A Clinical Lecture

ON MY

UNSUCCESSFUL OPERATIONS FOR CANCER OF THE TONGUE, AND ON THE EARLY DIAGNOSIS OF THE DISEASE.

[WITH COLOURED PLATE.]

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SUCCESSFUL OPERATIONS.

GENTLEMEN,—Nearly four years ago¹ I gave an address at the Hunterian Society on what operation can do for cancer of the tongue, and I showed then that the success of operations for cancer of the tongue is really very much greater than it had been previously thought to be. To-day I intend to make a continuation of that address, and have all my results collected up to the present time; and with the help of Mr. Young, my junior house-surgeon, who has carried out the work excellently, I have been able to collect the results of all my operations for cancer of the tongue performed up to three years ago. The cases are 129 in number. And out of those 129, 32 may be regarded as absolute successes. And if you take away from the total, as we do in making up these statistics, the cases of 12 patients who died of some other disease within three years after the operation, the totals then are 32 in 117 cases; that is a proportion of successes of over 27 per cent.—a very considerable proportion when the severity of many of the cases is taken into account. Then I was not satisfied about three or four of the cases, and I thought that, although I had not the least doubt myself that the disease was malignant, yet other people might have taken a more favourable view of them, and said that they were on the border-line of cancer. So I cut out 4 cases, and on that account the totals are 28 out of 113; thus the proportion is nearly 25 per cent. Three years ago it was only 20 per cent. I put these figures before you now—and I put them before myself with very considerable satisfaction—because, as far as I know, no more successful statistics have been published of any large number of cases of operation for cancer of the tongue. I was more particularly gratified, too, on account of the nature of the disease in some of these cases, and the length of time which had elapsed since the patient was operated upon. Take, for instance, an old man who is now between 80 and 90, on whom I operated in this hospital nineteen years ago. The case was very bad, because I removed not only a large part of the tongue, but the glands (which were malignant) on the same side of the neck.

Mr. Young received a letter from his daughter to say that he was still in perfect health, that he had never had any further trouble in his tongue or in his neck, and that he would have come up to see me if he had not been stricken by apoplexy three or four years ago, so that he was not able to travel to London.

There was another case of a very bad kind indeed. A gentleman came to me four years ago. Just at that time he had a very badly ulcerated cancer on the right side of the tongue, extending into the floor of the mouth, and he had more than one enlarged gland, and this state of things had been going on for a long time. In his case I was obliged to remove the entire tongue, and in the course of two or three weeks I removed all the contents of the anterior triangle; and, fearing that I had not taken out sufficient of the floor of the mouth, I cut away a portion at the second operation, so that I left a large cavity from the mouth almost to the clavicle. He made a very good recovery; he was a very determined person, and from both operations he made admirable recoveries.

Then the firm of which he was a very active member sent to ask what my opinion was—first, as to whether he should go back to his work; and secondly, what I thought would be likely to be the duration of his life. I replied to the first question that if he was inclined to go back to his work—and I could not conceive that he could do anything better—he could do so, because he was an extremely valuable man of business to his firm. To the second question I answered that in my opinion he would not live a year, and I should not be surprised if he was incapacitated for work in six months.

Last November (1901) he came to see me on a certain day and he said, "Do you know, Mr. Butlin, why I come to-day?"

I said "No." He said, "Because it is exactly three years to-day since the second operation was performed." I have seen him again within the last two or three months, when he came previous to taking a voyage I think to China or Japan, where his firm have large interests. And I was very gratified, because I looked upon his as a case that was well-nigh hopeless. I speak strongly about these successful cases, because an opinion prevails in the minds of even eminent surgeons that no operation for cancer of the tongue is ever permanently successful. That is an opinion which is not merely incorrect, it is most mischievous. As to the nature of the disease, in almost all these successful cases it was proved by microscopic examination, and the microscopical examination in the case of the patients operated upon in the hospital was made in the pathological department; therefore I am not responsible for it. And in some of the successful cases, not only was the disease in the tongue epithelioma, but the glands which were removed were also epitheliomatous; in fact they were transformed into epitheliomatous tumours.

UNSUCCESSFUL OPERATIONS.

