional.

The results of resection therapy for tuberculosis are not the same everywhere. In the Netherlands there appears to be great difference between the various results obtained in different sanatoria. Because little has as yet been published in this

TABLE 6—PRIMARY MORTALITY

Dissemination (resistant to streptomycin).....	1
Fistula with empyema (treated without streptomycin and PAS)	3
Cardiovascular irregularities	6
Lung embolism	6
Thrombosis of arteria pulmonis on the other side.....	1
Anoxia, death during narcosis.....	3
Bad lung function, bursting of emphysema-vesicle on other side	1
Hyperthermia without clear cause at autopsy.....	1
TOTAL	22

TABLE 7—LATE MORTALITY

Dissemination (2 resistant to streptomycin).....	3
Fistula with empyema (2 resistant to streptomycin).....	6
Haemoptysis (recurrent)	1
Cardiovascular irregularities	4
Lung embolism	3
Carcinoma pulmonis	1
Air embolism (Maurer drainage for recurrent cavity)....	1
Accident (drowned)	1
Carcinoma uteri	1
Unknown cause	2
TOTAL	23

field, only the figures of the University surgical departments in Utrecht and Groningen (Eerland) can be given here.

From a study of Tables 8 and 9 it appears that the results in the group operated five or more years ago do not differ from those operated three or more years ago. The follow-up examination gives one the strong impression that a patient who has remained free from recurrence for three years after a well carried out lung resection and careful post-operative treatment, has a very slight chance of recurrence of the disease. Such complications as reactivation, spread or bronchopleural fistula formation as have occurred, have done so in almost every case within the first six months after operation.

If this impression should prove to be correct, it would appear that lung resection offers a greater chance of permanent clinical cure than do the various surgical collapse operations. Seip was able to show that approximately a third of the patients originally clinically cured by collapse operations suffered recurrence of the disease within the first ten years after operation.

From Tables 8 and 9 it may be seen that 97.5 per cent of the surviving patients operated five or more years ago in the University clinic of Utrecht have now negative sputum and that the same percentage was found among the surviving patients operated three or more years ago. The results from the University hospital of Groningen are approximately the same: negative sputum in 88.2 per cent of patients after pneumonectomy, 93.3 per cent after lobectomy and 96.8 per cent after segmental resection or combined lobectomy and segmental resection.

The loss of function after resection appears in uncomplicated cases to be in direct proportion to the amount of lung tissue removed. A loss of

function of 10 to 14 per cent after lobectomy and 4 to 8 per cent after segmental resection has been reported in uncomplicated cases (Kraan)² Kraan and v.d. Drift³ found an average diminution of the vital capacity of 527 cc. after lobectomy. Seghers reported an average loss of 347 cc. of the vital capacity after segmental resection among the material of the University clinic of Groningen. In the examination of the patients in his own sanatorium Hirdes^{4,5} noted little difference in the effects on lung function of lobectomy and segmental resection. After lobectomy the average loss was 570 cc. and after segmental resection 400 cc. This implies that for both types of operation there is to be expected an average loss of approximately 10 per cent of the vital capacity.

In the department of lung diseases in the University hospital of Utrecht a further investigation was carried out in 100 uncomplicated cases of lung resection. Only in two cases was the loss of vital capacity more than 12 per cent after segmental resection or lobectomy and more than 18 per cent after combined lobectomy and segmental resection. In both cases the excessive loss was a result of damage to the phrenic nerve with diaphragmatic paralysis. Significant loss resulting from insufficient expansion or from postoperative bleeding was not seen.

It is also important to remark, that it appeared from the investigation of this last series of patients that the ventilation after the operation was qualitatively the same as or even better than before the operation; the expiration speed was seen to remain the same or even to increase after the operation.

Despite the continued existence of certain problems, in particular the problems of recurrence after resection therapy which still demand solution,

(Continued on page 441)

TABLE 8—OPERATIVE RESULTS, 1946-1951

	No.	Mortality		Living	Sputum Negative	Sputum Positive
		Prim.	Late			
Pneumonectomy	51	6	9	36	35	1
Lobectomy	90	3	1	86	85	1
Segmental resection	13	0	1	12	12	0
TOTAL	154	9	11	134	132*	2

* Represents 85.7% of total, 97.5% of surviving.

