Abstracts from papers on hydatid disease, Victoria and Tasmania as health resorts, the cause of the first heart sound, the Leirnur system, antiseptic treatment, and neuro-fibromata / by James W. Barrett.

With the Author's Compliments

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ON

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THE CAUSE OF THE FIRST HEART SOUND,

THE LEIRNUR SYSTEM,

ANTISEPTIC TREATMENT,

AND

NEURO-FIBROMATA.

BY

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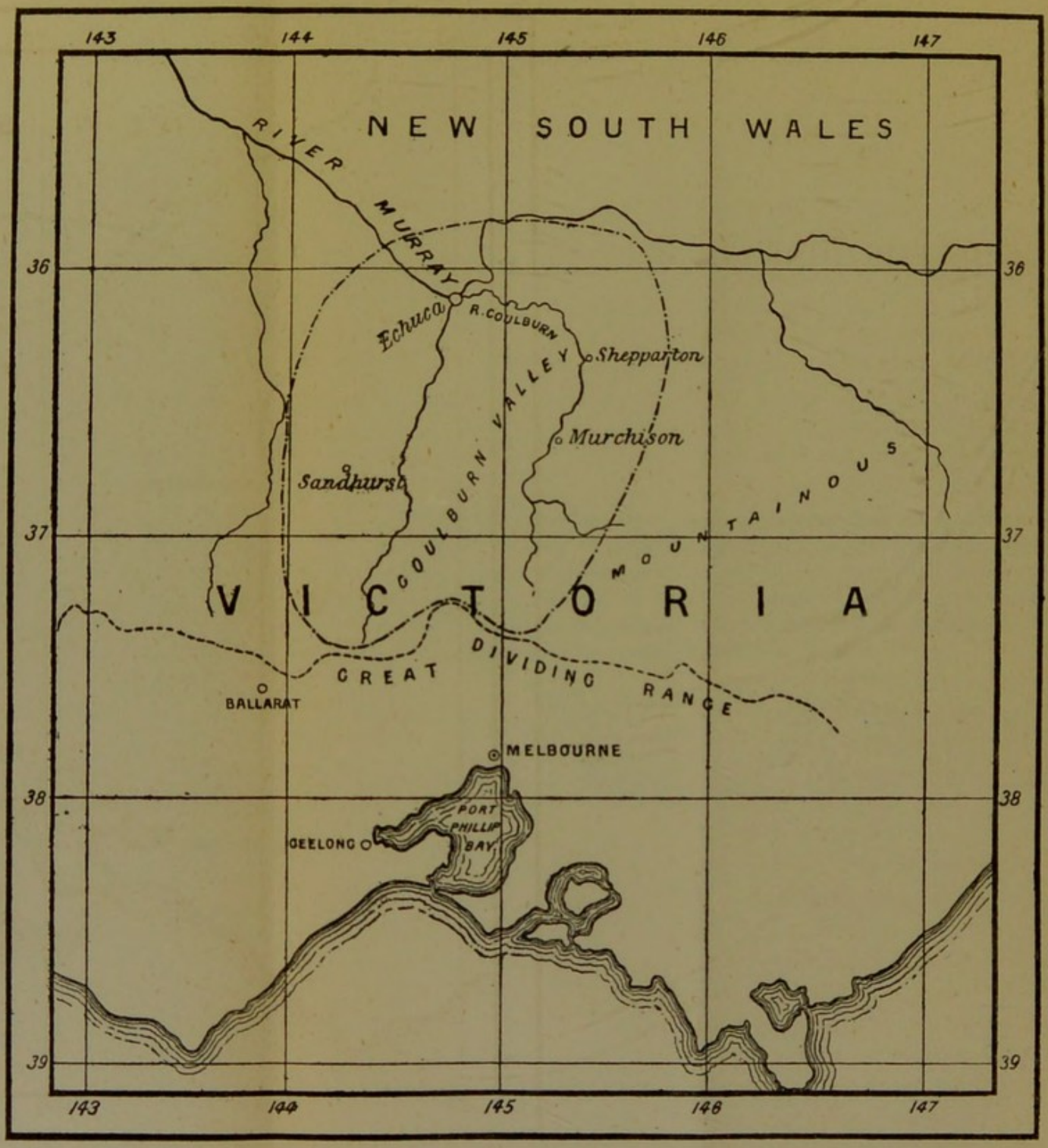
NOTE.—The following papers are mainly reprints from the *Medical Times and Gazette*, *Journal of Anatomy and Physiology*, and *Australian Medical Journal*. Since the writer's arrival in England many friends have been kind enough to ask him for reprints of different articles; in compliance with their request, he has collated those articles which are of special interest, so as to present them in a more compact form.



Sketch Map of Victoria.

The dotted line shows the limits of the region suitable for consumptive patients.

HYDATID DISEASE IN VICTORIA.

The great prevalence of hydatid disease in Australia, and the considerable mortality which it occasions, give medical practitioners in that country an opportunity of studying it which European observers apparently do not possess. It is on this account, therefore, that I venture to draw the attention of the medical profession in Great Britain to a few points of interest connected with its causation, pathology, clinical characters, and treatment. Its detailed anatomical characters are already so well known that no reference to them is necessary. The disease is very common in Victoria, especially in the flat and pastoral districts, where both the human beings and the beasts inhabiting the vast plains not unfrequently obtain their water from common water-holes, dams, and creeks. The beasts include, for the most part, cattle, sheep, horses, dogs, and in some places kangaroos.

It has long been known that the hydatid (echinococcus) is produced by the ingestion of the ova of the Tænia echinococcus, the embryos of which, when liberated in the stomach of a suitable host, make their way as proscolices through its coats, and either get deposited in the liver, or else obtain an entrance into the general blood circulation, whence they are deposited in more distant organs. Once they obtain a lodgment, they become cystic and are called hydatids. If in this condition they are swallowed by a suitable host, they develop into the Tænia echinococcus in the alimentary canal. Dogs, and especially stray ones (scavengers), are very numerous in Victoria, and in the pastoral districts large numbers are kept by shepherds. Dr. Thomas, of Adelaide, examined a number of dogs in Adelaide and in Melbourne, and found that in the former

city 40 per cent. were infested with the Tænia echinococcus. In Victoria very many dogs are so affected, but the exact proportion is not definitely determined. This being so, it is very easy to understand that many of the ova (which are passed in myriads with the dogs' fæces) find their way into the water-holes and into the surrounding pasture.

Of the tens of thousands of sheep and the large number of cattle that feed on these plains, and obtain their water from the common source, some are sure to swallow the ova. As a result, hydatids are frequently developed in their organs (generally the liver), as everyone who has any experience in the matter knows too well. The dogs are often fed on the flesh of these animals, and so in turn swallow the hydatids, which in their alimentary canal become Tænia echinococci, and so the cycle of development is complete.

Dr. Thomas attributes the great prevalence of Tænia echinococcus in the dogs of Adelaide to the easy access which they have to the slaughter-houses, where they devour viscera and flesh in which these echinococci are contained.

Bearing these facts in mind, it at first sight seems an extraordinary circumstance that so many human beings living in the pastoral districts should escape the disease. They owe their immunity, however, to their habit of drinking tea to excess; *i.e.*, they make tea almost their only beverage, and by boiling the water in its preparation destroy the hydatid embryo. Of course, if echinococci existed in man alone, they would soon cease to be, since dogs, no longer being able to swallow echinococci, could no longer suffer from Tænia echinococcus.

