To

The Dean

The Faculty of Medicine

University of Edinburgh

Sir

I have the honour herewith to submit a thesis on
"The Genesis, Significance and Treatment of Tuberculosis of Lymphatic Glands" as required by the
Regulations of the University of Edinburgh and declare
that the work has been done and the thesis composed
by myself.

I have the honour to be

Sir

your most obedient servant,

R. E. W. McIver

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113 pages.
A Thesis

on

The Genesis, Significance, and Treatment of Tuberculosis of Lymphatic Glands

By

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Tuberculosis is an infective disease and tuberculosis of the lymphatic glands is a local or regional manifestation, often early and primary of the systemic and spreading infection. The relation of the lymphatic system to the development and spread of tuberculosis is of exceeding interest. In the light of comparatively recent investigations it is known that tuberculosis of the lymph nodes to the cervical, hannah, bronchial, mesenteric and retroperitoneal glands often represent primary foci of infection. The lymphatic glands connected with the lymphatic vessels, thanks to their adenoid tissue and richness in lymphoid cells, form the first line of defense in the body against invasion by the bacillus tuberculosis. They seize upon and render innocuous entering tubercle bacilli at the cost of becoming themselves diseased. The primary form of the disease is due to the fact that the glands act in a great measure as a filter for the tubercle bacilli between mucous membranes and the blood on the one hand and the blood on the other. The glands nearest the point of entrance do not allow the tubercle bacilli to reach the blood stream or to infect other groups of glands without themselves becoming diseased. Therefore in cases of primary disease of the glands the place of injection must be looked for in the region or organ the lymph from which passes to those glands.

Glandular systems drain Tributary Areas

In view of the involvement of glands nearest to the point of entry
entry of digestive material, it has followed that certain glandular systems are formed to drain certain tributary areas.

Thus the glands of the neck, including the submaxillary, sublingual, submandibular and infrahyoid glands, constitute the lymphatic filters of the nose, throat, tonsils, palate, mouth, ears and orbit, as well as the skin of the face or head. There are both superficial and deep glands of the neck. The latter constitute a chain extending from the skull to the thorax, along the base of the ear and jugular, establishing a communication with the thoracic and axillary glands, as well as with the corresponding set of the opposite side. The deeper group especially serves as a reservoir for the lymphatics of the tonsils, mouth, nose, eye, and larynx. Glandular enlargement is usually noted in the region of the angle of the jaw before a downward extension along the neck is recognized.

The bronchial glands are the reservoir for the lymphatics from the lungs, pleurae and surrounding parts. They comprise three chief groups:

1. The tracheo-bronchial group situated at the bifurcation of the trachea.

2. The bronchial group surrounding the main bronchi.

3. The pulmonary or hilum group, situated at the root of each lung, and extending with the branches into the pulmonary tissue.
The glands located near the bifurcation of the trachea are more numerous on the right than upon the left side. A chain of smaller glands lie in close proximity to the left recurrent laryngeal nerve in its course under the aortic arch, and another along the right in its passage under the subclavian artery. Glands accompany the smaller sympathetic along the primary divisions of the bronchii, and are found, according to Quain, at the bifurcation of the branches of the pulmonary artery.

The mesenteric or retroperitoneal glands serve as filters for the intestinal lymph, the peritoneum and sometimes the genital urinary apparatus.

Less interest attaches to tuberculosiis of lymphatic glands of other parts of the body on account of the comparatively slight opportunity of infection through the skin.

Functions of Lymphatic Glands

The lymphatic system has both a nutritive and protective function. The germs taken up by the lymphatics are filtered out by the glands and usually destroyed there. When however the bacteria are present in overwhelming numbers the glands are destroyed in their vain endeavours to protect the body and become a menace to their possessor. It is probable that by the entry of bacilli the lymph system is kept in bacteriological rapport with the bacteria in the mouth and food. In fact the lymphoid tissue acts not
not only as a filter, but as a barrier to continue E. A. Wright's metaphor, and so provides material for the requirement of protection in the opsonic laboratory. There are chemical affinities between microbes and their products and the cells of the lymph nodes especially the leucocytes; and the struggle - the neutralization of the injurious effects - in the first instance takes place in the regional lymph nodes; later it extends to the nodes in general.

It has been shown that not only are the bacilli in many cases held in comparative security within the confines of the besieged glandular citadel, but often are rendered more or less innocuous.

Oster has referred to the experiments of Ahlong as indicating a degree of degeneration of the tubercular virus. Rabbits did not succumb to inoculation from a lymphatic gland, although a positive result was obtained with guinea pigs. Langiand demonstrated a quick lymphatic infection and early death upon inoculation of guinea pigs with tubercle bacilli from the lungs, as compared with a delayed lymphatic enlargement and death when infected from tuberculous glands.

It is known that bacilli from glandular structures are considerably less virulent than those from almost any other tuberculous focus in the body. Whether this is due to a difference in the infective material or to

...
certain modifying influences of the lymphatic glands has not as yet been determined.

Development and Spread

The development and spread of glandular tuberculosis is conveniently studied in the tuberculinized guinea-pig.

Animals susceptible to tuberculosis are guinea pigs, rabbits, calves and pigs. Calves and pigs are both subjects of natural tuberculosis, but in guinea pigs and in rabbits, tuberculosis is unknown outside the laboratory. These two animals, indeed, especially the guinea pig, kept under hygienic conditions, serve as excellent and accurate tests of the infectivity of any particular tuberculous material.

In guinea pigs inoculated subcutaneously in one or other groin by virulent tuberculous material, as early as nine days after inoculation a local lesion is seen, which on microscopic examination may be recognized as tuberculous. The inguinal glands become tuberculous in from seven to fourteen days, and about the third week, often in another fourteen days from the inoculation, the disease spreads to the internal lymphatic glands, always involving the lumbar glands, and usually affecting the coeliac glands before it spreads to the liver and spleen. Spreading to the thorax, which it does about the fourth week, it affects first the posterior mediastinal and bronchial glands; not subsequently about the fifth week the lungs. The
Mesenteric glands are affected only in very advanced tuberculosis following inoculation. The suprarenals and kidneys are never found affected by the disease.

In human beings an initial tubercular deposit having taken place, the infection is conveyed subsequently by way of the lymphatics much more frequently than by the blood vessels. When the vascular system is the site carrier of injection, the injection of various tissues is found to occur in distal portions of the body in sharp contrast to the direct sequence of glandular involvement which ensues when the microorganisms are distributed through the lymphatic channels. In the latter instance the proximal gland is the first enlarged, the subsequent injection through the immediate chain of lymphatics exhibiting a progressively diminishing centrifugal involvement. The smaller size of the glands in proportion to their distance from the original infected focus illustrates the method of gradual secondary invasion along the lymphatic route.

When the defensive capacity of the succumbing glands has become completely overtaxed, the barriers are removed, which hitherto have obstructed to a degree the onward march of the invader. The progressive advance of the infection is shown not only by the gradual diminishing size of the glands, but also by the serial stages of the tuberculous process. In the presence of an overpowering invasion of bacilli the proximal glands in their effort to perform their...
Their defensive function may be so overwhelmed as to result in tissue destruction, local degenerative processes take place. The infected gland may contain foci of various sizes, or become transformed into abscess containing sterile pus. In other glands less proximal to the original site of infection, the battle is not always completely in favour of the invaders. The bacilli may be held as prisoners and rendered incapable of doing any further damage until their release is secured by sufficient reinforcement to overcome the host cells protecting the army of defence. In more distant glands the enlargement may be so slight as to differ but little from the normal size, and yet a minute tuberculous focus may be present either in the interior or upon the surface.

Irrespective of the distance of the gland from the original site of infection, there occasionally occurs such a degree of fibrous tissue proliferation as to produce a complete protective metaplasia, the capsule becoming enormously thickened and the depth being tough and fibrous. This is nature's method of effecting a cure. In other cases a true calcification may result from the abundant deposit of lime salts. Induration of the glands with increasing fibrous contraction is sometimes stimulated by the presence of mineral dust. This is particularly true of the bronchial glands, which become densely pigmented and even gritty from the inhalation of particles of insoluble dust.
Channels of Infection

The various avenues of infection by tuberculosis may be classified into the Respiratory Tract, the Alimentary Tract, the skin, the genital passages, the throat, and the Fetal membrane. For the purposes of this thesis we are concerned chiefly with the first two. Clinically, by a study of the order in which the lymphatic glands are enlarged we can hazard the conclusion that either the mouth and pharynx or the intestines have been the avenue of entrance. Wulster's ring where lymphoid tissue abounds is common to both respiration and deglutition.

26. The Tuberculosis Conference at Edinburgh in 1910 notes: "The older observations regarding the channels of infection are largely valueless. The time has not come to recommend a sure doctrine. We must leave it to future years to establish a positive teaching regarding the avenues of infection in man."

26. At the same conference Sir Robert Philip remarked as follows: "In the case of individuals the mouth of infection during fifteen or twenty years, while the whole of the covering membrane of the alimentary and respiratory passages is vulnerable, perhaps the most liable to attack from the tracheal bronchus - that is the most frequent avenue of infection - is the nasal and pharyngeal mucous membrane. In the child the spread is most frequent from the thoracic region to the cervical lymphatic glands, and thence to other structures. We have abundant
analogy for the view that the passage of infection from the tissues in the suprarenalicular area directly into the lungs is possible. The analogy I suggest is the passage of infective disturbance from the liver into the lung. I do not think we are justified in adopting for most cases the more round about channel of the blood stream.

The mucous membranes of a child are in a more tender susceptible condition than the mucous surfaces in the experimental animal. The human subject passes through through changes of a histological nature similar to those traceable in the vegetable world. As the child advances in age a certain amount of protection is afforded naturally by the gradual condensation of tissue. Of great interest in this connection are the recent observations of Dr. Hamburger of Vienna, which show the relationships to injection changes as the child grows up. There is an increase in frequency of injection, but the rapidity of the process is less as the child grows.

I feel satisfied that I have been able in a very considerable number of cases, definitely to watch the progress of tuberculous disease from the tonsil - not always from a very obvious lesion of the tonsil - to the suprarenalicular glands, and to suprarenalicular glands, and at a later stage to the apex of the lung.

At the same conference Professor Evans Woodhead remarked as follows: "I wish to draw attention to the fact that pulmonary..."
Pulmonary Phthisis is the result of an aerial infection far more frequently than the result of any intestinal infection, in spite of the fact that in this country, direct infection from the intestines plays a more important part than it does in any other country in the world. In Japan, in China, and in other countries, they are troubled less with alimentary infection than we are, but I believe most firmly that intestinal infection from feeding does often occur, but that it is not so easily produced as is the form set up by inhalation of tuberculous material.

In 1886 I published a description of a series of cases of tuberculosis of the lung in which I thought that I was satisfied that after a small flow and allowed direction of lymph current undoubtedly occurs in children, and this in certain cases the pulmonary tissue was infected subsequent to the infection of the sympathetic, bronchial, and mesenteric glands. We have indeed very clear evidence of the alternation in the direction of the circulation of the lymph, not only temporarily but even permanently. If one gland be destroyed the lymph is diverted to another. Respiration must play a very important part in drawing and driving injurious material along lymph channels past obstructed glands, and in reversing even under normal conditions, and still more under abnormal conditions, the direction of the lymph currents. I should like to enter a protest against
attributing to the blood current the distribution of the tubercle bacilli. From the results of a large number of feeding experiments on pigs, there is no doubt that in certain of the cases the tubercle bacilli passing in the bronchi were carried along the lymphatics of the neck, penetrating lesions in the glands in course, and then set up a tuberculous lesion immediately above the apex of the lung. This was followed apparently by sheets of adhesions, over and through which the tubercle bacilli could, and did, pass to the lung tissue itself. There were no tuberculous lesions either in the intestines or any of the internal organs of the body; but there was evidence of a damaged tuberculous surface, an excellent indication of the line of injection in this case.

"Except perhaps in the case of children, pulmonary tuberculosis is incomparably more frequently produced by injection through the alimentary canal."

In designating certain sets of glands as the drainage basin for a given tributary area, referred to above, it must not be assumed that a primary focus of tuberculosis necessarily exists within this region. As a matter of fact, the majority of cases of glandular tuberculosis, especially in children, are of primary rather than secondary development, as has been clearly established through the recognition of a macroscopically distinct mucous membrane.

Raveneau has shown by experiments on dogs that he
bacilli may pass through an intact intestinal wall directly to the mesenteric lymphatic glands. Sydney Martin has also demonstrated that the bacilli may permeate a healthy intestinal mucosa and gain access to the mesenteric glands. Knecht, Wild, Klebs, Baumgarten, Wallace, and Hittersen, as well as Lebette and his followers, have concluded, as the results of their own experiments, that the tubercle bacilli often secrete a poison going through a normal mucous membrane. Plenda and Hamilton voice the conception of opinion that the point of invasion, by virtue of local conditions, may be an unfavorable site for tuberculous development, and yet the bacilli be conveyed to a soil, which is more receptive. It is known that tuberculous glands are found with great frequency at autopsy among children in whom there are no other discernible lesions.

Repeated investigations have demonstrated the role of the tonsils and adenoid vegetations in affording a port of entry for the tubercle bacillus, even in the absence of local inflammatory changes. Please see pages on Blackwood's Pravanse, pages 21 to 25. The deep crypts in the tonsillar tissue constitute an injection abrinum from which the further progress of the bacilli along the lymphatic channels to neighboring glands is frequently unaffected. On the other hand, tubercle bacilli have been shown to be present in the tonsils and in adenoid growths despite
Despite failure to discover tuberculous infection in other parts of the body, the adenoids have been found tuberculous somewhat more frequently than the tonsils, undoubtedly on account of the greater narrowing of the respiratory passage and the increased opportunity afforded for tuberculous deposit. The presence of tubercle bacilli in the tonsils and adenoid growths of apparently healthy individuals suggests the probability of their not infrequent passage to the lymphatic glands, producing therein a primary seat of tuberculous infection. Jacobs has held to the opinion for years that infection of the cervical nodes occurs much less frequently through the tonsils or adenoids than through the medulla of the lymph follicles in the nose and pharynx. It must be admitted that enlargement of the cervical lymph glands follows inflammatory processes in the nose and naso-pharynx, more quickly and more frequently than an infection confined solely to the tonsils.

It has been shown conclusively that when the lungs are also diseased, the pulmonary involvement in the vast majority of cases is secondary to tuberculous of the bronchial glands.