So far, so good. But one day, not very long ago, I was sitting and working out these results on pieces of paper, and was in a really happy frame of mind at the number of successful cases and the kind of case in which success had attended operation, when, as it were by chance, I cast my eye on the other side, and then saw to my horror—for it dawned upon me suddenly—that out of the 129 patients on whom I had operated for cancer of the tongue, nearly 100 are dead. And I assure you that from a state of satisfaction I became quite despondent, and I began to wonder, considering what all these people had been through in the way of pain and suffering, not only from the disease but from the operation, whether the game after all was worth the candle. When I had recovered myself a little, I began to consider whether things ought to be as bad as they certainly are at the present time, because the results I put before you are not what would be called bad results for cancer of the tongue. They would be called good; indeed I do not know any large statistics which are better, so that the proportion of unsuccessful cases is really very large.

When I came to look into them I found that out of the 97 patients 12 died of some other disease than cancer of the tongue within three years, and 14 died of the operation, not a large mortality when the severity of many of the operations is remembered. Unfortunately it is quite certain that some of these people, if they had not died of the operation or shortly after it, would have died from recurrence of cancer in the mouth or in the glands. Of the remainder, 29 patients died with recurrence in the mouth. The disease recurred in most of them very quickly, and all those patients went through the same suffering before death which they would have had if no operation had been performed. Therefore we must regard those particular operations as absolutely unsuccessful. One patient is said to have died of secondary disease, and 41 patients died from affection of the lymphatic glands without recurrence in the mouth. So here you have 84 people who died either of recurrence in the mouth or of affection of the lymphatic glands, or of the operation itself out of 129 persons operated upon for cancer of the tongue. Truly it is a deplorable state of surgery. I have no hesitation in saying it is pitiable; and if we cannot do better than that in the future it seems to me to speak very badly either for the art of surgery or for something connected with it.

Naturally when first I began to consider these results I tried to discover what I might call extenuating circumstances. I mean in this way: I said, Very well; if I were to perform these operations over again, upon the same people or on similar cases, I do not think I should lose so many patients from the operation. I think now, with the experience I have, and particularly with the routine practice of preliminary laryngotomy, that I could operate with a very much smaller mortality.

Again, I should know better now than to operate on some of the patients on whom I operated years ago; for many of the cases were extremely bad, almost hopeless; but in this hospital our rule in cases of malignant disease—and it is the rule of all my colleagues—is to operate if there seems to be the smallest chance of relieving the patient. It is a rule which is very destructive to good statistics, but it is a good rule, and I hope we shall adhere to it.

On the other hand, I had to acknowledge that several of the patients who died of the operation, or who died shortly afterwards from some other disease than cancer of the tongue,

would certainly, had they lived, have suffered from recurrence of the disease within the mouth or of affection of the lymphatic glands. And even this was not all; for, as I thought, I remembered how many people I had seen in public and in private practice suffering from cancer of the tongue which had passed beyond the reach of operation. I assure you, by the time I had finished the study from this point of view, I felt very miserable about the future of the operative surgery of cancer of the tongue. Nor should I have cared to lecture on the subject to-day, had it not, on still further consideration, presented itself to me in another form.

DIAGNOSIS OF CANCER: PREDISPOSING CAUSES.