Victorian medical practice furnishes numerous examples of hydatid disease appearing as a result of undue familiarity with dogs on the part of human beings. Thus, children have been known to play with them and to crawl into their kennels, families to make household pets of them, and, as a result, they have suffered in many instances from repeated attacks of hydatid disease. The reason that the disease is not so common in Europe would seem to be that the water-supply is better regulated, and dogs, sheep, and man do not obtain their water

from a common source. Even in Victoria, the disease is not nearly so frequent in the cities as in the country.

Pathology. — As is well known, the wall of an hydatid cyst comprises three layers. An outer one (adventitia) is formed by the condensation of the tissues in which the animal is situated. This layer is thick, somewhat fibroid, and vascular. The inner two layers are proper to the hydatid, and are not attached firmly to the outer one, except during the decay of the parasite. Of the two, the outer is known as the laminated, and the inner as the germinal membrane. Echinococci, therefore, obtain their nutriment by imbibition, and their growth is limited by (1) failure of developmental energy; (2) failure of nutritive supply. Like all other organised bodies, they have a period of growth, and reach a maximum size, then cease to grow, undergo retrograde changes, and diminish in size. Unfortunately, however, the limit of development is not the same for all individuals, and too often the life of the host is destroyed before it is reached.

It is now necessary to draw attention to the fact that a most important distinction exists between the varieties of hydatid cysts, which are of two kinds, the unilocular and the multilocular variety. The latter includes those hydatids in which large numbers of secondary cysts are formed in the interior of the primary one. The secondary (daughter) cysts, of course, have only two coats, *i.e.*, those proper to the echinococcus, the germinal and the laminated layers. The main cyst may be simply packed with the secondary cysts, or may contain fluid as well.

After the limit of growth is reached, hydatid cysts may either (1) degenerate (2) rupture, or (3) suppurate; they may, however, rupture or suppurate before it is reached, but if uninfluenced by treatment, their course is tolerably uniform.

1. Once the developmental process ceases, for either of the reasons mentioned previously, a series of degenerative changes ensue in the cyst and its contents: the walls become thickened, and *the coats inseparably blended;* the echinococci themselves degenerate and become unrecognisable; the fluid

is partly or wholly absorbed; and contraction of the whole mass steadily progresses.

(*a.*) If the cyst be unilocular, it becomes converted, first, into a thick-walled cyst containing a little fluid, and ultimately into a solid fibrous mass, which in course of time may become calcareous. In this process of contraction it is obvious that considerable traction may be exercised on any adhesions which may have formed during its growth. In one case, a patient, who was not aware that she had ever suffered from hydatid disease, was admitted into the Melbourne Hospital, exhibiting symptoms of pyloric obstruction. She became very emaciated and died. At the autopsy there was found to be situated near the pylorus a solid, round, calcareous body, the product of the degeneration of an hydatid cyst in the small omentum. Old adhesions extended on every side, and by traction on them both the pylorus and transverse colon had been constricted and totally obstructed; hence the fatal result. Sometimes calcification takes place in the cyst-wall during the process of contraction.

(*b.*) If, however, a cyst is multilocular, the degenerative process assumes a form of which I can at present find no description. When they reach their limit of development, the cyst-wall undergoes exactly the same changes as it does in the unilocular cysts. The fluid both inside and outside the secondary cysts is absorbed; and the material left inside the main cyst, consisting of echinococci and cyst-walls, becomes converted into a soft, greenish mass, which shows traces of the cyst-walls from which it is formed. To this form of degeneration, which is peculiar to the multilocular cysts, I propose to give the name of *gelatinoid degeneration*. It has only recently been recognised even in the Melbourne Hospital, where it was forced under notice by the following case, which I reported in the *Australian Medical Journal*, June 15, 1883:—

J. T., aged twenty-seven, admitted May 12, 1882, under the care of Mr. T. N. Fitzgerald. Four years ago the patient first noticed a small lump situated deeply in the left hypochondrium; it was for a long time painless, and grew slowly.

Twelve months since, the patient was thrown from a cart, and injured his side; and six months after noticed that the tumour was rapidly enlarging, and began to cause great pain. The tumour was tapped for hydatids, but no fluid obtained. When admitted, the patient was a muscular man, and seemed to be in good health. There was bulging in the left hypochondrium, where the edge of an enlarged spleen could be felt. The enlargement of the organ was considerable; by percussion, it could be made out to extend upwards posteriorly, where it encroached on the left lung; upwards laterally to the sixth rib, and forwards to within three inches of the mid-line. There was an obscure feeling of fluctuation in the hypochondrium. Measurement of the body showed that the distance from the umbilicus to the spine was two inches greater on the left than on the right side. The apex-beat of the heart was not displaced, but there was an apical systolic bruit. A consultation was held on June 6, 1882, when it was decided that the probabilities were in favour of the existence of an hydatid cyst, rather than that of a simple enlargement of the spleen, because (1) of the obscure sense of fluctuation, and (2) of the projection of the tumour upwards towards the lung. A fine trochar was passed into its lower part, and was felt to enter a thick-walled cavity, in which the point could be freely moved. No fluid came away, and a whalebone stilette was therefore passed through the canula into the cavity, but without result. A few days afterwards the patient was seized with a rigor, followed by vomiting, pain, and a rise of temperature to 104°. He sank rapidly, and died of collapse, symptoms of peritoneal inflammation not being marked.

At the autopsy, made twelve hours after death, the heart weighed three-quarters of a pound. The musculi papillares of the left ventricle were undergoing fatty degeneration (hence the bruit). Both lungs were congested at their dependent parts, and the pleural surfaces were studded with petechial ecchymoses. At the lower edge there were several wedge-shaped patches of congestion. The spleen weighed seven pounds and a half, and contained two hydatid cysts. The upper one, which was unilocular and large, contained

decomposing fluid. It was pressing upwards, and so compressing the left lung. Ulceration had so progressed that only a thin layer of diaphragm intervened between the hydatid and the left pleural cavity. The lower cyst, which had been tapped, was smaller, and had tough fibroid walls; it was full of secondary cysts undergoing *gelatinoid degeneration*. At the site of tapping there were adhesions. There was no general peritonitis, but there was some fluid blood in the peritoneal cavity. Peyer's patches and the mesenteric glands were enlarged, and there were petechial ecchymoses on the small intestines. The blood in the large veins was frothy and decomposing.

At the time of tapping, no one could understand why no fluid came away from a distinct cyst, and why the stilette was not even moistened. However, the gelatinoid degeneration explained it.

More recently, we had another case of multilocular hydatids of the liver, in which the main cyst was of enormous size, and contained hundreds of secondary cysts, *in some of which degeneration had just begun*. As in the unilocular form, calcification may ensue, and the whole hydatid may become a calcareous mass. When making post-mortem examinations of the bodies of persons who have died of other diseases, I have seen very many hydatids in various stages of degeneration. I have thus found them in many different organs, but mostly in the liver. Very frequently their existence was not even suspected during life.

2. *Rupture* rarely occurs spontaneously, but has occurred whilst a grooved needle has been introduced into a cyst or during manipulation. It *seems* to be unattended with any danger, provided no air obtains admission. It is followed by the appearance of the *hydatid rash*, a form of erythema attended with great itching, which appears all over the body, as a result of the absorption of some part of the hydatid contents, and lasts a few hours or days. So far, I have known of no case where rupture has been followed by a fatal result, or by further hydatid development, even though I have seen the patients some years afterwards.