The precise manner in which the bronchial glands become subject to tuberculous infection remains a disputed point, although the preponderance of evidence suggests an invasion of the body by bacilli through the digestive...
digestive system. Some maintain that the essential consideration is the aspiration of the bacilli into the bronchial tract and their passage through an intact bronchial mucosa. Behrning asserts that the aspiration takes place originally through the intestine rather than by inspired air. He believes the infected milk to be the chief source of tuberculosis in childhood as well as in adult life. He asserts that the focus of aspiration thus engendered remain latent for varying periods of time until individual resistance is sufficiently lowered to permit their active development.

Behrning's views have been discussed in connection with the method of aspiration through the alimentary canal as have also the experimental observations of others who have demonstrated the case with which the tubercle bacilli may penetrate the intestinal wall without visible lesion and gain ready access to the glandular structures. The later researches of Kalmia and Eucrise, Engel and Schlossmann, have shown the passage of bacilli through an intact mucous membrane to the mesenteric and bronchial glands of animals, and their early appearance in the thoracic duct and pulmonary arteries. Behrning's contention that the permeability of the intestinal wall is much greater in infancy on account of the more delicate structure is of much interest. Differences in the passage of microorganisms through the wall of the intestine at various ages.
A gas were demonstrated by experiments upon animals. Tubercle bacilli were fed to guinea pigs with the result that only the very young became tuberculous; enlargement of the glands of the neck being noticed, even while the general condition appeared entirely normal. Ravenel, on the other hand, has recently introduced tubercle bacilli with the food into the stomach of two monkeys and one cow, producing tuberculosis of the bronchial glands and lungs without mesenteric or intestinal lesions. Some investigators have been unable to produce tuberculosis of the lungs or bronchial glands after carefully conducted inhalation experiments. There can be no doubt as to the primary involvement of the lymph nodes in little children. In the light of available evidence it would seem that it must remain sub judice whether in individual cases the initial infection is purely respiratory or intestinal. It has been proved beyond question that the infection may assume either of these routes in different cases.

The important consideration in this connection is the fact that by whatever route glandular tuberculosis occurs with great frequency in children.

**The Susceptibility of Childhood**

The reasons for a greater frequency of glandular tuberculosis in children than in adults are found in:

1. The abundance of lymphoid tissue in infancy and childhood
hood, the susceptibility of the tubercle bacilli for lymphoid tissue being well known.

ii. The extreme delicacy of the mucous membranes which greatly facilitates the passage of bacteria through them.

iii. The increased facilities with which the gaseous conveyance through the open permeable lymph spaces which are relatively large.

iv. Certain accessory features increase the likelihood of infection and to a material extent diminish individual resistance e.g. enlarged tonsils, and especially the crypts of lymphoid placed tonsils very often furnish a port of entry and source for lodgment of the tubercle bacilli. Asthmoid vegetations so common during the early years narrow the respiratory passage and offer a delay inducing the deposition of bacteria at this point and greatly enhance with their subsequent expulsion. Moreover, as stated above the further progress of gaseous into the deeper lesions is enhanced by the steep angles upon the surface. Infantile bronchi directly dependent upon the bronchi are subjected to increased danger of exposure to tuberculous infection. The child is often on the floor and is thus brought in close contact with the bacilli which contaminate the flour kernels and rugs. The immunity of infants is frequently reduced by digestive disorders and bathe bed disturbances, imperfect ventilation, improper hygienic conditions, sickness infections, measles, whooping cough etc.

IV. Tuberculosis is primary in childhood
The three essentials for the production of disease are present in childhood viz. an active pathogenic organism, a non-immune individual, and an immune producing system, the lymphatic glands.

Statistics have been cited both to demonstrate and deny the influence of heredity as an etiological factor. The child does not inherit a hereditary taint of tuberculosis, but is born with tissues which are highly susceptible and even prone to tuberculosis. The tissues are from the blood has resistant. We may have inherited a transmitted liability or susceptibility to tuberculosis. Environment, however, is of more importance, for lowered resistance may take place among children of healthy parents; while more or less inherited predispension to disease may thrive by virtue of especially favourable conditions. A positive family history of tuberculosis while not to be regarded as a factor of great import must, nevertheless, be conceded to possess some beneficial signifi-

In infancy, the lymphatic system is the part which has relatively the greatest powers of resistance. In spite of this, it is not capable of withstanding the assaults of the tubercle bacilli. The tissue reaction is insufficient, and the glands fail to arrest the bacilli, which spread through the lymphatic system, attack other tissues, and without producing the characteristic local changes, consequently...
constantly, in infants, cause a rapid fatal ending.

In older children the power of the lymphatic glands increases with the general resistance. The glands are better able to deal with the tubercle bacilli, and to shut off the infection from the rest of the body temporarily or permanently. Also the extent of the disease is checked. It leads to the occult or latent tuberculosis of childhood, which latent tuberculosis as a result of nonmalignant and infectious diseases may set up acute phthisis, meningitis, or tuberculosis. This is possible because the occult tuberculosis in spite of its latency is active, the focus in the glands being recent, lesions and not sufficiently encapsulated occasionally flare up and infect the whole body or individual organs.

About the school age the resistance of the tissues will further slightly increases. As evidence of this we find that the bacilli are arrested in certain organs, which by their nature or growth are particularly liable to tuberculosis e.g. the lungs, the bones and joints. Thus is explained the typical secondary tuberculosis of mid-childhood.

About the time of puberty appears a certain general power of withstand ing tuberculous, which limits the importance of the glands, which no longer play the chief part. The chief occult foci are rendered machine by calcification and new infections follow.
The same course as in adults, that is directly attack the
organ most predisposed, namely, the lungs. And as these
have not yet acquired the same power of resistance as
adults, acute progressive pulmonary disease is more common.

If we consider the pathology of glandular tuberculosis
of childhood in this way, the various difficulties in the
course of the disease in children and adults will be
understood. The lymphatic glands are shown as the key
centre of cephalitic and childhood tuberculosis, from
which the disease may spread in various ways; either
by contiguity to the surrounding lung tissue — peri-
-glandular caseous pneumonia — or by the lymphatics
to various parts of the lung — lymphogenetic tuberculous
pneumonitis — or to a more distant part — mediastinic
glands, bones and joints. A lesion of a gland may also break into a bronchus, the esophagus,
or the bloodstream. In the first case by aspiration a
caseous pneumonia is produced. In the second an
infection of the intestinal canal may be traced. From
the throat there are two possibilities; either the infective
material enters an artery of the lung and sets up
disseminated pulmonary tuberculosis, or entering a
vessel going to the heart, ven. thorac. duct —
generalized hilar tuberculosis is thereby caused.

The destruction in children is very far
from gaining a true criterion of the prevalence of tuberculosis in childhood. Tuberculous disease of the glands, especially of the glands of the neck is very common in childhood, leading much its health and leaving ugly scars, but not off-hand dying in death.

The significance of glandular enlargement

has been dealt with throughout the thesis with real understating, so that I do not purpose elaborating this portion of my thesis in a separate section, contenting myself with a summary in which I shall note the main points. In glands the clinical latency of tuberculous pox has been found to persist for 10, 13, 14, 15 even 28 or 29 years. The duration of latency may be placed at 20 or 30 years and probably may be considerably longer. Sir Robert Philips in his lectures states: "Tuberculosis is ineradicable unless in hand sufficiently early, dealt with sufficiently firmly, and over a sufficient length of time." This especially applies to tuberculous glands in which prognosis is good if diagnosed early, especially in the case of children by means of Von Pirquet's skin reaction test, and even if necessary by a simple excision for purposes of histological examination or an inoculation test. A person with tuberculous glands like one with pleurisy, with esparsion can scarcely be considered to be out of the danger zone until three or four years have passed.

I shall go on now to statistics illustrating and developing...
Frequency of Glandular Tuberculosis Proved by Statistics.

Lautegn found 15 per cent of all adenoids tuberculous.

Robertson found 8 per cent of all hypertrophied tonsils tenen
respectively to be infected.

Lawson as a result of inoculation experiments upon guinea
pigs stated the proportion of tuberculosis in adenoids to be
20 per cent, and in hypertrophied tonsils to be 13 per cent.

Wood reports that out of 1671 adenoids 871 tonsils removed for
Tuberculosis without evidence of Tuberculosis involvement
elsewhere, a positive result was obtained in 85 or about
5 per cent.

Volland, Bernt, Behmann and Wohlgemann in the result of
an examination of many children, report the
cribriform lymphatic glands to be enlarged in the
proportion of from 81 per cent to 96 per cent, according
10 Pottenger.

The reports of other observers as to the character of the cribriform
enlargement in children would indicate that nearly two
thirds are Tuberculous.

Bertels analysis of the autopsy records of the Berlin
Pathological Institute for a period of 15 years shows
not a single case of glandular tuberculosis out of
4,865 cases from birth to the end of the first month.
from 2 to 3 months 6 per cent of the cases.
from 3 to 6 months 10.5 per cent.

from
from 6 to 9 months 17 per cent of the cases
from 10 to 12 months 27.7
from 1 to 2 years 26.6
from 2 to 3 years 29.6
from 3 to 4 years 31.8
from 4 to 5 years 22.4

Muller, Beker, Hennean, Neu mann, Still, Wund, Simonds, Schu ner, Betz, Jaccobi and Holt have reported statistics of especially dissimilar to the above, the proportion ranging, in children up to 5 years from 22 to 40 per cent.

Dr. Arthur Landesker says at Lucknow, India, the Health Officer in 1949 examined 103 children of school going age and found that at least 39 had distinctly enlarged cervical or auxiliary glands. During a tour through the cities of Northern India and Agra, Dr. Arthur Landesker examined 9128 children distributed amongst schools of various kinds and as far as possible representative of various classes and communities. Of the total number examined 2697 or 29.49 per cent of the whole, showed definite enlargement of the glands of the neck. The proportion varying from 9.1 per cent in a high class girls' boarding school in the United Provinces, to 11.3 per cent among the British children in healthy districts of Agra, or 14.7 per cent amongst the Hindu children of
Lundpur, a town laid out about 25 years ago on generous "town planning" lines in a tehsil colonisation area of the Central Punjab, at the one end of the scale, its proportions of even 60 per cent in the slums of some of the great cities at the other. The highest of all were 65.42 per cent in Mahomedan Primary Schools in the poorest quarters of Ahmedabad city and 57.27 per cent in similar schools in India.

The percentage of cases showing glandular enlargement amongst about 240,000 children belonging to the London School Board examined in 1913 was 10.5 per cent falling to 8.8 in 1914.

Cases after an examination of 1216 children came to the conclusion that excluding other causes of such enlargement, from 32.4 to 58.9 per cent of the cases tuberculous glands were present.

Fränkel found primary tuberculosis of the tonsils in 5 per cent of all enlarged tonsils. In 1671 cases quoted by Wood the percentage worked out at 5.2.

Poggiani inoculated guinea pigs with emulsions of the parotid, cervical, and mesentric glands of 20 non-tuberculous individuals and in 12 instances proved the existence of tubercle bacilli.

In 91 children without any evidence of tuberculosis Hardby found 13 were reactive, 10 being under one year of age.

13 times injection followed inoculation of the cervical
cervical glands.

Applegate inoculated emulsions of 11 tonsils and adenoids and on one occasion obtained a positive result, the bacilli isolated being of the bovine type.

In Rabenowitsch's case of a child dead from broncho-pneumonia, the mesenteric and cervical glands although apparently full of tubercle, were found to contain tubercle bacilli of the human type.

Kussmaul found 1.2 per cent. of 206 children came to the mortuary who, on post-mortem, contained tubercle bacilli; of these 17, 12 were children of tuberculosis; 27 were the subjects of tuberculous glands, in 18 the tubercle bacilli were discovered latent in the glands.

In a only of this class were the cervical glands free, while the mesenteric were involved only in 3.

Macfayden and Mac Conkey tested glands in 28 cases by inoculation. Of 8 glands from indubitable tuberculosis lesions only 5 gave a positive result. On the other hand, 8 out of the 28 non-tuberculous lesions showed the presence of tubercle bacilli.

Ochsner has observed that 4 out of 12 cases of tuberculosis of the glands of the neck were due to bovine tubercle.

Lazarus in 1896 found 70 to 100 per cent of children with enlarged glands.

Volkert gave 94 per cent as the number of children with enlarged
enlarged glands.

At the Manchester Royal Infirmary in 1900, 26 enlargements of the intrapulmonary lymphatic glands were proved by uncontradicted or undoubted histological evidence to be tuberculous in nature. Of these 26:

15 were cases of cervical adenitis and
2 were axillary adenitis. Of the latter, 1 was a descending infection from the cervical glands and 1 was an ascending infection from a primary lesion in the index finger.

Balayat at the Oklahoma City Tuberculosis Dispensary among 449 children under 16 years of age found
that 304 or 68 per cent were below slender height.
224 or 50 per cent had enlarged cervical glands.
211 or 47 per cent had enlarged tonsils.
154 or 30 per cent had tuberculous infection of the thoracic bronchial glands clinically diagnosed.

Lorant quotes the statistics of Steiner and Neumann who report tuberculosis of the lymph glands in 299 out of 302 autopsies. The bronchial glands were tuberculous in 286 of these cases. He also refers to the report of Bickert and Barthez, who found that the lymphatic glands tuberculous in 248 cases of a total of 312 autopsies upon tuberculous subjects.
Northrupp reports bronchial gland involvement in every instance in a series of 125 autopsies. The same results were obtained by Northrupp in a second series of 125 cases at the New York Foundling Hospital.

Holt reports 119 cases in which the bronchial glands were tuberculous in every instance.

In 115 autopsies Hand reports the bronchial glands involved in 81.7 per cent; the lungs in 78 per cent.

Both Steffen and Behrens found the lymphatic glands injected in nearly every autopsy reported upon tuberculous patients.

All observers agree that the thymic bronchial glands are involved more frequently than any others, and the cervical next in order. Hansehäller, in a report upon the results of 78 autopsies performed upon children who had died of acute bronchial tuberculosis, states that tuberculosis of the mediastinal glands was found in all but 4 cases. Enlarged bronchial glands from individuals exhibiting no evidence of tuberculosis have been found by inoculation experiments to be infectious to animals.

Pozzani, after inoculating animals with the bronchial glands of 40 patients, found 42 percent tuberculous. It is interesting to note that injection of the cervical glands from the same subjects was followed by tuberculosis in but 2 per cent of the animals, while none
None showed evidence of injection with inoculation of the
mucous glands.

Loomis has demonstrated by inoculation experiments that
inoculation glands the existence of tuberculosis which had
previously been unrecognized.

Barbieri discovered tuberculosis of the bronchial glands in 20
out of 24 children who had died of tuberculous meningitis.

From the observations of England, Woodhead, Still, Shenman,
Seymore and Fisher, Lysholm, Carr, Allen, Kingsford,
Price Jones and others, it would appear that in 1560
autopsies in children primary tuberculosis was found
in the intestines or lymphatic glands pertaining
thereto in 290 cases, that is in 18.6 per cent.

