though later on the spasticity increased, the plantars became bilaterally extensor, with some ataxic nystagmus and some wasting of the extensors in the thigh. The injury appears to have produced some damage, possibly in the spinal cord, damaging his right leg, but beyond that there is a progressive element of nervous disease as shown by the nystagmus and the fibrillary tremor and wasting of the extensor muscles in the right thigh. The absence of anaesthesia and sphincter symptoms might suggest, in view of the wasting and fibrillary tremors, amyotrophic lateral sclerosis, though the ataxic nystagmus is more in favour of disseminated sclerosis. In any case, a progressive nervous disease following immediately upon severe concussion of the spine is evident. A point in favour of the disease being really disseminated sclerosis may be taken to be the presence of trigeminal neuralgia, and, seeing that this had commenced two years before his injury, it is quite possible, if not probable, that disseminated sclerosis was lying latent and was aggravated definitely by the injury.

Case 15.—An interesting case because of its early commencement was that of a man whom I saw in 1920, aged nearly 23. When 8 years old, for three months he suffered with incoordination of both his hands and loss of sensation. He never walked well in the dark, but he was a fair long-distance runner as a boy. Diplopia was first observed when he was 15 years old, but he had no weakness of his legs until three months before I saw him, and five months previously to commencement of the weakness of his legs he had had a bad fall from a horse, and shortly before that a severe blow on his head.

On examination he was a typical case of disseminated sclerosis, ataxic, with bilateral extensor plantars, bladder incontinence, and nystagmus, especially to the right. It seems probable that the two severe blows that he had a few months before the onset of the weakness of the legs aggravated the existing disease and caused it to progress more rapidly.

Case 16.—Another case of trigeminal neuralgia complicating chronic spinal sclerosis I saw in a man, aged 49, who had had a severe fall when bicycle racing, being badly concussed and unconscious for several days. He was laid up for some weeks after this, and his right leg never became quite right again. Five years later he had a fall when out shooting, causing numbness of the legs, which were paralysed for an hour.

The case was mistaken for a pressure paraplegia as a result of the fall, and laminectomy was done, and seven years later trigeminal neuralgia commenced. When I saw him he was very spastic and ataxic, with extensor plantars and absence of abdominal reflexes. The case appears clearly to be one of a chronic spinal sclerosis, possibly disseminated sclerosis, developing as a sequel of severe spinal and cerebral concussions.

Case 17.—A case I saw at St. Mary's in 1919—a man of 36, who, when aged 22, was struck on the head by a falling log of wood, and was unconscious for a quarter of an hour. From then onwards he complained of sensations of weight on the top of his head, though he kept at work for eighteen months. Then one night he had a "stroke," his left arm and leg being paralysed for weeks, and his face drawn over. In two months' time he was better, and was able to return to his work for three months at the time, when the weakness would return, either on the right side or left, accompanied by sphincter trouble. On examination I found spastic paraplegia, with some ataxy of his hands, well-marked nystagmus, extensor plantar reflexes, and ankle-clonus.

This case was clearly one of disseminated sclerosis, which appears to have had its origin in the blow upon the head three years previously. In addition to these cases I have notes of six more hospital cases in which the symptoms in disseminated sclerosis appeared to follow directly after injury, but it is, I think, unnecessary further to labour this point.

Owing to the greater liability of the brain to contusion from injury it is not a matter of surprise to me that cerebro-spinal sclerosis appears to be a far commoner sequel of injury than is tabes or progressive muscular atrophy—degenerative processes almost limited to the spinal cord. The spinal cord is far more carefully protected from injury than is the brain. Hanging suspended by ligaments in a water-jacket contained within a jointed bony tube, which is itself encased in thick musculature, it is not surprising that it is able to withstand moderately severe blows upon the back without gross injury. Severe falls or violent blows can no doubt effect direct damage to the spinal cord itself through all its defences, sometimes by fracturing a vertebra and causing direct contusion of the cord, which may lead to transverse myelitis. Such fractures of a vertebra are to-day more easily demonstrated by improved technique in taking lateral x-ray photographs of the spine. Kümmell's disease has thus been shown to be definitely a fracture of the body of the vertebra and not a shock absorption of the bony tissue due to a blow.

Concussion of the cord, without fracture, sometimes produces immediate symptoms of pins and needles in the arms and hands, hyperaesthesia, and curious sensations like electric shocks on flexing the head. Almost certainly punctiform haemorrhages are produced in this way, the immediate symptoms being aggravated a few days later by oedema secondary to the haemorrhages and contusion. Nerve cells may thus be damaged and then atrophy; and who in our present state of pathological ignorance, I will not say knowledge, can confidently assert that such a process, once started, may not progress, even to a fatal termination?

REFERENCE

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THE TREATMENT OF TUBERCULOSIS OF THE LARYNX*

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The subject of the treatment of tuberculosis of the larynx has in the past been a favourite one at Annual Meetings of the British Medical Association. It was discussed at Manchester in 1929, at Birmingham in 1911, at Leicester in 1905, and at Cheltenham in 1901, and I have no doubt that there have been other discussions of the subject which I have overlooked. The reasons are not far to seek. The subject is one which interests not only the laryngologist, but the physician (particularly if he specializes in diseases of the chest), the tuberculosis officer, the medical officer of health, and last but by no means least, the general practitioner; for the disease is a common one—tuberculosis is the commonest of all specific infections of the larynx—and the last word on its treatment has yet to be said.