TABLE 9—OPERATIVE RESULTS, 1946-1953

	No.	Mortality		Living	Sputum Negative	Sputum Positive
		Prim.	Late			
Pneumonectomy	93	7	9	77	73	3
Lobectomy	250	10	8	232	226	6
Segmental resection	175	1	2	172	169	3
TOTAL	518	18	19	481	469*	12

* Represents 90.5% of total, 97.5% of survivors.



BLAKISTON'S NEW GOULD MEDICAL DICTIONARY by Normand L. Hoerr, M.D., and Arthur Osol, Ph.D., Editors, with the cooperation of an editorial board and 88 contributors. 252 illustrations on 45 plates, 129 in color. Second Edition. The Blakiston Division, McGraw-Hill Book Company, Inc., New York, 1956. xxvi + 1463 pp., \$11.50.

This well edited book is more than just a dictionary, it is a minute medical encyclopedia. Compiled by a distinguished editorial board and 88 outstanding specialists from various fields, this new edition has 12,000 new terms and 8,000 changes. Obsolete terms have been omitted.

Particularly helpful are the 45 beautiful color illustrations and tables on isotopes, enzymes, arteries, muscles and hormones—to mention a few. In addition to being a thorough dictionary, this book also has a wealth of medical data.

Every doctor will benefit by having this dictionary in his library for constant use and reference.

DIAGNOSIS AND TREATMENT OF PERIPHERAL VASCULAR DISORDERS by David I. Abramson, M.D., F.A.C.P. Professor and Head of the Department of Physical Medicine, University of Illinois, College of Medicine; and Chief of Physical Medicine and Rehabilitation, University of Illinois, Research and Educational Hospitals; Attending Physician, Michael Reese Hospital, Mt. Sinai Hospital and Veterans Administration Hospital (Hines); Consultant in Peripheral Vascular Disorders, Regional Office, Veterans Administration, Chicago. Hoeber-Harper Book, New York, 1956. xv + 537 pp. \$13.50.

This well written book provides an excellent guide for anyone interested in the care of peripheral vascular disorders. The book is divided into three main parts.

Part I deals chiefly with the differential diagnosis of symptoms and signs. Procedures for the study of the arterial and venous circulations are described. Tests used are practical ones that can be performed without elaborate equipment.

Part II is concerned with the various peripheral vascular diseases affecting the arteries, veins and lymphatics. Not only discussed are the disorders caused by degenerative changes, inflammation and trauma but also those

produced by noxious agents, the rare diseases and the congenital lesions. These are complete and detailed descriptions which serve as useful clinical guides. Treatment for all of the entities is described fully. Many therapeutic aids that may be used in the office or at home are outlined. The author gives his personal results with the various methods of therapy.

Part III summarizes the basic sciences as related to peripheral vascular disorders by talking of anatomy, physiology, pharmacology and pathology. Particularly interesting in this final part are the discussions on intravascular blood clotting and its prevention and the pharmacologic action of agents used in treating these disorders.

The tables and photographs throughout this book provide wonderful teaching material. These contain treasures of information themselves without additional description.

Surgeons, surgical residents and general practitioners will find this book particularly informative and helpful.

(Nuboer, from page 413)

we are optimistic as regards the result of this method of treatment. The overall mortality from tuberculosis in the Netherlands has diminished considerably and is for 1955 6.6 per 100,000, a figure which can be regarded as being among the lowest in the world.

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(Ross, from page 430)

In thus naming the new center for a former teacher, the founders of the Ross Medical Center have established a precedent for Howard graduates. The *Journal* wishes them the greatest success in the rendering of service in their venture and it is proud to join in their salute to Dr. Ross.

(Townsend, from page 431)

to Meharry Medical College. In 1954 \$2000 was donated to Howard Medical School and \$2000 to the Legal Educational and Defense Fund of the N.A.A.C.P. In 1956 \$2000 was given the National Fund for Medical Education, \$2000 to the United Negro College Fund and \$2000 to the Legal Educational and Defense Fund of the N.A.A.C.P.

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