3. *Suppuration* does not generally occur unless the hydatid has been tapped, although it may occur spontaneously. As a result, the echinococci are killed, and the cyst becomes equivalent to a thick-walled abscess. It has been said that scirrhus and medullary cancer and hydatid disease are related to one another causally, because they are not infrequently co-existent. The irritation of the hydatid probably determines the cancerous growth to the organ in which the hydatid is situated.

Hydatid fremitus is a peculiar vibration attendant on percussion of a hydatid cyst. It is noticeable just after the blow is struck with the finger, and seems to be most readily perceived in multilocular cysts in which the main cyst is tightly filled with secondary cysts.

Treatment of hydatids is almost purely surgical, since at present there is no remedy which materially influences their growth, once they obtain a lodgment. Remembering that the parasite has a definite period of growth, after which it undergoes degeneration, and its walls contract, and that, on the other hand, its removal means a surgical operation, with its attendant risks (which may or may not be slight), it follows that an effort must be made to procure this degeneration and contraction, provided that the presence of the cyst is not incompatible with the preservation of health.

As already shown, their existence is not necessarily injurious to health; so that, in the first instance, it must be considered whether the hydatid is likely to degenerate if left alone. If it is large enough to have caused the victim to seek advice, it is not likely that it will be benefited thus, but still in some cases it may be left for a little time. Delay in suitable cases can do no harm, and may give time for degeneration and contraction to commence.

The remaining cases, which require treatment, are divided into two great groups—(*a*) those seen before suppuration has taken place in the cyst, and (*b*) those seen after suppuration has occurred.

(*a.*) Before suppuration has occurred, treatment is adopted with a view of causing contraction. This may often be accom-

plished by tapping them with a capillary trochar, and removing *a few ounces of fluid—not more.* This withdrawal of *a small quantity* of fluid is said to be followed by an exudation of albumen into the non-albuminous hydatid fluid, and is often followed by the death and degeneration of the parasite. If it fail to do so, the tapping may be repeated. If, on tapping, no fluid is obtained, it follows that the cyst is multilocular, and is either (1) full of growing cysts, or (2) undergoing gelatinoid degeneration. If the wall is very thick and tough, it is probably the latter.

The immunity with which capillary trochars may be plunged into almost any part of the body is remarkable. I have seen a physician try to find a hydatid cyst in the liver by plunging a capillary trochar into that organ in many different directions; as usual, however, in such cases no ultimate harm resulted.

If this tapping fails to destroy the vitality of the parasite, and the cyst continues to grow, if it causes serious inconvenience, or if it suppurates, then it must either be (1) opened, emptied, and drained, or (2) removed by operation. It must be remembered that nearly all hydatid cysts are met with in parts and organs formed from the splanchnopleure; hence, to reach the cyst, the trochar must pass through one of the various subdivisions of the pleuro-peritoneal space.

The description of treatment given here is wholly directed to cysts situated in these parts, since in the brain they cannot be accurately diagnosed, and are beyond the reach of surgical treatment; and in the other parts formed from the somatopleure or its divisions, the treatment is conducted on the same principles, but is, of course, infinitely more simple.

1. If the cyst is to be opened and drained, care must be taken that none of the fluid escapes into the serous sacs. To prevent this, adhesions must be formed between the opposed surfaces, and the tumour tapped through them. Some adhesions always form naturally at the projecting part, but, as a

rule, they are not very extensive, since an hydatid is not an inflammatory growth. With regard to the pleura, adhesions form easily. In the peritoneum they form less easily, but may be produced by *Mr. Fitzgerald's method* :—Tap the hydatid at its most prominent part with a fine trochar, and let fluid come away. (If the canula, however, chokes, let things be for a few hours.) Next, pass a number of harelip-pins through the abdominal wall into the hydatid, disposing them in a circle round the trochar. Leave everything for a day or two, and then remove them. Adhesions will be formed, and the opening may now be enlarged, either with dilators (tents, &c.), or by cutting with a bistoury. The sooner the contents of the cyst, including the inner two fine layers of its wall, can be removed, the more quickly will recovery ensue. Many surgeons enlarge the opening by dilatation or cutting, and then seize these two layers with their fingers or with forceps, and slowly drag them away.

It will be seen at once that the larger the opening the freer the drainage, and the more perfect the antiseptic precautions used the more rapid will be recovery. The adventitia left will contract, and the cavity granulate. At the same time, it will be understood how easily decomposition of the contents may occur, and septicæmia result.

Recently, my father, Dr. James Barrett, of Albert Park, was called to see a case of suppurating hydatid of the liver which had been tapped. An attendant had, however, allowed a probe to drop into the cavity. My father dilated the opening with tents until it was about two inches in diameter, then with crocodile-billed pharynx forceps he succeeded in extracting the black and oxidised probe from the bottom of the cavity, which extended nearly to the spine. The patient made a good recovery.

2. Sometimes, from the enormous size of a cyst, which if opened would kill by suppuration, or from the existence of suppuration in a cyst, it is necessary to remove them by operation. In the lungs no special operation is necessary, because they can be removed by the method just described. From

the abdominal viscera they must be removed by abdominal section or some other operative method. There is nothing special to note in the operations, which are performed in the usual manner, except that as much of the adventitia should be removed as is compatible with safety, so as to avoid the probability of subsequent suppuration.

VICTORIA AND TASMANIA AS RESORTS FOR CONSUMPTIVES AND PERSONS AFFLICTED WITH LUNG DISEASE.

The number of persons suffering from lung disease (chiefly phthisis) who are sent to the colonies for the benefit of their health has been increasing for some time past, and is still on the increase.

The results ensuing are exceedingly distressing in many cases, not so much from any fault of the climate, or rather climates (for there are many in Australia), as from an absence of information on the part of the invalids and their advisers as to the place to go to, and the occupation to be followed when they reach it.

Seeing so many lives, as I believe, sacrificed in this way, I have endeavoured in this paper to give briefly and accurately the necessary information, for the benefit of patients ordered to that country.

Taking, then, as the climate required for persons suffering from lung disease *one not liable to sudden changes; equable to a high degree; not necessarily hot or cold, but preferably temperate*, it remains to be seen to what extent these considerations are satisfied by any of the numerous Australian climates.

For this purpose a brief allusion to geographical and meteorological conditions is necessary.

Of those Colonies which are to the north of the Victorian part of the river Murray, which lies between latitude 36° S. and 34° S., little need be said; for, although the inland climates are equable, they are altogether too hot during the

long summer to be desirable residences for delicate people. The heat, however, though intense, is throughout almost the whole of Australia very dry, and free evaporation is allowed, otherwise it would be unbearable.

It will then be necessary only to consider the climates of Victoria, Tasmania, and New Zealand, which are all south of the 34th parallel of latitude. Of the last-named colony, the information I possess is not based on personal experience, but accounts tend to show that the climate is rather similar to that of Great Britain, and if that be so, it is certainly not a desirable residence for this class of invalids.

Victoria, situated as it is between the 34th and 39th parallels of latitude, possesses unique geographical and meteorological characters. It is the most southern part of the Australian continent, and is irregularly oval in shape, the long dimension running from east to west. It is bounded on the north by a large river, the Murray, and on the south by the Southern Ocean, and is completely divided by a chain of mountains into a northern and a southern area. The northern area, that situated between this great dividing range and the Murray, is practically a wooded plain, traversed by great rivers which run to the Murray. The southern area, that between the dividing range and the ocean, is an irregular slope to the sea.