According to the last official report¹ the deaths from tuberculosis of the respiratory system in England and Wales in 1931 amounted to 29,658 (in 1921 it was 33,505, and there is apparently a persistent decline in the mortality). The total number of cases in England and Wales of pulmonary tuberculosis on December 31st, 1931, on the registers of notifications kept by medical officers of health, as shown in the returns, was 236,758

* Read in opening a discussion in the Section of Laryngology at the Annual Meeting of the British Medical Association, Dublin, 1933.

(127,006 males and 109,752 females). So that Sir StClair Thomson's rough estimation (167,525) of the number of cases in 1921,² calculated as five people ill with pulmonary tuberculosis for every death from the disease, was a considerable underestimate. Sir StClair Thomson also calculates (supported by Maurice Fishberg³ of America, after the examination of various statistics) that on an average one out of three patients with active phthisis has a laryngeal lesion, which gives the formidable total of 78,919 persons in England and Wales afflicted with tuberculosis of the larynx at one stage or another.

In coming to a conclusion on the value of any method of treatment in disease some control is necessary, and the possibility of spontaneous arrest or cure must be considered. It is interesting, therefore, to look at a paper published in 1922 by I. D. Bronfin and C. Markel.⁴ Their study of 200 cases of pulmonary tuberculosis showed that in 85 per cent. there were pathological changes in the larynx which in at least 63 per cent. in their opinion were tuberculous. It was found that among 139 cases, undergoing little or no treatment, there were only eight showing progress of the disease, whereas thirty-one showed improvement and 100 were stationary. The authors express the opinion that, though subacute or chronic tuberculous laryngitis should be under constant observation, it does not require active treatment in the absence of distressing symptoms.

In gauging the value of any method of treatment the type of case must also be considered carefully. For example, in any study of tuberculosis of the larynx the first work of reference to be examined must be the masterly monograph by Sir StClair Thomson, published in 1924 under the auspices of the Medical Research Council.² Sir StClair Thomson's clinical material, however, belonged to a very restricted group. His patients at Midhurst consisted of comparatively early cases from the middle classes, people who could afford to pay something for their board and treatment—school teachers, post office and bank employees, and clerks, with a sprinkling of clergymen, doctors, Army officers, and their families. Cases which were steadily getting worse were not kept on, and the occasions for post-mortem examinations, he says, were rare. Of 477 cases of laryngeal tuberculosis in ten years at Midhurst 119 were cured, or 24.9 per cent. This may be contrasted with the clinical material in one of the best recent reviews of the subject, by a young American, R. W. Wilkinson.⁵ Wilkinson reported a series of forty-five cases, of which forty-three were in Group III of the Turban-Gerhardt classification (advanced involvement), two were in Group II (severe involvement), and none were in Group I (slight involvement). His patients were seen in general hospitals maintained as public institutions, and the majority of the patients were from the poorer strata of society, including many illiterates. Of his cases four were cured, fourteen improved, sixteen did not improve, and eleven were worse.

The age of the patient is still another factor that must be taken into consideration. Over the age of 40 pulmonary tuberculosis is a relatively benign disease, and in my experience almost any method of treating tuberculosis of the larynx gives better results in patients over 40 than under 40; but after 55 the results are worse again.

ARTIFICIAL PNEUMOTHORAX

In the treatment of pulmonary tuberculosis the greatest advance—Sir James Kingston Fowler⁶ called it in 1921 the only advance—since the introduction of sanatorium treatment has been the employment of the method known as artificial pneumothorax, which consists in inflating the pleural space of the affected or more affected lung with air, thus resting the diseased lung as a splint rests a tuberculous joint. Artificial pneumothorax has been

practised on an increasing scale in the past fifteen years, but most authorities consider its induction unjustifiable without a preliminary trial of pure sanatorium treatment. Cedric Shaw⁷ has recently, however, made a plea for pneumothorax to be induced in an earlier type of case than the conventional, basing his argument on the good results obtained in 267 cases of pulmonary tuberculosis treated by artificial pneumothorax at an out-patient clinic at the Brompton Hospital during the past ten years.

Artificial pneumothorax is beginning to receive more and more attention as a method of treating tuberculosis of the larynx. L. S. T. Burrell,⁸ in his report on artificial pneumothorax to the Medical Research Council, says that "tuberculous laryngitis is no contraindication, and is usually improved by the treatment." S. Dumarest and P. Brette,⁹ in their monograph on artificial pneumothorax, say that the laryngeal condition is generally improved, and that in any case it renders the larynx more favourable for local treatment. In 1927 Sir StClair Thomson and R. R. Trail¹⁰ reported nine cases of tuberculosis of the larynx treated by artificial pneumothorax, with complete healing in six. They point out in their conclusions that cases of pulmonary tuberculosis are always rendered much more serious by the addition of a laryngeal extension; the complication is of still worse augury if it develops after admission to a sanatorium or after induction of an artificial pneumothorax. Despite this experience, the presence of laryngeal tuberculosis is no contraindication to this operation, but it may speedily effect a cure or render the galvano-cautery or other treatment more promising. The larynx can be cured by this measure, even though bacilli may continue to be present in the sputum and mischief to be detectable in the chest. The indications for induction of artificial pneumothorax must, primarily, be based on the pulmonary and general condition of the patient. So far as the larynx is concerned the only contraindication would be an acute miliary invasion.