In this way. There is, perhaps, no part of the body in which early operation for cancer is called for so urgently as in the tongue; and there is no part of the body in which early operation is likely to be attended by better results. So that, if the disease could be diagnosed at an early period of its existence, and if the patients could be induced to undergo operation during the early period of the disease, it might and would be possible to exhibit far other results than those which are before you to-day. Now, I venture to say that there is no part of the body, unless it be the face—certainly, there is no internal organ of the body—in which the early diagnosis of cancer is so easy as the tongue. Is there any internal organ which is so easy to observe, or which is more frequently observed? People look at their tongues whether there is anything the matter with them or not. The first thing a doctor does when he comes into the house is to look at the patient's tongue; it is before him; there is no difficulty in examining any part of the tongue except the posterior part, where cancer certainly does sometimes occur, but where it is rarely within the reach of successful operation. So if you come to consider the ease with which the tongue can be examined, and every change which it undergoes can be observed, you will see at once that a diagnosis of a surface disease ought to be comparatively easy, and that certainly it ought to be made very early. Then, again, the tongue is a part of the body in which the preparation for cancer is made in the most elaborate and deliberate fashion. Here I have for your inspection some drawings which are well worth looking at and bearing in mind. Here is a condition of chronic superficial glossitis, with red patches on the dorsum and borders of the tongue; and if you examine such a condition as this you will find cracks and fissures, and excoriations, and chronic ulcers. Take another variety—for instance, this, in which the tongue looks at first to be covered with bluish fur, a sort of film, perfectly smooth. There are no appendages of papillae on it at all. Here is another which looks as if a thick daub of white paint had been placed upon the middle of the tongue. Here is another, in which a similar condition exists, but in which you have the association of chronic superficial glossitis, and this white material which is called leukoplakia. All these are *predisposing* conditions to cancer of the tongue; they are predisposing so far and to such an extent that I believe if you take 100 cases of cancer of the tongue, in about 90 of them the cancer will have been preceded by one or other or a combination of these conditions. We speak of all these conditions as being due to chronic superficial inflammation. I do not know whether that is quite correct. I believe some of them are degenerative changes. In any case they are so frequently associated with chronic superficial inflammation that you may class them all together under the general term of chronic superficial glossitis and its results. Now, whether this be due to past syphilis, or whether it be due to rheumatism and gout, or whether it be due to much smoking or to much drink, is of small consequence; nor does it make much difference which variety of these superficial troubles the patient suffers from. All the people who have them are much more liable to cancer of the tongue than other people are; it is a preparation for the occurrence of cancer at some later period. You must not suppose that everybody who has a tongue in one or other of these conditions is sure to have cancer. A man may have a tongue like this for fifteen, twenty, or thirty years, and yet never have cancer; but the man who has this condition is more liable to cancer of the tongue than a man whose tongue is healthy. Again, when once these conditions have been established, no matter what they are, never again, by any means that I know of, can the tongue be made like it was before; so that these conditions of tongue, once established, remain throughout the patient's life.

The knowledge of the relation of these conditions to cancer

is not limited to a few people; it is common knowledge. Every medical man who sees these conditions has in his mind the possibility that his patient may be the subject of cancer of the tongue; and not only the medical man but often the patient is perfectly aware of his liability to cancer, especially if he be educated and well-informed; so that it is very rare indeed, when a person comes to see me with one of these conditions of the tongue, that he does not ask me whether he has cancer or whether I think he is likely to have it.

PRE-CANCEROUS CONDITIONS.

Then there are certain *pre-cancerous* conditions—conditions which lead up from one of the states I have just described to the actual existence of cancer. These pre-cancerous conditions, I am sorry to say, are not so well known as they ought to be; and I am still more sorry to say that I am to a certain extent responsible for that, for in the first edition of my book on *Diseases of the Tongue* (page 269) I wrote thus:

The first appearance of a carcinoma may vary within very wide limits. It may commence as a blister, as an excoriation, an ulcer, a fissure, a pimple or tiny tubercle, a wart or warty growth, or a lump or nodule in the substance of the tongue.

And a little further down the page I say,

It is not, therefore, so important to remember the number of instances in which carcinoma has first appeared in each one of these forms as it is to bear in mind that each one of these forms of disease is capable of becoming carcinomatous.

Well, that was written at a time when I had not had a very large clinical experience of cancer of the tongue. Within a few years of that time I had seen many cases, and had seen some of them in a comparatively early stage and had watched them. At a meeting of the Harveian Society I brought forward what may be termed a correction of this view. I pointed out that there are certain conditions which are so likely to pass into cancer of the tongue that they may be regarded as absolutely precancerous conditions. I point them out to you now. If you look at this picture you will see a warty growth on a tongue predisposed to cancer. Here is another of a larger size which probably has actually just become cancerous. Here is a picture in which there are warty growths scattered about upon the tongue. These warts and warty growths so certainly become cancer in the course of time that directly they form you may regard them as really pre-cancerous conditions. I can say for myself, I have never known one of these warty growths on a tongue of this kind get well, nor have I known it successfully treated except by destruction or excision; and, as far as my experience goes, it is the most common form in which cancer begins upon these tongues.

DESCRIPTION OF COLOURED DRAWINGS.

Fig. 1.—Thick areas of leucoplakia or leucoma on the right border of the tongue of a woman, one of which is warty and fluffy. Epithelioma afterwards developed in the white areas.

Fig. 2.—White warty growth on the right side of the dorsum of the tongue of a man, the surface of whose tongue had been the seat of smooth leucoma and glossitis for years. The warty growth shows the pre-cancerous stage.

Fig. 3.—The tongue of a man, who had for years suffered from glossitis and leucoma. On the left border is a fully-developed epithelioma and on the dorsum are several small warty growths, in the pre-cancerous stage.