In the United States, Northrup, Emmet Hove and Banks
in New York report 319 autopsies with 3 cases of primary
intestinal tuberculosis or 0.94 per cent.

Hand in 115 autopsies in the Children's Hospital, Philadelphia,
found the percentage to be 8.7

In 220 children dying from diphtheria, Councilman,
Mallory and Pearce found latent tuberculosis 35
times, that is in 16 per cent. Among these 13 that is
5.9 per cent of the total mortality, or 37.1 per cent
of latent tuberculosis were of intestinal origin.

Baginsky in 933 cases found no primary intestinal
tuberculosis, and in a second series of 806
autopsies
Necrospes in children only 6 out of 14 cases of tuberculosis, that is 4.2 per cent.

Of 231 autopsies made by him found only 2 cases of primary intestinal tuberculosis among a total of 47 tuberculous cases.

Langhorne in 1903 published a series of 975 autopsies of which only 5 or 0.5 per cent were of primary intestinal tuberculosis.

Biester saw only 16 cases of intestinal tuberculosis in 3104 necropsies in children.

In the Usher's Institute in Kiel between 1873 and 1894 there were 714 post mortem examinations in children dead from diphtheria. In 410 of these or 59.6 per cent, tuberculosis was accidentally discovered and 53 or 37.3 per cent of these latent cases were referred to a primary intestinal infection.

Hof analyzed the 15,000 necropsies made in Kiel in 30 years referred 23.1 per cent to primary intestinal tuberculosis.

Hubarsh, from the study of necropsy material comprising 1820 cases noted tuberculosis in 60.6 per cent; in 297 necropsies in children he found tuberculosis 63 times, and of these 14 or 21.2 per cent were referable to intestinal infection. In children under one year the percentage of alimentary tuberculosis

Tuberculosis was actually 23.8 per cent.

Francis Hare, in examining the fatal cases and adding the latent cases, found the primary lesion in the respiratory tract in 40 per cent and in the digestive tract in 22 per cent. The tuberculosis infection of the respiratory and alimentary tracts showed 20.5 per cent, general lymph gland tuberculosis 9.4 per cent, and cases of doubtful origin 6.8 per cent.

Fibiger and C.O. Jensen from Freidrich's Hospital Copenhagen examined 213 bodies of all ages, and found tuberculosis beginning in the intestines 13 times or 6 per cent.

Spies, examining these observations on 600 cases, noted primary tuberculosis of the digestive system in 32; 102 of the cases were children between 0-15 years and died from diseases other than tuberculosis. The variations which may take place in one and the same town are strikingly seen in the reports from Berlin. In the Berliner Hospital in 1904-5, Ehrns in 21 tuberculous necropsies considered 35.5 per cent were of primary intestinal origin; whereas in the pathological department of the Charite, of the 77 necropsies found only 8 of digestive origin.

Hamburger in Vienna recently found tuberculosis in 33.6 out of 848 necropsies, but in no single case was the primary
primary source of the disease certainly in the intestine.

The causes of these differences according to Clifford and Rolleston are not easy to determine, one factor, however,
is the inclusion of different age limits in the statistics.

In the following compilation, this is similarly borne out when the amount of tuberculosis between
0-15 years is compared with that between 1-15 years.

<table>
<thead>
<tr>
<th></th>
<th>Hertfordshire 1901</th>
<th>Hertfordshire 1902</th>
<th>Middlesex 1904</th>
<th>Oxford 1904</th>
<th>Dorset 1905</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cases in children under 0-15 years</td>
<td>220</td>
<td>714</td>
<td>973</td>
<td>297</td>
<td>203</td>
<td>723</td>
</tr>
<tr>
<td>Cases of primary tuberculosis</td>
<td>13</td>
<td>53</td>
<td>5</td>
<td>14</td>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td>Percentage</td>
<td>5.9</td>
<td>7.4</td>
<td>0.5</td>
<td>4.7</td>
<td>0.98</td>
<td>3.38</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Hertfordshire 1905</th>
<th>Liverp. 1904</th>
<th>Edwa. 1905</th>
<th>Oxford 1904</th>
<th>Dorset 1905</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cases in children under 1-15 years</td>
<td>76</td>
<td>67</td>
<td>52</td>
<td>91</td>
<td>74</td>
<td>131</td>
</tr>
<tr>
<td>Cases of primary tuberculosis</td>
<td>16</td>
<td>11</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>Percentage</td>
<td>21.1</td>
<td>16.4</td>
<td>23.0</td>
<td>12.0</td>
<td>13.5</td>
<td>12.3</td>
</tr>
</tbody>
</table>

Boviced and Splenectomised apparently healthy mesenteric glands into healthy guinea pigs proved that
that the glands contained living bacilli. In the following table a comparison is made between the relative frequency of manifest tuberculosis and tuberculoce which can be induced by inoculation.

<table>
<thead>
<tr>
<th>Tonsil and</th>
<th>Tuberculoce produced by inoculation</th>
<th>Macromosaic Tuberculosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonsil and</td>
<td>11.7 per cent</td>
<td>0.6 per cent</td>
</tr>
<tr>
<td>Neighbourhood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphoid glands</td>
<td>58.8 per cent</td>
<td>4.5 per cent</td>
</tr>
<tr>
<td>Bronchial glands</td>
<td>52.9 per cent</td>
<td>6.4 per cent</td>
</tr>
<tr>
<td>Mesenteric glands</td>
<td>100 per cent</td>
<td>4.5 per cent</td>
</tr>
</tbody>
</table>

Max Fryden and Max Newkey inoculated the mesenteric glands of 20 children free from tuberculosis and 8 instances produced tuberculosis. Their inoculations with emulsions of 34 tonsils and 44 adenoids were however negative.

Rosenberger in 21 non-tuberculoid cases, including 10 children, injected tuberculoce 6 times by inoculation.

Eiling's post-mortem examinations gave the following figures for the glandular tuberculosis of infancy:

- Bronchial glands: 81.6 per cent
- Mesenteric glands: 34.2 per cent

Notthorp found 13 cases in whom tuberculosis was limited to the bronchial glands, these cases having died of acute disease.
Since Woodhead in 1888 found maximum perforation of glands in children between the ages of 1 and 5, he had 4 cases in the 1st year of life

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-7</td>
<td>12</td>
</tr>
<tr>
<td>8-10</td>
<td>13</td>
</tr>
<tr>
<td>11-15</td>
<td>9</td>
</tr>
</tbody>
</table>

Eberst found in a series of 26 cases 16 under one year

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>6</td>
</tr>
<tr>
<td>2-5</td>
<td>37</td>
</tr>
</tbody>
</table>

Sims and Woodhead found primary perforation of glands in 64 per cent of all cases of tuberculosis in children.

\[
\text{Cases in 40 necropsies} \\
\text{5} \quad 120 \\
\text{110} \quad 4
\]

W. S.

These statistics collected chiefly from the volumes noted in the section on 'Bibliography' have been copied from my notes and cannot in each case be separately numbered and handed to the author of 'Compilers'.
General tuberculosis of lymphatic glands.

Incidentally, in the Mortuary, or in sections and generally formal cases of tuberculosis in which lymphatic gland enlargement was the older and primary lesion, we find tuberculosis of the lymphatic glands in the neck, as well as in the chest and abdomen. It is not rare to find it occur thus as a general disease both in children and in adults.

Dr. Francis Horbury in the Journal for Injuries 1917-21 has published the results of an extensive and painstaking study of tuberculosis of the lymph nodes. He says:

"In general we may say that in children mostly the tuberculous infections have their point of departure in tuberculosis of the lymph nodes. The tubercle bacilli are deposited here where they pass through minor membranes of the skin. Here they propagate enormously or remain latent but virulent for a long time. Years and years, eventually escaping and infecting other organs. Most frequently the dissemination occurs by the lymph vessels, but also by the blood vessels and probably more often than now believed."

The observations are based on 2,406 necropsies in Christiania, Norway, during a period of twelve years, 2,439 of persons over fifteen years, and 417 of children. Of the entire number 431 or 14.8 per cent died of tuberculosis, 351 or 14 per cent being adults, and 80
or 19 per cent children. In 203 cases there was considerable involvement of the lymph nodes, and on analysis Harbitz
finds that there were 57 cases of primary tuberculosis of the bronchial lymph nodes with 8 somewhat doubtful; 10 of
primary extrinsic tuberculosis of the cervical glands, all in adults; 9 of primary tuberculosis of the abdominal lymph
nodes; 40 of chronic tuberculosis of the lymph glands of the
neck and chest; 4 of primary contemporaneous old
tuberculosis of the cervical and other abdominal lymph
glands; 22 of tuberculosis of the thoracic and abdominal
nodes, and 61 of general lymph node tuberculosis. The
last group he considers the most interesting and the most
important. It contained 29 children, and in 20 of these the
disease developed during the first three years of life, and
with one exception tuberculosis caused death. There was
marked involvement of the lymph nodes of the neck,
chest and abdomen. The process is often a descending
one in the neck, the swelling being most marked above
and descending downward; whereas in the thorax it is
descending less marked along the upper portion of the
trachea and increasing toward the triradiation and
the hilum of the lung, where the enlargement is greatest.
A more isolated process may be observed in the
abdomen which from an anatomic point of view would
not suggest continuous spread along lymph channels.
but rather repeated infection at various points from different sources. This is especially indicated when processes are present that are evidently of different age. In cases of extensive tuberculosis of all the groups of lymph nodes, a continuous spread from group to group, or a hematogenous dissemination may be assumed. Ungarmann is cited as believing that in such cases, the infection is by the blood stream, usually by way of the thoracic nodes which in turn are infected from the lung following inhalation of tubercle bacilli.

According to Harrity, in about half the cases of lymph node tuberculosis in children, death results from Pulmonary Tuberculosis; in about one fourth from Tuberculosis of the intestinal tract; and the remaining one fourth from miliary tuberculosis or tuberculous meningitis.

The general lymph node tuberculosis was found in 32 adults and in 30 was fatal. It would seem that the infection may originate at different times and in different ways at the various points, especially when the process is discontinuous and of different ages in the various locations. Cases of generally disseminated, apparently continuous tuberculosis of all the important groups of lymph nodes are the more numerous.
numerosos and the process is usually of long standing.

The condition of the nodes in the neck and the chest is much the same as in children of this group; but in the abdomen the process is somewhat more extensive. There may be enlargement of the mesenteric nodes, sometimes accompanied by intestinal ulcers, involvement of the retroperitoneal nodes, especially those behind the stomach and pancreas; and further down there may be swelling of the nodes along the iliac vessels to the inguinal region, decreasing in the downward. The affection plainly seems to have come about by a continuous secession along the lymph vessels from one of the groups of lymph nodes, a procedure easily within the limits of possibility, taking into account the generally accepted reversal of the lymph stream under pathological conditions and the limited means of communication between the lymphatic systems of the various organs. In an earlier article — Journal Leprosy Diseases 1905: 2: 442 — Frasier Harbottle maintained that this mode of extension was both frequent and important. Tendler and Strang both support this view; the latter having apparently demonstrated the spread of tuberculosis along lymph vessels, particularly from the abdominal lymph nodes to the liver and spleen. A plausible explanation seems to hold one or more groups of nodes become infected.
injected, and the process spreads from node to node in the
unexpected group or groups and to the internal organs adjacent,
and thence to other lymph nodes and vessels. In adults as well
as in children it seems probable that in many cases distribution
takes place by way of the blood.

Thus the process is not arrested may be due to the
residence of the organism or to repeated injections together with
a lowered resistance. Death from Tuberculosi is the usual
termination of lymph node tuberculosis, and in the opinion of
Harbottz most of the cases of Tuberculous Tuberculosis in patients
with lymph node involvement are derived from injection of the
lymph nodes either by direct perforation or by spread into the
lung or by hematogenous invasion.

**Relationship to Tuberculous in lungs and in adult hips.**

Today the pathologists are few who do not believe
that clinical Tuberculosis in adult hips in civilized countries
is with rare exceptions only a recurrence of the infection
acquired in childhood's lymphatic gland injections. Anderson
Andverd, Rome, March and Hamburger and Sir Robert
Phelps are of opinion that much of the Tuberculosis in adults is
a result of Tuberculous infection in childhood when Glandular
Tuberculosis is so frequent. According to Andoverd's
experience only about 20 to 30 per cent of tubercular
infection was due to primary infection, whereas in from 70
to 80 per cent the infection probably began in
childhood.
childhood. Tillisch, while satisfied from clinical experience of the dependence of a certain amount of tuberculosis in adults on infection during childhood, was disappointed by his inability to prove this on the basis of pathological anatomy. Humbly points out, however, that from his first series of cases in 1901-1902 he estimated that from 15 to 20 per cent of all cases of pulmonary tuberculosis in adults arose from tubercle in other organs, particularly the lymph glands by way of the blood. In the later report on lymph-node tuberculosis Humbly found the death rate from tuberculosis was 14.8 per cent and in 18 per cent of those dying the anatomical picture clearly indicated tuberculosis infection in childhood, which corresponds with his earliest observations. Thus tubercle bacilli may live and retain their virulence over long periods of time has been abundantly proved, and lends support to the theory of auto-infection.

There already quoted Sir Robert Philips and Honoro Ellis Woodward on the channels of infection from gland to lung.

With and Robertson say great difference of opinion exists as to the manner of transport of the bacillus to the lung. Thus, although many hold that pulmonary consumption is preceded by cervical gland tuberculosis, the path by which this takes place is stated variously by authors. Thus Biedl and Vokand and Chievì
state that tubercle bacilli pass in the lymph stream through the cervical lymphaticans into the venous system, and thence to the lungs. Others again hold that the bacilli pass from the cervical to the supraclavicular glands, and thence to the apex of the lung (Lyonet, Kubo). Aeprech, Jorjoros, Hyrivity, Welhemininsky and Harbiz consider that tubercle bacilli pass from the cervical glands to the bronchial glands, whence they get into the blood and are carried to the lungs. Whilst the description of anatomists vary considerably with reference to the normal distribution of lymphatic glands and vessels, the recent careful injections made by Most and by Bézïme with the aid of Groton's method go to show that there are not any vessels passing from the cervical to the bronchial glands, and that if injection take place from the cervical glands it must be by way of the cervical lymphatic and superior vena cava. The assertion by Welhemininsky that the bronchial glands receive the lymph of the mesenteric glands is not confirmed by the work of Hank, Dohleker, and Kintamura who have vindicated the position of the bronchial glands as pertaining to the lungs.