In 1926 Dworetzky¹¹ compiled two tables, one of which revealed 1,592 cases of pulmonary tuberculosis treated with artificial pneumothorax by various physicians, and tuberculous laryngitis developed in only four of these cases. The other table listed thirty-two cases of laryngo-pulmonary tuberculosis treated by artificial pneumothorax, in twenty-six of which the condition was definitely improved, in four it remained stationary, and in two the patient died. The four stationary cases were reported as not showing a satisfactory collapse. In 1930 the same authority¹² published a table summarizing the statistics he gathered during the previous five years, showing the part that artificial pneumothorax plays in the prevention of tuberculous laryngitis. Tuberculosis of the larynx developed in only twelve of 5,382 patients treated in this manner by seventeen different physicians, while in fifty-six of their patients with laryngo-pulmonary tuberculosis treated by immobilization of the lungs the laryngeal lesion was arrested or cured in twenty-six, improved in nineteen, stationary in five, and unimproved in six. Dworetzky gives details of nine cases of his own of tuberculosis of the larynx treated by artificial pneumothorax, of which four had the disease arrested or cured, and five were improved; of those arrested two had a phrenicotomy performed as well as the artificial pneumothorax, one had also the aid of the galvano-cautery, and one had also a thoracoplasty; of those improved two had also a phrenicotomy and one had a phrenicotomy and thoracoplasty. Dworetzky concludes that a satisfactory pneumothorax, by arresting the pulmonary lesion, will almost always prevent the development of laryngeal tuberculosis, and that a satisfactory collapse of the diseased lung by either artificial pneumothorax, phrenic avulsion, or extrapleural thoracoplasty, usually exerts a beneficial effect on the laryngeal lesion.

My own experience of artificial pneumothorax in the treatment of tuberculosis of the larynx has so far been highly satisfactory. In the various sanatoriums to which I am attached there were forty cases of tuberculosis of the larynx treated by artificial pneumothorax in 1932 (included among them one case treated by oleothorax, gomenol being injected); there are other cases still being

treated, but these forty are cases in which treatment was completed and the patients were either discharged from hospital or (in four cases) transferred to other institutions; there was among them one death. Of the thirty-five patients discharged, in twenty-four the condition of the larynx was clinically cured or improved, in six it was stationary, and in five it was worse; of the four patients transferred to other institutions, in two the larynx had improved and in two it was stationary. There were also nine cases of tuberculosis of the larynx treated by phrenic avulsion and two by thoracoplasty, in all of which the condition of the larynx improved. It must, however, be remembered that all of those patients were at the same time under general sanatorium regime and every case was also treated by vocal rest, supplemented, in a few cases, by the galvano-cautery. Nevertheless, the beneficial influence of artificial pneumothorax and the other methods of lung collapse in these cases is very striking.

For the following analysis of the cases at Colindale I am obliged to Dr. Heaf:

Artificial Pneumothorax

Type of Laryngeal Lesion	Age of Patient	Lung Condition	General Progress	Laryngeal Progress
Intrinsic	34	Fibroid unilateral	Improved	Improved
Extrinsic	19	Caseo-fibrotic; slightly bilateral	Temporarily improved, but relapsed	Improved
Intrinsic	53	Fibro-caseous	Improved	Improved
Localized	20	Caseo-fibrotic	Improved	Improved
Localized	34	Caseo-fibrotic	Improved	Improved
Localized	35	Fibro-caseous	Improved	Much improved
Extrinsic	28	Fibro-caseous	Improved	Improved
Localized	21	Fibro-caseous	Improved	Improved
Localized	45	Fibroid	Quiescent	Clinically cured
Extrinsic	35	Caseo-fibrotic	Much improved	Much improved
Localized	43	Fibro-caseous	Much improved	Clinically cured
Extrinsic	61	Caseo-fibrotic	Worse	Worse
Intrinsic	24	Caseo-fibrotic; (very toxic)	Worse	Worse
Extrinsic	62	Fibro-caseous bilateral; A. P. T. done for haemoptysis	Slight improvement	Improved

Phrenic Avulsion

Type of Laryngeal Lesion	Age of Patient	Lung Condition	General Progress	Laryngeal Progress
Localized	24	Fibro-caseous; slightly bilateral	Much improved	Much improved
Intrinsic	23	" "	Quiescent	Clinically cured
Localized	50	Fibroid	Improved	Improved
Localized	29	Fibroid	Worse	Slight improvement
Localized	35	Fibroid	Quiescent	Clinically cured

VOCAL REST

So far as the local treatment of tuberculosis of the larynx goes the sheet anchor, as is universally recognized to-day, must be vocal rest—a method of treatment which will always be associated with the name of Sir StClair Thomson, who has preached its importance for over thirty years. Sir StClair Thomson⁷ obtained twenty-three cures by strict silence alone in a total of 477 laryngeal cases, equal to a proportion of 4.8 per cent., while nineteen others were improved. Of the same total 336 were put on whispers and had no other special treatment; this alone led to a cure in fifty cases, or a proportion of 14.8 per cent., while an additional ninety-six were improved. It was generally the more advanced and less hopeful type of case for which whispers were prescribed. Silence is more easily maintained by a patient in a sanatorium, where the discipline and the example of other patients

improving on silence are helpful. The best way to help a patient on silence is to explain exactly why it is necessary and to prescribe a notebook and pencil. Contrary to an opinion that has been expressed by others, I have found some women patients stick to absolute silence better than most men; but the atmosphere in this matter is better in some sanatoriums than others. Every patient in whom I have diagnosed early tuberculosis of the larynx has been put on silence at once; silence is particularly beneficial to cases in which one cord is affected or where infiltration is not far advanced, limited to the arytenoid region. In chronic cases and where there is a painless tuberculoma silence is not of so much benefit as always to be worth while, though some cases may be the better for it or for being kept on whispers. Silence may have to be maintained for six months, and the larynx does not usually show much, if any, improvement for the first two or three months, but then, if the treatment has been conscientiously carried out, improvement may be rapid. If there is no real improvement in six months some other method of treatment must be considered. The vast majority of the cases in the sanatoriums with which I am associated are treated by either silence or whispers, and no other treatment except the sanatorium regime.