Fig. 4.—Showing a flat chronic ulcer on the under aspect of the right border of the tongue of a lady, in the pre-cancerous stage. It had commenced from the rubbing of a rough tooth, and, after the removal of the tooth, continued to increase in size.

The first three drawings are from the originals in the museum of St. Bartholomew's Hospital, and Mr. Butlin has kindly been permitted to use them. Mr. Mark has lately made Fig. 4 for Mr. Butlin.

Here is another condition which Mr. Mark drew for me the other day. Underneath the border of a tongue which is not in the least predisposed to cancer is a flat ulcer, which was ascribed to the rubbing of a tooth, and probably was due to the rubbing of a tooth. The tooth was taken out, but the ulcer, instead of getting better, slowly spread on the surface of the border of the tongue, and its edge became a little raised and was found to be a little hard. I have seen cancer begin in that form on several occasions, perhaps eight or ten times, and I look upon it as a very dangerous condition which is almost certain to become cancerous. Again, some of these white plaques become cancerous in this fashion: A small or larger area of leucoma or leucoplakia becomes thicker and a little more prominent, and then tends to break down and soften in the centre. Here are white plaques which became cancerous in this fashion. That is a warning; it is a pre-cancerous condition, for out of that condition cancer will almost certainly develop. As to lumps and nodules in the

substance of the tongue, they rarely become cancerous, and the old chronic ulcerations of the tongue rarely become cancerous; they are not nearly so dangerous as the white thick plaques or as the indolent ulcer which makes steady progress in the course of a few weeks or months. Now note again—and it is very important as far as early diagnosis is concerned—all these conditions are on the surface; they are not hidden; they do not lie in the substance of the tongue; they are where anybody can see them. And they are watched. The patient watches them and the doctor watches them, and the doctor applies sometimes one thing and sometimes another, and the disease makes slow progress from week to week.

You will ask why it is—and I have asked myself over and over again—that medical men watch these dangerous conditions for weeks and months until the cancer is absolutely established? Why do not they deal with them earlier? Why do they treat them with nitrate of silver, and washes, and lotions, and dose the patient with potassium iodide, when cancer is developing and growing under their eyes? And why does not the patient press for radical treatment at an earlier date? I believe that the reasons are of several kinds. First, there is a great lack of knowledge, not of the predisposing conditions, but of the actual pre-cancerous conditions, and a lack of knowledge of the changes which indicate the transition from a pre-cancerous into a cancerous condition; that little induration about the base of an ulcer, or a little more raising of its border, a little hardening somewhere, or a little more fixation of the pre-cancerous condition. Even worse than this is the lack of knowledge of the deadly nature of the disease itself and of the very short time it takes to obtain such a hold upon the individual that operation is absolutely hopeless. Three months is an immense time, and even half that time—six or seven weeks—may be fatal to the hope of a successful operation. Yet patients are often watched for many months. You would be surprised if you were to see my notebooks; it is not that men act to their patients otherwise than they act to themselves, for there are doctors who come to me and show me the worst cancers in their own mouths or in the mouth of some relative or friend, and many of these doctors tell me the same thing. Dr. John comes to me with a horrible cancer in his mouth, and at the first glance I know how bad a case it is. He says, "I showed it to my friend Dr. William, and he said, 'My dear boy, that is nothing, you just apply a little caustic and don't bother any more about it.' A few days later I met Dr. James and he had a look at it. He said, 'My dear fellow, that is nothing; don't you bother about that.'" And then, poor wretch, when he cannot sleep at night because of the pain, and the growth has attained a considerable size, he at last comes to me or to some other surgeon—I am sorry to say a good many such patients come to see me—and by that time all hope of doing him good by operation is past. Within the last year certainly, a doctor consulted me about a small warty ulcer upon his tongue. He was a capable person, but I had great difficulty in persuading him to have it removed, and even then I could not persuade him to give me permission to do what I wanted; he would only allow me to remove a small portion of the tongue. At the end of four or five months he came back with what I told him he would have—a new formation, in another part of the tongue, where I had pointed out to him it was very likely to occur. I removed the fore part of the tongue, and he returned to his practice. I wished to remove his glands after the second operation, but he would not hear of it. A few months later he came back with a mass of glands behind the angle of the jaw, fixed, and beyond the reach of operation. And, would you believe it? he told me he had noticed them three or four months? Can you conceive an able medical man playing thus with such a horribly dangerous disease?