**Virgin Races**

"In the Lancet" 10 February 1917 we read: "All recent epidemio-nomological enquiry seems to establish without doubt the fact that the virgin races of mankind are extremely susceptible to tuberculosis, in other words that their power of resistance..."
resistance to the disease have not yet been developed owing to the absence of the hostile organism itself.

In his classic lectures Dr. Robert Koch refers to the negro troops when exposed to infection in the French army from down with glandular tuberculosis.

**Immunity conferred by lymph node tuberculosis.**

In his article on "Tuberculosis of lymph nodes. Their frequent origin and relation to other tuberculous lesions, especially pulmonary tuberculosis," in the Journal of Hygiene, 1907, Francis Harlty says: "It would seem that in about one-fifth of all cases of pulmonary tuberculosis in adults, one can demonstrate anatomic changes which originated early, perhaps most often in childhood and which may have been the cause of later infection, eventually of the process in the lungs—hence upon autoinoculation or endogenous infection or re-infection. If this is the case, does it contravene the modern view that most tuberculosis late in life, for example, in the lungs, kidneys, bones and the joints, has the same origin, especially because earlier infections in childhood were assumed to have left behind a relative immunity or increased resistance to new infection? This would be a hasty and incorrect conclusion because it is only tuberculous infection with marked and advanced anatomic changes that we have considered. The milder latent infections of childhood, demonstrable by angiocardiography..."
systematic observations of lymph nodes, or by tuberculin tests, which are present in most children are not included, and there is no ground to doubt that such infections also influence the organism, possibly in the way of increased resistance."

The mild infections referred to in the last sentence of the preceding paragraph seem to me to be to Tuberculosis what vaccine lymph vaccination is to smallpox.

In this connection Leavitt writes an interesting article in the Journal of the American Medical Association 1917, LXXVIII on "Occurrence in Clinical Tuberculosis of Scars from Tuberculous Lymphadenitis." Scars in the neck due to Tuberculous Lymphadenitis would be found with reasonable frequency in a large series of patients who are suffering from Clinical Tuberculosis. There may be objections that these scars may not be due to Tuberculous disease; but a careful examination and inquiry into the history will exclude some, and the assumption that all are due to Tuberculosis unless definitely proved otherwise will give fair conclusions and will place the errors on the safe side.

In 1916-17 (11/2 years) at Sea View Hospital, Staten Island, New York, 2000 patients with Clinical Tuberculosis were examined for scars in the neck. The entire neck was inspected and palpated and the patient was questioned as to the scars. Of the 2000 there were 1600 who had moderately and for advanced...
pulmonary tuberculosis, and the great majority were far advanced with an unfavorable prognosis. The remaining 400 had incipient (a few per cent, orthopedic, glandular, genito-urinary and surgical tuberculosis. A group such as this is a fairly representative series of the common run of tuberculosis. A group such as this is a fairly representative and it is fair to assume that it should give an idea of how frequently these need scars occurred.

Among the 2000 patients there were 69 with scarred scars. Of these

5 were excluded viz

1 scar followed an operation for very recent

2 scars from birth absence

2 scars during scarlet fever

of the remaining 64.

20 occurred in childhood, their clinical tuberculosis not becoming evident until many years after childhood.

15 were improving; 5 retarding; 12 had

pulmonary tuberculosis; 4 pulmonary and

orthopedic tuberculosis; and 4 orthopedic

tuberculosis.

15 whose scars appeared after childhood and before

the onset of their clinical tuberculosis.

9 were improving; 9 retarding; 16 had

pulmonary tuberculosis; 2 pulmonary and

orthopedic tuberculosis.
9 whose scars occurred after the onset of their clinical tuberculosis.

4 were retrograding; 7 had pulmonary tuberculosis; and 2 pulmonary and orthopædic tuberculosis. "This group impressed the authors as having the poorest prognosis."

17 whose scars occurred at the same time at which their clinical tuberculosis began.

15 were improving; 2 retrograding; 13 had pulmonary tuberculosis; 1 pulmonary and orthopædic tuberculosis; and 3 orthopædic tuberculosis. "This group seemed to have less active tuberculosis and a better prognosis than any of the other groups. It was rather difficult to classify some of these as to their type; and some had cases probably of uncomplicated glandular tuberculosis."

The whole number of patients who had neck scars (64) is 3.2 per cent of the entire group, and it was less than was expected. Slightly more than two-thirds were improving, which is worthy of note when the unfavourable and advanced nature of the great majority of the 2,000 cases is considered. The number of patients who had orthopædic tuberculosis (16) is larger in proportion, since there were only about 250 orthopædic cases in the series."
These observations were made chiefly to learn how many patients with chronic tuberculosis had old cervical scars due to lobar disease which had occurred in childhood. There were 20 that is one per cent of the series. This was also a great deal less than was expected. This is of interest because of the present popular theory of childhood infection of tonsils, adenoids, and others. According to this theory, all tuberculosis has its incidence in childhood. It is primarily a disease of the lymphatic structures in which it is latent until it assumes the characteristic type. The tonsil is a frequent portal of entry for tuberculosis in childhood, and the cervical glands usually derive their infection by way of the tonsils. The tendency of tuberculosis cervical adenitis is to suppurate and thus produce necrotic scars, or if treated surgically to produce scars; and yet only one per cent of 2000 patients with chronic tuberculosis showed this evidence of infection in childhood. There seems like a growing belief among many observers that simple granular tuberculosis in childhood adds resistance to later tuberculosis infection, and that few adults who show this type of tuberculosis. Further, the radical removal of tuberculosis cervical adenitis by surgery has many advocates who consider many of these cases as purely local lesions, which if cured cause the patient little if any further trouble. These findings are in agreement with both of these beliefs, for few
Sears were found, especially childhood scars, and the majority were showing a tendency to improve.

29. In his book on "Bronchitis Tuberculosis lesions in the Child", he writes: "There have also been particularly impressed with the fact that children who suffer from the surgical forms of tuberculosis such as tuberculous glands, joint disease, and lupus, very rarely indeed are attacked even in the late stages of their malady by pulmonary tuberculosis. The lungs may be affected in the course of a general or miliary tuberculosis, but it is rare to see pulmonary tuberculosis associated with surgical tuberculosis. The cause of death in the great majority of these cases is tuberculosis and miliary degeneration. I have come to the conclusion that these two varieties of tuberculosis are antagonistic to each other in the human body, and that children who have suffered from bovine tuberculosis in the form of tuberculous glands, spinal rickets, tuberculous joints, and lupus, are immune... The work of Von Behring and Kussow corroborates this view. The only strain of tubercle bacilli which they found to produce complete immunity in cattle was the human strain, and by using human bacilli they have been able to vaccinate thousands of cattle against bovine tuberculosis. If human bacilli will protect cattle, it is natural to suppose the converse. The bovine bacilli in children will
I quote them again: "human tubercle or phthisis." I give this extract without comment other than the remark that the question of transmissibility of type is still sub judice as far as my information goes.

**Types of Tubercle Bacilli in Mammalian Tuberculosis**

- The Council of 8th February 1917 gave the types of tubercle bacilli in cervical and axillary gland tuberculosis in 102 cases as ascertained by Dr A. Stanley Griffith.

<table>
<thead>
<tr>
<th>Age Periods</th>
<th>Number of Cases</th>
<th>Human TB</th>
<th>Bovine TB</th>
<th>Heifer TB</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 years</td>
<td>14</td>
<td>2</td>
<td>12</td>
<td>-</td>
<td>85.7</td>
</tr>
<tr>
<td>5-10 years</td>
<td>29</td>
<td>10</td>
<td>19</td>
<td>-</td>
<td>68.9</td>
</tr>
<tr>
<td>10-15 years</td>
<td>20</td>
<td>12</td>
<td>7</td>
<td>1</td>
<td>35.0</td>
</tr>
<tr>
<td>15-20 years</td>
<td>18</td>
<td>12</td>
<td>6</td>
<td>-</td>
<td>33.3</td>
</tr>
<tr>
<td>20 years+</td>
<td>21</td>
<td>16</td>
<td>4</td>
<td>1</td>
<td>19.0</td>
</tr>
<tr>
<td>Total</td>
<td>102</td>
<td>52</td>
<td>48</td>
<td>2</td>
<td>47.0</td>
</tr>
</tbody>
</table>

The figures show that in childhood, cervical gland tuberculosis is caused more frequently by the bovine than by the human type of tubercle bacilli. Nearly three quarters (72.1 per cent) of the cases in children under 10 years of age having yielded bovine tubercle bacilli. In persons over 10 years of age, infection of human origin is more common, bovine infection accounting for about a third of the cases in the 10 to 20 years period, and far less than a fifth of the cases in persons over 20 years of age.
Dr. E. C. Choyce in the System of Surgery edited by his pupil results obtained by Dr. J. F. Dobson. Tubercle bacilli of the bovine type as well as of the human type have been isolated from diseased glands. The following table illustrates the frequency of the two varieties (Park):

**Human and Bovine Bacilli in Tuberculous Lymphadenitis**

<table>
<thead>
<tr>
<th>Type</th>
<th>Under 5 years of age</th>
<th>5-10 years</th>
<th>over 16 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>17</td>
<td>37</td>
<td>24</td>
<td>78%</td>
</tr>
<tr>
<td>Bovine</td>
<td>20</td>
<td>20</td>
<td>1</td>
<td>41%</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>57</td>
<td>25</td>
<td>119</td>
</tr>
<tr>
<td>Percentage of bovine infections</td>
<td>34.2%</td>
<td>35.7%</td>
<td>4.0%</td>
<td>34.2%</td>
</tr>
</tbody>
</table>

It has been suggested that one type may after the lapse of time assume the characteristics of the other type, and that individuals infected during infancy with the bovine bacillus may later years show lesions containing bacilli of the human type. It is probable that in the majority of cases of tuberculous cervical adenitis in young children, the infection is derived from tuberculous milk; while in older children, and in adults, it is mainly incurred by the inhalation of dust containing bacilli from dried spumum or from secretions of glandular tissue, the bovine type of bacillus is the one usually found, and the washings of tuberculous milk, butter, or cheese...
Cheese, lumps of, is mainly responsible, in haches, bronchial gland disease. The infection may arise by inhalation of dust containing bacilli, or the disease may be secondary to primary abdominal gland tuberculosis following the ingestion of tuberculous milk, butter, cheese, sausages or...

This thesis emphasizes the fundamental question as to the nature of the origin of the tubercle bacillus for lymphatic tissue, re-infection from the outside and auto-infection of the tuberculous, the different degrees of virulence of the bacillus, of resistance on the part of the host as expressed in the variable course of tuberculosis and others.

But as especially dealt with, subsection I of the following section of my thesis on ‘Treatment’, this study has a direct practical significance as it emphasizes the great importance, immediate and remote, even under the most conservative view, of lymph gland tuberculosis, especially in children, which alone or at least may be prevented by teaching for them, clean food, clean surroundings, and freedom from mixed infant milk; with the tuberculous; and which very often is used by doing everything possible to increase tissue resistance.

Treatment
Treatment

This is capable of a finer field classification:

I Hygienic and dietetic
II Medical
III Tuberculin
IV Roentgen Ray
V Surgical

I Hygienic and dietetic

Consequences should not be dealt with till all local causes of glandular infection have been removed. All sources of toxemia and irritation should be removed as a first step so that the resistance of the tissues may not be lessered, and the danger of a mixed infection be minimised. Attend to a distressed Waldenström's mug by removing adenoids and enucleating the tonsils which often contain Tubercule Bacilli.

Stop or restrict canine teeth. Treat diseases of the pharynx, nose, ears, eyes, throat and skin. As regards the ear pay particular attention to the middle ear, and with reference to the skin treat Eczema, Impetigo, Tuberculous Eruption.

Diagnose early cases of Tertiary Tuberculosis and frequently examine their eruption and remove the patient from contact with tuberculous relatives, nurses, attendants or associates. Infants and young children should be kept away from infectious or doubtful tuberculous individuals. Breast feeding by tuberculous mothers...
mother is undesirable and should be prohibited. Even short periods of exposure to infection should be guarded against.

Avoid contamination of dwelling house, furniture, utensils, and food with spumum or bacilli. As even yet fifteen per cent of all milk delivered in large cities is tuberculous sterile; all milk before use and in the case of infants keep it in Sokshel's bottles.

Clinical evidence is now conclusive to the effect that many cases of glandular tuberculosis are clearly susceptible of rapid and permanent cure through the adoption of an unrestricted out of door existence. This should be combined with every precaution for the mind and body along with amendment to secure elasticity of the bodily frame and buoyancy of mind. As Marcus Patterson states in his book "Auto-Immulation in Pulmonary Tuberculosis," auto-immulation should be produced by means of graduated labour. Excessive auto-immulation as revealed by a record of the temperature, pulse, or respirations should be controlled by means of complete immobilisation. The influence of Rest and Exercise upon the body fluids may be determined by the opsonic index. A medical guide is needed to regulate exercise. Physical exercise promotes activity of the skin, regulates the circulation, increases the power of the respiratory muscles.
muscles and heart; hardens the system, and accelerates nutritional changes. Exercise should comprise walking, riding, and outdoor games of the less violent kind such as golf, bicycling, shooting, and fishing. The more continuous equal activity of which golf is an excellent example, is better than the more irregular and exciting sports such as football or tennis. Swedish movements are of service providing the following points are attended to. The movements must be slow, and regulated by the rate of respiration. The movements must be of definite direction with reference to the production of a healthy form of chest and the correction of existing architectural deformity e.g. Harrington's slacks. The exercise must be taken in the open air or at least in a room with the windows fairly open the individual being lightly clad while exercising, and covered up thereafter. Gymnastics, massage and electricity may be of aid.

Occupation for the mind comprises Reading, Drawing, Chess, Billiards, and other Indoor Games, and Instrumental Music. Life should be one of rest and release from disturbing conditions such as visits of friends and receipt of letters.

Therapy is analgesic, bactericidal, antimicrobial, and produces curative action. Among the first effects which the sun produces on the organism, the first place must be
given to its action on the skin, the organ of absorption and sensation, of nutrition and of secretion, of whose great physiological importance has been unrecognised for
his long. The best techniques for increase of tissue resistance
is to live in the open air and in the sun, the two essentials
for organic growth. Certain precautions must be exercised
in giving the treatment as improperly applied it may
prove not only unsatisfactory but very injurious.