Now there is a constant heating of the interior of Australia by the sun, and as the ocean stretches from the southern coast to the South Pole in almost unbroken extent, it is easily understood why southerly winds prevail almost constantly along this coast.

These winds are laden with water, which is deposited on the southern area, and on the dividing range, whilst but little reaches the northern area, which is comparatively dry. From time to time, however, either from compensatory or cyclonic causes, fierce northerly winds prevail, blowing therefore from the land to sea. These hot winds are of excessive temperature, and correspond probably to the sirocco. During their continuance, from one to five days, the evaporation is enormous, but sooner or later the cool southerly wind rushes

in, and a fall of temperature of as much as 50° Fahr. occurs in a few hours, whilst along the line of neutralisation, rain is often deposited in a tropical manner.

But this line of neutralisation is neither mathematical nor fixed, and is a broad area, which travels from the sea to the range with some velocity, *but which rarely or never crosses the range.*

Thus in Victoria are two distinct climates. *The southern,* variable in the extreme, especially in summer, and often damp. *The northern,* equable and dry; in fact, to agriculturists, unpleasantly so.

It will thus be seen that the one climate is the exact antithesis of the other. In the southern I have known the temperature in the sun fall from 140° Fahr. to 90° Fahr. in two hours. It need hardly be added that such changes usually occur in the summer, when people are wearing light summer clothes, so that the results to them are intensified. Melbourne, which is in the southern climate, corresponds in mean temperature to Nice and Mentone, but in no other climatic conditions is there much correspondence.

In this southern area, and on the range, live the greater part of the population of Victoria, in the cities of Melbourne (population 300,000), Ballarat (population 40,000), Geelong (population 12,000), and other smaller towns with districts. The only city in the northern area is Sandhurst (population 36,000). But there is a large population on the plain, particularly along the Goulburn River, in the so-called Goulburn Valley; Shepparton, Mooroopna, Murchison, Numurkah, and Echuca, being towns so situated. But of all the cities in the southern area, none experience such sudden changes as Melbourne, and it will therefore be of use to contrast the relative mortality from phthisis in Melbourne and in the rest of the colony, of which the total population is about 800,000.

The Government statist, Mr. Hayter, has been kind enough to furnish me with the following returns, which give the necessary information.

Deaths from Phthisis per 10,000 Persons Living In and Outside Melbourne 1861–82.

Year.	Melbourne.	Extra Metropolitan Districts.
1861	23·44	10·63
1862	24·64	8·71
1863	23·71	8·79
1864	20·08	8·70
1865	22·11	8·57
1866	20·42	9·53
1867	21·56	8·87
1868	20·83	7·63
1869	23·87	8·83
1870	22·49	8·56
1871	22·08	7·20
1872	18·69	8·62
1873	20·51	8·77
1874	22·04	8·94
1875	21·46	9·25
1876	22·46	8·28
1877	22·74	9·29
1878	22·62	9·63
1879	21·77	8·45
1880	23·95	8·92
1881	22·71	9·45
1882	23·09	10·03
Means ...	22·15	8·88

That is, the mean mortality from phthisis in Melbourne is 22·15, in the rest of Victoria 8·88.

It has been urged that importations from abroad have swelled the list. But the results are too uniform to be affected by such a comparatively small and variable element. So that evidence from this source is strong as to the influence of the climate of Melbourne in producing phthisis, and in assisting its progress when present, probably by promoting pneumonic attacks. It may be of interest to notice also that phthisis in Victoria is actually increasing amongst males from 20 to 55 years of age, although their numbers have decreased thus :—

Year.	Males Living Between 20 and 55 years of age.	Deaths.
1861	178,695	337
1871	174,076	384
1881	154,290	433

In England and Wales the death-rate from phthisis from 1866 to 1880 was 22·81 per 10,000 persons living, and is therefore nearly the same as that in Melbourne, but very much greater than that of the rest of Victoria, and, judging from my own experience, infinitely greater than that in the northern area of Victoria.

Further, the death-rate from phthisis in Melbourne is much higher than that in any of the other Australian colonies. But the death-rate from phthisis in the other parts of Victoria is less than the total results of any other colony, save New Zealand, thus:—

	Mean No. of Deaths from Phthisis per 10,000 Persons Living.
Melbourne	22·15
Rest of Victoria... ...	8·88
South Australia	9·73
New Zealand	8·48
Tasmania...	10·21
New South Wales ...	10·31
Queensland	12·48

All these figures, then, prove more or less conclusively that the climate of Melbourne has a powerful influence in producing phthisis, and, conversely, that the climate of the extra-metropolitan districts have a less powerful influence.

The death-rate from phthisis in the northern area has never yet been obtained; but, as has been shown, even when combined with part of that of the southern area (extra-metropolitan), it is only 8·88. If alone, it would be in all probability very much smaller; and it seems to me to be in every respect

a suitable and desirable climate for consumptives; in fact, to all appearance, the most perfect existing.

Climate of Tasmania.—Tasmania is an island situated about 250 miles south of Melbourne. It is smaller than Ireland, and almost uniformly mountainous. Whilst the climate is warm during parts of the year, still, owing to its situation, the hot winds and the sudden changes which are characteristic of the climate of Melbourne never occur. But, on the other hand, in winter the climate is decidedly cold, and snow, which is quite unknown in Melbourne, falls frequently. Whilst the summer is equable and in every way adapted for consumptives, the winter is decidedly unsuited.

Tasmania, in fact, possesses a bracing climate, better adapted for Indian invalids than any other class, and a sanatorium for soldiers of the Indian army has been established there. The mildness and beauty of the summer induce the Melbourne people to flock over in thousands during the height of the Melbourne summer.

From this sketch, it will be seen that all evidence tends to show that the climate of Melbourne is favourable, not only to the production, but to the fatal termination of phthisis cases, and that the most suitable climate for persons affected with lung complaint is that of the northern area of Victoria for the whole year, or of Tasmania for the summer.

The low rate of mortality from phthisis in the other colonies simply shows that their climates do not tend to produce phthisis to the same extent that the Melbourne climate does; but it does not follow that they are equally suitable for such sufferers as that of the northern area of Victoria. And, as a matter of fact, they are not; north of about the thirty-fifth parallel the temperature is very great, and the climate is very trying.

The first part of the question may be regarded as answered, viz., a determination of the most suitable place of resort.

The second, as to the occupation to be followed, can be very shortly and definitely stated.

It is a very great mistake (where possible to avoid it) to exchange sedentary life in England for a similar one in

Victoria. The object should be to seek manual or outdoor employment in one of their very varied forms on the sheep or cattle stations.

Such employment is easily forthcoming to the willing, and is both beneficial and agreeable.

The influence on phthisical patients of some mild but purposive occupation is too well known to require comment, and this form is doubly beneficial.

If the summer should prove too severe for an invalid, he can in thirty-six hours reach Tasmania, and stay there till the heat of midsummer has passed.

It cannot be too strongly insisted that no patients should be sent out who are suffering from advanced phthisis; they should remain near home. It is for patients in the early stages that the climate of the Northern area holds out such advantages.

To Recapitulate.—The following advice should be given to patients in the early stage of phthisis who wish to try the climate of the colonies of Australia:

(1) That they should, if possible, go out by the fastest and best equipped steamers.