GALVANO-CAUTERY

Treatment of tuberculosis of the larynx by the galvano-cautery, which was introduced by Grünwald in 1907, likewise owes much to the advocacy of Sir StClair Thomson, but he uses this treatment only in selected cases, in which he has achieved 62.1 per cent. of cures.² Of every 100 cases admitted to Midhurst in the past seven years twelve were found to have tuberculosis of the larynx, of whom only two were considered suitable for treatment by the galvano-cautery; the remainder were treated by routine sanatorium principles and partial or complete vocal rest.⁶ But the results in other hands are not equally good. A. Tenjaev¹³ reported in 1929 on the results of treatment by galvano-cautery in eighteen cases of laryngeal tuberculosis seen in eighteen months. For energetic treatment by deep puncture only proliferative cases with good lung condition were taken. These showed the best reaction and no general ill effects. Of six patients of this group, with stationary fibroid lung processes and limited infiltration of the cords and bands, in two complete cicatrization was obtained, two were much improved, one improved, and one was unaffected. Exudative cases with superficial disintegration of the infiltrate react more strongly to cauterization, but here, too, the cautery can be employed to produce local cicatrization. In five patients of this group with pulmonary tubercle, partly proliferative and partly exudative, in whom the laryngeal condition was advancing, the infiltrate larger, and partly ulcerated, with oedematous perichondritis, there could, on account of the greater general reaction, be produced only a partial cicatrization of the infiltrate; three of these patients died in eight to ten months of a generalization of the pulmonary condition; the other two were still under treatment. In the presence of widespread destructive changes with severe lung disease the galvano-cautery is contraindicated. In seven patients with acute pulmonary tubercle, deep ulceration, necrosis of cartilage, and stenosis, no improvement was obtained on account of the severe general reaction and high fever. Of these patients five died, and in the two survivors the prognosis was very bad. E. Tovölgyi¹⁴ has made a useful suggestion as a guide in the use of the cautery. If in any given case one is doubtful as to its applicability, a single puncture is made, and this is afterwards kept under observation for a few days. A good inflammatory reaction round the puncture favours the use of the cautery; the absence of reaction or occurrence of necrosis contraindicates it. T. H. Ruedi,¹⁵ who bases his opinions on 2,800 cases of tuberculosis of the larynx treated at Davos, sounds a note of warning against a tendency to over-optimism as to the results of treatment with the galvano-cautery. While admitting the undoubted success obtained by its use he has had cases where the use of

the cautery has been followed by an aggravation of the disease. C. D. Parfitt¹⁶ in Canada is a strong advocate of active local treatment rather than dependence on the local results of the improved general condition under sanatorium treatment, and he has found the best results from treatment with the galvano-cautery as opposed to other operative methods.

In my own practice I tend to use the galvano-cautery less and less, depending more upon other methods of treatment. The chief indication for the use of the galvano-cautery is, in my opinion, dysphagia caused by a small ulcer. It is important, first, to find the exact spot that is causing the pain. After the application of 20 per cent. cocaine, the sharp-pointed cautery, almost at white heat (as advised by Sir StClair Thomson), is driven, under indirect laryngoscopy, through the margin of the diseased ulcer to reach the healthier area, two or three punctures being made. The patient should be kept on silence for a few days, during which time he may use a simple oily laryngeal spray containing chloretone. Almost immediate relief from pain is usually experienced.

Diathermy.—One word about diathermy, which is beginning to be recommended in place of the cautery. I have seen two cases of such appalling sloughs from diathermy in tuberculosis of the larynx that I prefer not to attempt its use. Mr. J. E. H. Roberts, the thoracic surgeon, tells me that in the surgical treatment of pulmonary tuberculosis he has given up diathermy for similar reasons and returned to the galvano-cautery.

ARTIFICIAL SUNLIGHT

The therapeutic use of sunlight is not new, and it was probably already old when the elder Pliny said, "*Sol est remedium maximum.*" In 1903 Rollier of Leysin began his famous experiments in the treatment of surgical tuberculosis with sunlight, and in 1904 Sörgo demonstrated a number of cases of tuberculosis of the larynx successfully treated with reflected sunlight.

Sunlight in the treatment of tuberculosis of the larynx may be natural or artificial, local or general. The leading authority on this subject is O. Strandberg of Copenhagen, who reported his first successful cases in 1914, and in 1928 published a review of the whole subject in great detail.¹⁷ Strandberg advocates generalized ultra-violet light treatment only of laryngeal tuberculosis, as he believes that by local light applications a symptom only is being treated, whilst if general light baths are given the constitutional affection itself is dealt with. The type of lamp used at the Finsen Institute is the carbon arc, the spectrum of which most nearly approximates to that of the sun. Baths are given for from five to ten minutes at first, increasing the time up to two and a half hours. There is no need to discontinue the baths if fever occurs; it is usual to get a rise of temperature after the first few light baths. Light baths alone are given until the patient's general condition improves. Local surgical treatment (cauterization) shortens the treatment, but must be given at the right moment. Strandberg's indications for cauterization—scarring the surface with a dull red cautery—are a steady increase in weight, no fever, and an approximately normal sedimentation rate of the red blood cells.

Strandberg reports a series of 203 patients with tuberculosis of the larynx treated by general light baths followed by the galvano-cautery; 113 of them were cured of the disease in the larynx, and most of the others improved greatly. Seventy-seven of the cured patients had a purely intrinsic lesion, thirty-four had intrinsic and extrinsic disease, and only two had extrinsic disease alone. The rapidity with which hoarseness and pain on swallowing disappeared under treatment by light baths was, he says, remarkable. As a rule the treatment lasts from six to sixteen months, but it should be noted that most of his cases were treated as out-patients.