First accustom the patient to life in the open air before
insolation is attempted. This may, take a week or more, all
depending on the patient and the weather. At first place him
in an open porch for an hour or so, gradually increasing
the time till he is practically in the open for twenty-four hours.
Keep a record of the patient's temperature, Respiration,
Pulse, and of the examination of his urine and Blood.
The Real Solar Beach is to be taken not later than half an
hour before or earlier than one hour or better two hours
after a meal, in a recumbent position in bed, on a flat
loung or on the floor. The feet are exposed first without
regard to the site of the lesion. Joints are not to be exposed
to the sun till the whole body has been gradually uncovered.
No breeze is to strike the body. This is secured by wind
screens. Protect the head of the patient by a linen cap
umbrella, or awning at the head of the bed. Shield the
eyes by coloured glasses, or a towel over the eyes and
forehead.
Table showing the progression by which the face and hands are exposed to the sun:

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1st day The feet are exposed and bathed in the sun's rays for five minutes, three or four times at hourly intervals.

2nd day The feet are washed, and the legs from ankle to knee five minutes, three or four times at hourly intervals.

3rd day The feet are washed, the legs from ankle to knee ten minutes, and the thighs five minutes, three or four times at hourly intervals.

4th day The insulation of the previously exposed parts is increased by five minutes, and the abdomen and lumbar region are exposed five minutes, and the head and thorax are exposed three or four times at hourly intervals.

5th day Again the insulation of the previously exposed parts is increased by five minutes, and the chest,
Chest and back are exposed five minutes, three or four times a day at hourly intervals.

6th day. Increase the exposure by five minutes.

The time of exposure is increased daily, according to this ratio, until two or three hours of sun bath is given. If the patient's condition does not allow this schedule to be carried out, expose the front of the body first, and on the 6th day or as soon as he can be turned conveniently, expose the back in accordance with the above schedule.

After the whole body has been insolated, lesions may be covered with a wire screen, so that sun and air may play upon them. The only covering after complete insolation of the body has been reached is a linen cloth, or a wire screen.

From the 10th to the 15th day increase exposure according to the same scale as given in the table above. From the 15th day on, for a maximally exposed portion of the body should receive the same amount of insolation as the least exposed part; increasing the time five minutes daily, till a bath of from three to four hours is taken.

If the discharge is profuse, use frequent light-gauze dressings to catch the discharge.

After each insolation vigorously rub the patient with spirits of camphor to harden the skin. If the skin is sensitive, a rubbing with some vegetable oil such as coconut oil, or olive oil may be given before each exposure.
exposure. If during this preliminary treatment for any reason the sun bath is interrupted, the insolation should be resumed at a stage a little earlier than that at which it was stopped. The Alpine sun lamp is useful in the absence of sunlight.

Great care must be taken while the patient is becoming accustomed to the sun, and during the formation of the first pigment. See that no reaction such as dermatitis, high pulse, rise of temperature, nausea, headache, or constitutional disturbance takes place. See that the patient does not over-expose himself being over-anxious to get as much sun as possible. If there be fever or if the patient be feeble, the time of exposure must be shorter and be most carefully regulated. If there be any reaction, stop the exposure or shorten the time.

Throughout the summer months, sun baths are not given during the hottest hours of the day, as a reaction may occur, due to the depressing and fatiguing effect of the sun's rays at this time of the year.

During the winter months, regardless of the conditions of the sun, if a child looks or feels chilly, he must be taken into a warm room and the treatment discontinued for the time being.

In warm weather children "wear only their tunics" regardless of where they are, whether at play or meals. On pleasant winter days when the wind is not too strong,
The children who can stand exercise may wade in the open for an hour at a time.

After treatment has been taken for some time, and weather conditions are unfavourable for exposure, an air bath may be given, the length of time depending upon the general condition and resisting power of the patient.

As treatment proceeds, the surface of the skin becomes brown, then copper colour, and finally a chocolate brown. By the time pigmentation has reached this stage, the skin has assumed a soft velvety feel and a healthy look. The resistance to bactericidal injection is now most noticeable.

At this stage no cases of skin infection again appear; the inner wounds are healed, although during the summer months the child climbs trees and runs through the woods naked, and has every chance of getting abrasions and cuts.

The favourable progress of the cure is in direct proportion to the intensity of the pigmentation of the skin. The degree of pigmentation is used as an index to prognosis. Many parents report that this treatment looks strange, anemic and emaciated and are often misled. Some are suffering so much pain that they cannot stand even the slightest jar. After a very short period of this treatment, the general condition of the patient improves remarkably. The fever and chills gradually disappear, and usually at the end of ten days the patient is entirely relieved of pain.
pain, we find moreover a return of appetite, an increase in weight and strength, and a better blood condition. Red cells and haemoglobin increase; leucocytes if present becomes reduced; as pigmentation advances, an actual lymphocytosis takes place, eosinophilia is also present to a slight degree, and the patient begins to look like a happy, healthy normal being once more.

The effect upon lymph nodes or glands is a gradual reduction of their size, and in broken down nodes their contents are often absorbed.

Aerotherapy. If the patient cannot carry out this treatment at home, a maximum of pure air, efficient ventilation in bed away from dustless rooms both by day and night, treatment at an institution such as Sanatorium or Farm Colony should be recommended.

The clothing of the patient should be warm yet light. The should wear woollen garments, e.g., the and wool clothing, next the skin, woollen socks or stockings and thick boots.

Expiratory Sphincter: According to Kappeler, sponging of the whole body with soft soap has a good effect. In weakly anemic children adopt dry sponging of the body once or twice a day from ten to twenty minutes at a time. After several weeks or months they begin sponging. When the general condition has considerably improved try cold sponging; and finally a regular morning.
morning dip in cold water, or a cold shower bath, the
shortens the better. This line of treatment is known as Bratton's
therapy.

Climate change and change of environment have often
by my knowledge resulted in the disappearance of glandular
swellings. Brannan, last advocate the seaside; Beulah,
Moore, Freeman report quiescent and results in inland
cliniques. Sir Robert Philp classifies climatic health resorts
as follows:

i. Seacoast and seavoyages with maximum sunlight,
pure air, ozone, and a relatively equable
temperature.

ii. Seacoast cliniques with sunlight and dry pure air

iii. Medium elevation - forest and woodland. Height
fifty to one thousand five hundred feet. Pure
air and shelter from wind.

iv. Mountains. Height from one thousand five hundred
to five thousand or six thousand feet. Pure
air. Rarity of atmosphere. Dry. Lack. With
sheme chillness.

But fresh air and the open air life can be secured at
home without the drawbacks of inconveniences in a
changeable land.

Diets: Children have an intolerance for fats, so
avoid fatty foods, especially fat contained in
meat.
milk. In sucklings reduce the fat in the mother's diet, lessen the number of times of feeding, partially replace the mother's food by artificial food poor in fats and rich in carbohydrates. From the first year limit the milk to one pint daily and in its place give fresh green vegetables, potatoes, white bread, rice, fresh fruit, and some meat. Eggs are unadvised because of the fat in the yolk. Lessen the butter given.

In older children and adults three meals a day should suffice viz: a formal Breakfast, Dinner, and Tea. Between Breakfast and Dinner a cup of soup or warm milk maybe given, and similarly at bedtime. Milk should be allowed freely throughout.

With the purity of the milk and meat supplies.

Secure rest before and after meals. Yrri Milk, Cream, Butter, Fat, Bacon.

As stimulant, when recommended by the doctor use Ale or Stout.

Zymotherapy: Richet and Herron's claim excellent results from zymotherapy. They find that the beneficial effect of raw meat juice is due to the muscle plasma: and they are inclined to attribute this to a special tonic action on the nervous system. Sir Robert Gifford has also reported good results from the use of raw meat. He says: Zymotherapy, or the systematic exhibition of
raw meat, is a therapeutic as well as a dietetic procedure. Form and dosage require to be regulated as we regulate the exhibition of other therapeutic agents. It has been shown conclusively in the case of dogs intoxicated artificially with typhoidosis, that such animals when fed in the ordinary way undergo progressive emaciation, while those fed on raw meat put on weight more or less rapidly. To be efficacious, the doses of raw meat must be sufficient in proportion to the weight of the animal. Under these conditions, raw meat treatment is effective even when the animals seem in extremis. Cooked meat has been found of no value in the case of typhoid dogs. Pepsinotherapy is thus something more than a question of ration feeding. When systematically pursued, there follow increase of nitrogen retention, improvement in intestinal metabolism, an increase in haemoglobin, and a striking increase in destructive leukocytes (lymphocytosis).

Raw meat may be exhibited in several ways:

(1) Pounded raw meat i.e. finely minced or brined fresh beef (mutton may be used if preferred), seasoned with salt as according to taste, served natural, like mince collops, hot or gently warmed throughout, half a pound twice or three times daily. The meat may be served with salad or along with aspic jelly, or in a variety of other ways.
(2) Beef juice prepared as follows: Boil half a pound of meat in half a pint of cold water plus half a teaspoonful of salt, for one and a half to two hours at 100° F. Express the liquid through a cloth, and serve. Or, the juice may be squeezed from the meat directly by more powerful pressure, without the addition of water. Worcester sauce or other flavouring agent may be added.

(3) Raw meat soup, prepared as follows: Take half a pound of finely mince (nected meat and mix in a bowl with sufficient milk to produce a thick, uniform paste. Immediately before serving, add half a pint of milk at 150° F. In place of milk, the soup may be made in similar fashion with stock of beef, chicken, veal or mutton.

In all cases, the meat should be as fresh as possible. Beef juice especially must be freshly prepared immediately before use. Prepared juice speedily undergoes changes which both detract from its value and tend to irritate the gastro-intestinal tract.

In the same dietician category may be included raw eggs. The patient's meal may be prepared with one, two, or three eggs — nature — swallowed like oysters. The eggs should be quite fresh, ie. newly laid. They should not be boiled or mixed with milk, or other ingredients, apart from a sprinkling of pepper or salt.
In cold weather the chill is better taken off with one or two preparations
by gentle friction to warm just before use.

II Medicinal

As Allbutt and Rolleston put it: "Drugs have
all passed through the successive stages of exaggerated
and heartless denunciation, helpful and contumacious neglect."

For many years the purely medicinal treatment of glandular
adenopathies has revolved largely to the administration of lodide
of iron and colloid oil. Without detracting from the use
of a valuable agent, in a large majority of cases it is, nevertheless true that the benefits to be derived from
their use is decidedly inferior to the results afforded by
general symptomatic management. Medicinal agents of any
kind are not indicated invariably in these cases, and
when employed at all, should not be prescribed in accordance
with a conventional or routine method. Attention to
digestion is of the utmost importance. The correction of
disturbances through dietary precautions and
medicinal aids is of much more value than the
administration of lodide oil, arsenic, or the ferruginous
tonics.

Arsenic may be given in pill containing one sixteenth
of a grain of acid arsentic, or in the form of
arsenious acetate of sodium one fourth of a grain sub.

- Enema usually
- internationally, or as an elixir; or arsenic may be
  given in two minute doses three a day, freely divided
  and taken forty food of Fowler's solution. It must be
  continued for long periods and pushed to the point of
  tolerance.

It is excellent practice to use the derivate of iron alternately
occasionally with Fowler's solution given until toward the
limit of tolerance as stated above.

The various prepnors of iron, Manganese, lobvive oil, or easily digested fats are often of undoubted
value provided that appetite and digestion are not
impaired. Aids to nutrition in this, as in other forms
of tuberculosis, may be expected to increase vital
resistance which is the aim of the physician.

Sugar no drug can be considered to be a specific.
Therefore increase the resisting power of the patient so
as to put him in the best condition to withstand the
inroads of the disease.

III Tuberculin

Last spring at the Edinburgh Royal Infirmary Sir
Robert Chalmers gave a demonstration to members of the
British Medical Association of a number of patients
who had been or were suffering from tuberculosis of
glands who had been cured, and still under treatment
but improving under the treatment by injection of
of Tuberculin. The ointment he uses is known as Moro's ointment. Tuberculin is readily absorbed by the skin and may be conveniently applied in an oily medium. Thus, using preferably Koch's original Tuberculin:

Tuberculin: 1 part
Lanolin: 1 part

Music Van

4. For external use

It is not necessary that the ointment be applied directly on the affected gland or glands. In fact, in Sir Robert Philips's cases it was never applied over the glands, but in the infraclavicular regions of the chest or at the back between the vertebral column and the spines of the scapulae. Striking and satisfactory results were demonstrated from its prolonged use.

At Gaya, India, I obtained satisfactory results from the subcutaneous injection of Tuberculin 13E (Bacillary Emulsion). This Tuberculin was suitably diluted with normal saline to which half per cent phenol was added for conservation, and put up in Burroughs Wellcome and Company's tuberculin phials with rubber tops after the sterilization. Had six bottles viz.

1 1/2 D1 dilution 1 in 10 = 0.1 cc Tuberculin
1 cc D2 dilution 1 in 100 = 0.01 cc "
1 cc D3 dilution 1 in 1000 = 0.001 cc "
1 cc D₄ dilution 1/i,100,000 = 0.0001 cc Tuberculin
1 cc D₅ dilution 1/i,100,000 = 0.00001 cc
1 cc D₆ dilution 1/i,1000,000 = 0.000001 cc

I generally began with 0.2 of phial D₆ and went up by 0.2 once or twice a week according to the reaction produced.

39. Nathan Raw says: "With regard to the present treatment of various forms of glandular tuberculosis in children, I am glad to report that since the routine treatment by tuberculin has been adopted we have observed most gratifying and beneficial results. The improvement which follows tuberculin is most marked in tuberculous glands which readily soften, and in many cases ultimately disappear. I have found however that it is not desirable to inject tuberculin where the glands are encapsulated or inflamed."

Though not falling under the head of therapeutic treatment, I would quote again from Dr. Raw regarding the prophylactic treatment with tuberculin: "Regarding what is perhaps the most important aspect of this problem - namely, the vaccination of children against tuberculosis not much has at present been done. I have vaccinated several children with small doses of Boebeck tuberculin, with the object of producing immunity against infection of human origin. All these cases were children of tuberculous parents, who had been
exposed to inoculation at home. So far, none of them have
developed tuberculosis; but of course, it is too soon yet to
draw any conclusions."

Dr. C. C. Choyce says: "I have had an extensive experience
of the treatment of tuberculous adenitis with tuberculin, and
am firmly convinced of its great value in the early stages of
the disease. Abscesses and sinusae will not clear up under
tuberculin, nor is it, as a rule, of value where there is much
carcinoma. But pain and fluctuating glands, even though of
considerable size, will often disappear very quickly indeed.
It is not necessary to insist on the dosage of tuberculin by
estimations of the opsonic index. The method of administration
adopted is that of small doses at long intervals. The dose
at the commencement of the course of inoculation should be
not more than one-fifth thousandths of a milligram of
the Baricillin emulsion for a child, and may be increased
gradually to one thousandth of a milligram, though very
good results have been met with in cases where the dose
has never exceeded one-fifth thousandths of a milligram.
The tuberculin is given hypodermically once in ten or
fourteen days. In very young children it may be given
by the mouth in the early morning, when the stomach
is empty, and a slightly larger dose may then be
employed. By administering tuberculin in such
doses and at such long intervals no harm can be
done.
At Paris after repeated operations chiefly for
soreness in a case of a Bengalee lady suffering from
lymphatic tuberculosis, I used Tuberculin with the result
that the sores healed, the general condition improved
and no more operations were needed.