(2) That they should go to Melbourne, and at once travel north of the Dividing Range, to such places as Sandhurst, or anywhere in the valleys of the great rivers, the Goulburn or the Murray.

(3) That they should obtain outdoor employment, on a sheep or cattle station, or some similar place.

(4) That, should the summer try them, and the practice of midday rest fail to relieve, they should go to Tasmania for January and February.

*That, however, in all cases, they must remember that their place of safety lies north of the Great Dividing Range.**

* See Map on page 2.

THE CAUSE OF THE FIRST SOUND OF THE HEART, AND THE MODE OF ACTION OF THE CARDIAC MUSCLE.

As a visitor to England the conflict of opinion on these subjects has proved so exceedingly confusing to me that I desire to draw attention to some original experiments performed by Professor Halford of Melbourne, some twenty-five years ago, which throw considerable light on the subject. I may add that I have repeated and somewhat modified these experiments at frequent intervals since 1877.

(A.) *The Cause of the First Sound.*

This is allowed by most observers to be due either to the auriculo-ventricular valves or to the contraction of the ventricular muscle, and the matter resolves itself into a determination of the relative merits of these two suppositions.

If it is caused by the valves, it is not due to the closure of the valves, since, in the first place, their closure would cause a short sharp sound like the second; and, further, they are closed before ventricular contraction begins. This may be shown by the following experiment:—

From a relaxed heart (man) the upper part is cut off by a horizontal incision through the auricles just above the level of the auriculo-ventricular valves. The aorta and pulmonary artery are ligatured and the ventricular portion put in a cup with the apex downward. Fluid is now driven, by means of a syringe, through the auriculo-ventricular orifice, care being taken to use only very moderate force. As soon as the ventricle is filled the valves close.

Here the ligature represents the semilunar valves closed

from arterial tension, the syringe represents the auricular contraction, and the distension of the ventricle represents the "loading" of the ventricular muscle, which occurs normally, and by which the elasticity of the ventricle is called into play, and pressure is exerted on the blood, and so closure of the auriculo-ventricular valves effected. If, then, it is due to these valves, it is caused by their vibration and not by their closure, since that occurs before the ventricle contracts.

As to its being caused by contraction of the heart muscle. In this case the duration of ventricular systole must coincide in length with the first sound, or, in other words, the second sound and closure of the semilunar valves occur in ventricular diastole, and some time after it has begun, which is inconsistent with results obtained from simultaneous cardiograph and sphygmograph observations. In fact, this view of the causation of the first sound seems to be supported by only one experiment, viz., that of Ludwig and Dogiel, which consisted in ligaturing, in order of the flow of blood, all the vessels of the heart. The heart, however, presumably empty, continuing to contract, caused a sound. From this it was inferred that the contraction of the muscle can cause a sound.

Now, if there were nothing whatever in the heart, then all the internal surfaces would be in contact, and it is exceedingly difficult to understand how it could contract, since it could not relax, the "contraction remainder" owing to atmospheric pressure being enormous.

If, however, it did contain any fluid such as a little muscle serum, it could readily cause vibration of the valves and a sound.

Now, disregarding any other evidence against this view, such as the fact that the heart muscle cannot undergo tetanus, a reference to Professor Halford's original experiment is sufficient to completely disprove the supposition that the contraction of the heart muscle is a factor in the production of the first sound.

If the heart of a living dog is exposed, artificial respiration being kept up, and a stethoscope placed on the heart, the first sound will be heard. If now the superior and inferior cavæ

be clamped outside the pericardium, after a beat or two the sound ceases although contraction continues, *i.e., there is muscular contraction but no sound.* After repeating this, blindfold an observer, and let him listen to the sound, then alternately clamp and release the veins, and the result will be uniform. Once with Professor Halford, and once with me, the experiment failed, but, on searching, in each case an azygos vein was found entering the right auricle behind. On clamping it the experiment again succeeded. This variety is not uncommon in Colonial dogs.

This experiment is simply conclusive, and can readily be performed by any one. In an hour the observer can be quite satisfied as to the cause of the first heart sound.

The musculi papillares pull the valve one way, and the blood pushes it another, but as the two forces are not mathematically equal, a to-and-fro movement—a vibration in fact—is set up and causes the sound.

This agrees with cardiograph experiments, which tend to show that the first sound lasts only so long as blood is contained in the ventricle during ventricular systole.

(B.) *On the Mode of Action of the Cardiac Muscles.*

The following doctrines* with regard to this subject are merely mentioned because they are inconsistent with the results of experiments performed in the Melbourne School:—

1. The increase in the antero-posterior diameter of the heart is apparent not real, and is due to the rotation of the heart on its long axis.
2. There is no shortening of the distance from the auriculo-ventricular line to the apex, except slightly at the conus arteriosus.
3. The whole heart is pushed down by the expansion of the pulmonary artery and aorta.
4. The upward movement of pins stuck through the chest-wall into the ventricle is due to the rotation of the heart.

* Foster's "Text-book of Physiology," Ed. IV.

If the heart be exposed in a medium-sized dog, in which the pericardium, whilst tough, is tolerably transparent,—great care being taken not to injure the pericardium—and needles be put into the apex, the middle of the ventricles, the auriculo-ventricular line, and the auricles, the needles will move up and down, and but slightly laterally.

The one at the apex moves very slightly, and that at the auriculo-ventricular groove very greatly. Here the fulcrum on which they move is the pericardium, not the chest-wall, and if there were much rotation of the heart they would show marked lateral movement. Further, it can be seen that the rotatory movement is not very great. The auriculo-ventricular groove is covered with fat, and is thus easily seen to move vertically at each contraction. The pericardium itself moves but slightly, and seems to be of much the same bulk all through.

When the ventricles contract the auriculo-ventricular line descends, and the distended auricles occupy the upper part of the space. When they contract the auriculo-ventricular line ascends, and the ventricles occupy the greater part of the space, *i.e.*, the base and apex are the most fixed parts of the heart, and the auriculo-ventricular line the most movable.

If the abdomen be opened, and that part of the diaphragm which corresponds to the apex be watched, it will be seen to be comparatively motionless, *i.e.*, the heart as a whole is not pushed down, as was shown by the pin experiment.

If the pulmonary artery and aorta be laid bare it will often be difficult to see the expansion. If they are to push the heart down, they must have some point to act from. They are far more likely to push the areolar tissue in the mediastinum up than the heart down, if they did exercise any such force.

Lastly, paradoxical as such a statement may seem, "the apex is the point from which the longitudinal fibres of the ventricles act and pull down the auriculo-ventricular line," for the apex does not move downward, and it cannot move upward since there is nothing to take the place, and lateral movement is prevented by the pericardium.

As it is therefore fixed, it is the *point d'appui* of the longi-

tudinal ventricular fibres, just as the base of the heart is that of the longitudinal auricular fibres, so that all the longitudinal fibres may be regarded as being inserted into the auriculo-ventricular groove.

But all these statements are true, only so long as the pericardium is intact, since it is the great regulator of the action of the muscle.

Now cut it down the middle. In a moment the apex of the heart flies forward. The auriculo-ventricular groove no longer moves very much, but the apex is dragged upward at each contraction of the ventricles. The *point d'appui* of the longitudinal ventricular fibres is changed, and the action of the muscle completely altered.

It will be seen then that the auriculo-ventricular groove moves in ordinary action up and down, according as it is acted on by the ventricular or auricular longitudinal fibres, and that the apex and base of the heart are the most fixed points. It is probable that at each contraction there is slight rotation and shortening of the interventricular spiral also.