Strandberg's conclusions have been rather criticized by Sir StClair Thomson.¹⁸ Thirty-two favourable cases of pulmonary tuberculosis were treated by general light baths of the Finsen pattern at Midhurst, and there were no striking evidences of benefit; in only two or three

cases might some help be claimed. Nor could it be said that the healing of laryngeal tuberculosis was hastened or that the course of light baths in any way rendered subsequent cure by the cautery more rapid or more certain. Quite as good results have been obtained and just as swiftly, with voice rest, sometimes supplemented with the galvano-cautery or artificial pneumothorax and, in all cases, the sanatorium regime. Sir StClair Thomson is of opinion that, on the whole, in patients in a well-ordered sanatorium, artificial sunlight baths are no addition to the treatment at present in use.

My own opinion, judging from a limited experience with Dr. Heaf at Colindale, lies somewhere between the two extremes. We have found general carbon arc light baths beneficial only for early laryngeal cases in patients of good physique with a slight pulmonary lesion. In poorly nourished and emaciated cases, and those with extensive pulmonary infection, carbon arc light treatment does not do any good and may do a great deal of harm.

E. Wessely¹⁹ has devised a method for the direct endolaryngeal application of artificial sunlight. He uses a carbon arc lamp impregnated with a special metallic salt in order to overcome the obvious disadvantage that the amount of light actually reaching the larynx is but small and each exposure of short duration; Strandberg, in criticizing this method, states that the salt changes the continuous carbon arc spectra to a line spectrum like that of a mercury vapour lamp, and so greatly diminishes the efficiency of the rays. In using Wessely's method, the patient has to be thoroughly cocaineized and a Killian's suspension laryngoscope introduced. This in itself is a serious procedure to inflict on a patient as ill as the majority of these patients are. Wessely insists that a good resistance should be built up in the patient before local measures are undertaken.

Joseph W. Miller²⁰ is an enthusiast in America in employing the method of Wessely. He states that of seventy-four patients treated by this method only two did not respond to radiation; fifty-nine of the other seventy-two patients showed complete healing of the laryngeal lesions, with no subjective symptoms referable to the larynx; while the subjective laryngeal symptoms of the other thirteen patients improved, there was either partial or no healing of the tuberculous larynx. It should be noted that Miller's work was carried out, not in a sanatorium, but apparently in a hospital out-patient department.

E. Glenn²¹ has found that small doses of light from a mercury vapour lamp used with a Wagner prism applicator gave great relief from pain and from dysphagia, and in cases in which the tuberculous process in the lungs was not advancing was definitely of curative value.

A. J. Cemach²² holds a middle view between those who, like Strandberg, trust to general light radiation, and those, like Wessely, who believe in the local. He combines the local radiation with all general means. He considers natural sunlight, which is so valuable in tuberculosis of joints, harmful in that of the larynx, and artificial sunlight to be the method of choice. Arc light is no better in his opinion than the quartz light, and very much dearer. The intensity must be moderate and well under the erythema dose. Ultra-violet light has an analgesic action, and is therefore most effective in cases of dysphagia. Cemach²³ has recently designed a small quartz lamp in the form of a laryngoscope for direct irradiation of the larynx, which in his hands has given increasingly good results, though he says that it does not pretend to replace sanatorium treatment. W. G. Howarth²⁴ has pointed out the length of time that the artificial sunlight treatment of Wessely and others requires, and considers that the cases he had seen in foreign clinics would probably have been cured more quickly by other methods.

In a recent article A. Eidinow²⁵ has published his results on the treatment of chronic tuberculous disease of the larynx by ultra-violet light. He uses a small water-cooled "vacuum type" quartz-mercury vapour lamp, consisting of a quartz mercury vapour vacuum high-pressure burner, a quartz water-jacket, and a metal jacket, to which the burner is cemented and which contains water-cooling apparatus, and also insulated leads carrying the electric current. The lamp, which is straight, and almost the size and shape of the adult thumb, does not appear to me to be very well adapted for applying the rays to the larynx, however good it may be in other respects. Eidinow states that he has, in all, treated eight cases, six with successful results—restoration of voice and

healing of ulcerated areas. Two patients died, but in these there was extensive involvement of both lungs, and treatment was only applied in an attempt to relieve dysphagia and painful symptoms. He found that considerable reaction occurred after treatment, lasting for twenty-four to forty-eight hours, with oedema extending to the soft palate and uvula.

At Colindale Hospital since the beginning of the present year I have been trying to ascertain the effect of the treatment of tuberculosis of the larynx by ultra-violet light, using the Kromayer model No. 2 water-cooled mercury vapour arc lamp, with a quartz laryngeal applicator designed by Dr. William Beaumont. This applicator has a special curve so that it can be passed, with the aid of a laryngeal mirror, within the epiglottis to about half an inch from the vocal cords, and it is silvered over so that the rays are limited to the end. Up to the present we have treated eight patients only, and of these six have had full courses of treatment, the other two having been discharged for various reasons before treatment had been completed. Of the six patients who had complete courses of treatment five improved very greatly; in each case the larynx became much cleaner and healthier, and any ulceration present healed. In the sixth case, although the patient said that the larynx felt better and dysphagia was relieved, in my opinion the larynx at the end of the three months was not so healthy, infiltration and ulceration having rather more advanced than otherwise. In all these cases the treatment consisted in giving two-minute applications three times a week for a period of from three to four months. The patients were all men, aged 39, 36, 32, 23, 27, and 22 respectively; all had tubercle bacilli in their sputum, and all were in a moderately advanced stage of the disease. After an application of the rays there was invariably a slight reaction, with reddening and sometimes slight swelling, but it was never serious, and subsided within twenty-four hours. The number of cases in this series is too small for one to draw any real conclusions, but at any rate this treatment shows promising results, and is well worth persevering with. It will probably be found that artificial sunlight will be best employed as an adjuvant to other methods of treatment.