Secondly, there is a great prejudice against operations on the tongue. I do not mean to complain that there should be prejudice in the mind of any man against an operation being performed upon himself. It is only natural he should be prejudiced against it. But there is an excessive prejudice both on the part of patients and their doctors against operations on the tongue, however trivial; they fear that death may be the result even of the simplest operation. Therefore I have great difficulty in persuading doctors and their patients that the patient is not in the least likely to die from a small operation on the tongue. I have only lost three or four cases from operation where the whole of the fore part of the tongue, or one half of it, was removed. Two of these patients were of the worst class of

hospital alcoholics; and one patient had been subject to haemophilia all his life, and purposely concealed the fact from me, although he had been told to warn me of his weakness. Generally, you can say to a patient who is otherwise in good health that the operation of removal of one half or of the fore part of the tongue will be attended by no danger to life.

Another prejudice is that the patient will ask you, with all earnestness, Shall I ever be able to speak again? That is in cases where the removal of only a portion of the tongue is necessary. Both he and his doctor think that he will be incapacitated for his business by the removal of a portion of the tongue, and that, at all events, he will not be able to take part in any social functions. I beg of you presently to ask the three patients who are here some questions; large portions of their tongues have been removed, and you will find that they can talk so well that you would hardly be conscious from their conversation that they had ever had a serious operation performed upon the tongue. Another prejudice which presses very much on the minds of some people is that they think if half the tongue is removed they will never be able to take solid food again. I can tell you that, unless the entire tongue has been removed, the patient will take his food quite well; he may have a little more trouble at first in the management of it; but in the course of time he will be able to take the same food and in the same manner as other people. These fears and prejudices produce a want of courage on the part of the patient to undergo an operation on the tongue, and a want of courage on the part of the doctor to advise it at a time when it might be carried out with the best possible result. Hence the delay; hence the trivial treatment of a serious disease until, in 7 or 8 cases out of every 10, the opportunity is allowed to pass, and the patient's life is sacrificed. Seeing the mischief which is wrought by ignorance and prejudice, I determined that you who heard have me lecture to-day should not leave this hospital without at least the chance of knowing better. Bear in mind that the predisposing conditions to cancer of the tongue are as well known as anything in surgery; bear in mind that cancer of the tongue begins on these predisposed tongues in such a manner that anybody and everybody can see it. Bear in mind, too, that a small operation at the right time is worth more than the largest and most admirably designed and conducted operation when the disease is advanced; and, bear in mind that not only the life but the saving of the patient from a hideous death depends upon your knowledge and advice.

Now let me lay down certain rules for your guidance in regard to these matters. In the first place, if you are consulted about warts and warty growths, particularly on tongues which are the seat of one of these predisposing conditions, see that no time is lost in removing them. This should be done by two elliptical incisions which include the healthy tissues around the wart into the muscular substance. The edges are brought together and the wound is healed in four or five days. In the second place, in regard to indolent ulcers upon the surface or under the border of the tongue, which are ascribed to the rubbing of a tooth, see that the cause of the irritation is removed at once. And if, at the end of a week or ten days from that time, the ulcer is not well or healing rapidly, cut it out in precisely the same fashion. Do not hesitate for a moment. The operation is trivial, and may save the patient from great misery, and often from a horrible death. If white patches or plaques become thicker, and if they become a little more prominent, and particularly if they show a tendency to break down in the centre or soften, let them be cut with as little delay as possible. Of late years I have gone further than this, and have advised patients suffering from bad superficial glossitis, where the tongue is constantly irritated, where the patient consequently is always suffering and always in dread and danger of cancer, to have that portion of the tongue removed, even when there is no sign of cancer or of a precancerous condition. I have given that advice particularly when the under-surface is in a healthy condition, so that the mucous membrane can be turned up to make a good covering for the stump. It is very difficult indeed to persuade patients to undergo an operation of that kind. But such patients are infinitely better off and happier for the operation. They speak well enough to carry on their business and to go about like other people, so well that few people would have the least notion that an operation had been performed upon them. They are relieved not only of the fear but of the danger of cancer; and they are able to take all kinds of food which had been

previously denied them on account of the constant irritation which such food produced.

REFERENCE.
1 BRITISH MEDICAL JOURNAL, 1898, vol. i, p. 547.

A Contribution

TO THE

STUDY OF CANCER MORTALITY.