Dr. Ronney says "The administration of the bacillary
emulsion of both to cases of lymphatic tuberculosis opens an
entirely new therapeutic field and is, perhaps, destined
to yield gratifying results in many cases thus far but
little amenable to management. Wright's work adds con-
firmation to the value of this agent as applied to nearly all
cases of "surgical" tuberculosis. Although his reported
results suggest the predominant value of the new
tuberculin in cases presenting a localized form of
tuberculous infection, no in tuberculous bones and
joints, highly satisfactory results are sometimes
obtained in carefully selected cases of pulmonary tuber-
culosis."

With the aid of the
Reactive Emulsion to the uracumetaplasia of the
phlegm, the failure of children afflicted with
enlargement of mediastinal and mesenteric glands is
rendered somewhat brighter. After a provisional
establishment of the diagnosis by the subjective and
objective signs, together with the use of the X-Rays,
ample
ample justification is afforded for the continuance of the administration of the tuberculin.

I would only note in passing, that to qualify tuberculosis as Medical and Surgical is not scientific.

**Roentgen Ray**

X-rays stimulate the growth of connective tissue, destroying rapidly developing giant cells and releasing the tubercle bacilli; expose them to the destructive action of the leucocytes, are believed to produce pathological changes, raise the leucocytic index as treatment progresses, destroys tuberculous granulation tissue, and stimulates an amount of reaction in surrounding tissues.

As I have no personal experience of this line of treatment I shall reproduce Dr Martin Berry's excellent article on "X-Ray Treatment of Tuberculous Cysts," the best article I have read on the subject.

Dr Berry does not know of any published list of results comprising sufficient cases from which to draw definite conclusions as to percentage of cures; he believes, however, that X-Ray treatment efficiently applied will show promising results in those of treatment T, IV, IT, and V.

It is advisable in cases undergoing a course of X-ray treatment to combine with it such medicinal or general measures as may be indicated, for by this means the prognosis is considerably improved. Fresh air and good nourishing food should be ordered, and, in particular,
particularly, the state of the blood should be kept as nearly normal as possible. It has been shown by Knox in cases of malignant disease submitted to irradiation therapy that the response to such treatment is more rapid and more lasting in cases where the red corpuscle count and the haemoglobin content remain high than in those cases where they are low. If, as some contend, a large proportion of the benefit resulting from X-Rays is due to the secondary radiations received in the tissues, then the haemoglobin content of the blood becomes of extreme importance, since this is the solvent most likely, by virtue of its iron, to give rise to useful secondary radiations, and therefore any measures directed towards keeping up the haemoglobin will definitely influence the response to X-Ray treatment in addition to improving prognosis by the better general health resulting from such measures.

It may be asked, what cases of tuberculosis are suitable for X-Ray treatment? And the answer may confidently be given that in no case is it contraindicated. It may be necessary in some cases to combine operative with radiative treatment, but if so the result will be better than if operative treatment alone is used. If any gland breaks down and suppurates it is obvious that an outlet for the pus must be made, and it is found that if efficient X-Ray treatment be given before the
The inclusion is made a protective barrier will be set up around the broken down gland, thus allowing the pus to be evacuated through a much smaller opening, and leaving a less objectionable scar than if no evacuation be used, also any scar tissue which may already be present as the result of previous operation or abscess will be softened. Reference to this point will be found later among the case notes.

Another class of case which comes for treatment is that in which discharging sinuses already exist, either from bursting of a tuberculous abscess by natural means, or sometimes is surprising how rapidly old sinuses may be healed by X-Rays, and illustrative cases will be found at the end of this section.

In considering the action of X-Rays on the body one must not lose sight of the fact that the response is both local and general, and may be due to both chemical and histological factors. We know of many chemical changes induced in vitro by X-Rays and, in fact, many of these changes every time we take a radiograph. The chemical changes induced in the human organism are more complicated and not yet so well known. It is not the purpose of this article to enter into them at the present time, but probably they exercise a profound influence on the
Course of the case.

The normal tissues of the body vary greatly in their susceptibility to irradiation, the lymphoid and glandular structures exhibiting a much greater response than any other tissues. In general it may be stated that young and actively growing cells are much more influenced than are those which have become mature and reached their fixed state. To this, in part, is due the selective action of X-rays. Experiments by Penhaé illustrated the effect of X-rays on actively dividing cells. He irradiated developing ova, and found considerable retardation of development in those submitted to radiation when compared with control specimens which had not been irradiated. The dosage, however, was considerably in excess of that used therapeutically. Laboratory cultures of organisms also seem to require longer doses than are usually used therapeutically before they show any material change. But it must not be forgotten that the action of X-rays is not entirely limited to their inhibitory action on the infected foci; they stimulate the surrounding healthy cells and the blood to reach the influence of the wounded organism.

In small doses the action of X-rays is curative; in large doses it is destructive, and great caution must be exercised lest healthy tissues be damaged in an attempt to destroy an
an injected focus. The effect of a dose may vary from
eight transient erythema of the skin surface to a deep and
spreading ulceration in the case of greatly excessive over-
doage. In the smaller doses formation of anti-toxins is
stimulated, and these not only act locally, but are
carried by the blood stream to all parts of the body, there
to exercise their beneficial influence.记载 on record
in which lesions have removed from the irradiated area
have cleared up during the course of treatment.

The response of enlarged glands to treatment varies
widely according to the cause of the enlargement. Simple
inflammatory glands respond very rapidly, unless pus be
present. Lymphadenoma reacts rapidly, but shows a
marked tendency to recurrence. Sarcomatous glands
diminishing in size much more rapidly than carcinomatous.
Tuberculous glands usually react fairly slowly, but do
not show the tendency to enlarge again, which is seen in
lymphadenoma.

The common position in which we find tuberc-
ulous glands is the neck, and we must remember that in
the vast majority of cases the injection is not pure, but is
complicated by various septic organisms derived from the
mouth or other areas drained by the lymph vessels of the
chain. This explains the different response to treatment:
deserved in different cases, and even in the same case.
the proportions of the various secrections in different glands may not be the same. In some cases which come for treatment with many glands enlarged all of them disappear, except one which resists treatment, and may either remain enlarged and hard or break down and disappear, whilst the others clear up normally. Examples of this will be found amongst the case reports.

In presenting the details of a course of treatment there are several points to be borne in mind, chief amongst them are the nature of the ray to be used, the degree ofillation, the size of the dose, and the intervals between doses. It is not sufficient merely to say "X-ray treatment"; but attention must be paid to details, if success is to be attained. Brief comments on these points may be made here.

The Nature of the Ray

X-rays are either vibrations analogous to light rays, but of much shorter wave length and correspondingly higher frequency of vibration. The rays of short length and high frequency are called "hard", and are more penetrating than the rays of greater length and lower frequency, which we call "soft". The hard rays are used for treating deeper lesions, whilst the soft ones are useful for cutaneous affections. The great difference between these extremes will be best appreciated by comparison with light rays. The range of X-rays which we use in medicine
medicine extends over considerably more than an octave; that is to say, the soft rays have more than double the wave length of the hard rays. In the case of light, the interval between the extreme red and violet ends of the visible spectrum is less than an octave, so that the range of X-rays which we use is considerably greater than that included in the entire visible spectrum of light.

The effect of filtration

A beam of X-rays passing through any material suffers partial absorption, with the result that the emergent beam is less powerful than the incident. The softer rays are absorbed to a greater extent than the harder, so that the average hardness of a heterogeneous beam, such as is emitted by an X-ray tube, is increased by passing through any material. We make use of this fact in treatment by causing the beam of rays to pass through such a filtering material as aluminium before reaching the patient. By this means we cut out the softer rays in proportion varying with the thickness of our filter and thus enable larger doses to be given to the deeper tissues of the patient. It must be remembered that the limit of dosage which we can give is determined by the skin reaction provoked in the patient, and the soft rays give a more intense skin reaction than do the hard ones; at the same time the soft rays are so much
much absorbed in the more superficial tissues than they do not reach the deeper structures in quantity sufficient to give us the effect we desire. On both of these grounds we follow out the soft rays when treating the deeper structures. But this will be found in the case notes as to the degree of filtration used.

...The profound influence exercised by the quality of the ray and the degree of filtration on the dose received by the deeper tissues was shown by experiments of Guénieminist. A single example taken from his experiments will suffice to show the importance of these points. By varying the quality of the ray, without using any filter, the tissues at a depth of three millimetres from the skin surface would be made to receive from thirteen to forty-two per cent of the skin dose, and then, by introducing filters of aluminium up to five millimetres thick, the percentage rose to sixty-seven — in other words, the dose received at this depth with hard unfiltered rays was more than five times that given when soft unfiltered rays were used. The skin dose in each case being the same.

...The size and frequency of the dose

These can only be determined for each case individually. Broadly speaking, we may give large doses at intervals of about three weeks, or smaller doses at shorter intervals. Some cases do better on one method and some on the other. Both are included in the case reports.

... case 1.
Case 1: Female aged 35. Enlarged glands in both sides of neck.
Duration: Some years. Treatment: Doses of medicine size:
intermediate between doses a fortnight. Filtered 3 millimetres of:
aluminium. Eleven doses given to right side, and twelve to left.

Case 2: Female aged 21. Enlarged glands in
right side of neck, anterior and posterior. Duration: Two years.
Sometimes a dull ache, and dysphonia on excitation. Glands
hard and freely mobile. Treatment: Three quarters of a
full dose given through 3 millimetres of aluminium at each
treatment. All taken at anterior and posterior triangles. One
treatment each week, so that each area was treated once a
fortnight. Twelve doses in all were given, and the glands
had entirely disappeared at the end of the course.

Case 3: Male aged 26. Masses of enlarged
glands in each side of neck and under chin. Glands enlarged
in both anterior and posterior triangles, also one in the
right axilla. All glands mobile on palpation. Duration:
Three and a half years. Treatment: In all 24 doses were
given. Each was just a full dose, and was filtered through
3 millimetres of aluminium. Different areas were treated
at each sitting, and it was arranged that no area was
irradiated at intervals of less than a fortnight and
sometimes three weeks. At the end of the course all
glands had entirely disappeared, except one which
remained
remained quite palpable under the chin after considerably diminishing in size. It had been stationary for some time, and gave rise to no symptoms. In this case the glands responded to treatment very well. Even that under the chin became much smaller, but could not be cured entirely. If this had caused any trouble it could have been removed surgically after inflammation quieted down, as it was by this time, small, hard, and freely mobile.

Case 4: Female aged 28. Several enlarged glands around the angle of the lower jaw. Old operation scar in this region, discharging sinus below and behind the scar. Right posterior cervical glands also enlarged. Treatment: 15 doses given at weekly intervals, each dose slightly over half the maximum, total 3 1/2 millimoles of aluminium. At the end of treatment sinus had been completely healed for several weeks, and all glands had entirely disappeared except a single small discrete one, which apparently was inactive. The case illustrates healing of a sinus under treatment, and persistence of one gland, whilst all the others disappeared.

Case 5: Male aged 8. Enlarged glands on both sides of neck. Treatment: Thirty-glass doses at intervals of about a fortnight and sometimes three weeks. Total 5 millimoles of aluminium. Doses given to each side of neck. At the end of treatment glands were scarcely palpable, and there had been no remission.
recurrence 4 months later. This case reacted rapidly to treatment and there was no breaking down, though children as a general rule show much greater tendency to suppuration than do adults.

**Case 6:** Female aged 19. Enlarged glands in right side of neck. Treatment: At first very small; highly filtered doses were given, and of these 19 were administered during a period of 24 months. Following this the dose and filtration were increased, and a further 7 doses given. At the end of treatment the glands were markedly reduced in size, but had not entirely disappeared. When seen again 8 months later the condition was unchanged. This case illustrates a type of gland more resistant to the rays, and success was not complete, but the condition was much improved.

**Case 7:** Female aged 17. Enlarged glands in left side of neck, that in operation 6 weeks ago had several enlarged glands still present. Treatment: Fancy four doses at intervals of three weeks. Filtration 3 1/2 millimetres of aluminium. 8 doses quin. Seen 6 months after end of treatment, when only one very small and discrete gland was palpable. This case illustrates visceralisation following operation clearing up glands which had not been removed.

**Case 8:** Female aged 20. Enlarged glands on left side of neck. There was a very long history in this case. The glands had been enlarged since childhood.
Two years ago the tonsils were removed. Whilst doing V.A.3 work she contracted a septic skin condition on her hands, for which she had about 40 injections of colloidal manganese. The skin condition improved, but the glands became further enlarged. Radiographic examination showed enlarged glands in each side of the neck, more numerous on the left side. Also tuberculous areas in the upper lobes of the lungs, especially on the left side. When first seen it was apparent that one gland just under the lower margin of the jaw would break down, and it was decided to direct treatment towards building up a barrier round the gland, so that it might be opened by a small puncture. After 5 moderate doses of X-ray, internal through a 3 millimetre filter of aluminium, this puncture was made and pus extracted. The dose was now increased, and 7 further applications given, supplemented by 3 applications of high frequency. At the end of the course the sinus was healed, and the glands only just palpable. The scar of the puncture was barely visible.

This case illustrates several points - building up a barrier around a breaking down gland, opening by small puncture, healing of the sinus, and minimal scar formation. It was not possible to render the glands totally unpalpable since many of them were already calcified.

Case 9: Female aged 15. This case is not one of tuberculous glands, but it illustrates the healing of a sinus.
tuberculosis by X-rays. A tuberculous process had been opened in the bullet, and the patient came for treatment with two discharging openings. After 5 small doses of radium needles through a 5 mm. needle, the wounds had entirely healed.

Case 10: Male aged 24. This case again illustrates healing of tuberculous sinuses. It was a case of tuberculous lumbosacral vertebrae. Lumbosacral abscess formed and was aspirated twice. Following this an Albee graft was inserted, after which the process wasthree more aspirations, and finally burst. The patient came for treatment with discharging sinuses. Very small, heavily filtered doses were given twice a week until 21 doses had been administered. At the end of the course the sinuses were healed, and remained healed two months later. The patient at this time being able to walk fairly well.