X Rays and Radium.—It has been suggested that therapeutic x rays or radium might give better results than ultra-violet rays, and some successful cases have been reported; but I have no personal experience of such methods of treatment, and, indeed, see no particular advantage in them.

CHAULMOOGRA OIL

The value of the local application of chaulmoogra oil, which is used effectively in the treatment of leprosy, in tuberculosis of the larynx has been praised enthusiastically by R. M. Lukens,²⁶ who is attached to the Jefferson Medical College, Philadelphia. He began to use this method of treatment in 1921, and says that until that time he had been very sceptical about arresting tuberculosis of the larynx. Blocking of the superior laryngeal nerve for dysphagia had been the almost daily occurrence, but since employing chaulmoogra oil the use of alcohol injections had been reduced to an occasional one, as cases of dysphagia were now the exception rather than the rule. Lukens insists that the Burmese chaulmoogra oil should be used rather than the Indian variety, as it contains a larger proportion of chaulmoogric acid and is apparently much more effective in treatment. The oil is used either in the diluted form (10 to 20 per cent. in mineral oil) or full strength, and is dropped into the larynx or applied by a swab, and is applicable to ulcerative tuberculous laryngitis and superficial infiltrations.

R. W. Wilkinson,⁵ on the other hand, who worked for a time in Lukens's clinic, treated some of his patients with chaulmoogra oil, but did not get as satisfactory results as he had hoped. My own experience of chaulmoogra oil has not been encouraging. I have used chaulmoogra oil regularly, applying it once weekly by a swab to the larynx, in a large number of cases during the past two years at Colindale, but, although it is

soothing, I cannot say that it has proved to be of any curative benefit. It is certainly inferior in our hands to the old-fashioned lactic acid (introduced by Krause in 1885), which I still use in strengths of 50 per cent. and 100 per cent.—even although Joseph W. Miller says that "to-day, no one even whispers about its curative properties."²⁰ In this I follow, however, in the footsteps of Sir James Dundas-Grant, and with considerable benefit to ulcerative cases, particularly when the epiglottis is affected.

INJECTION OF GOLD SALTS

The value of the treatment of pulmonary tuberculosis by sanocrysin and other gold derivatives is still in dispute, but there seems little doubt that in certain cases sanocrysin has a definitely beneficial effect; it seems, however, to be difficult to select the cases that will benefit from this method of treatment.

A. Fischer²⁷ treated 115 cases of tuberculosis of the larynx with a gold preparation, but concluded that any good results were due not to the specific action of the gold on the tuberculous process, but to stimulation of the whole of the reticulo-endothelial system. D. Ferrando²⁸ treated twenty cases of laryngeal tuberculosis by intravenous injections of sanocrysin; twelve cases were cured or arrested, five improved, and three were no better for the treatment. Ferrando concluded that sanocrysin could determine favourable modifications and even clinical cures in certain forms of laryngeal tuberculosis.

W. C. Fowler²⁹ of Pinewood Sanatorium tells me that he has been very much impressed by the value of sanocrysin in some of the cases of tuberculosis of the larynx there, and he thinks it has a definite specific effect upon laryngeal lesions in some cases. In the past eighteen months I have been examining regularly nine cases of tuberculosis of the larynx, all women—two moderately advanced and the other seven comparatively early cases—who were being treated by Dr. Fowler with sanocrysin. One case had also artificial pneumothorax and phrenic avulsion (with improvement), and one had also artificial pneumothorax (with improvement). Of the nine cases, one is completely healed, six are definitely improved, and two are worse (one insisted on going home to Scotland before completing treatment, and one was transferred for other treatment). All of these patients were treated in addition by vocal rest and general sanatorium regime.

H. Gainsborough and P. J. Jory³⁰ have used intramuscular injections of the compound benzyl cinnamic ester (Jacobson) in cases of laryngeal tuberculosis in which the condition was stationary or getting worse. Seven patients were treated, and of these five were noticeably improved. The effect on the pain and dysphagia was especially favourable.

TRACHEOTOMY

Tracheotomy to afford complete rest to the larynx affected by tuberculosis was advocated so long ago as 1829 by Albers,³¹ who was the first to differentiate syphilis from tuberculosis of the larynx, but I hardly expected to hear it advised by a modern laryngologist a year or two ago in the Royal Society of Medicine. Sir StClair Thomson³ has only twice been obliged (in 477 cases) to perform a tracheotomy for the relief of stridor and dyspnoea caused by the disease, and once because of stenosis resulting from cicatricial stenosis consequent on the healing of galvano-cautery applications. I have personally seen only one case in which tracheotomy was necessary, because of a web almost closing the glottis, due to the cicatrization of ulcerated vocal cords.