An Address delivered to the Dundee and District Branch of the British Medical Association,

By CHARLES TEMPLEMAN, M.D., D.Sc., M.O.H.,
President of the Branch.

I HAVE first of all to thank you for the honour you have done me in appointing me President of this important Branch of the British Medical Association. With such an energetic Secretary as we possess in Dr. Buist the duties of the Chairman are very light, and the only thing calculated to give rise to serious embarrassment is that it entails the delivery of an address on some subject likely to prove of interest to the members of the Branch.

I have been at a loss to hit upon a subject suitable for such an occasion and such an audience as this, but it occurred to me that in these days, when the subject of cancer was so much in the air, it might be profitable to investigate the incidence of this disease in a manufacturing city such as Dundee, more especially as we possess a record, extending over a quarter of a century, of all certificates of deaths registered in the several districts of the city. From these it has been possible to obtain details as to parts of the body affected, etc., which are not available in the returns of the Registrar-General.

One is constantly being asked why it is that cancer is so much more prevalent now than it was wont to be, and if one were to judge solely by statistics, more especially those of our hospitals, one could not but admit that the question is a very pertinent one.

I propose, therefore, from a study of the cancer mortality in Dundee during the past 25 years—that is, from 1877 to 1901 inclusive—to consider the following questions:

1. Has the mortality from cancer increased?
2. Is the increase real or apparent?
3. If real how is it to be accounted for?

In making such an inquiry one has to bear in mind that the value of a statistical investigation such as this has its limitations. The only data available are the death certificates; and, apart from the fact that the diagnosis of cancer is often very obscure, it must be admitted that only too frequently medical men perform this duty of death certification in a very perfunctory manner, without regard to the important part such returns play in the solution of public health problems. Another fact to be remembered is that these statistics only apply to our own city, and that therefore the conclusions cannot be accepted as of universal application.

It will be apparent to you all at the outset that the comparison of the crude cancer death-rate—that is, the proportion of deaths to the total population—is of little value. Cancer is a disease of adult and later life. As Sir James Paget says: "It is a disease of degeneracy, the frequency of which increases as age advances." It is therefore obvious that a city in which a large proportion of the population are of an age at which cancer does not prevail—that is, in childhood and youth—will give us a low crude death-rate for this disease, while another in which a large proportion of its population are of mature years will give a high cancer death-rate, although the actual incidence of the disease in both be the same. In the same way, as the death-rate from cancer in females is higher than in males at all ages, this death-rate in any locality will vary according to the proportion of the sexes living there.

The manner in which this investigation has been carried out is as follows:

All the deaths from cancer have been extracted from the registers in the Public Health Department. Persons who have died in the infirmary but who resided outside the city boundaries have been excluded, but we have not the information necessary to allow us to include persons belonging to the

city who have died from cancer elsewhere. The former class has of late years been considerable, but the latter class has never been so large as to materially affect our figures. The deaths included are those of persons over 20. The few deaths in earlier years are certified as due to "sarcoma."

For the purpose of comparison the period over which the inquiry extends has been divided into five quinquennia. The rates given are the mean annual death-rate per 10,000 of the population over 20, unless where otherwise stated. These deaths have been carefully classified according to: (1) Sex, (2) age, (3) part of the body affected (in each sex).

TABLE I.—Showing the Total Number of Deaths from Cancer in Persons over 20 Years of Age.

	Males.	Females.	Total.
1877-1881	72	202	274
1882-1886	84	250	334
1887-1891	162	337	499
1892-1896	106	390	586
1897-1901	258	510	768

TABLE IA.—Showing Death-rates per 10,000 of Persons of each Sex over the Age of 20.

	Males.	Females.	Total.
1877-1881	4.97	9.25	7.27
1882-1886	5.45	11.46	8.77
1887-1891	9.83	13.87	12.24
1892-1896	11.27	15.27	13.65
1897-1901	14.02	18.90	16.92

These tables show us three facts: (1) that the total mortality during this period has more than doubled; (2) that the cancer mortality in males has during the whole of this period been considerably less than that of females; and (3) that the increase during this time has been almost the same in both sexes—namely, 9.05 per 10,000 in the case of males, and 9.65 per 10,000 in the case of females, though proportionately the increase in males is much the greater, having nearly trebled, while that of females has little more than doubled. The following chart shows this graphically:

Dundee
Cancer Death rate per
10,000 of Population over
twenty years of age.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.