These experiments were carefully conducted with the aid of anæsthetics.

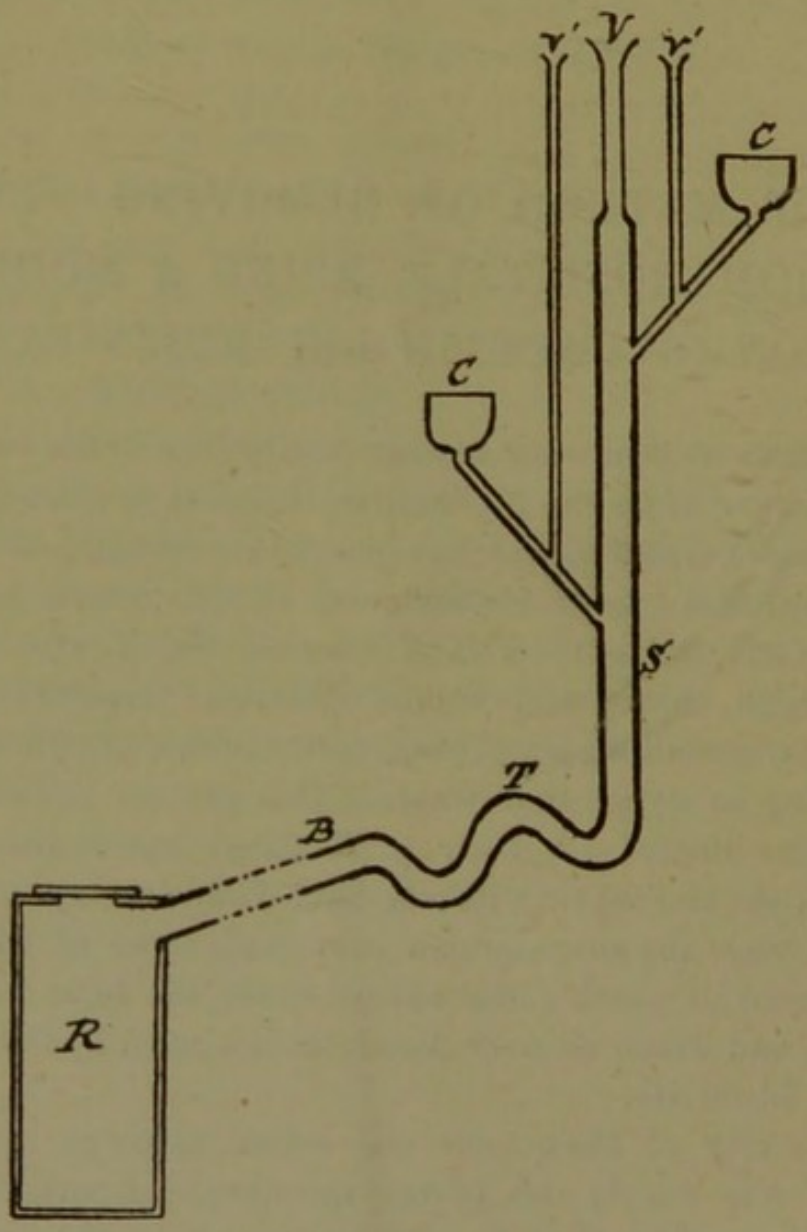
A NEW METHOD OF REMOVING SEWAGE FROM HOSPITALS, BEING A MODIFICATION OF CAPTAIN LEIRNUR'S SYSTEM.

The system of removing sewage (using the term strictly to mean excreta) from the Melbourne Hospital is a modification of Captain Leirnur's, and has proved so simple, cheap, and efficacious, that I have endeavoured in this article to briefly describe it. Being used in a hospital which was formerly ridden with septic and wound diseases (traumatic fever, erysipelas, spreading gangrene, septicæmia, and pyæmia) it is interesting to notice that whereas this system (which being unique was blamed for their production) has remained unchanged, yet the septic diseases have become very much less frequent since the introduction into Melbourne of that form of treatment to which in its widest sense the term antiseptic is given, and which all over Australia is known by the generic name of Listerism.

In the city of Melbourne the water carriage system of removal was simply out of the question. Apart from the prevalent opinion that it was not equal to the dry earth system, the fall from the city to the sea is not sufficient to allow of its safe introduction, and when a system of removal of sewage had to be adopted the choice lay between the dry earth and the Leirnur system; and as thirty years ago very little was known of Leirnur's method it was not adopted. But to the Melbourne Hospital (300 beds), which is built partly on the old or barrack plan, and partly on the new or pavilion method, the dry earth system was totally inapplicable,

for many reasons too lengthy to detail, and so Leirnur's method was experimentally tried, and being found to answer perfectly, was generally adopted.

The following diagram represents this air-tight scheme.



In this diagram, *R* represents one of the underground iron tanks which, as mentioned already, are situated in the hospital grounds ; and *B*, a basal soil pipe leading to it from one of the blocks of the building. This pipe *B* is double trapped at *T*. *S* represents a vertical soil pipe, into which the soil pipes of two commodes, *C*, *C*, open at an acute angle. These pipes and the vertical soil pipe are ventilated by tubes represented by *V'*, *V'*, and *V* respectively.

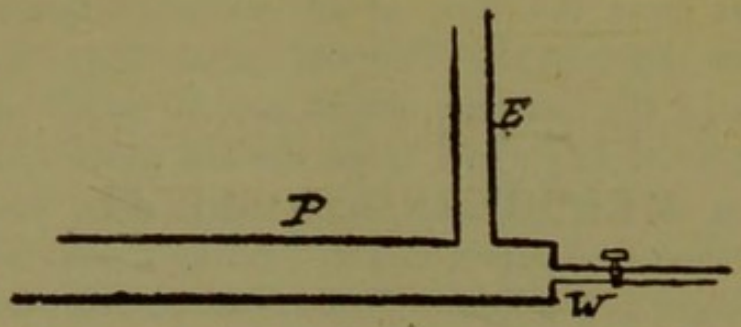
The exact mechanism may be described as follows :—In the grounds of the hospital are placed four iron air-tight tanks,

each of a capacity of from 200 to 300 cubic feet; into these, receive pipes, which may be termed basal soil pipes, convey the sewage from the base of the various segments of the building to the tanks. The soil pipes from the various commodes in the building, which are 36 or 38 in number, open at an acute angle into large vertical pipes which run to the bottom of the building, and there, after describing a horizontal S-shaped curve, and so forming a double trap, open into the basal soil pipes. The upper extremities of these vertical tubes are freely ventilated by air shafts opening on the highest points of the roof. The soil pipes leading from the commodes to the vertical pipes are also in many cases similarly treated.

From this it will be seen that, in the first place, by virtue of the air-tight character of the system no reflux of gas to the commodes can occur; if from imperfection any reflux did tend to occur, it would have to overcome the double trap, and, finally, if any gases get as far as the vertical soil pipe, either the main (*V*) or the subordinate (*V'*) ventilators would carry them off.

Any sewage thrown into the commodes falls through the vertical tubes to the traps, and there generally remains for some time. But once a day the tanks (*R*) are exhausted of air, and then everything in the system is driven with great violence into the tank, and the system is thus thoroughly emptied and cleaned; for the exhaustion of air is continued until it is empty throughout. Once a day also the tanks themselves have their contents transferred by the same pneumatic action to air-tight carts, and the sewage is taken into the country and buried. The mechanism by which the exhaustion is effected is equally simple and effective. In Melbourne the water pressure is very great, and this motive force is here utilised. Into a large metal tube is blown a small but powerful jet of water in the direction of the axis of the tube, whilst opening into the tube at right angles is the metal pipe leading to the chamber which it is required to exhaust, the actual connexion being made by coarse india-rubber tubing.