It would be possible to multiply cases and instances, but sufficient has been said to indicate the position occupied by Radiolitics in the Treatment of Tuberculous Glands and Sinuses. It is not contended that X-rays are invariably successful, but a large proportion of cases derive considerable benefit, and many are entirely cured. As irradiation does not prevent operation being performed subsequently, and, indeed, often renders such operation more easy of performance, it appears that X-rays should be tried.
found before resorting to the very wide dissection and
evisceration which operation entails. In the case reports
no attempt has been made to select only cases which were
entirely favourable, but to portray cases of each type.

\[ \text{\textbf{Surgical}} \]

Objections to surgical interference:

i. There is ample evidence to show that in many
cases tubercular glands after reaching a certain stage, may
completely subside and in a sense disappear. This process
points to a natural resistance on the part of the tissues and
to a power to overcome the onslaught and destraining influ-
ence of the tubercle bacillus. Before therefore deciding
on operative interference, every effort should be put forth to
increase the normal vital resisting powers of the body. We
may know our efforts are succeeding not only by the gradual
diminution of the glandular masses, but by what is always
do favorably significant in tubercular disease anywhere
in the body, an increase in body weight and muscular
tone, and general constitutional improvement.

ii. The tuberculous infection may be more widely
diffused than is superficially evident, and in spite of a
successful operation, structures formerly quiescent come
to the front in due time and present themselves in the
neighborhood of the former site. The percentage of
recurrences varies from about twenty to sixty.
as reported by several observers. The return is not always
the fault of the operator, nor is it necessarily dependent on an
impaired condition of the patient.

iii. Operative interference may lead to a dissemina-
tion of the bacilli to other parts than the part operated on,
leading to a tuberculous cellulitis, meningitis, dural
meningitis, tuberculous or a general infection or infection in
distant organs.

iv. Tuberculosis being a constitutional disease with
local manifestations, operation should not be undertaken
in the presence of active tuberculous disease elsewhere in the
body as in the intestines or lungs.

v. It has also to be noted, not without grounds,
that extensive splenectomy, resections, produce a marked
diminution of the circulation of the organism as
shown by a very positive Von Pirquet Reaction. And thereby
open the way to fresh infection.

Encouragements to Surgical Action:

i. It is generally believed that clinical tubercu-
losis of adult life is a recurrence or reawakening of
infection contracted in childhood. As Maynard says,
"if arguments were needed in favour of the probable
virulence of secreting tuberculous glands, they are to
be found in the fact that existent tubercle bacilli
frequently lie latent in glands, which have even become
calcaneous."
calcaneous. Rubinovitch investigated four such cases of apparently quiescent salivary glands. Although the microscope would detect no micro-organisms, guinea pigs and rabbits, when subcutaneously injected with these glands became extensively infected.

ii. Proven after an analysis of the statistics of several clinicians reports that pulmonary tuberculosis developed in seventy-five per cent of all unoperated cases, and in less than fifteen per cent of those who underwent excision of glands. The percentage is higher than in normally.

The conclusions of other observers hardly bear witness to these results, but the evidence remains irrefutable that the proportion of cases developing other foci of tuberculous infection is much larger in patients denied the benefit of active surgical interference.

Counter irritation by instillments or eliminatory solutions containing preparations of iodine, Echsholz and Raventost are of schematic doubtful utility and quite un-sustained by practical results.

Message of the glands is "unworthy of other than condemnatory mention".

Electrolysis has been found "uniformly ineffective." Aspiration of the fluid contents works, with or without the later injections of various preparations such as lodoform and ether, echthiosis of..
Simple Incision is indicated in cases of acute glandular tuberculosis exhibiting unmistakable evidences of softening. As soon as suppuration occurs and is rendered possible of detection by fluctuation, the abscess however small should be opened. The incision should be of no greater length than necessary to ensure complete evacuation of the pus and subsequent drainage. The knife should not be inserted too far into the tissues of the neck. Either a pair of blunt-pointed scissors or a grooved director should penetrate the fascia in a search for the suppurating cavity. After the incision of the incisor or forceps into the abscess, the fascia should be torn and stretched by withdrawing the instrument opened, thus avoiding the danger of injuring the immediate structures.

Enucleation is sometimes employed especially in cases of large abscess formation and is particularly applicable to gland sinusces with a probable mixed infection. When prolonged anesthesia and radical surgical intervention is preceded by the general condition of the patient, it is occasionally permissible to attempt the disintegration of glands by this process, the results varying according to the thoroughness with which the glandular tissue is scraped away. To remove this entirely without penetrating the adherent
adherent capsule is well nigh impossible, while considerable trauma may result, not only involving possible injury to immediate blood vessels, but also producing rapid extension of the tuberculous infection to other parts.

Mayo recommends the application of iodine solution or tincture of iodine following excision and treatment and an immediate closure of the incision in order to avoid prolonged drainage. Sutures are stimulated with tincture or tincture of iodine in order to effect as complete sterilization as possible. In many cases it is sufficient to pack lightly the cavity with iodine gauze for a few days. The operation is simple, necessitates but a small incision. There is but little danger of penetrating the capsule and injuring veins, arteries or nerves, provided a blunt spoon curette is employed. The deficiencies of the operation relate to its unreliability and the possibility of further tuberculous infection.

Total excision of tuberculous glands is, in the majority of instances, the operation of choice. Excision of tuberculous glands of the neck is an operation which, as Sir W. H. I. Balfour has said, "is performed too seldom rather than too frequently, and which moreover, is often too long postponed." It should be attempted if three months of treatment to increase the tissue resistance of the patient has not succeeded in eliminating the glandular enlargements.
To obtain the best results, with rapidity of healing, absence of a prominent scar (a very minor consideration), and freedom from recurrence the operation should be performed before suppuration has occurred. It is to be advised when more simple measures, including the treatment of any predisposing affection of the mouth or throat, have been tried and have failed to induce repair in the diseased glands, when the affection spreads rather quickly from one gland group to another, and when there is reason to fear suppuration. When abscesses or sinuses have formed, operative treatment is essential. The range of the operation to be performed will depend on the extent of the enlargement and on the presence or absence of an abscess or a sinus. It will generally be found that the disease is much more extensive than would be thought, and, unless a wide excision of the diseased glands is performed, recurrence will probably take place. It is not sufficient to enucleate the largest glands only, and no operation can be considered complete unless a large number of small and slightly affected glands are removed with those more obviously diseased. The best incisions are those running obliquely across the neck in the line of the natural folds of the skin. They form scars which are very slightly noticeable, and which do not tend to stretch. Longitudinal or oblique incisions parallel to the sternum are not to be recommended as they.

Whelan
stretch, and leave very conspicuous scars. A good
mission for extensive cases is that in the form of an inverted J,
through which all the glands of the deep cervical chain can be
reached. The mission should go down to the deep fascia,
and the platysma should be raised with the skin flaps.

For disease of the upper deep cervical glands,
the group which most often requires removal, the best
mission is that which commences one inch behind and
below the tip of the mastoid process, and extends forwards
and downwards to the upper border of the thyroid cartilage.

With adequate retraction, the superficial cervical glands,
all the upper deep cervical glands, and the glands in the
submaxillary triangle can be reached. The mission is
carried down to the sternomastoid muscle, and the external
inguinal vein divided. The external and posterior borders
of the muscle are then defined by incising the deep fascia.
The next step should be to define those important structures
in most danger of division, the internal jugular vein, and
the spinal accessory nerve. The nerve will be found as
it enters the deep eminence of the sternomastoid about one
and a half inches below the tip of the mastoid process. The vein is
exposed in the lower part of the wound at the point where the
sternocleidomastoid crosses it. The operation is then continued by
dissecting the glands upwards and backwards off the
jugular vein. The common facial vein will be exposed
ranging...
running downwards and backwards into the jugular, and should be divided and ligatured. A wound of this vein close to the jugular will give rise to a very troublesome hemorrhage. If the glands are firmly adherent to the jugular vein, it may be necessary to remove a portion of the vein between ligatures. As the dissection proceeds upwards the level of the spinal accessory will be reached and the nerve is carefully exposed. This may be a matter of some difficulty. The glands are then cleared from the deep surface of the sternocleidomastoide, to which they may be adherent. The neck is drawn backwards and separated from the jugular vein, the posterior belly of the digastric, and the parotid gland. The inframandibular branch of the facial nerve is here in some danger of division. It now remains to remove the posterior glands of the upper deep cervical group, which extend backwards behind the sternocleidomastoide towards the trapezius muscle. Numbers of small, slightly elevated glands are found here, which are readily removed from the underlying muscles, there being no important structure in danger. If however, these glands are much enlarged, it may be necessary to extend the incision backwards, or even to turn it a little downwards over the posterior triangle. After the bleeding points have been secured, the platysma is entered with fine bistoury and the skin edges are accurately approximated, a small suction drain is placed and the wound is closed with fine catgut sutures. The neck is wrapped with a bandage.
Intercular drain being left in the lower angle of the wound.
Nichols' clips are convenient, though troublesome to remove in
young children. A large elastic dressing is applied, and the
bandages should enclose the head and the upper part of the
chest. A dressing should be maintained for a few weeks to
give support to the neck and to prevent traction upon the
scar. Throughout the operation care must be taken not to
prevent traction puncture or knot a supporting gland,
as a diffuse fibrousous cellulitis may be the result.

When the submaxillary glands are enlarged
they may be reached by a curved incision from below the
tip of the mastoid process in the hyoid bone and upwards
towards the symphysis menti. This incision does not
allow of removal of the upper deep cervical glands at the
same time, though they are frequently affected; and it is
preferable to make the other incision mentioned above. The
submaxillary lymphatic glands are so closely associated
with the submaxillary gland that it is usually necessary to
remove the latter, the facial artery being tied as it reaches
the gland and again as it crosses the ramus of the mandible.
The infra-mandibular branch of the facial is in danger,
but the hypoglossal nerve is protected by fascia. The
submaxillary glands are excised through a curved incision
midway between the mandible and the hyoid bone. They
are not in contact with any important structures, and
small vessels only are met with.

When the lower deep cervical glands are diseased,
in addition to the upper group, the two oblique incisions
indicated above, or the inverted J incision may be utilized.
The dissection of the upper glands is performed as described,
and, after the mass is free above, it is drawn downwards
behind the sternomastoid and the lower glands are exposed.
The sternomastoid must be retracted forwards and, if
necessary, some of its clavicular fibres divided. This must
be done at some little distance from the clavicle, to allow of
subsequent suturing. At this stage the external jugular vein
should be tied. The mass of glands is separated from the
trapezius and dissected forwards, particular care being
taken of the spinal accessory nerve and of the muscular
branches of the cervical plexus. Sometimes, the tumour
extends under both of the clavicles, and there may be some
difficulty in enucleating its lower end and outer part. When
this has been done the mass is held forwards and separated
from the brachial plexus and from the anterior cervical
muscles. The cords of the plexus and the phrenic's
nerve are protected by a layer of fascia, and should not
be in danger with careful dissection. The anterior and
lower part of the mass remains to be freed. It has no
close relation to the internal jugular and vertebral
veins, and on the left side to the thoracic duct. A
Good
good light, adequate retraction, and a dry wound are necessary at this stage. Glands may be found running down behind the clavicle into the superior mediastinum, and in such case the dissection should not be prolonged. Serious hemorrhages have followed the attempt to enucleate these glands through an incision in the neck. In some cases the enlarged glands will be found continuous with a mass in the axilla. If so, the latter should be removed through a separate incision, and preferably on another occasion. The large wound resulting from this extensive dissection must be drained, as there is a free serosus discharge. The tube may be inserted in the centre of the lower incision or through a separate puncture just above the clavicle.

The superficial cervical glands lying around the upper part of the external jugular vein are sometimes dissected, generally in association with enlargement of the upper deep cervical glands. They are exposed and may be removed through the upper oblique incision.

When the parotid (preauricular) glands are affected they can be removed through a small transverse incision, the greatest care being taken of the facial nerve and its branches.

Tuberculosis of the lateral pharyngeal glands is sometimes the cause of a retropharyngeal abscess. The abscess should be opened from outside rather than through...
Through the pharyngeal wall

**Difficulties and dangers.** With ordinary care and a good knowledge of anatomy, hemorrhage is not a serious danger in these operations. Difficulty arises most frequently from the attempt to remove large glands through an insufficient incision in the skin and fascia, and from operating by blunt dissection with an inadequate view of the field. Small veins passing from the glands to the jugular vein may be divided or torn close to the larger vessel, and the bleeding may be difficult to control unless the parts are kept in clear view. A lateral ligature may be applied to the jugular vein, or a continuous suture of fine catgut inserted when the wound is small, but if extensively wounded or torn the vein should be ligatured above and below. The jugular vein may be torn close to its exit from the jugular foramen, and it may be impossible to control the hemorrhage except by packing with gauze. Bleeding from the common facial vein is apt to be troublesome, but should be avoided if the position of the vein is remembered.

The entry of air into a vein is most likely to take place in the dissection at the root of the neck. When the accident occurs a peculiar hissing noise will be noticed, and the patient may immediately collapse, the pulse fail, the pupils dilate, the face become pale.
and when a large quantity of air has entered, death may be almost immediate. On listening to the heart a peculiar thrumming noise will be heard. In the slighter cases the air contained in the heart is drawn forwards into the capillaries of the lung, and the patient recovers quickly. The accident is to be avoided by sufficient exposure and by careful dissection. Should it occur, the wound should be filled at once with saline solution or sterile water, not with an antiseptic lotion, and the opening in the vein closed by the pressure of the fingers or gauge. The wound is then dried and the aperture in the vein seared with forceps and subsequently ligatured. When the accident is dealt with promptly the patient quickly recovers. In the more severe cases intravenous injections of ether or brandy are given, and the foot of the bed is elevated. If recovery does not occur, undoubtedly the most rational method of treatment would be to perform massage of the heart and attempt to squeeze the air onwards into the pulmonary vessels. This may be done through the diaphragm after making an abdominal incision, the heart being pressed against the chest wall by the hand visible through the abdomen. This method has been found successful in chloroform anaesthesia.

The nerves most likely to be injured are the spinal accessory, particularly in the posterior triangle.
triangle, the facial and its inframandibular branch, and
to a lesser degree the hypoglossal, pneumogastric, sympathetic,
phrenic, muscular branches of the cervical plexus, and
the cords of the brachial plexus. In some cases it is almost
impossible to preserve the spinal accessory, but it is
easily repaired by culture, and recovery of function is the
rule. The facial branch should not be in danger, but the
inframandibular branch is not infrequently wounded in
removing glands adherent to the parotid or in the sub-
maxillary triangle. The lower lip is then gradually paralyzed,
but this always recovers. The superficial branches of the
cervical plexus are, of course, divided in making the
skin incisions; but the resulting anesthesia disappears
in a short time.