METHODS FOR THE RELIEF OF DYSPHAGIA

The most simple means of relieving pain in swallowing is by the insufflation into the larynx, by Leduc's tube, of a powder consisting of equal parts of orthoform and anaesthesin (Dundas-Grant). If the pain is caused by a small localized ulcer in the larynx this is best cleared up by the use of the sharp-pointed galvano-cautery at white heat, after having applied 20 per cent. cocaine to the ulcer. In more advanced cases an excellent method is to block the superior laryngeal nerve with alcohol, using a hypodermic syringe and a solution of 2 grains

of eucaine hydrochloride in 1 ounce of 80 per cent. alcohol. I note that both Sir StClair Thomson² and W. G. Howarth²⁴ have found this method disappointing, but as carried out according to the directions of Sir James Dundas-Grant²⁵ it is simple and effective:

The patient is placed in a semi-recumbent or horizontal position and the operator stands on the side on which the injection is to be performed. The neck is sterilized with tincture of iodine or alcohol and the operator's hands with alcohol. He then passes his left hand over the patient's chin and grasps the larynx with his left thumb and fingers, pulling the larynx towards him with the fingers and feeling for the thyro-hyoid space with the thumb, noting a spot about one centimetre in front of the tip of the great cornu of the hyoid bone, or directly above the oblique line for muscular attachment on the thyroid cartilage, and close above this cartilage. The needle, detached or else fixed upon the syringe, is inserted perpendicularly to the skin to the depth of about a centimetre and a half, varying slightly according to the thickness of the superjacent soft tissues. If blood comes from the needle this should be withdrawn and reintroduced at a slightly different spot. The syringe, if detached, may now be screwed on and a few drops of the alcohol should be injected. This generally causes slight smarting, and the patient is instructed to raise the hand when the smarting stops. One c.cm. or a little more may then be injected. In order to make sure that there has been no penetration of a vein, the syringe, if attached, may be screwed off and then readapted, or a very gentle aspiration may be made to see whether a drop of blood passes into the syringe.

The patient should be given a drink of water a minute or two after the injection, and if it has been successful he will swallow at once without any pain.

I have carried out this method of blocking the superior laryngeal nerve in eight cases, with relief for from three weeks to three months in five cases. Dr. Houghton, senior assistant medical officer at Colindale, has carried out a similar method in a very large number of cases, with complete success in over 50 per cent. of them. A word of warning must be given about blocking both superior laryngeal nerves; this may prove very troublesome, causing regurgitation of food or even oedema of the larynx. When pain recurs constantly resection of the nerve under local anaesthesia has been advised by C. H. Ernlund²³ and others. H. Schugt²⁴ has resected the nerve in fifteen cases, with complete healing of the lesions in nine cases; the nerve resection should be carried out only if the general condition of the patient is good.

CONCLUSION

In reviewing the multiplicity of remedies for tuberculosis of the larynx the first principles upon which treatment is based should be kept clearly in mind. Tuberculosis of the larynx is never primary, and its treatment must be founded upon the conception that it is always secondary to tuberculosis of the lung. It is the patient who must be treated and not the larynx, and, on the whole (for exceptions have been known), any improvement in the larynx will progress with the improvement in the lung. It is of little use to cure the larynx and have the patient die of his lung disease. Hence the extreme surgical treatment of tuberculosis of the larynx, advocated by a former generation, has been abandoned, and such methods of treatment as artificial pneumothorax and phrenic avulsion are in the ascendant.

The importance of preventive measures must not be forgotten. Every patient suffering from pulmonary tuberculosis, or suspected to be, should have the larynx examined regularly, as a routine. I have pointed out in a previous paper²⁵ that routine examination of the larynx would frequently enable a definite diagnosis of pulmonary tuberculosis to be made at a time when the stethoscope yields no evidence and would allow of treatment being begun at an early stage of the disease. A proper use of the voice, restraint of noisy coughing, and clear breathing through the nose all tend to inhibit the development of tuberculosis in the larynx; I have resected several badly deflected nasal septums under local anaesthesia in quiescent cases, with apparent benefit both to the larynx and to the lung. Any infection of the nose or throat should be adequately treated; a simple alkaline nasal douche to clear catarrhal or purulent discharges from the nasal passages has, in my experience, often helped

the improvement in affected patients, and has no doubt helped to prevent infection of the larynx in others. A simple nasal spray or nasal oil containing menthol is also often helpful. In a few cases I have drained infected maxillary sinuses with beneficial results. In certain carefully considered cases removal of septic tonsils may undoubtedly be beneficial; in a few such cases I have dissected out the tonsils under local anaesthesia. M. C. Myerson (quoted by R. W. Wilkinson²⁶) states, however, that he has seen two cases in which tonsillectomy was followed by general miliary tuberculosis and rapid decline in young adults. Alcohol and tobacco should be prohibited or, if tobacco be allowed, greatly restricted. C. E. Edson²⁶ and others are advocates of climatic treatment, and believe that the patient with tuberculosis of the larynx has an advantage in high altitudes.

It is difficult to assess the various methods of treatment in vogue at their true valuation. For example, in comparing artificial sunlight with vocal rest and the sanatorium regime, it should be emphasized that Strandberg's patients are hospital out-patients and Sir StClair Thomson's patients intelligent, well-disciplined middle-class patients in a sanatorium that is one of the best in the world. Nor should it be forgotten that when Strandberg records his results of treatment with light baths most of his patients have also been treated with vocal rest and the galvano-cautery.

As regards my own cases, I am fortunate in having my patients in six sanatoriums and hospitals, with just over 1,400 beds, comprising early, moderately advanced, and advanced cases, and including men, women, and children. During 1932 a total of 3,549 patients passed through these hospitals, of whom 415 were transferred to other institutions for various reasons, an undetermined number were discharged after short periods during which the larynx was not examined, and there were 197 deaths. I had under my own observation 320 cases of tuberculosis of the larynx, of whom thirty-eight showed clinical cure, 101 were improved, eighty-one were stationary, fifty-nine were worse, and forty-one died. The mainstays of treatment have been general sanatorium regime and vocal rest, supplemented by artificial pneumothorax and by the various methods we have been trying out in the throat clinic of the Colindale Hospital with the co-operation of Dr. Heaf. But when I try to come to a conclusion about any method of treatment, whether it be artificial pneumothorax, ultra-violet light, sanocrysin, or another, I have to remember that all my patients were also being treated by the sanatorium regime, many of them by vocal or physical rest, and all of them constantly under the eyes of keen medical officers, who have devoted their lives to the study of the treatment of tuberculosis.