The annexed diagram will serve to explain the arrangement.



In this diagram, *W* represents the water pipe and tap, *P* the large metal tube, whilst *E* represents the tube which is connected with the chamber it is required to exhaust. With a very moderate expenditure of water, the exhaustive force obtained with this apparatus is enormous.

From these various considerations it will be seen that this system, carefully adapted with good material, is, in a city with a tolerably high pressure water-supply, almost perfect, and is wonderfully cheap in application and use. Melbourne is, I believe, the only city in which this modification is used, and the results are there very good indeed. The only weak point in the system is the fact that the tanks must be opened once a day in order to be emptied, and are then apt to give rise to smells, &c. The objection is not insuperable and can be readily overcome by disinfectants. Of course any gases thus arising are at once in the open air and far from the hospital walls. The tanks, tubes, and carts are made of iron, and all doors and openings are closed by iron plates which screw on by a tolerably coarse but well fitting screw thread which proves sufficient to make them air-tight. The most ignorant men are found to be perfectly competent to successfully conduct the working part of the operations.

ANTISEPTIC TREATMENT IN THE MELBOURNE HOSPITAL.

At the time the writer was first appointed Resident Medical Officer to the Melbourne Hospital the enormous prevalence of septic disease in the institution (which contains about 300 beds) was attracting great attention, and causing much anxiety; in fact, so great was the prevalence of septic disease that it was proposed to pull the hospital down and rebuild it.

The writer then experimentally adopted the Listerian method of treatment in a number of cases, with the result that none of them contracted septic disease, although, in other respects, they were subject to precisely the same conditions as the other patients, some of whom developed septic disease.

A careful search through the records of the institution showed that, previous to this, strict antiseptic treatment had not been adopted in any case in which septic disease had developed.

So far, then, all that was proved was that all the cases which had developed septic disease had not been treated antiseptically, and that the few he had so treated had not developed it.

From this, and other evidence, it was recommended that, in place of rebuilding the Hospital, an attempt might be made to apply the antiseptic treatment throughout the Hospital, and see whether that would effect the necessary cure.

This was done, at first incompletely, but subsequently efficiently, and, when the writer left Melbourne, at the close of 1883, the septic diseases had been largely and steadily diminishing in frequency. The first diminution was great; after that it was slower.

At a subsequent period to the original investigation, of eleven cases of septic disease which came under his care only one had been treated on antiseptic principles. In fact, the result of an experience of nearly two years is that almost all the cases which developed septic disease during that time were not treated on the principles which Sir J. Lister recommends; and that, of those which were so treated, but one or two ever developed septic disease. It is, unfortunately, impossible in these cases to be certain that the antiseptic precautions were perfect. On the other hand, it would perhaps be unfair to ascribe this great improvement purely to the dressing, since, coincident with their application, many other sanitary improvements were effected. Still, the first cases (those below) were recorded before such improvements were effected. The stereotyped dressings were not used, but many other antiseptics, such as terebene, thymol, and bichloride of mercury, were used, in combination with the carbolic gauze-pad and bandages.

It is, of course, obvious that in many cases strict antiseptic treatment could not be adopted, as in perineal cases, &c.; and many of these developed septic disease.

In this paper it will be observed that reference is made to the antiseptic treatment purely as a prophylactic to the grosser form of septic disease, no allusion being made to the effect in bringing about primary union, &c.; although, as far as my own experience went, the result in that direction was equally striking. Still, on that head, no statistical information is available.

It should be mentioned, by way of explanation to English readers, that by "Listerism" is understood, in Australia, the complete adoption of antiseptic precautions,—that is to say, all materials which touch a wound are sterilised (as regards septic organisms), and the dressings are so arranged as to prevent their admission in the intervals between the dressings.

It may interest English surgeons to learn, so deeply did this treatment impress authorities at the Hospital, that some laymen, on the authority of a German surgeon, talked of making the next case of septic disease that

occurred in the Hospital a matter of investigation in the criminal courts, asserting that a patient who died of septic disease, which was clearly avoidable by a certain course of treatment, must be considered as "slain" within the meaning of the law, and that his slayer was the surgeon who neglected to thus treat him, and who was therefore guilty of manslaughter. Fortunately, better counsel prevailed.

The great advantage of the antiseptic method in reducing the frequency of dressings was exceedingly noticeable in a semi-tropical city like Melbourne, where the staff of dressers was often limited. In one case of amputation of the thigh, dressings were re-applied but four times, an interval of a week passing between each dressing.

(A.)—Cases which contracted Erysipelas prior to Admission to the Hospital.

No. of Case and Date of Admission.	Nature of Case.	Date at which Septic Disease was Contracted. Nature of Same.	Treatment.	Remarks.
(1) 5, 2, '81	Lacerated wounds of face	Erysipelas some time after admission	No strict antiseptic treatment.	
(2) 31, 5, '81	Wound of face	Ditto.	,,	
(3) 4, 9, '81	Lacerated wound of eye-lid	Erysipelas contracted three days after injury (outside Hospital)	,,	

(B.)—Cases which contracted Septic Disease after Admission.

(1) 5, 2, '81	Wounds of Scalp	Erysipelas some time after admission	No strict antiseptic treatment.	
(2) 31, 5, '81	Wound of face	Erysipelas after admission	,,	
(3) 31, 10, '81	Wound of knee-joint	Septicæmia, developed definitely, 13, 3, '82	,,	
(4) 28, 12, '81	Wound of hand	Erysipelas two days after admission	,,	

(5)	5, 1, '82	(*a*) Fractured leg (*b*) Bedsore	Septicæmia, declared 27, 2, '82	,,		
(6)	10, 1, '81	Wounds on forehead and breast	Erysipelas, developed three days after injury	,,		
(7)	28, 1, '82	(*a*) Concussion of brain (*b*) Bedsores on heels	Erysipelas of legs, 17, 2, '82	,,		
(8)	12, 2, '82	Compound fracture of leg	Septicæmia, 13, 3, '82	,,		
(9)	15, 2, '82	Contused wound of forehead	Erysipelas three days after admission	,,		
(10)	8, 3, '82	Gunshot wound of leg	Erysipelas seven days after admission	,,		
(11)	21, 1, '82	Incised wounds, forearm	Erysipelas five days after admission	,,		

(C.)—Cases which were treated Antiseptically. In none of these did Septic Disease supervene.

No. of Case and Date of Admission.	Nature of Case.	Treatment.	Result and Remarks.
(1) 24, 1, '82	Suppurating bursitis over knee-joint. Pus burrowing about, but not communicating with joint	Strict antiseptic treatment adopted	Discharged from Hospital cured, 14, 3, '83. This case was treated in the ward in which No. 8 case septicæmia occurred, and at the same time.
(2) 14, 2, '82	Gunshot wound, hand	,,	Discharged cured. This case was treated in ward in which No. 8 case erysipelas occurred, at the same time.
(3) 15, 2, '82	Incised wound over knee-joint	,,	Discharged cured, 3, 3, '82. Remarks about preceding case apply equally to this.
(4) 26, 2, '82	Strangulated femoral hernia. Operation and reduction, sac being opened	,,	Cured in three weeks. No. 5 case septicæmia occurred in ward in which this patient was treated, one day after the operation.
(5) 28, 2, '82	Arm torn off by machinery. Amputation below shoulder-joint	,,	Discharged in one month, almost well. During treatment of this case, No. 9 case septicæmia developed, in the same ward.