When an abscess or sinus is present with a mass of
enlarged glands, it is the practice of some surgeons to
perform excision at once, opening the abscess in the facial
incision, or perhaps after removing an ellipse of damaged
skin, washing away pus and caseous material, scraping
the cavity, and then proceeding to remove the mass of
glands. The objection to this procedure is the risk of
producing a cellulitis of the neck or even of disseminating
the disease. It is better to deal with the abscess or sinus
on the lines indicated below, and to perform excision
as a later date when the wound is almost or entirely healed.
When an abscess or sinus is present without extensive glandular enlargement, the abscess should be opened or the sinus enlarged by a small oblique incision, lancing material and granulation tissue thoroughly scrapped away (care being taken to remove any tonsillar glands lying beneath the fascia), the wound purified with hydrogen peroxide and drained. The patient should then be treated by the methods primarily described, but if further glandular enlargement manifests itself, excision must be performed without delay.

Tuberculous cervical adenitis secondary to tuberculous ulceration of the tonsil, tongue, pharynx, or thyphoidosis or typhus. Tuberculous glandular disease is overshadowed by the primary disease. Its surgical treatment should be limited to opening abscesses as they form.

The axillary, suprascapular, the brachial (a small group of glands lying along the brachial artery), and the axillary glands lying in association with the cephalic vein near its termination, may become diseased in the suppurative condition.

The axillary glands are the most frequently affected. Suppuration occurs here as elsewhere, and the principles of treatment are identical with those adopted in the case of the cervical glands. Excision should be performed at an early date, before abscesses and sinuses form, particularly in those cases where there is a definite local lesion preceding.
The glandular disease. The glands can be readily removed through an incision parallel to and a little behind the anterior fold of the axilla. The Pectoralis Major is retracted, and the glands can then be dissected off the great vessels and nerves. When they are very adherent, or when sinuses are present, the operation may be one of extreme difficulty and it may be necessary to divide some of the fibres of the Pectoralis Major. Care must be taken not to interfere with the nerve supply of the pectoral muscles, or with the nerve of Bell, or the long subscapular nerve. When axillary gland disease is associated with general glandular tuberculous operative treatment is of doubtful value. When sinuses are present they may be enlarged and incised and drained, and they will sometimes heal; but, as a rule, excision of the glands becomes necessary.

Tuberculous disease of the submandibular and brachial glands and of the glands on the cephalic vein is best treated by excision.

The inguinal glands, the glands in the base of the scrotum, and the popliteal glands are the glands most likely to become affected in the lower extremity.

Excision of the inguinal glands should be performed at an early stage before abscesses or sinuses form. A curved flap, with its base at Popper's ligament may be turned upwards, or the glands may be
be exposed by an incision parallel to and a little above the
ligament, and another running downwards from it in the
line of the femoral artery. The whole group of glands is
then dissected off the deep fascia en masse. The superficial
branches of the femoral artery will require ligature, and
in many cases the epigastric vein also. The deep perineal
glands should be examined by opening the crural canal,
and if diseased should be removed.

When the illiac glands, lying to the outer side
of the iliac vessels are affected, they may be removed by
making a transverse incision through the thicken
muscles above Poupart's ligament. The peritoneum is
exposed and the glands brought into view by stripping
it upwards and backwards. A glandular abscess can form
in the illiac fossa as a result of an infected wound of the
lower extremity, without any material enlargement of the
perineal glands, and may be mistaken for a chronic
appendicular abscess or a psoas abscess unless the local
lesion is detected.

When discharge of the glands of the groin is clearly part
of a general glandular affection, it is doubtful whether
surgical intervention is called for, unless suppuration occurs.

The popliteal glands are rarely affected,
but if diseased, may be removed through a longitudinal
incision, the relations of the vessels and nerves being borne
in...
Disease of the Mediastinal and Tracheobronchial Glands is very common, though rarely coming within the province of the surgeon. Suppuration is injurious, but if an abscess forms in the mediastinum it will cause symptoms by pressing on the esophagus, trachea, or bronchi. If an abscess can be recognized (for this a radiograph is almost indispensable) and appears to be within reach, an effort should be made to open and drain it by removing portions of the second, third or fourth costal cartilages and perhaps part of the border of the sternum, or whichever side the abscess appears most prominent. It may be necessary to tie the internal mammary artery, and the position of the large vessels and other structures must be borne in mind. No attempt should be made to scrape the abscess wall or to remove the glands. The cavity is merely opened and drained. Occasionally such an abscess will perforate the chest wall and simulate the abscess from caries of the rib. On opening it an aperture will be found leading into the chest. This may be enlarged by removing a costal cartilage or part of the border of the sternum and the extrathoracic cavity drained. In the after treatment of such a case careful aseptic dressing is essential, and hygienic treatment on the lines already indicated in the section on treatment is of importance. Tuberculin may be of advantage.
Intestinal Meconium Glands

may enter the field of surgical treatment, but many and serious are the complications arising out of the infection of these glands.

The question of excision should only be entertained when the infection can be regarded as primary, no indication of extra-intestinal disease existing in the intestinal or pulmonary tract.

There are certain comparatively simple cases where the removal of one or more glands may be the proper course to pursue as for instance in those cases where a gland, by contracting adhesions, has led to the formation of bands and the consequent stricturening of a loop of intestine. In operating on these cases for the relief of obstruction, it may add but very slightly to the gravity of the operation to remove the gland and so rid the patient of any possibility of the subsequent formation of adhesions from the same source.

There are however cases in which it is more difficult to decide what course to pursue. They occur mostly among adult patients, and present usually great enlargement of one or two glands, which form a tumour like mass within the abdomen. In these cases operations are often undertaken for purely exploratory purposes, and it is not until the part is partly exposed that the true nature of the tumour is revealed. Glands which have themselves, or in conjunction with each other, formed local masses of considerable size,
are likely to contract very intimate adhesions to the overlying peritoneum, so that simple enucleation is im-
possible, and removal could not be undertaken without
leaving away also a considerable part of the mesenteric. The
injury such an operation would be likely to inflict on
posterior of the bowel by interfering with the blood supply,
renders any attempt at excision undesirable. There are
however, not a few cases recorded where it would seem so
of the simple exploration, without any further treatment,
that has been followed by good result. Such success
attended an attempt in case 30 Glasgow Victoria Infirmary
in October 1897. - Enlarged Tubercular Mesenteric Glands:
Exploration Laparotomy; Inoperable. Enlargement
complete disappearance and restoration of gird up to
perfect health.

In further illustration of the rapid disappearance of
Tubercular glands after operation a case recorded by Halsted
- A. E. Halsted "Annals of Surgery" 1906. Vol. X, p. 702 may be referred to. When the abdomen was opened a large
number of enlarged mesenteric glands were found, so
many that it was not thought wise to remove them, some
were as large as a hen's egg. The abdomen was closed, and
the patient recovered after about three months. Three years
after she was operated upon for post-operative hernia. The
opportunity was taken to inspect the abdominal cavity
When it was found that the only evidences of the earlier trouble existed in the form of a small calcareous body resembling a gland. Of equal interest is a similar case recorded by Mr. Arthur in the *Archives of Anatomy and Surgery*, 1906, vol. LXXI, 799, case of a child in whom when the abdomen was opened, among other tubercular lesions was the presence of glandular masses in the mesenteric as large as a pest. Twelve months later the abdomen was reopened for the relief of hypertrophic tuberculous in the iliac and sacral region. It was then found that the lymphatic masses had almost disappeared. We may therefore receive encouragement from the fact that, where removal is not possible, the exploratory efforts may have some beneficial effects in the way of helping towards the future absorption and disappearance of large glandular masses. Such knowledge should further prevent an attempt at excision where any endeavour would be unduly difficult if not actually accompanied with danger.

In adults more than in children there is the possibility of mixed infection of the glands, and this to the extent sometimes of forming abscesses of a more or less sub-acute character. To deal with these by incision or extirpation, partial or complete, is a matter of much anxiety; for unless drainage can be very efficiently secured one is the exclusion of the general peritoneal cavity.
tunity, a supplicative peritonitis may be set up. This accident occurred in a case operated upon by Dr. Von Bruns Beiträge 8, Vol. 390. Oelvi, 1870, p. 430; partial exploration and drainage leading to death from septic peritonitis. Also Dr. Mawland's case, 20 Victoria Infirmary, Glasgow, February 1907, of case of tuberculous glands; mixed injection of mesenteric glands; laparotomy; glands opened and stripped with India-rubber gauge; death from supplicative peritonitis. Monthly and 3A.

If in children all reasonable efforts by constitutional methods have failed to produce any appreciable diminution in a mass of tubercular mesenteric glands, and it seems likely that some of least of the symptoms from which the child suffers are due to the enlarged glands, the question of excision should be raised. In recent years quite successful attempts have been made in this direction. McLaughlin - Ed. the Arch. Annals of Surgery, 1906, Vol. XXVIII.

In the case above quoted, alludes to another, where, in operating upon a child, aged nine years, immensurable enlarged tubercular mesenteric glands were found. Here the operation continued to remove until the child was almost in a state of collapse. The child recovered, and when last heard of was in perfect health.

Roths, 7. M. Retia, Jour. Amer. Med. Assoc., 1903, Vol. XXXII. 70 - Wattle, the case of a child who had been
fevering in appetite, losing in weight and strength, and increasing severity, and having a heightened temperature. A tubercular mesenteric gland could be detected by physical examination. This was removed, and the child, when heard of about six years later, had had no return of the disease.


Vol. XXIX p. 389. At a meeting of the Medical Society of London referred to the fact that he had operated upon four cases of tubercular mesenteric glands. Two of these were removed at some length, and in view of the interest which attaches to the subject they may be briefly described. The first was a case of a boy aged six years, who presented a well defined, somewhat rounded mass in the region of the coecum, about the size of a核桃核. The upper limit reached to the level of the umbilicus, the origin of the mesenteric root, the lower to the level of the duodenum superior pancreas, and the mass to the duodenum. The swelling was definitely movable, particularly upwards. There was some tenderness on palpation, and small nodulations were to be felt on its anterior surface. An incision was made over the swelling, and after stripping off theomentum, which was adherent to the anterior surface, a large rounded mass was found lying in the mesentery, adherent to the coecum, the ascending colon, and partly to the transverse colon. An incision was
was made into the mass, and lesions for escaped; part of the mass was scraped away, and part excised. The cavity left was closed with two rows of silk sutures after thorough irrigation with saline solution. The abdominal wound was closed. The wound healed by first intention, and the boy made a perfect recovery.

In the second case, that of a boy, aged 12 years, there had been a marked previous history of Tubercular Enteritis, or enteritis. On examination of the abdomen a movable tumour of the size of an adult kidney was present in the left groin and epigastrium. On opening the abdomen lesions Tabercular glands in the mesentery were found to form a large tumour which extended into the left hypochondrium and loin. The peritoneal cavity was opened off, and the mesentery excised on both sides, the glands studded out and wrinkled. The abscesses had burrowed extensively. Gauze drains were inserted in each side of the mesentery, and the abdomen was partially closed. The wound healed well, and the boy rapidly improved in health and gained in weight.

In commenting upon these cases, Professor Edward W. Corner Med. for Trans. and 1876, 211 x 211 x 319 - observe:

"From the point of view of abdominal operation it is most important that a tumour. The result of Tabercular lymphocele had one of tuberculous mesenteric gland, the
the injection being from the intestine, perhaps from a tuberculous enteritis: should be distinguished."

Reasoning from what we know of the course sometimes pursued in a wound after the removal of tuberculous glands in the neck, how for want of drainage, some tension, infection, and inflammation we apt to follow, a word of caution will not be out of place in recommending the technique of excision of mesenteric glands. If we are to be encouraged in the radical procedure, it will only be by the most careful attention to detail, so as to avoid the possible septicemia of the peritoneal cavity, either by the contents of the glands or by the devascularized lymphatics which course from the bowel to them.

**Chemotherapy**

As Sir Robert Philip says in his Vees lectures: The value of Tuberculin is great and the outlook as regards cure in cases of Tuberculosis is on chemotherapy lines — in the chemotherapy of something on the lines of 606 and 914 in Syphilis. When little be treated survive and preserve their virulence for a long time in apparently healed lesions, they are not completely encapsulated nor entirely isolated from the host. According to C. E. Scott, E. Fisher and Gilbert, they are held within in a state of minimum activity, a sort of hibernation, in which there is still some physiological exchange between them and the host’s tissue. This view seems more consistent with the current theory, that the existence of such lesions is accompanied by active immunity against a new infection. It also offers some encouragement to our hopes of finding some chemotherapy as the most successful method of chemotherapy in Tuberculosis.

**Summary/Conclusions**
Summary of Conclusions:

1. The tubercle bacillus has a great affinity for lymphoid tissue. The abundance of lymphoid tissue in children renders them particularly susceptible.

2. The lymphatic glands are generally the first to be involved, the first primary signal of a tuberculous infection. Thymus which for the earliest indicative of spreading involvement of lymphatic glands in young children especially from the external thoracic gland to the supraclavicular triangle.

3. The importance of injection by the alimentary and respiratory tracts and especially by the nasopharynx where both lines meet is emphasized.

4. Enlarged glands form a gland index to the health of a community.

5. Early diagnosis and treatment result in a cure and prevent unpleasant sequelae. Early treatment means a good prognosis.

6. Glands apparently healthy have proved to be latent foci by inoculation experiments. Latency of injection lasts for years. Hence in cases of doubt, a tuberculin test and even section of a gland for purposes of histological examination or inoculation experiments is recommended.

7. Tuberculosis being a universal, protean, systemic infection with topical manifestations
litholytic, as in the case of glands the suspensoid of this thesis to bear up as periods of stress and strain in life, secure good food and healthy environments for the people, especially for children, to increase tissue resistance.

vii. Glandular tuberculosis is believed to give an immunity from adult tuberculosis in adult life.

x. Suppurating glands should be excised without delay.

x. Glands manifest a tendency to subside of themselves if tissue resistance be improved. Hence special emphasis is laid on lyseric and dietic treatment. If glandular enlargements do not subside within a reasonable period of time, even if the glands be calcified, as latent loci have been proved to be in them, operate subject to the caustic against and encourage the view of surgical interference advocated in the thesis. Surgical treatment in this thesis. It should however be noted that surgery should be regarded as secondary and only, an adjunct to lyseric, dietic, tuberculin, and x-ray treatment.

xi. Tuberculin has proved a valuable asset to the armamentarium of the specialist in tuberculosis.

xii. No specific thing is known

xiii. Chemotherapy is the hope of the future

xiv. The less well known fact that tuberculosis of glands may be a general disease affecting the whole-
The lymph gland system is elaborated.
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