I must acknowledge my indebtedness to Sir James Dundas-Grant, from whom I gained most of my knowledge of tuberculosis of the larynx. For their kind help in the preparation of this paper I have to thank Dr. James Watt, Dr. W. C. Fowler, Dr. Agassiz, and Dr. F. R. G. Heaf, and I must also thank Sir Frederick Menzies for his permission to make use of the abundant clinical material in the London County Council tuberculosis hospitals and sanatoriums.

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THE PROGNOSIS OF TUBERCULOUS LARYNGITIS*

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I must ask for the acceptance of my conclusions as those of a phthisiologist who has taken a special interest in the changes of the larynx in tuberculous patients for a number of years, and for a review of them in the light of the wider knowledge and experience of oto-rhino-laryngologists. It would seem at first that the answer to the question "What is the prognosis of tuberculous laryngitis?" could be answered by the single word "bad"; some might require to qualify it by saying "very bad." Why then spend time in discussing a subject apparently so dismal and depressing? The reason is that there are few diseases in which such important changes in treatment and prognosis have taken place during the last few years as in tuberculosis, and these changes have materially affected the outlook on one of the most serious complications of the infection. Nowadays far more attention is paid to the larynx in tuberculous patients, with the result of earlier diagnosis, better response to treatment, and a more favourable prognosis.

THE POSITION THEN AND NOW

Forty years ago tuberculous laryngitis was regarded as absolutely incurable. Sir StClair Thomson gives a number of quotations in his masterly survey of tuberculosis of the larynx, published in the Special Reports of the Medical Research Council.¹ Three of these illustrate the pessimistic view prevalent fifty years ago. In 1880 Morell Mackenzie² wrote: "It is not certain that any cases ever recover." In 1894, Lennox Brown³ reported one case in which cure had been effected, and at that time Kreshaber of Paris wrote of tuberculous laryngitis that it "invariably ends fatally."

In some respects the general opinion of the prognosis of tuberculous laryngitis has not changed very much since those days. Standard textbooks on medicine still contain phrases such as: "It is doubtful if any cases of extensive infiltration recover, with exception of a few rare instances where it is confined to the epiglottis and can be

entirely removed." The infected larynx is still regarded as the certificate of death by the majority of clinicians, but the patient and his relatives rarely regard the complication as serious. This is to some extent fortunate, in that the patient is stimulated by an unfailing hope that his symptoms can be relieved and a recovery secured. This optimism does play an important part in the prognosis of the lesion, for if it fades away and is replaced by despondency treatment will then be of little avail and the result will be disastrous. Unfortunately there is a tendency for an excess of assurance to lead to complete disregard of advice—particularly with reference to resting the voice—thereby endangering the future.

The pessimistic attitude towards tuberculous laryngitis is greatly due to the fact that the complication is usually associated with advanced pulmonary lesions, and in a large number of cases is first diagnosed when the lungs have become grossly infiltrated. Further support to this impression is given by the statistics compiled by observations made at necropsies on patients dying from pulmonary tuberculosis. Fetterolf, quoted by Spencer,⁴ found the larynx involved in eighty-three out of a series of 100 cases, and in a series of 150 necropsies on my own cases I found the larynx involved in 68 per cent. Of this 68 per cent. I found 44 per cent. had ulceration of the intestines, a figure which is of importance, as there seems to be some connexion between the two complications. It will be seen that over two-thirds, maybe over three-fourths, of cases suffering from pulmonary tuberculosis have laryngeal infiltration before they die. It is thus easy to conclude that if a pulmonary patient develops laryngitis then his days are numbered, and the end is not far off. Now if this were true how sad and depressing would be the work of a laryngologist in a tuberculosis hospital or sanatorium! Can one imagine anything more hopeless and melancholic than passing a death sentence on men and women by diagnosing an incurable condition which will end their days in the near future?

Happily such a conclusion, based merely on observations made in the post-mortem room, is not true. Because the majority of patients dying from pulmonary tuberculosis suffer from active laryngeal infiltration it does not follow that a patient with laryngitis is bound to die from pulmonary tuberculosis, or that the laryngitis determines the fatal termination of the disease. There is evidence that a patient with pulmonary and laryngeal tuberculosis can recover completely from the laryngitis and yet succumb to the chronic pulmonary lesion. I had two such cases in my series, and Cooper and Benson⁵ report thirty-nine from a series of 798 necropsies on pulmonary cases. If the larynx can recover in patients actually dying from pulmonary tuberculosis, to how much greater an extent can we expect recovery when the pulmonary lesion is also arrested?

FACTORS IN PROGNOSIS

We have met to-day to determine the factors and conditions which influence the possibility of recovery from the laryngeal lesion, and I will now ask you to consider the most important points which control the prognosis of this interesting subject. I say "interesting subject" because, during the fifteen years I have been examining the throats of tuberculous patients, I have learnt the extreme value of this procedure, by which one can gain information in many cases of the patient's resistance to the disease, of his temperament, of his symptoms, and occasionally of his habits, by a laryngeal examination. The prognosis of tuberculous laryngitis depends on all these factors, and many more, for although the nature, position, and extent of the local lesion must be considered, the most important information is the amount of resistance the patient has to the disease.

* Read in opening a discussion in the Section of Oto-rhino-laryngology at the Annual Meeting of the British Medical Association, Dublin, 1933.