(6)	7, 3, '82	Contused wound, leg. Houghing	,,	Discharged cured, 20, 3, '82. This case was coincident with No. 9 case of septicæmia.
(7)	8, 3, '82	Compound fracture into ankle joint. Fracture of tibia close to joint. Great comminution of the lower half of the fibula. Projection of tibia through skin	,,	Was under treatment when paper was published, and was then free from septic disease.
(8)	20, 3, '82	Circular saw accident to hand. Amputation of fingers	,,	Discharged well, in a fortnight after admission.
(9)	2, 4, '82	Gunshot wound of hand. Amputation of forearm	,,	Discharged in three weeks, almost well.

TWO CASES OF NEURO-FIBROMATA.

Case 1.—*Diffused Neuro-Fibromata.*

Thomas E., aged twenty-one, single, native of Lancashire, left England when twelve years of age, and has since followed the occupation of sailor.

Previous History.—The patient came to Victoria eighteen months since, and at that time he first noticed a few small lumps situated beneath the skin on the right side of the chest. They were hard, and only painful when injured. Their size was about that of a pea, and their subsequent growth has been very slow indeed, but similar lumps have rapidly made their appearance on all the other parts of the body except the hands, feet, head, and genitals. None of them have grown to any great size. Two years ago he had a fit, during which he lost consciousness; six weeks ago he had a second similar fit; and two days ago a third. The only previous illness with which he has been troubled was a liver complaint, which prostrated him for seven weeks when he was eleven years of age. He was then jaundiced. His paternal grandfather and his father both died of consumption. His maternal grandfather, his mother, sisters, and uncles are all living, and in good health, with the exception of a maternal uncle who suffers from "fits."

Present Condition.—On examination, the patient is seen to be of small stature, but of fairly well developed frame, with moderate muscular development. Face pale. All the organs seem healthy except the heart, which is excitable, the patient suffering from palpitation very frequently. Almost all the nerves of the body which can be examined by the finger are affected, with firm oval or round growths situated on them, and interrupting their continuity. In the case of the oval ones the nerves are attached to each end of the oval. They can be moved freely in a direction at right angles to that of

the nerve on which they are placed, and but slightly in its direction, and then only with pain. The size varies from that of a walnut to that of a pin's head or smaller still, but the average size is about that of a small marble. They are all hard and firm. Their number was not ascertainable definitely, being many thousands. Some, if not most, of the nerves have become mere chains of these growths, and where there are no *apparent* nodules still the nerve is enlarged and hard, probably owing to a multitude of infinitely small ones being situate on it. The internal cutaneous nerve in the forearm is affected from its origin to its terminal branches of distribution, and can be lifted with the fingers from the deep fascia, and when pulled on far down in the forearm can be felt to move in the arm.

Details of Distribution.—Right upper limb: The posterior interosseous nerve and its branches, the radial nerve, the anterior cutaneous nerves of the forearm, the median nerve in the arm and as far as it can be traced in the forearm, and part of the musculo-spiral, have become mere chains of these growths. The ulnar nerve is also affected just where it passes between the olecranon and internal condyle. All the nerves running along the axillary artery are in a similar condition. With the exception of the musculo-spiral, the same description applies exactly to the left upper limb. Both the hands are *apparently* free from disease. The head is not affected. Neck: A few branches of the superficial cervical plexus are affected, and both spinal accessories are extensively involved. Trunk: Most of the superficial branches of the posterior spinal nerves are similarly diseased, and all the anterior and lateral cutaneous branches of the intercostal and abdominal nerves are in the same state, the growths on the right side of the thorax being the larger. Lower limbs: Both equally affected, nearly all the cutaneous nerves being chains of fibromata—the musculo-cutaneous at their emergence, the long saphenous, the external saphenous, the internal, middle, and external cutaneous nerves, the internal and external popliteal, and, in fact, every nerve that can be felt in the leg or thigh, is in this condition. The feet are

not involved. From the sensation caused by pressure over the sciatics, which is similar to that caused by pressure on some of the other tumours, the patient believes that they are affected also.

Remarks.—The patient would not consent to the removal of a superficial tumour for microscopical examination, so that their nature was not definitely determined, still there is no doubt that they are fibromata. None of the tumours were painful or caused the slightest inconvenience except they were pressed, rubbed, or rolled.

Case 2.—*Localised Neuro-Fibromata.*

The patient who forms the subject of this report was under the private care of Mr. T. N. Fitzgerald, Senior Surgeon to the Melbourne Hospital, who, after removing the tumours, forwarded them to me for general and microscopical examination, and gave the subjoined notes:—The patient had four tumours, three of which were situate on his right arm, and one on his leg. Two situated near the elbow were of the size of a goose-egg, another (on the shoulder) was about that of a marble, whilst the fourth (on the leg) was about as large as a walnut. They had been growing a very long while, but had only caused trouble of late, having in January, 1882, produced paralysis of the right arm, which hung down useless, whilst the leg was useless on account of the pain caused by movement. They caused no inconvenience except on movement or pressure. In January, 1882, Mr. Fitzgerald excised them all at one sitting, and then found that the large ones were situated on the ulnar and median nerves. That on the ulnar was placed just at the elbow-joint, and the nerve was divided in removal. That on the median was just below the elbow in the forearm, and by great care Mr. Fitzgerald contrived to save a few fibres of this nerve. The small one at the shoulder was removed from a branch of the circumflex nerve. The fourth, in the leg, was situate on the posterior tibial nerve, at the ankle-joint. Mr. Fitzgerald opened the capsule and enucleated this tumour, thus leaving the nerve almost uninjured.

He would have enucleated the large ones, but found it impossible to do so from the nature of their growth and attachments. The patient made a rapid recovery, as far as the operation-wounds were concerned, and regained a limited amount of movement in his arm, and perfect power of movement in his leg, and up to the present (May 16, 1883) has had no return of the tumours. The tumours were oval in shape and firm in consistence, but were not hard. They had a sheath of connective tissue continuous with that of the nerves on which they were placed, which were attached to each end of them. Many, if not all, of the bands of nerve-fibres ran through the tumour in and beneath this sheath, being, however, separated widely from one another. This accounts for the success which attended the enucleation of the one situated on the posterior tibial nerve. Microscopically, the section showed a great predominance of white fibrous tissue over every other structure. The bands of this tissue interlaced in every direction, and were in many places arranged concentrically. The cells were badly defined; they were diffused through the specimen, and were exceedingly numerous for such growths, which could fairly be called soft fibromata.

The contrast in these two cases is very marked. In the first, the morbid developmental energy seems to have been expended in the production of an immense number of minute tumours and in a general fibroid infiltration of the nerves. In the latter the same energy, perhaps less intense, seems to have been expended in the production of much larger and infinitely fewer growths, which, however, were more destructive as regards their immediate consequences. The first patient still goes about his business and does not trouble himself about these tumours, and tells me that he can notice the increase in numbers almost weekly. With the exception of the fits and the palpitation he is absolutely free from disease in the popular sense. It would seem that the boundary-line between these growths and some forms of sarcomata is exceedingly difficult to draw.

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